PROJECT MANUAL

Phase II Electrical Replacement & Replace Generators & Transfer Switches, Infrastructure

Algoa Correctional Center

Designed By: RTM Engineering Consultants LLC
3701 S. Lindbergh Boulevard
St Louis, MO 63127

Date Issued: April 16, 2025

Project No.: C2402-01

STATE *of* MISSOURI

OFFICE *of* ADMINISTRATION

Facilities Management, Design and Construction

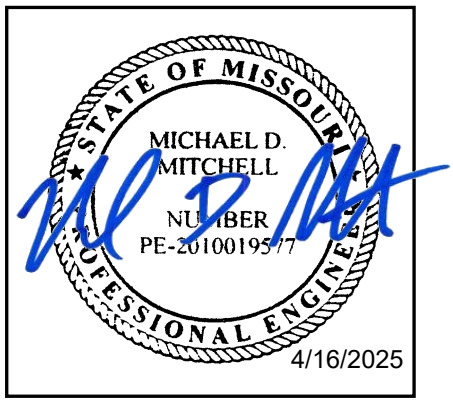
SECTION 000107 - PROFESSIONAL SEALS AND CERTIFICATIONS

PROJECT NUMBER: C2402-01 "ELECTRICAL REPLACEMENT & REPLACE GENERATORS & TRANSFER SWITCHES"

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

Design Professionals of Record:

1. Work (General, Electrical)
    a. RTM Engineering Consultants, LLC
    b. Michael Mitchell
    c. PE-2010019577
    d. Sections responsible for: Divisions 01, 26, 31, 32



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SECTION 000115 – LIST OF DRAWINGS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

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

PART 2 - PRODUCTS (NOT APPLICABLE)

PART 3 - EXECUTION

3.1 LIST OF DRAWINGS

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

	TITLE	SHEET #	DATE	CAD #
1.	Cover Sheet	Sheet G-001	04/16/2025	
2 .	Project Phasing Information & Drawing Index	Sheet G-002	04/16/2025	
3.	Electrical Legend and Notes	Sheet E-001	04/16/2025	
4.	Site Plan - Electrical	Sheet E-101	04/16/2025	
5.	Service Building First Floor Plan - Electrical	Sheet E-102	04/16/2025	
6.	Service Building Second Floor Plan - Electrical	Sheet E-103	04/16/2025	
7.	Details - Electrical	Sheet E-500	04/16/2025	
8.	Details - Electrical	Sheet E-501	04/16/2025	
9.	One-Line Diagram – Electrical Demolition	Sheet E-600	04/16/2025	
10.	One-Line Diagram - Electrical New	Sheet E-601	04/16/2025	

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. Phase II Electrical Replacement & Replace Generators & Transfer Switches, Infrastructure
Algoa Correctional Center
Jefferson City, Missouri
Project No.: C2402-01

3.0 BIDS WILL BE RECEIVED:

A. Until: 1:30 PM, July 10, 2025

B. **Only electronic bids sent to FMDCBids@oa.mo.gov shall be accepted: (See Instructions to Bidders for further detail)**

4.0 DESCRIPTION:

A. Scope: The project includes providing a standby emergency generator and switchgear systems to support the existing medium voltage distribution system for the campus of Algoa Correctional Center. The project also includes work under alternate bids to replace portions of deteriorated feeders serving housing units and replacing an existing kitchen panelboard.

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

5.0 PRE-BID MEETING:

A. Place/Time**:** 10:00 AM, June 27, 2025, at Algoa Correctional Center, Administration Building Conference Room, 8501 No More Victims Rd., Jefferson City, MO 65101

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: RTM Engineering Consultants LLC, Matthew Crook, (314) 492-5914, email: matt.crook@rtmec.com

B. Project Manager: Shannon Thompson, (573) 257-7137, email: Shannon.Thompson@oa.mo.gov

8.0 GENERAL INFORMATION:

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

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

SECTION 002113 – INSTRUCTIONS TO BIDDERS

1.0 - SPECIAL NOTICE TO BIDDERS

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

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

2.0 - BID DOCUMENTS

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

B. For the convenience of contractors, subcontractors and suppliers, bidding documents are available on the Owner's website at https://oa.mo.gov/facilities/bid-opportunities/bid-listing-electronic-plans.

3.0 - BIDDERS' OBLIGATIONS

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

B. Under no circumstances will Bidders give their plans and specifications to other Bidders. It is highly encouraged, but not required, that all Bidders be on the official planholders list to receive project updates including but not limited to any addenda that are issued during the bidding process.

4.0 - INTERPRETATIONS

A. No Bidder shall be entitled to rely on oral or written representations from any person as to the meaning of the plans and specifications or the acceptability of alternate products, materials, form or type of construction.

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

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

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

5.0 - BIDS AND BIDDING PROCEDURE

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

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

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

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

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

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

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

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

6.0 - SIGNING OF BIDS

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

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

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

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

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

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

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

7.0 - RECEIVING BID SUBMITTALS

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

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

8.0 - MODIFICATION AND WITHDRAWAL OF BIDS

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

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

9.0 - AWARD OF CONTRACT

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

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

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

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

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

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

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

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

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

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

10.0 - CONTRACT SECURITY

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

11.0 - LIST OF SUBCONTRACTORS

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

12.0 - WORKING DAYS

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

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

13.0 - AMERICAN AND MISSOURI - MADE PRODUCTS AND FIRMS

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

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

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

14.0 – ANTI-DISCRIMINATION AGAINST ISRAEL ACT CERTIFICATION:

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

15.0 - MBE/WBE/SDVE INSTRUCTIONS

A. Definitions:

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

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

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

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

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

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

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

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

B. MBE/WBE/SDVE General Requirements:

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

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

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

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

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

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

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

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

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

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

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

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

D. Certification of MBE/WBE/SDVE Subcontractors:

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

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

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

E. Waiver of MBE/WBE/SDVE Participation:

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

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

   a. The amount of actual participation obtained;

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

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

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

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

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

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

F. Contractor MBE/WBE/SDVE Obligations

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

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

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

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

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

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

State of Missouri
Construction Contract

THIS AGREEMENT is made (DATE) by and between:

Contractor Name and Address

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

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

ARTICLE 1. STATEMENT OF WORK

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

Project Name: **Phase II Electrical Replacement & Replace Generators & Transfer Switches, Infrastructure**

Algoa Correctional Center
Jefferson City, Missouri

Project Number: **C2402-01**

in strict accordance with the Contract Documents as enumerated in Article 7, all of which are made a part hereof.

ARTICLE 2. TIME OF COMPLETION

The contract performance time is **540 working days** from the transmittal date of this agreement. The contract completion date is **MONTH, DAY, YEAR**. This time includes ten (10) working days for the Contractor to receive, sign and return the contract form along with required bonding and insurance certificates. Failure of the Contractor to provide correct bonding and insurance within the ten (10) working days shall not be grounds for a time extension. Receipt of proper bonding and insurance is a condition precedent to the formation of the contract and if not timely received, may result in forfeiture of the Contractor's bid security. Work may not commence until the Owner issues a written Notice to Proceed and must commence within seven (7) working days thereafter.

ARTICLE 3. LIQUIDATED DAMAGES

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

ARTICLE 4. CONTRACT SUM

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

Base Bid: $

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

TOTAL CONTRACT AMOUNT: ($CONTRACT AMOUNT)

UNIT PRICES: The Owner accepts the following Unit Prices:

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

ARTICLE 5. PREVAILING WAGE RATE

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

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

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

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

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

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

Total $

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

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

ARTICLE 7. CONTRACT DOCUMENTS

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

1. Division 0 – Procurement and Contracting Information, including, but not limited to:
    a. Invitation for Bid (Section 001116)
    b. Instructions to Bidders (Section 002113)
    c. Supplementary Instructions to Bidders (if applicable) (Section 002213)
    d. The following documents as completed and executed by the Contractor and accepted by the Owner, if applicable:
        i. Bid Form (Section 004113)
        ii. Unit Prices (Section 004322)
        iii. Proposed Contractors Form (Section 004336)
        iv. MBE, WBE, SDVE Compliance Evaluation Form(s) (Section 004337)
        v. MBE, WBE, SDVE Eligibility Determination Form for Joint Ventures (Section 004338)
        vi. MBE, WBE, SDVE Good Faith Effort (GFE) Determination Form (Section 004339)
        vii. Missouri Service Disabled Veteran Business Form (Section 004340)
        viii. Affidavit of Work Authorization (Section 004541)
        ix. Affidavit for Affirmative Action (Section 005414), if applicable
    e. Performance and Payment Bond, completed and executed by the Contractor and surety (Section 006113)
    f. General Conditions (Section 007213)
    g. Supplementary Conditions (Section 007300)
    h. Supplementary General Conditions for Federally Funded/Assisted Construction Projects (Section 007333), if applicable
    i. Wage Rate(s) (Section 007346)
2. Division 1 – General Requirements
3. All Drawings identified in the Project Manual
4. All Technical Specifications included in the Project Manual
5. Addenda, if applicable

ARTICLE 8 – CERTIFICATION

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

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

APPROVED:

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

_____
Contractor's Authorized Signature

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

_____
Corporate Secretary

Bond No._____

SECTION 006113 - PERFORMANCE AND PAYMENT BOND FORM

KNOW ALL MEN BY THESE PRESENTS, THAT we _____

as principal, and _____

_____as Surety, are held and firmly bound unto the

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

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

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

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

_____

_____

_____

(Insert Project Title and Number)

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

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

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

AS APPLICABLE:

AN INDIVIDUAL

Name: _____

Signature: _____

A PARTNERSHIP

Name of Partner: _____

Signature of Partner: _____

Name of Partner: _____

Signature of Partner: _____

CORPORATION

Firm Name: _____

Signature of President: _____

SURETY

Surety Name: _____

Attorney-in-Fact: _____

Address of Attorney-in-Fact: _____

_____

Telephone Number of Attorney-in-Fact: _____

Signature Attorney-in-Fact: _____

NOTE: Surety shall attach Power of Attorney

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

PRODUCT SUBSTITUTION REQUEST

PROJECT NUMBER

PROJECT TITLE AND LOCATION

CHECK APPROPRIATE BOX

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

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

FROM: BIDDER/CONTRACTOR (PRINT COMPANY NAME)

TO: ARCHITECT/ENGINEER (PRINT COMPANY NAME)

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

SPECIFIED PRODUCT OR SYSTEM

SPECIFICATION SECTION NO.

SUPPORTING DATA

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

☐ Sample ☐ Sample will be sent, if requested

QUALITY COMPARISON

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

PREVIOUS INSTALLATIONS

PROJECT	ARCHITECT/ENGINEER	
LOCATION		DATE INSTALLED

SIGNIFICANT VARIATIONS FROM SPECIFIED PRODUCT

REASON FOR SUBSTITUTION

_____

_____

_____

_____

_____

_____

DOES PROPOSED SUBSTITUTION AFFECT OTHER PARTS OF WORK?

☐ YES ☐ NO

IF YES, EXPLAIN _____

_____

_____

_____

_____

_____

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

☐ YES ☐ NO

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

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

BIDDER/CONTRACTOR	DATE

REVIEW AND ACTION

☐ Resubmit Substitution Request with the following additional information:

_____

☐ Substitution is accepted.

☐ Substitution is accepted with the following comments:

_____

☐ Substitution is not accepted.

ARCHITECT/ENGINEER	DATE

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

FINAL RECEIPT OF PAYMENT AND RELEASE

PROJECT NUMBER

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

(PROJECT TITLE, PROJECT LOCATION, AND PROJECT NUMBER)

at

(ADDRESS OF PROJECT)

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

DOES HEREBY:

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

DATED this day of , 20 .

NAME OF SUBCONTRACTOR

BY (TYPED OR PRINTED NAME)

SIGNATURE

TITLE

ORIGINAL: FILE/Closeout Documents

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

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

MBE/WBE/SDVE PROGRESS REPORT

Remit with **ALL** Progress and Final Payments

(Please check appropriate box) ☐CONSULTANT ☐CONSTRUCTION

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

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

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

Revised 06/2023

INSTRUCTIONS FOR MBE/WBE/SDVE PROGRESS REPORT

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

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

At Initial Pay Application fill in the following:

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

For all subsequent Pay Applications fill in the following:

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

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

PROJECT NUMBER

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

State of _____ personally came and appeared _____
(NAME)

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

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

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

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

SIGNATURE

NOTARY INFORMATION

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

FILE: Closeout Documents

GENERAL CONDITIONS

INDEX

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

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

ARTICLE 1 – GENERAL PROVISIONS

ARTICLE 1.1 - DEFINITIONS

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

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

ARTICLE 1.2 DRAWINGS AND SPECIFICATIONS

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

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

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

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

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

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

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

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

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

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

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

E. Any contractor or subcontractor to such contractor at any tier signing a contract to work on this project shall provide a ten-hour Occupational Safety and Health Administration (OSHA) construction safety program for their on-site employees which includes a course in construction safety and health approved by OSHA or a similar program approved by the Department of Labor and Industrial Relations which is at least as stringent as an approved OSHA program. The contractor shall forfeit as a penalty to the public body on whose

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

ARTICLE 1.4 - NONDISCRIMINATION IN EMPLOYMENT

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

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

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

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

ARTICLE 1.5 - ANTI-KICKBACK

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

ARTICLE 1.6 - PATENTS AND ROYALTIES

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

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

ARTICLE 1.7 - PREFERENCE FOR AMERICAN AND MISSOURI PRODUCTS AND SERVICES

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

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

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

ARTICLE 1.8 - COMMUNICATIONS

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

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

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

ARTICLE 1.9 - SEPARATE CONTRACTS AND COOPERATION

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

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

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

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

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

F. Should a Contractor sustain any damage through any act or omission of any other Contractor having a contract with the Owner, the Contractor so damaged shall have no claim or cause of action against the Owner for such damage, but shall have a claim or cause of action against the other Contractor to recover any and all damages sustained by reason of the acts or omissions of such Contractor. The phrase "acts or omissions" as used in this section shall be defined to include, but

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

ARTICLE 1.10 - ASSIGNMENT OF CONTRACT

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

ARTICLE 1.11 - INDEMNIFICATION

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

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

ARTICLE 1.12 - DISPUTES AND DISAGREEMENTS

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

ARTICLE 2 -- OWNER/DESIGNER RESPONSIBILITIES

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

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

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

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

E. Failure or neglect on the part of Owner to observe faulty work, or work done which is not in accordance with the drawings and specifications shall not relieve the Contractor from responsibility for correcting such work without additional compensation.

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

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

2. If the Contractor is directed to uncover work, which was not otherwise required by the Contract Documents to be inspected, and the work is found to be defective in any respect, no compensation shall be allowed for this work. If, however, such work is found to meet

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

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

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

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

ARTICLE 3 -- CONTRACTOR RESPONSIBILITIES

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

ARTICLE 3.1 -- ACCEPTABLE SUBSTITUTIONS

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

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

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

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

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

1. Written verification is received from the manufacturer stating they cannot make delivery on the date previously agreed, or
2. Material delivered fails to comply with contract requirements.

ARTICLE 3.2 -- SUBMITTALS

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

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

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

B. All subcontractors' shop drawings and schedules shall be submitted by the Contractor and shall bear evidence that Contractor has received, reviewed, and approved them. Any shop drawings and schedules submitted without this evidence will be returned to the Contractor for resubmission.

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

D. The Designer shall check shop drawings and schedules with reasonable promptness and approve them only if they conform to the design concept of the project and comply with the information given in the contract documents. The approval shall not relieve the Contractor from the responsibility to comply with the drawings and specifications, unless the Contractor has called the Designer's attention to the deviation, in writing, at the time of

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

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

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

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

ARTICLE 3.3 – AS-BUILT DRAWINGS

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

ARTICLE 3.4 – GUARANTY AND WARRANTIES

A. General Guaranty

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

B. Extended Warranty

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

ARTICLE 3.5 -- OPERATION AND MAINTENANCE MANUALS

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

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

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

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

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

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

   b. Belt sizes, types, and lengths.

   c. Wiring diagrams.

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

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

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

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

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

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

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

ARTICLE 3.6 – OTHER CONTRACTOR RESPONSIBILITIES

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

ARTICLE 3.7 -- SUBCONTRACTS

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

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

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

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

ARTICLE 4 -- CHANGES IN THE WORK

4.1 CHANGES IN THE WORK

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

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

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

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

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

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

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

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

2. The percentages for overhead and profit charged on Contract Changes shall be subject to the following limits: (a) the percentage mark-up for the Contractor shall be limited to the Contractor’s fee: (b) fifteen percent (15%) maximum for Work directly performed by employees of a subcontractor, or sub-subcontractor; (c) five percent (5%) maximum for the Work performed or passed through to the Owner by the Contractor; (d) five percent (5%) maximum subcontractor’s mark-up for

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

3. The Contractor will be allowed to add the cost of Contractor's payment and performance bonding, builder's risk insurance, and general liability insurance to their cost of work. The above listed bonding and insurance cost shall not exceed two percent (2%) and shall be allowed on the total cost of the added work, including overhead and profit.

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

5. The percentage(s) for overhead and profit to be credited to the Owner on Contract Changes that are solely decreases in the quantity of work or materials shall be the same as those for additive Contract Changes provided above.

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

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

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

ARTICLE 4.2 – CHANGES IN COMPLETION TIME

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

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

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

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

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

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

2. Labor strikes or acts of God occur, OR

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

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

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

ARTICLE 5 - CONSTRUCTION AND COMPLETION

ARTICLE 5.1 – CONSTRUCTION COMMENCEMENT

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

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

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

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

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

ARTICLE 5.2 -- PROJECT CONSTRUCTION

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

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

ARTICLE 5.3 -- PROJECT COMPLETION

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

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

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

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

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

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

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

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

ARTICLE 5.4 -- PAYMENT TO CONTRACTOR

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

1. Updated construction schedule
2. Certified payrolls consisting of name, 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:
Matthew Crook
RTM Engineering Consultants LLC
3701 S. Lindbergh Boulevard
St Louis, MO 63127
Telephone: (314) 492-5914
Email: matt.crook@rtmec.com

Construction Representative:
Brendan Frazer
Division of Facilities Management, Design and Construction
709 Missouri Blvd (Upper Level)
Jefferson City, MO 65109
Telephone: 573-690-4958
Email: brendan.frazer@oa.mo.gov

Project Manager:
Shannon Thompson
Division of Facilities Management, Design and Construction
301 West High Street, Room 730
Jefferson City, Missouri 65101
Telephone: 573-257-7137
Email: Shannon.Thompson@oa.mo.gov

Contract Specialist:
Paul Girouard
Division of Facilities Management, Design and Construction
301 West High Street, Room 730
Jefferson City, Missouri 65101
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. 31

Section 026
COLE 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 8, 2024**

Last Date Objections May Be Filed: **April 8, 2024**

Prepared by Missouri Department of Labor and Industrial Relations

OCCUPATIONAL TITLE	**Prevailing Hourly Rate
Asbestos Worker	$62.47
Boilermaker	$30.53*
Bricklayer-Stone Mason	$54.17
Carpenter	$50.84
Lather	
Linoleum Layer	
Millwright	
Pile Driver	
Cement Mason	$43.74
Plasterer	
Communication Technician	$57.89
Electrician (Inside Wireman)	$58.31
Electrician Outside Lineman	$30.53*
Lineman Operator	
Lineman - Tree Trimmer	
Groundman	
Groundman - Tree Trimmer	
Elevator Constructor	$30.53*
Glazier	$56.48
Ironworker	$68.93
Laborer	$43.22
General Laborer	
First Semi-Skilled	
Second Semi-Skilled	
Mason	$30.53*
Marble Mason	
Marble Finisher	
Terrazzo Worker	
Terrazzo Finisher	
Tile Setter	
Tile Finisher	
Operating Engineer	$67.64
Group I	
Group II	
Group III	
Group III-A	
Group IV	
Group V	
Painter	$42.11
Plumber	$70.54
Pipe Fitter	
Roofer	$54.75
Sheet Metal Worker	$57.54
Sprinkler Fitter	$52.79
Truck Driver	$30.53*
Truck Control Service Driver	
Group I	
Group II	
Group III	
Group IV	

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

OCCUPATIONAL TITLE	**Prevailing Hourly Rate
Carpenter	$55.19
Millwright	
Pile Driver	
Electrician (Outside Lineman)	$80.11
Lineman Operator	
Lineman - Tree Trimmer	
Groundman	
Groundman - Tree Trimmer	
Laborer	$48.42
General Laborer	
Skilled Laborer	
Operating Engineer	$63.82
Group I	
Group II	
Group III	
Group IV	
Truck Driver	$48.68
Truck Control Service Driver	
Group I	
Group II	
Group III	
Group IV	

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

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

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

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

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

OVERTIME
and
HOLIDAYS

OVERTIME

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

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

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

HOLIDAYS

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

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

SECTION 011000 – SUMMARY OF WORK

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 WORK COVERED BY CONTRACT DOCUMENTS

A. The Project consists of providing a standby emergency generator and switchgear systems to support the existing medium voltage distribution system for the campus of Algoa Correctional Center. The project also includes work under alternate bids to replace portions of deteriorated feeders serving housing units and replacing an existing kitchen panelboard.

1. Project Location: **8501 No More Victims Road, Jefferson City, MO, 65101**.
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 April 16, 2025 were prepared for the Project by RTM Engineering Consultants, LLC.

C. The Work under Base Bid consists of providing a new standby emergency generator system, medium voltage switchgear with Automatic Transfer Switch (ATS) operation, low voltage switchgear, pad-mount transformer, and generator docking station. The new medium voltage switchgear will be service entrance rated and will be provided with a new medium voltage service entrance feeder from Ameren. After the new electrical service is energized and commissioned, the existing service entrance connection from Ameren will be demolished, and the existing switchgear that provides medium voltage distribution to the Algoa Correctional Center camps will be reconnected to the new medium voltage switchgear. The Base Bid Work also includes cleaning and re-torquing existing line-side feeder connections to the existing 480V panelboard at the kitchen of the Service Building.

1. Base Bid Work includes:
    a. Providing a 1500kw, 480Y/277V, 3-phase, 4-wire diesel-engine generator with weatherproof enclosure, 72-hour base tank (with fuel for testing, commissioning and top-off), and a 100-amp 480Y/277V auxiliary panelboard.
    b. Providing a generator docking station with separate camlocks connections for connecting a portable generator and a portable load bank.
    c. Providing 480V, 3-phase, 3-wire low voltage switchgear with breakers and kirk-key interlock to select and isolate temporary power source connections.
    d. Providing a 2000kVA padmount transformer, 480V Primary (wye), 12.47KV secondary (delta).
    e. Providing medium voltage service entrance switchgear with protective relays and main breakers for automatic transfer operation of utility and emergency power sources. The switchgear shall comply with Ameren Standard CE-10, including provisions for “cold sequence” metering.

f. Coordinating with the Electrical Utility Company (Ameren) to provide a new utility pole and medium voltage service-entrance conductors in an underground duct provided by the Contractor.
g. From the new medium voltage switchgear, back-feeding existing service entrance and distribution switchgear that provides power to the existing medium voltage loop encircling the campus at Algoa Correctional Center.
h. Providing a PLC with automatic transfer controls and human machine interface (HMI) in the medium voltage / ATS switchgear.
i. Providing a second HMI at the Security Office to mirror and monitor information displayed at the HMI in the medium voltage / ATS switchgear.
j. Providing a generator annunciator at the maintenance office.
k. Providing concrete equipment pads for the generator, medium voltage / ATS switchgear, padmount transformer, low voltage switchgear and generator docking station.
l. Providing a ground ring around the medium voltage / ATS switchgear and padmount transformer; bonding from the ground ring to the equipment.
m. Grounding and bonding for the generator, low voltage switchgear, and generator docking station.
n. Trenching and backfilling and/or boring.
o. Submittal coordination to ensure the PLC ATS controls and protective relays comply with Ameren document CE-10 standards.
p. Coordination to have Ameren-provided CT and metering equipment shipped to the factory and installed by in the medium voltage switchgear by the factory.
q. Pre-testing and commissioning of the generator and ATS operations with Ameren field representatives.
r. Coordinating with Ameren to energize the new medium voltage service entrance equipment and demolish the existing utility pole and service conductors to the existing equipment.
s. Cleaning existing line-side feeder connections at Kitchen Panel KP in the Service Building and reconnecting them utilizing anti-oxidation compound and torquing the connections to factory specifications.

D. The Work under Alternate Bid #1 consists of replacing a portion of each feeder from Distribution Panelboard DP1 in the Service Building's electrical room to Housing Units #6 through #10.

1. Alternate Bid #1 Work includes:
   a. Intercepting existing 480V, single-phase feeders in the tunnel leading to Housing Units #6 through #10 (5 feeders total). Disconnect each feeder at the point of interception with enough slack for splicing. The remaining portions of the feeder conduits and conductors to each Housing Unit's main disconnect shall remain and be reused.
   b. Providing new junction/splice boxes for each feeder and connecting to the remaining feeder portion in the tunnel. See Drawings for approximate locations.
   c. Demolishing existing feeder conductors and their conduit systems from the new junction/splice boxes to existing Distribution Panelboard DP1 in the Service Building. Conduits and conductors that cannot be removed due to deterioration may be abandoned in place. Existing conduits and wireways in the Service Building's electrical room shall not be demolished.
   d. Providing new feeder conduits and conductors from each junction/splice box to Panelboard DP1 and making connections.

e. Splicing new feeders to existing feeders at the new junction/splice boxes.
f. Testing each feeder after modifications are made to confirm continuity and integrity of insulation resistance per current ANSI NETA testing standards.
g. Providing temporary power to include a standby generator, portable power cables, fuel and connections to Housing Units if scheduled power outages to replace feeders extend beyond daylight hours.
h. Replacing 500 linear feet (LF) of additional feeder conductors determined to be defective, (2) #2/0 and (1) #6 ground in existing conduit, from junction/splice box at tunnel to existing disconnect switch(es) located in Housing Unit(s) #6 through #10. Additional or unused portions of the feeder conductors will be addressed in the Section 012200 - Unit Prices Specification.

E. The Work under Alternate Bid #2 consists of replacing a portion of each feeder from Distribution Panelboard DP1 in the Service Building's electrical room to Housing Units #1 through #5.

1. Alternate Bid #2 Work includes:
   a. Intercepting existing 480V, single-phase feeders in the tunnel leading to Housing Units #1 through #5 (5 feeders total). Disconnect each feeder at the point of interception with enough slack for splicing. The remaining portions of the feeder conduits and conductors to each Housing Unit's main disconnect shall remain and be reused.
   b. Providing new junction/splice boxes for each feeder and connecting to the remaining feeder portion in the tunnel. See Drawings for approximate locations.
   c. Demolishing existing feeder conductors and their conduit systems from the new junction/splice boxes to existing Distribution Panelboard DP1 in the Service Building. Conduits and conductors that cannot be removed due to deterioration may be abandoned in place. Existing conduits and wireways in the Service Building's electrical room shall not be demolished.
   d. Providing new feeder conduits and conductors from each junction/splice box to Panelboard DP1 and making connections.
   e. Splicing new feeders to existing feeders at the new junction/splice boxes.
   f. Testing each feeder after modifications are made to confirm continuity and integrity of insulation resistance per current ANSI NETA testing standards.
   g. Providing temporary power to include a standby generator, portable power cables, fuel and connections to Housing Units if scheduled power outages to replace feeders extend beyond daylight hours.
   h. Replace 500 linear feet (LF) of additional feeder conductors determined to be defective, (2) #2/0 and (1) #6 ground in existing conduit, from junction/splice box at tunnel to existing disconnect switch(es) located in Housing Unit(s) #1 through #5. Additional or unused portions of the feeder conductors will be addressed in the Section 012200 - Unit Prices Specification.

F. The Work under Alternate Bid #3 consists of replacing existing kitchen panelboard PP1 in the Service Building.

1. Alternate Bid #3 Work includes:
   a. Replacing existing panelboard PP1 at its current location, utilizing the existing enclosure.
   b. Disconnecting and protecting existing branch circuits/feeder and saving them for reconnection to the new panelboard.
   c. Providing a new 400-amp, 3-phase, 3-wire panelboard to include a main circuit breaker, copper buss assembly, copper ground bar, branch circuit breakers, and

dead-front. The new panelboard shall be installed in the existing panelboard enclosure.
d. Terminate existing branch circuits/feeders to breakers in the new panelboard.
e. Provide field-measuring and a custom-fabricated, painted cover with returned edges to trim the cover to the finished wall.

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

1.3 WORK SEQUENCE

A. The Work will be conducted in five phases. **The Work for each phase is described in detail on Sheet G-002.**

1. PHASE 1: Procurement and Non-Critical Work

PHASE 1 DURATION IS 456 WORKING DAYS FROM NOTICE TO PROCEED.

a. Upon Notice to Proceed, the Contractor shall diligently pursue shop drawings for long-lead items, such as the generator, medium voltage / ATS switchgear, padmount transformer, low-voltage switchgear, and the generator docking station.
b. Provide all necessary coordination with Ameren to confirm compliance with Ameren design standards in Document CE-10, and to resolve any discrepancies.
c. Replace portions of existing feeders to Housing Units #6 through #10 (Alternate Bid #1) and Housing Units #1 through #5 (Alternate Bid #2).
d. Replace existing Panelboard PP1 in the kitchen of the Service Building (Alternate Bid #3).

2. PHASE 2: Preparation for Installation of Generator, MV / ATS Switchgear, Padmount Transformer, LV Switchgear, and Generator Docking Station

PHASE 2 DURATION IS 352 WORKING DAYS FROM NOTICE TO PROCEED.

PHASE 2 WORK SHALL BE COMPLETED PRIOR TO THE SCHEDULED DELIVERY OF THE MEDIUM VOLTAGE / ATS SWITCHGEAR, PADMOUNT TRANSFORMER, AND LOW-VOLTAGE SWITCHGEAR.

a. Provide underground conduit systems.
b. Provide conduit systems from switchgear to the data room in the Service Building for the HMI to be installed at the Security Office and the generator annunciator to be installed at the Maintenance Office.
c. Provide concrete pads for Generator, MV/ATS Switchgear, padmount transformer, low voltage switchgear, and generator docking station.
d. Provide ground loop for MV / ATS switchgear and padmount transformer.
e. Provide ground systems for LV switchgear and generator.

3. PHASE 3: INSTALL NEW GENERATOR, MV / ATS SWITCHGEAR, PADMOUNT TRANSFORMER, LV SWITCHGEAR, AND GENERATOR DOCKING STATION

PHASE 3 DURATION IS 517 WORKING DAYS FROM NOTICE TO PROCEED.

a. Install the generator, MV/ATS switchgear, padmount transformer, LV switchgear, and generator docking station.
b. Complete installation of feeder conductors, auxiliary circuits, and controls.
c. Complete bonding of ground loop to the MV/ATS switchgear and padmount transformer.
d. Complete bonding of grounding systems to the LV switchgear and generator.
e. Complete installation of the HMI at the Security Office and the generator annunciator at the Maintenance Office.
f. Coordinate with Ameren to provide medium voltage service entrance conductors to the MV/ATS switchgear and energize.
g. Provide generator load bank testing and commissioning by a factory authorized technician.
h. Provide pre-testing of MV/ATS switchgear and LV switchgear by a factory authorized technician.
i. Coordinate with Ameren to provide commissioning of MV/ATS switchgear, generator, and LV switchgear per Ameren Standard CE-10.

4. PHASE 4: Transfer Utility Power to the MV/ATS Switchgear

PHASE 4 DURATION IS 522 WORKING DAYS FROM NOTICE TO PROCEED.

ALL WORK FOR PHASE 3 SHALL BE COMPLETE PRIOR TO BEGINNING PHASE 4 WORK.

THE MAXIMUM ALLOWABLE TIME FOR THIS PHASE SHALL BE 12 HOURS. ONCE THE OUTAGE FOR PHASE 4 HAS BEGUN, CONTRACTOR SHALL WORK CONTINUOUSLY UNTIL OUTAGE WORK IS COMPLETED.

a. Coordinate outage to disconnect the existing service entrance feeder from Ameren.
b. Intercept the existing service entrance conduit to the existing MV switchgear. Connect new conduit from MV/ATS switchgear.
c. Provide new medium voltage feeder conductors from MV/ATS switchgear. Terminate and test cables.
d. Energize existing MV switchgear.

After the existing MV switchgear is energized, coordinate with Ameren to demolish the existing utility pole currently serving the existing MV switchgear. This work is not subject to the duration limitations of Phase 4.

5. PHASE 5: Demolition of Existing Generators

PHASE 5 DURATION IS 539 WORKING DAYS FROM NOTICE TO PROCEED.

a. Demolish existing Generators #2, #3, #4, and #5.
b. Demolish existing feeders from the four generators to their respective automatic transfer switches.

c. Demolish auxiliary power circuits for generators (i.e. battery charger, block heater).
d. Demolish generator controls circuits.
e. Demolish interior components of existing automatic transfer switches. Splice normal power feeder and load power feeder together in each ATS enclosure.

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.

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

1.5 OCCUPANCY REQUIREMENTS

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

B. Partial Owner Occupancy: The Owner reserves the right to occupy and to place and install equipment in completed areas of the building prior to Substantial Completion, provided such occupancy does not interfere with completion of the Work. Such placing of equipment and partial occupancy shall not constitute acceptance of the total Work.

1. The Designer will prepare a Certificate of Partial Occupancy for each specific portion of the Work to be occupied prior to substantial completion.

2. Prior to partial Owner occupancy, mechanical and electrical systems shall be fully operational. Required inspections and tests shall have been successfully completed. Upon occupancy, the Owner will operate and maintain mechanical and electrical systems serving occupied portions for the building.

3. Upon occupancy, the Owner will assume responsibility for maintenance and custodial service for occupied portions for the building.

END OF SECTION 011000

SECTION 012100 – ALLOWANCES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

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

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

B. Types of allowances include the following:

1. Weather allowances.

C. Related Sections include the following:

1. Division 1 Section "Contract Modification Procedures" for procedures for submitting and handling Change Orders for allowances.
2. Division 1 Section "Unit Prices" for procedures for using unit prices.

1.3 WEATHER ALLOWANCE

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

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

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

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

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

1.4 SELECTION AND PURCHASE

A. At the earliest practical date after award of the Contract, Designer of the date when final selection and purchase of each product or system described by an allowance must be completed to avoid delaying the Work.

B. At Designer's request, obtain proposals for each allowance for use in making final selections. Include recommendations that are relevant to performing the Work.

C. Purchase products and systems selected by Designer from the designated supplier.

1.5 SUBMITTALS

A. Submit proposals for purchase of products or systems included in allowances, in the form specified for Change Orders.

B. Submit invoices or delivery slips to show actual quantities of materials delivered to the site for use in fulfillment of each allowance.

C. Coordinate and process submittals for allowance items in same manner as for other portions of the Work.

1.6 COORDINATION

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

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 EXAMINATION

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

3.2 PREPARATION

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

3.3 SCHEDULE OF ALLOWANCES

A. Weather Allowance: Included within the completion period for this Project fifteen (15) "bad weather" days.

END OF SECTION 012100

SECTION 012200 – UNIT PRICES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

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

1.2 SUMMARY

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

B. Related Sections include the following:

1. Division 1 Section "Contract Modification Procedures" for procedures for submitting and handling Change Orders.
2. Division 011000 Section “Summary of Work” for description of work associated with Unit Prices.

1.3 DEFINITIONS

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

1.4 PROCEDURES

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

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

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

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

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 LIST OF UNIT PRICES

A. Unit Price No. 1 – Replace feeder conductors to Housing Units #6 through #10 (associated with Alternate Bid #1 only).

1. Description: Replace (2) #2/0 and (1) #6 ground conductors in existing conduit from junction/splice box at tunnel to the existing disconnect switch(es) located in Housing Unit(s) #6 through #10.
2. Unit of Measurement: Linear feet (LF)
3. Base Bid Quantity: 500

B. Unit Price No. 2 – Replace feeder conductors to Housing Units #1 through #5 (associated with Alternate Bid #2 only).

1. Description: Replace (2) #2/0 and (1) #6 ground conductors in existing conduit from junction/splice box at tunnel to the existing disconnect switch(es) located in Housing Unit(s) #1 through #5.
2. Unit of Measurement: Linear feet (LF)
3. Base Bid Quantity: 500

END OF SECTION 012200

SECTION 012300 - ALTERNATES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

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

1.3 DEFINITIONS

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

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

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

1.4 PROCEDURES

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

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

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

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

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

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION

3.1 SCHEDULE OF ALTERNATES

A. Alternate No. 1: *Replace a portion of each feeder from Distribution Panelboard DP1 in the Service Building's electrical room to Housing Units #6 through #10.*

B. Alternate No. 2: Replace *a portion of each feeder from Distribution Panelboard DP1 in the Service Building's electrical room to Housing Units #1 through #5.*

C. Alternate No. 3: *Replace existing kitchen Panelboard PP1 in the Service Building.*

END OF SECTION 012300

SECTION 012600 – CONTRACT MODIFICATION PROCEDURES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

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

B. Related Sections include the following:

1. Division 1, Section 012100 "Allowances" for procedural requirements for handling and processing Allowances.
2. Division 1, Section 012200 "Unit Prices" for administrative requirements for using Unit Prices.
3. Division 1, Section 013115 “Project Management Communications” for administrative requirements for communications.
4. Division 0, Section 007213, Article 3.1 "Acceptable Substitutions" for administrative procedures for handling Requests for Substitutions made after Contract award.
5. Division 0, Section 007213, Article 4.0 "Changes in the Work" for Change Order requirements.

1.3 REQUESTS FOR INFORMATION

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

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

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

1.4 MINOR CHANGES IN THE WORK

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

1.5 PROPOSAL REQUESTS

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

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

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

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

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

1.6 CHANGE ORDER PROCEDURES

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

END OF SECTION 012600

SECTION 013100 – COORDINATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes administrative provisions for coordinating construction operations on Projects including, but not limited to, the following:

1. Coordination Drawings.
2. Administrative and supervisory personnel.
3. Project meetings.

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

C. Related Sections include the following:

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

1.3 COORDINATION

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

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

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

4. Where availability of space is limited, coordinate installation of different components to ensure maximum performance and accessibility for required maintenance, service, and repair of all components including mechanical and electrical.

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

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

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

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

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

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

1.4 SUBMITTALS

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

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

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

1.5 PROJECT MEETINGS

A. The Owner's Construction Representative will schedule a Pre-Construction Meeting prior to beginning of construction. The date, time, and exact place of this meeting will be determined after Contract Award and notification of all interested parties. The Contractor shall arrange to have the Job Superintendent and all prime Subcontractors present at the meeting. During the Pre-Construction Meeting, the construction procedures and information necessary for submitting payment requests will be discussed and materials distributed along with any other pertinent information.

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

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

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

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

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

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

a. Contract Documents

b. Options

c. Related RFIs

d. Related Change Orders

e. Purchases

f. Deliveries

g. Submittals

h. Review of mockups

i. Possible conflicts

j. Compatibility problems

k. Time schedules

l. Weather limitations

m. Manufacturer's written recommendations

n. Warranty requirements

o. Compatibility of materials

p. Acceptability of substrates

q. Temporary facilities and controls

r. Space and access limitations

s. Regulations of authorities having jurisdiction

t. Testing and inspecting requirements

u. Installation procedures

v. Coordination with other Work

w. Required performance results

x. Protection of adjacent Work

y. Protection of construction and personnel

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

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

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

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

7. Project name

8. Name and address of Contractor

9. Name and address of Designer

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

11. RFI description

12. Date the RFI was submitted

13. Date Designer's response was received

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

END OF SECTION 013100

SECTION 013115 - PROJECT MANAGEMENT COMMUNICATIONS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

B. Division 1, Section 013300 - Submittals

C. Division 1, Section 012600 – Contract Modification Procedures

1.2 SUMMARY

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

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

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

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

E. Authorized Users: Access to the web site will be by individuals who are authorized users.
   1. Individuals shall complete the E-Builder New Company/User Request Form located at the following web site: https://oa.mo.gov/facilities/vendor-links/contractor-forms.

Completed forms shall be emailed to the following email address: OA.FMDCE-BuilderSupport@oa.mo.gov.

2. Authorized users will be contacted directly and assigned a temporary user password.
3. Individuals shall be responsible for the proper use of their passwords and access to data as agents of the company in which they are employed.

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

G. Communications: The use of fax, email and courier communication for this project is discouraged in favor of using E-Builder® to send messages. Communication functions are as follows:
1. Document Integrity and Revisions:
   a. Documents, comments, drawings and other records posted to the system shall remain for the project record. The authorship time and date shall be recorded for each document submitted to the system. Submitting a new document or record with a unique ID, authorship, and time stamp shall be the method used to make modifications or corrections.
   b. The system shall make it easy to identify revised or superseded documents and their predecessors.
   c. Server or Client side software enhancements during the life of the project shall not alter or restrict the content of data published by the system. System upgrades shall not affect access to older documents or software.
2. Document Security:
   a. The system shall provide a method for communication of documents. Documents shall allow security group assignment to respect the contractual parties communication except for Administrative Users. DO NOT POST PRIVATE OR YOUR COMPANY CONFIDENTIAL ITEMS IN THE DATABASE!
3. Document Integration:
   a. Documents of various types shall be logically related to one another and discoverable. For example, requests for information, daily field reports, supplemental sketches and photographs shall be capable of reference as related records.
4. Reporting:
   a. The system shall be capable of generating reports for work in progress, and logs for each document type. Summary reports generated by the system shall be available for team members.
5. Notifications and Distribution:
   a. Document distribution to project members shall be accomplished both within the extranet system and via email as appropriate. Project document

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

6. Required Document Types:
    a. RFI, Request for Information.
    b. Submittals, including record numbering by drawing and specification section.
    c. Transmittals, including record of documents and materials delivered in hard copy.
    d. Meeting Minutes.
    e. Application for Payments (Draft or Pencil).
    f. Review Comments.
    g. Field Reports.
    h. Construction Photographs.
    i. Drawings.
    j. Supplemental Sketches.
    k. Schedules.
    l. Specifications.
    m. Request for Proposals
    n. Designer's Supplemental Instructions
    o. Punch Lists

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

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

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

END OF SECTION 013115

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

SECTION 013200 – SCHEDULE – BAR CHART

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

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

PART 2 - PRODUCTS – (Not Applicable)

PART 3 - EXECUTION

3.1 SUBMITTAL PROCEDURES

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

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

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

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

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

   b. Close Out Documents

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

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

   c. General Conditions

      1) No more than 10%

B. The Contractor shall submit an updated Schedule for presentation at each Monthly Progress Meeting. The Schedule shall be updated by the Contractor as necessary to reflect the current Schedule and its relationship to the original Schedule. The updated Schedule shall reflect any changes in the logic, sequence, durations, or completion date.

Payments to the Contractor shall be suspended if the Progress Schedule is not adequately updated to reflect actual conditions.

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

3.2 CONSTRUCTION PROGRESS SCHEDULE – BAR CHART SCHEDULE

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

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

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

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

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

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

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

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

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

1. Requirement for Phased completion

2. Work by separate Contractors

3. Work by the Owner
4. Pre-purchased materials
5. Coordination with existing construction
6. Limitations of continued occupancies
7. Un-interruptible services
8. Partial Occupancy prior to Substantial Completion
9. Site restrictions
10. Provisions for future construction
11. Seasonal variations
12. Environmental control

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

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

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

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

3.3 SCHEDULE OF SUBMITTALS

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

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

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

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

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

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

3.4 SCHEDULE OF INSPECTIONS AND TESTS

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

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

1. Specification Section number
2. Description of the test
3. Identification of applicable standards
4. Identification of test methods
5. Number of tests required
6. Time schedule or time span for tests

7. Entity responsible for performing tests
8. Requirements for taking samples
9. Unique characteristics of each service

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

END OF SECTION 013200

SECTION 013300 – SUBMITTALS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

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

1.2 SUMMARY

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

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

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

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

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

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

1.3 SUBMITTAL PROCEDURES

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

1. Coordinate each submittal with fabrication, purchasing, testing, delivery, other submittals, and related activities that require sequential activity.
2. Coordinate transmittal of different types of submittals for related elements of the Work so processing will not be delayed by the need to review submittals concurrently for coordination.
    a. The Designer reserves the right to withhold action on a submittal requiring coordination with other submittals until all related submittals are received.

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

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

1.4 SHOP DRAWINGS

A. Comply with the General Conditions, Article 3.2.

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

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

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

1.5 PRODUCT DATA

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

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

1. Mark each copy to show applicable choices and options. Where printed Product Data includes information on several products that are not required, mark copies to indicate the applicable information including the following information:
   a. Manufacturer's printed recommendations
   b. Compliance with Trade Association standards
   c. Compliance with recognized Testing Agency standards
   d. Application of Testing Agency labels and seals
   e. Notation of dimensions verified by field measurement
   f. Notation of coordination requirements
2. Do not submit Product Data until compliance with requirements of the Contract Documents has been confirmed.

1.6 SAMPLES

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

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

1. The Contractor shall mount or display samples in the manner to facilitate review of qualities indicated. Prepare samples to match the Designer's sample including the following:
   a. Specification Section number and reference
   b. Generic description of the Sample

c. Sample source

d. Product name or name of the Manufacturer

e. Compliance with recognized standards

f. Availability and delivery time

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

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

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

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

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

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

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

1.7 QUALITY ASSURANCE DOCUMENTS

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

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

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

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

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

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

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

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

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

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

1.8 OPERATING AND MAINTENANCE MANUALS AND WARRANTIES

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

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION

3.1 REQUIRED SUBMITTALS

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

SPEC SECTION	TITLE	CATEGORY
013200	Schedules	Construction Schedule
013200	Schedules	Schedule of Values
013200	Schedules	List of Subcontractors
013200	Schedules	Major Material Suppliers
260513	Medium Voltage Cables	Product Data
260513	Medium Voltage Cables	Test Report
260513	Medium Voltage Cables	Certification
260519	Low-Voltage Electrical Power Conductors and Cables	Product Data
260526	Grounding and Bonding for Electrical Systems	Product Data
260526	Grounding and Bonding for Electrical Systems	Test Report

260529	Hangars and Supports for Elecctrical Systems	Product Data
260533	Raceways and Boxes for Electrical Systems	Product Data
260548	Vibration and Seismic Controls for Electrical Systems	Product Data
260548	Vibration and Seismic Controls for Electrical Systems	Shop Drawings
260548	Vibration and Seismic Controls for Electrical Systems	Certification
260553	Identification for Electrical Systems	Product Data
261216	Liquid-Filled, Medium-Voltage Transformers	Shop Drawings
261216	Liquid-Filled, Medium-Voltage Transformers	Product Data
261216	Liquid-Filled, Medium-Voltage Transformers	Test Report
261216	Liquid-Filled, Medium-Voltage Transformers	Operation / Maintenance Manual
261216	Liquid-Filled, Medium-Voltage Transformers	Warranty
261216	Liquid-Filled, Medium-Voltage Transformers	Operation / Maintenance Manual
261216	Liquid-Filled, Medium-Voltage Transformers	Warranty
262413	Switchboards	Shop Drawings
262413	Switchboards	Product Data
262413	Switchboards	Test Report
262413	Switchboards	Operation / Maintenance Manual
262413	Switchboards	Warranty
262413	Switchboards	As-Builts
262416	Panelboards	Shop Drawings
262416	Panelboards	Product Data
262416	Panelboards	Test Report
262416	Panelboards	Operation / Maintenance Manual
262416	Panelboards	Warranty
262416	Panelboards	As-Builts
262550	Generator Docking Station (Dual Purpose)	Shop Drawings
262550	Generator Docking Station (Dual Purpose)	Product Data
262550	Generator Docking Station (Dual Purpose)	Test Report
262550	Generator Docking Station (Dual Purpose)	Operation / Maintenance Manual
262550	Generator Docking Station (Dual Purpose)	Warranty
262816	Enclosd Switches and Circuit Breakers	Shop Drawings
262816	Enclosd Switches and Circuit Breakers	Product Data
262816	Enclosd Switches and Circuit Breakers	Operation / Maintenance Manual
262816	Enclosd Switches and Circuit Breakers	Warranty
263213.13	Diesel-Engine-Driven Generator Sets	Shop Drawings
263213.13	Diesel-Engine-Driven Generator Sets	Product Data

263213.13	Diesel-Engine-Driven Generator Sets	Certification
263213.13	Diesel-Engine-Driven Generator Sets	Test Report
263213.13	Diesel-Engine-Driven Generator Sets	Operation / Maintenance Manual
263213.13	Diesel-Engine-Driven Generator Sets	Warranty
260535	Cabinets & Enclosures	Product Data
260543	Underground Ducts & Raceways for Electrical Systems	Product Data
262313	Emergency/Standby Power Systems and Automatic Transfer Equipment	Shop Drawings
262313	Emergency/Standby Power Systems and Automatic Transfer Equipment	Product Data
262313	Emergency/Standby Power Systems and Automatic Transfer Equipment	Certification
262313	Emergency/Standby Power Systems and Automatic Transfer Equipment	Test Report
262313	Emergency/Standby Power Systems and Automatic Transfer Equipment	Operation / Maintenance Manual
262313	Emergency/Standby Power Systems and Automatic Transfer Equipment	Warranty
262313	Emergency/Standby Power Systems and Automatic Transfer Equipment	As-Builts

END OF SECTION 013300

SECTION 013513.16 - SITE SECURITY AND HEALTH REQUIREMENTS (DOC)

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUBMITTALS

A. List of required submittals:

1. Materials Safety Data Sheets for all hazardous materials to be brought onsite.
2. Schedule of proposed shutdowns, if applicable.
3. Revise list to include all required submittals.
4. 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.
5. Tuberculin skin test results for all employees required to be tested as set forth below.

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. The Contractor shall provide Facility Representatives notice twenty-four (24) hours prior to any possible vehicle entry and/or required escort. The Contractor shall maintain a time log of any delays in gaining entrance to the Facility due to lack of an escort, which is to be submitted monthly with the Contractor’s pay request materials. The purpose of this log is to establish a basis for a contract change, if required. The log shall contain the date and time of delay, date and time of request of entry, workers delayed (name and occupation), and name of the Facility Representative to whom the request was made, if possible. Any delay in entry must be

validated by sallyport and pass office personnel at the Facility. Only delays greater than thirty (30) minutes will be considered for a contract change. A 30-minute delay upon arrival with a vehicle to enter the sallyport should be expected.

3.2 RULES OF THE FACILITY

A. The Contractor and its workers shall observe the following rules:

1. There shall be no fraternization with inmates.
2. No intoxicating beverages or illegal drugs shall be brought onto Facility grounds.
3. No firearms, other weapons, or explosives shall be carried onto Facility grounds.
4. No prescription drugs above one day's dosage shall be carried on Facility grounds.
5. Any vehicle or individual is subject to search at any time while on Facility grounds.
6. The vehicles of the Contractor and its workers shall be locked whenever unattended.
7. All tools and equipment shall be tightly secured during non-working hours in the Contractor's storage trailer or assigned area.
8. The Facility will not be responsible for the Contractor's tools, equipment, or materials. The Contractor shall keep and maintain a current tool inventory. The tool inventory shall be made available to Facility Representatives and the Owner upon request.
9. The Contractor shall report any missing tools to Facility Representatives immediately.
10. Smoking shall be permitted only in accordance with the regulations of the Facility.
11. Possession or use of smokeless tobacco or smokeless non-tobacco alternatives is strictly prohibited.

B. All workers shall be required to sign an acknowledgement of receipt of these rules.

3.3 SECURITY CLEARANCES AND RESTRICTIONS

A. DOC SECURITY CLEARANCE REQUIREMENTS

1. Prior to the commencement of any onsite work, the Contractor shall submit a list containing the name, date of birth, and Missouri driver's license number or social security number of all construction personnel to the Missouri Department of Corrections for the purpose of obtaining security clearances. The required information shall be submitted at the pre-construction meeting, or as otherwise directed by Department of Corrections' personnel. Any construction personnel with pending warrants or felony convictions within the last five (5) years or other offenses deemed to create a security risk by Department of Corrections shall not be allowed onsite. The Department of Corrections reserves the right to refuse admission to any individual they feel may be detrimental to the security of the Facility.

3.4 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. The Contractor's workers shall not be under the influence of any intoxicating substances while on the Facility premises.

3.5 TUBERCULOSIS TESTING REQUIREMENTS

A. All workers who will be in the confines of the Facility for more than ten (10) consecutive working days must provide proof of a negative tuberculin skin test. The test results must be no more than six (6) months old at the commencement of construction. The Contractor or the worker, not the Owner, shall pay the cost of the test.

B. The Contractor shall submit to Facility Representatives current tuberculin skin test results for all workers who are required to have such a test in accordance with paragraph A above. If the contract period extends for more than twelve (12) months, the Contractor must provide new test results for all workers prior to the anniversary of the contract commencement date.

C. Any worker required to have a tuberculin skin test under paragraph A above who fails or refuses to do so will be denied admission to the facility until such time as proof of the test results are provided.

D. If any worker has a tuberculin skin test with positive results, the worker shall be denied access to the facility until the worker produces a certification from a physician licensed to practice in the State of Missouri that the worker does not have infectious tuberculosis.

E. The Contractor shall not be entitled to any additional time or compensation if any of its workers are denied access to the facility because of failure to produce negative tuberculin skin test results.

F. Failure or refusal of the Contractor to maintain and produce the required tuberculin skin test records shall be a material breach of this contract, which shall subject the Contractor to a declaration of default.

3.6 PREA FOR CONTRACTORS AND EMPLOYEES

A. The contractor and all of the contractor's employees and agents providing services in any Department of Corrections institution must be at least 18 years of age. A Missouri Uniform Law Enforcement System (MULES) check or other background investigation may be required on the contractor, the contractor's employees and agents before they are allowed entry into the institution. The contractor, its employees and agents understand and agree that the Department may complete criminal background records checks annually for the contractor and the contractor's employees and agents that have the potential to have contact with inmates.

B. The institution shall have the right to deny access into the institution for the contractor and any of the contractor's employees and agents for any reason, at the discretion of the institution.

C. The contractor, its employees and agents under active federal or state felony or misdemeanor supervision must receive written division director approval prior to providing services pursuant to a Department contract. Similarly, contractors/employees/agents with prior felony convictions and not under active supervision must receive written division director approval in advance.

D. The contractor, its employees and agents shall at all times observe and comply with all applicable state statutes, Department rules, regulations, guidelines, internal management policies and procedures, and general orders of the Department that are applicable, regarding operations and activities in and about all Department property. Furthermore, the contractor, its employees and agents, shall not obstruct the Department or any of its designated officials from performing their duties in response to court orders or in the maintenance of a secure and safe correctional environment. The contractor shall comply with the Department's policies and procedures relating to employee conduct.

1. The Department has a zero tolerance policy for any form of sexual misconduct to include staff/contractor/volunteer on offender, or offender on offender, sexual harassment, sexual assault, sexual abuse and consensual sex.

    a. Any contractor or contractor's employee or agent who witnesses any form of sexual misconduct must immediately report it to the warden of the institution. If a contractor or contractor's employee or agent fails to report or knowingly condones sexual harassment or sexual contact with or between offenders, the Department may cancel the contract, or at the Department's sole discretion, require the contractor to remove the employee/agent from providing services under the contract.

b. Any contractor or contractor's employee or agent who engages in sexual abuse shall be prohibited from entering the institution and shall be reported to law enforcement agencies and licensing bodies, as appropriate.

E. The contractor, its employees and agents shall not interact with the offenders except as is necessary to perform the requirements of the contract. The contractor, its employees and agents shall not give anything to nor accept anything from the offenders except in the normal performance of the contract.

F. If any contractor or contractor's employee or agent is denied access into the institution for any reason or is denied approval to provide service to the Department for any reason stated herein, it shall not relieve the contractor of any requirements of the contract. If the contractor is unable to perform the requirements of the contract for any reason, the contractor shall be considered in breach.

3.7 DISRUPTION OF UTILITIES

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

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

3.8 CELL PHONES AND ELECTRONIC DEVICES

A. Cell Phones, pagers, smart watches (that can send/receive messages), fitness wrist bands (that can send/receive messages) or other electronic devices are not permitted.

1. Contractors, repairpersons, or information technology services department staff may be permitted to bring in a cell phone and portable wireless router (Wi-Fi, MiFi, etc.) if approved by the Chief Administrative Officer (CAO) when the phone is necessary to complete job duties relating to repairs on a case by case basis.
2. Tables (IPad, etc.) are not allowed with the exception of for re-entry purposes approved via the division of adult institutions (DAI) director and the re-entry manager.
3. Laptop computers may be permitted by the CAO on a case by case basis.

3.9 PROTECTION OF PERSONS AND PROPERTY

A. SAFETY PRECAUTIONS AND PROGRAMS

1. The Contractor shall at all times conduct operations under this Contract in a manner to avoid the risk of bodily harm to persons or risk of damage to any property. The Contractor shall promptly take precautions which are necessary and adequate against conditions created during the progress of the Contractor's activities hereunder which involve a risk of bodily harm to persons or a risk of damage to property. The Contractor

shall continuously inspect Work, materials, and equipment to discover and determine any such conditions and shall be solely responsible for discovery, determination, and correction of any such conditions. The Contractor shall comply with applicable safety laws, standards, codes, and regulations in the jurisdiction where the Work is being performed, specifically, but without limiting the generality of the foregoing, with rules regulations, and standards adopted pursuant to the Williams-Steiger Occupational Safety and Health Act of 1970 and applicable amendments.

2. All contractors, subcontractors and workers on this project are subject to the Construction Safety Training provisions 292.675 RSMo.
3. In the event the Contractor encounters on the site, material reasonably believed to be asbestos, polychlorinated biphenyl (PCB), lead, mercury, or other material known to be hazardous, which has not been rendered harmless, the Contractor shall immediately stop Work in the area affected and report the condition to the Owner's Representative and the Architect in writing. The Work in the affected area shall not thereafter be resumed except by written agreement of the Owner's Representative and Contractor if in fact the material is asbestos or polychlorinated biphenyl (PCB) and has not been rendered harmless. The Work in the affected area shall be resumed in the absence of asbestos or polychlorinated biphenyl (PCB), or when it has been rendered harmless by written agreement of the Owner's Representative and the Contractor. “Rendered Harmless” shall mean that levels of such materials are less than any applicable exposure standards, including but limited to OSHA regulations.

B. SAFETY OF PERSONS AND PROPERTY

1. The Contractor shall take reasonable precautions for safety of, and shall provide protection to prevent damage, injury, or loss to:

    a. clients, staff, the public, construction personnel, and other persons who may be affected thereby;
    b. the Work and materials and equipment to be incorporated therein, whether in storage on or off the site, under care, custody, or control of the Contractor or the Contractor's Subcontractors of any tier; and
    c. other property at the site or adjacent thereto, such as trees, shrubs, lawns, walks, pavements, roadways, structures, and utilities not designated for removal, relocation, or replacement in the course of construction.

2. The Contractor shall give notices and comply with applicable laws, standards, codes, ordinances, rules, regulations, and lawful orders of public authorities bearing on safety of persons or property or their protection from damage, injury, or loss.
3. The Contractor shall erect and maintain, as required by existing conditions and performance of the Contract, safeguards for safety and protection, including, but not limited to, posting danger signs and other warnings against hazards, promulgating safety regulations, and notifying owners and users of adjacent sites and utilities.
4. When use or storage of explosives or other hazardous materials or equipment or unusual methods are necessary for execution of the Work, the Contractor shall exercise the highest degree of care and carry on such activities under supervision of properly qualified personnel.
5. The Contractor shall promptly remedy damage and loss (other than damage or loss insured under property insurance required by the Contract Documents) to property referred to in this Section caused in whole or in part by the Contractor, a Subcontractor of any tier, or anyone directly or indirectly employed by any of them, or by anyone for

whose acts they may be liable, and for which the Contractor is responsible under this Section, except damage or loss attributable solely to acts or omissions of Owner or the Architect or anyone directly or indirectly employed by either of them, or by anyone for whose acts either of them may be liable, and not attributable to the fault or negligence of the Contractor. The foregoing obligations of the Contractor are in addition to the Contractor's other obligations stated elsewhere in the Contract.

6. The Contractor shall designate a responsible member of the Contractor's organization at the site whose duty shall be the prevention of accidents, and the maintaining, enforcing and supervising of safety precautions and programs. This person shall be the Contractor's superintendent unless otherwise designated by the Contractor in writing to the Owner's Representative and Architect. The Contractor shall hold regularly scheduled safety meetings to instruct Contractor personnel on safety practices, accident avoidance and prevention, and the Project Safety Program. The Contractor shall furnish safety equipment and enforce the use of such equipment by its employees and its subcontractors of any tier.
7. The Contractor shall not load or permit any part of the construction or site to be loaded so as to endanger its safety.
8. The Contractor shall promptly report in writing to the Owner all accidents arising out of or in connection with the Work which cause death, lost time injury, personal injury, or property damage, giving full details and statements of any witnesses. In addition, if death, serious personal injuries, or serious property damages are caused, the accident shall be reported immediately.
9. The Contractor shall promptly notify in writing to the Owner of any claims for injury or damage to personal property related to the work, either by or against the Contractor.
10. The Owner assumes no responsibility or liability for the physical condition or safety of the Work site or any improvements located on the Work site. The Contractor shall be solely responsible for providing a safe place for the performance of the Work. The Owner shall not be required to make any adjustment in either the Contract Sum or Contract Time concerning any failure by the Contractor or any Subcontractor to comply with the requirements of this Paragraph.
11. In no event shall the Owner have control over, charge of, or any responsibility for construction means, methods, techniques, sequences or procedures or for safety precautions and programs in connection with the Work, notwithstanding any of the rights and authority granted the Owner in the Contract Documents.
12. The Contractor shall maintain at his own cost and expense, adequate, safe and sufficient walkways, platforms, scaffolds, ladders, hoists and all necessary, proper, and adequate equipment, apparatus, and appliances useful in carrying on the Work and which are necessary to make the place of Work safe and free from avoidable danger for clients, staff, the public and construction personnel, and as may be required by safety provisions of applicable laws, ordinances, rules regulations and building and construction codes.

END OF SECTION 013513.16

SECTION 015000 – CONSTRUCTION FACILITIES AND TEMPORARY CONTROLS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

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

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

1. Temporary electric power and light
2. Sanitary facilities, including drinking water

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

1. Field offices and storage sheds
2. Construction aids and miscellaneous services and facilities

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

1. Barricades, warning signs, and lights

1.3 QUALITY ASSURANCE

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

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

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

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

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

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

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

2.2 EQUIPMENT

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

B. Water Hoses: Provide ¾” (19mm), heavy-duty, abrasion-resistant, flexible rubber hoses 100’ (30m) long, with pressure rating greater than the maximum pressure of the water distribution system. Provide adjustable shutoff nozzles at hose discharge.

C. Electrical Outlets: Provide properly configured, NEMA-polarized outlets to prevent insertion of 110 to 120V plugs into higher voltage outlets. Provide receptacle outlets equipped with ground-fault circuit interrupters, reset button, and pilot light for connection of power tools and equipment.

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

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

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

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

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

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

PART 3 - EXECUTION

3.1 INSTALLATION

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

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

3.2 TEMPORARY UTILITY INSTALLATION

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

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

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

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

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

B. Temporary Toilets: Use of the Owner's existing toilet facilities will be permitted, so long as facilities are cleaned and maintained in a condition acceptable to the Owner. All construction personnel will be allowed access only to those specific facilities designed by

the Construction Representative. At substantial completion, restore these facilities to the condition prevalent at the time of initial use.

C. Wash Facilities: The Owner will provide wash facilities within the building. All construction personnel will be allowed access only to those specific facilities designated by the Construction Representative.

D. Drinking-Water Facilities: The Owner will provide drinking water facilities within the building. All construction personnel will be allowed access only to those specific facilities designated by the Construction Representative.

E. 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. Available storage areas are shown on the drawings. 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.

3.4 SECURITY AND PROTECTION FACILITIES INSTALLATION

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

B. 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.

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

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

3.5 OPERATION, TERMINATION AND REMOVAL

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

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

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

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

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

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

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

3. At Substantial Completion, clean and renovate permanent facilities used during the construction period including, but not limited to, the following:

a. Replace air filters and clean inside of ductwork and housing.

b. Replace significantly worn parts and parts subject to unusual operating conditions.

c. Replace lamps burned out or noticeably dimmed by hours of use.

END OF SECTION 015000

SECTION 017400 – CLEANING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

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

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

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

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

PART 2 - PRODUCTS

2.1 MATERIALS

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

PART 3 - EXECUTION

3.1 PROGRESS CLEANING

A. General

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

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

3. At least <once><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.

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

3.2 FINAL CLEANING

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

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

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

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

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

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

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

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

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

8. Broom clean concrete floors in unoccupied spaces.

9. Vacuum clean carpet and similar soft surfaces removing debris and excess nap. Shampoo, if required.

10. Clean transparent material, including mirrors and glass in doors and windows. Remove glazing compounds and other substances that are noticeable vision-

obscuring materials. Replace chipped or broken glass and other damaged transparent materials. Polish mirrors and glass, taking care not to scratch surfaces.

11. Remove labels that are not permanent labels.

12. Touch up and otherwise repair and restore marred, exposed finishes and surfaces. Replace finishes and surfaces that cannot be satisfactorily repaired or restored or that already show evidence of repair or restoration.

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

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

14. Clean plumbing fixtures to a sanitary condition free of stains, including stains resulting from water exposure.

15. Replace disposable air filters and clean permanent air filters. Clean exposed surfaces of diffusers, registers, and grills.

16. Clean ducts, blowers, and coils if units were operated without filters during construction

17. Clean food-service equipment to a sanitary condition, ready and acceptable for its intended use.

18. Clean light fixtures, lamps, globes, and reflectors to function with full efficiency. Replace burned-out bulbs and defective and noisy starters in fluorescent and mercury vapor fixtures.

19. Leave the Project clean and ready for occupancy.

C. Pest Control: Engage an experienced, licensed exterminator to make a final inspection and rid the Project of rodents, insects, and other pests. Comply with regulations of local authorities.

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

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

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

END OF SECTION 017400

SECTION 017900 - DEMONSTRATION AND TRAINING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section includes administrative and procedural requirements for instructing Owner's personnel, including the following:

1. Demonstration of operation of systems, subsystems, and equipment.
2. Training in operation and maintenance of systems, subsystems, and equipment.
3. Demonstration and training video recordings.

1.3 INFORMATIONAL SUBMITTALS

A. Instruction Program: Submit outline of instructional program for demonstration and training, including a list of training modules and a schedule of proposed dates, times, length of instruction time, and instructors' names for each training module. Include learning objective and outline for each training module.

B. Attendance Record: For each training module, submit list of participants and length of instruction time.

C. Evaluations: For each participant and for each training module, submit results and documentation of performance-based test.

1.4 CLOSEOUT SUBMITTALS

A. Demonstration and Training Video Recordings: Submit two copies within seven days of end of each training module.

1. Identification: On each copy, provide an applied label with the following information:

a. Name of Project.
b. Name and address of videographer.
c. Name of Architect.
d. Name of Construction Manager.
e. Name of Contractor.
f. Date of video recording.

2. Transcript: Prepared in PDF electronic format. Include a cover sheet with same label information as the corresponding video recording and a table of contents with links to corresponding training components. Include name of Project and date of video recording on each page.

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

1.5 QUALITY ASSURANCE

A. Facilitator Qualifications: A firm or individual experienced in training or educating maintenance personnel in a training program similar in content and extent to that indicated for this Project, and whose work has resulted in training or education with a record of successful learning performance.

B. Instructor Qualifications: A factory-authorized service representative experienced in operation and maintenance procedures and training.

C. Preinstruction Conference: Conduct conference at Project site to comply with requirements in Section 013100 "Coordination". Review methods and procedures related to demonstration and training including, but not limited to, the following:

1. Inspect and discuss locations and other facilities required for instruction.
2. Review and finalize instruction schedule and verify availability of educational materials, instructors' personnel, audiovisual equipment, and facilities needed to avoid delays.
3. Review required content of instruction.
4. For instruction that must occur outside, review weather and forecasted weather conditions and procedures to follow if conditions are unfavorable.

1.6 COORDINATION

A. Coordinate instruction schedule with Owner's operations. Adjust schedule as required to minimize disrupting Owner's operations and to ensure availability of Owner's personnel.

B. Coordinate instructors, including providing notification of dates, times, length of instruction time, and course content.

C. Coordinate content of training modules with content of approved emergency, operation, and maintenance manuals. Do not submit instruction program until operation and maintenance data has been reviewed and approved by Architect.

PART 2 - PRODUCTS

2.1 INSTRUCTION PROGRAM

A. Program Structure: Develop an instruction program that includes individual training modules for each system and for equipment not part of a system, as required by individual Specification Sections.

B. Training Modules: Develop a learning objective and teaching outline for each module. Include a description of specific skills and knowledge that participant is expected to master. For each module, include instruction for the following as applicable to the system, equipment, or component:

1. Basis of System Design, Operational Requirements, and Criteria: Include the following:

a. System, subsystem, and equipment descriptions.
b. Performance and design criteria if Contractor is delegated design responsibility.
c. Operating standards.
d. Regulatory requirements.
e. Equipment function.
f. Operating characteristics.
g. Limiting conditions.
h. Performance curves.

2. Documentation: Review the following items in detail:

a. Emergency manuals.
b. Operations manuals.
c. Maintenance manuals.
d. Project record documents.
e. Identification systems.
f. Warranties and bonds.
g. Maintenance service agreements and similar continuing commitments.

3. Emergencies: Include the following, as applicable:

a. Instructions on meaning of warnings, trouble indications, and error messages.
b. Instructions on stopping.
c. Shutdown instructions for each type of emergency.
d. Operating instructions for conditions outside of normal operating limits.
e. Sequences for electric or electronic systems.
f. Special operating instructions and procedures.

4. Operations: Include the following, as applicable:

a. Startup procedures.
b. Equipment or system break-in procedures.
c. Routine and normal operating instructions.
d. Regulation and control procedures.
e. Control sequences.
f. Safety procedures.
g. Instructions on stopping.
h. Normal shutdown instructions.
i. Operating procedures for emergencies.
j. Operating procedures for system, subsystem, or equipment failure.
k. Seasonal and weekend operating instructions.
l. Required sequences for electric or electronic systems.
m. Special operating instructions and procedures.

5. Adjustments: Include the following:

a. Alignments.
b. Checking adjustments.
c. Noise and vibration adjustments.
d. Economy and efficiency adjustments.

6. Troubleshooting: Include the following:

    a. Diagnostic instructions.
    b. Test and inspection procedures.

7. Maintenance: Include the following:

    a. Inspection procedures.
    b. Types of cleaning agents to be used and methods of cleaning.
    c. List of cleaning agents and methods of cleaning detrimental to product.
    d. Procedures for routine cleaning
    e. Procedures for preventive maintenance.
    f. Procedures for routine maintenance.
    g. Instruction on use of special tools.

8. Repairs: Include the following:

    a. Diagnosis instructions.
    b. Repair instructions.
    c. Disassembly; component removal, repair, and replacement; and reassembly instructions.
    d. Instructions for identifying parts and components.
    e. Review of spare parts needed for operation and maintenance.

PART 3 - EXECUTION

3.1 PREPARATION

A. Assemble educational materials necessary for instruction, including documentation and training module. Assemble training modules into a training manual organized in coordination with requirements in Section 007213 "General Conditions".

B. Set up instructional equipment at instruction location.

3.2 INSTRUCTION

A. Engage qualified instructors to instruct Owner's personnel to adjust, operate, and maintain systems, subsystems, and equipment not part of a system.

1. Architect will furnish an instructor to describe basis of system design, operational requirements, criteria, and regulatory requirements.
2. Owner will furnish an instructor to describe Owner's operational philosophy.
3. Owner will furnish Contractor with names and positions of participants.

B. Scheduling: Provide instruction at mutually agreed on times. For equipment that requires seasonal operation, provide similar instruction at start of each season.

1. Schedule training with Owner with at least seven days' advance notice.

C. Training Location and Reference Material: Conduct training on-site in the completed and fully operational facility using the actual equipment in-place. Conduct training using final operation and maintenance data submittals.

D. Cleanup: Collect used and leftover educational materials and remove from Project site. Remove instructional equipment. Restore systems and equipment to condition existing before initial training use.

3.3 DEMONSTRATION AND TRAINING VIDEO RECORDINGS

A. General: Utilize a cell phone or video recorder to produce a recording with quality audio and video resolution for training modules. Record each training module separately. Include classroom instructions and demonstrations, board diagrams, and other visual aids, but not student practice.

1. At beginning of each training module, record each chart containing learning objective and lesson outline.

B. Video: Provide minimum 1080p video resolution.

1. Electronic Media: .mp4 file format on thumb drive, 32 gigabytes maximum per drive.
2. File Hierarchy: Organize folder structure and file locations according to project manual table of contents. Provide complete screen-based menu.
3. File Names: Utilize file names based upon name of equipment generally described in video segment, as identified in Project specifications.
4. Contractor and Installer Contact File: Using appropriate software, create a file for inclusion on the Equipment Demonstration and Training thumb drive that describes the following for each Contractor involved on the Project, arranged according to Project table of contents:

    a. Name of Contractor/Installer.
    b. Business address.
    c. Business phone number.
    d. Point of contact.
    e. E-mail address.

C. Recording: Mount recording device on tripod before starting recording, unless otherwise necessary to adequately cover area of demonstration and training. Display continuous running time.

1. Film training session(s) in segments not to exceed 15 minutes.

    a. Produce segments to present a single significant piece of equipment per segment.
    b. Organize segments with multiple pieces of equipment to follow order of Project Manual table of contents.
    c. Where a training session on a particular piece of equipment exceeds 15 minutes, stop filming and pause training session. Begin training session again upon commencement of new filming segment.

D. Light Levels: Verify light levels are adequate to properly light equipment. Verify equipment markings are clearly visible prior to recording.

1. Furnish additional portable lighting as required.

E. Narration: Describe scenes on video recording by audio narration by microphone while video recording is recorded. Include description of items being viewed.

F. Transcript: Provide a transcript of the narration. Display images and running time captured from videotape opposite the corresponding narration segment.

G. Preproduced Video Recordings: Provide video recordings used as a component of training modules in same format as recordings of live training.

END OF SECTION 017900

SECTION 260000 - GENERAL ELECTRICAL REQUIREMENTS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Common electrical installation requirements.

1.2 SPECIFICATION FORM AND DEFINITIONS

A. These Specifications are abbreviated form and contain incomplete sentences. Omissions of words or phrases such as “the Contractor shall,” “shall be,” “as noted on the drawings,” “according to the drawings,” “a,” “an,” “the,” and “all” are intentional. Omitted words and phrases shall be supplied by inference.

B. When a word such as “proper,” “satisfactory,” “equivalent,” and “as directed” is used, it requires Engineer’s review.

C. “Provide” means furnish and install.

D. “Working Day” wherever used in these Specifications, shall mean the normal working days Monday through Friday, exclusive of Saturday, Sunday, and federally observed holidays.

E. Architect/Engineer hereinafter abbreviated AE shall mean the Design Engineers.

F. Design Engineer hereinafter abbreviated DE shall mean the engineering firm, RTM Engineering Consultants, 3701 S. Lindbergh Suite 204, St. Louis, MO 63127, Telephone (314) 725-5889. Contact Person: Matt Crook.

G. General Contractor hereinafter abbreviated GC shall mean the person or company and their subcontractors who enter into contract with the Owner to perform the general division work.

H. Electrical Contractor hereinafter abbreviated EC shall mean the person or company and their subcontractors who enter into contract with the GC to perform the division 26 work.

I. Mechanical Contractor hereinafter abbreviated MC shall mean the person or company and their subcontractors who enter into contract with the GC to perform the division 23 work.

J. Plumbing Contractor hereinafter abbreviated PC shall mean the person or company and their subcontractors who enter into contract with the GC to perform the division 22 work.

K. Fire Protection Contractor hereinafter abbreviated FPC shall mean the person or company and their subcontractors who enter contract with the GC to perform the division 21 work.

L. Equipment and/or materials manufacturer hereinafter abbreviated EM shall mean the manufacturer of equipment or materials specified or referred to.

1.3 GENERAL EXTENT OF WORK

A. Provide electrical systems indicated on drawings, specified or reasonably implied. Provide every device and accessory for proper operation and completion of mechanical systems. In no case will claims for “Extra Work” be allowed for work about which EC could have informed himself before bids were taken.

B. EC shall familiarize himself with equipment provided by other contractors, which require electrical connections and controls.

C. Make required electrical connections to equipment provided under Architectural and mechanical divisions of this project, except where shown or specified otherwise. Make required internal field wiring modifications indicated on wiring diagrams of factory installed control system for control sequence specified. These field modifications shall be limited to jumper connections and connection of internal wiring to alternate terminal block lugs. Cost for field modifications requiring re-wiring of factory installed control systems for equipment provided by GC or MC shall be included in base bid of each respective contractor.

D. EC shall check electrical data and wiring diagrams received from M/C for compliance with project voltages, wiring, controls, and protective devices on electrical drawings. Promptly bring discrepancies found to attention of AE for a decision.

E. Provide safety disconnect switches, contactors, and manual or magnetic motor starters (starters are required for any motor 3/4hp or larger) for all mechanical and electrical equipment requiring such devices, whether specifically scheduled or shown on the drawings or not – no adds shall be paid for this equipment required for proper operation of the equipment after the bid. Coordinate with the M/C and omit these devices only where they are included as part of the equipment, unless scheduled otherwise on the drawings, and only where approved by the AE. Where approval has not been obtained from the AE prior, include all costs for this equipment in the base bid. With exception of factory installed devices, provide safety disconnect switches, contactors, and motor starters by one manufacturer to allow maximum interchangeability of repair parts and accessories for these devices.

F. Coordinate closely with MC and PC for all mechanical, plumbing and/or HVAC equipment overcurrent protection. Where the provided equipment is listed with a ‘Maximum Fuse Size’, a fused disconnect switch shall be provided with fuses sized per the manufacturer’s listing, regardless of what is shown on the drawings. Where the equipment is listed with a ‘Maximum Overcurrent Protection (MOCP)’, a fused or non-fused disconnect switch shall be provided as indicated and scheduled on the drawings. Include all costs in the base bid as necessary for coordination with all other contractors and including appropriate disconnecting means as required. Where overcurrent or disconnecting means sizes on the electrical drawings do not match the mechanical or plumbing drawings or any of the actually provided equipment, the EC shall include costs for the larger sizes (including upsizing wiring and conduit to match overcurrent size) in the base bid. Notify the AE in all instances.

G. Coordinate closely with MC and PC for all mechanical, plumbing and/or HVAC equipment electrical connection requirements. Disconnecting means as indicated on the drawings is shown schematically. EC shall verify mounting location and equipment connection points with all other contractors and connect all equipment per the supplied equipment manufacturer’s requirements. EC shall verify mounting location of all disconnecting means with the MC and install per those requirements and so as not to impact equipment performance, access, operation

and/or warranty. Disconnecting means shall be installed in an accessible location with working clearances as required by the National Electric Code. Provide structural supports securely attached to the building structure separate from mechanical equipment and/or supports for mounting of disconnecting means as required and include costs for all such supports and associated equipment in the base bid. Maintain all conduit and conductor feeds to equipment concealed inside the building or below grade and stub up at the equipment inside the curb or at equipment supports. Unistrut shall not be allowed for any roof penetrations.

H. Coordinate closely with GC, MC and PC for all electrical, lighting, mechanical, plumbing and/or HVAC equipment locations. Refer to the mechanical, plumbing and architectural plans for exact locations and quantities of all HVAC equipment, plumbing equipment, smoke dampers, fire/smoke dampers, pumps, miscellaneous equipment, etc. Locations and quantities shown on the electrical drawings are approximate and may not reflect final position or quantity. The electrical contractor shall be responsible for familiarizing himself with all drawings and specifications in the construction documents, not just the electrical drawings. The electrical contractor shall provide final connection to all equipment and lighting. Where equipment or lighting is shown on the mechanical, plumbing or architectural plans but not shown on the electrical plans, electrical contractor shall provide power to the equipment based on equipment requirements as scheduled or noted, specified and/or per the manufacturer's requirements and include all costs in the base bid. Location shown of electrical connection to mechanical, plumbing or other equipment is schematic and may not reflect actual connection points. Rough-in and connection to the equipment shall be per the equipment manufacturer's requirements, the National Electric Code and as required to keep electrical connections concealed from view. All rough-in requirements shall be verified with the respective contractor and equipment manufacturer prior to any work being performed.

I. Electrical controls in boiler rooms, equipment rooms, and control rooms shall be grouped in accessible locations and arranged according to function. Where possible use group control panels and combination starters in lieu of individually enclosed devices.

J. All electrical work as required to provide temporary power for construction shall be the responsibility of the electrical contractor. Include all costs as required in the base bid. Coordinate and verify all requirements with the general contractor.

K. Refer to the construction documents for owner-supplied, contractor installed materials, equipment or fixtures. Contractor shall be prepared to receive materials and equipment arriving on the project site and shall be responsible for storing, removing from packaging and assembling on site prior to installation. Coordinate delivery times and all requirements with the owner through the general contractor. Contractor shall provide any and all necessary additional materials, supports, bracing, mounting brackets, back-boxes, etc. as required for installation of owner-supplied, contractor-installed materials, equipment or fixtures.

1.4 LOCAL CONDITIONS

A. Visit site and determine existing local conditions affecting work in contract.

B. Failure to determine site conditions or nature of existing or new construction will not be considered a basis for granting additional compensation.

1.5 CODES, ORDINANCES, RULES, AND REGULATIONS

A. Provide work in accordance with applicable codes, rules, ordinances, and regulations of Local, State, and Federal Governments and other authorities having lawful jurisdiction.

B. Drawings and specifications indicate minimum construction standards, but should any work indicated be sub-standard to any ordinances, laws, codes, rules, or regulations bearing on work, EC shall promptly notify AE in writing before proceeding with work so that necessary changes can be made. However, if EC proceeds with work knowing it to be contrary to any ordinances, laws, rules, and regulations, he shall thereby have assumed full responsibility for and shall bear all costs required to correct non-complying work.

C. Conform to latest editions and supplements of the following codes, standards, or recommended practices.

1. BUILDING CODES:

a. NFPA 70, 2014.

b. NFPA 110, 2016.

2. SAFETY CODES:

a. National Electric Safety Code Handbook H30 – National Bureau of Standards.

b. Occupational Safety and Health Standards – Department of Labor.

3. ENERGY CODES:

a. IECC, 2018.

b. ASHRAE 90.1, 2016.

4. UNDERWRITERS LABORATORIES, INC.:

a. UL 508 – Standards for Industrial Control Equipment.

b. UL 1008 – Standard for Automatic Transfer Switches.

c. All materials, equipment and component parts of equipment shall bear UL labels whenever such devices are listed by UL.

D. EC shall secure and pay for necessary permits and certificates of inspection required by governmental ordinances, laws, rules, or regulations. Keep a written record of all permits and inspection certificates and submit two (2) copies to AE with request for final inspection.

E. EC shall secure and pay for necessary permits and certificates of inspection required by governmental ordinances, laws, rules or regulations. Keep a written record of all permits and inspection certificates and submit two copies to AE with request for final inspection.

1.6 LOCATIONS AND INTERFERENCES

A. Locations of equipment, piping, and other mechanical work are indicated diagrammatically by

electrical drawings. Lay out work from dimensions on Architectural and Structural Drawings. Verify equipment size from manufacturer's shop drawings.

B. Study and become familiar with contract drawings of other trades and in particular the general construction drawings and details to obtain necessary information for figuring installation. Cooperate with other workmen and install work to avoid interference with their work. Minor deviations not affecting design characteristics, performance, or space limitations may be permitted if reviewed by AE prior to installation.

C. Any conduit, apparatus, appliance, or other electrical item interfering with proper placement of other work as indicated on drawings, specified, or required shall be removed and if so shown, relocated and reconnected without extra cost. Damage to other work caused by the E/C, his subcontractor, his workmen, or by any cause whatsoever, shall be restored as specified for new work.

D. Do not scale mechanical and electrical drawings for dimensions. Accurately lay out work from dimensions indicated on architectural drawings unless such is found in error.

1.7 SYSTEM PERFORMANCE

A. Final acceptance of work shall be subject to the condition that all systems, equipment, apparatus, and appliances operate satisfactorily as designed and intended; work shall include required adjustment of systems and control equipment installed under this specification.

1.8 WARRANTY

A. Unless noted otherwise in specifications, EC warrants to Owner and Architect the quality of materials, equipment, workmanship, and operation of equipment provided under this specification division for a period of one (1) year from and after date of substantial completion of building and acceptance of mechanical systems by Owner.

B. Where manufacturers' warranties expire before or during the one-year warranty period as specified in item 1, the EC shall include provisions for extending the manufacturer's warranty as required to match the one-year period from substantial completion and shall include cost for warranty extension in his base bid.

C. EC warrants to Owner and Architect that on receipt of written notice from either of them within one (1) year warranty period following date of acceptance, all defects that have appeared in materials and/or workmanship shall be promptly corrected to condition required by contract documents at EC's expense.

D. The above warranty shall not supersede any separately stated warranty or other requirements by law or by these specifications.

E. Keeps an itemized list of all equipment warranties listing equipment by name, mark, and type along with length and expiration date of each warranty. Submit two (2) copies to AE with request for final inspection.

F. If the Architect's specification includes a warranty requirement that exceeds the above warranty requirements, the Architect's warranty shall take precedence.

1.9 MATERIALS, EQUIPMENT AND SUBSTITUTIONS

A. Refer to Sections 01 2600.

1.10 SHOP DRAWINGS, OPERATION AND MAINTENANCE INSTRUCTION

A. Refer to Section 01 3300.

1.11 PROPOSED VALUE ENGINEERING/PROJECT SCOPE REVISIONS

A. Where design revisions are requested/required based on value-engineering or proposed changes in project scope, the contractor shall include in his proposed cost savings or adds the necessary MEP design fees that are required for modifying construction documents and associated meetings. In order to determine that value to be included, the contractor shall submit to the A/E the proposed scope of the work required for the changes at least 7 days prior to required pricing submittal so that the design fees can be accurately determined and included. Design work and drawing changes will only commence once the design fee is established and a signed agreement returned to the A/E for inclusion.

B. Where the contractor proposes to use different size equipment, feeders, feeder materials, circuit breakers, fuses or significant difference in routing of feeders or branches than shown in the construction documents, the contractor shall include the necessary MEP design fees that are required for modifying or creating construction drawings necessary either for construction or submission to the authority having jurisdiction and required for additional review. Design work and drawing changes will only commence once the design fee is established and a signed agreement returned to the A/E for inclusion.

1.12 DIGITAL FILE REQUESTS

A. Refer to Section 01 3300.

1.13 CUTTING AND PATCHING

A. Contractor shall do cutting and patching of building materials required for installation of work herein specified. Cut no structural members without Architect’s approval and in a manner approved by him.

B. Patching shall be by mechanics of particular trade involved and shall meet approval of Architect.

C. Drilling and cutting of openings through building materials requires Architect’s review and approval. Make openings in concrete with concrete hole saw or concrete drill. Do not use star drill or air hammer for this work.

D. Provide polished chrome plated escutcheons as needed for all pipe, tube, etc that penetrates a wall where exposed. Provide fire rated material at all rated wall per UL, NFPA, or as otherwise required.

1.14 MUTILATION

A. Mutilation of building finishes, caused by installation of electrical equipment, fixtures, outlets,

and other electrical devices shall be repaired at E/C's expense to approval of Architect.

1.15 SETTING, ADJUSTMENT AND EQUIPMENT SUPPORTS:

A. The following are general specifications. Refer to section 26 0529 Hangers and Supports for Electrical Systems for additional requirements.

B. Work shall include mounting, alignment, and adjustment of all systems and equipment. Set equipment level on adequate foundations and provide proper anchor bolts and isolation. Level, shim, and grout equipment bases as recommended by EM. Mount motors, align and adjust drive shafts and belts according to EM's instructions. Equipment failures resulting from improper installation or field alignment shall be repaired or replaced by EC at no cost to Owner.

C. Provide concrete bases for all floor and slab mounted equipment, regardless of whether specifically noted on the drawings or not.

D. Provide each piece of equipment or apparatus suspended from ceiling or mounted above floor level with suitable structural support, platform, or carrier in accordance with best recognized practice and the EM. EC shall arrange for attachment to building structure, unless otherwise indicated on drawings or specified. Provide hangers with vibration eliminators. Contractor shall verify with structural engineer that structural members of buildings are adequate to support equipment. Submit details of hangers, platforms, mounting brackets and supports together with total weights of mounted equipment to structural engineer and AE for review before proceeding with fabrication or installation.

E. Supports and/or support wires for electrical equipment, raceways, light fixtures, etc. shall be designated (painting is acceptable) separately from supports and/or support wires for other building systems. All supports and/or support wires shall be designated the same throughout the project.

F. Provide grout, sleeves, demolition, supports, and anchors as needed for complete professional installation.

1.16 START-UP, CHANGE-OVER, TRAINING AND OPERATIONAL CHECKS

A. EC shall perform initial start-up of systems and equipment. Personnel qualified to start-up and service this equipment, including EM's technicians, when specified, and Owner's operating personnel shall be present during these operations.

B. EC shall be responsible for training Owner's operating personnel to operate and maintain systems and equipment installed. Keep a record of training provided to Owner's personnel listing the date, subject covered, instructor's name, names of Owner's personnel attending, and the total hours given each individual.

C. EC shall report in person to Owner's designated operating personnel at end of first month of operation and thereafter at end of sixth and 12th months after date of substantial completion of building to check operation of equipment that was installed under contract. Contractor shall answer operating personnel's questions regarding system operation and shall ascertain that systems are operating normally and are being properly maintained by Owner. If EC finds that systems are not being operated and maintained as designed, he shall inform the building engineer/Owner and AE in writing.

D. After each inspection, EC shall submit written report to AE indicating condition of equipment and including any recommended changes in operation of system or other information which will be helpful to Owner.

1.17 MAINTENANCE OF SYSTEMS

A. EC shall be responsible for operation, maintenance, and lubrication of equipment installed under his contract. All equipment and systems shall be fully operational when turned over to the owner at project substantial completion.

1.18 PROTECTION AND CLEANING OF SYSTEMS AND EQUIPMENT

A. It shall be EC's responsibility to protect and prevent damage to all electrical materials and equipment stored and/or installed under this contract. All work, materials, and equipment shall be adequately protected by all means necessary to prevent damage by weather, flooding, condensation, construction debris, fire, and construction equipment and vehicles.

B. Equipment not rated for outdoor use shall be protected from moisture damage before and during construction. Covering equipment with a tarp on site is not considered a means of providing protection from moisture. Any equipment not rated for outdoor use exposed to moisture for any duration shall be replaced with new equipment at the contractor's expense.

C. Where job conditions, or work of other contractors produce the potential for damage to electrical systems and equipment, EC shall immediately notify the GC so that corrective action can be taken.

D. EC shall take extra precautions to protect electrical equipment containing solid state electronics, open relays, and contacts from damage by water, dust, dirt, construction debris, and the formation of condensate. All equipment so damaged shall be replaced by E/C with new equipment at no cost to Owner.

E. EC shall periodically inspect and clean all systems and equipment to ensure all systems and equipment remain in like new condition during construction, free from dust and debris. All cleaning shall be done in accordance with EM's recommendation where available and applicable.

F. Before request for final inspection, all systems and equipment shall be properly cleaned, vacuumed, polished, painted, etc., as required to return equipment to like new appearance.

G. All equipment requiring painting or touch-up shall be properly prepared and painted in accordance with this specification.

H. All recessed floor boxes, poke-throughs and/or floor vaults shall be fully sealed and protected from moisture, dirt, construction debris and damage during and after installation. Provide protective covers for all equipment and follow all manufacturer's installation instructions. Install only the boxes and minimum support elements initially with final inserts, electrical components and electronics to be installed at final device installation as per the manufacturer's installation instructions. Where any moisture or debris does get into the wiring compartment(s) of recessed floor boxes, poke-throughs or vaults, it shall be the contractor's responsibility to replace all interior components at his expense. Where damage is done to the recessed box frames or tops, it shall be the contractor's responsibility to cut the damaged equipment out and

replace with new (all patching and repair shall be the contractor's responsibility – coordinate with GC). Notify AE of all instances.

I. EC shall keep a written record listing systems and equipment cleaned. Where special procedures or chemicals were used or where partial or complete disassembly of factory assembled equipment was necessary, EC shall list special procedures and/or disassembly required and equipment components affected. Prior to final inspection, EC shall submit two (2) copies of cleaning record to AE for their records.

1.19 PAINTING OF MATERIAL

A. In all interior areas without finish ceilings, or where exposed conduit, junction boxes, hangers, supports, mounting brackets or device back-boxes are installed on walls, floors or exposed on finish ceilings, the contractor shall be responsible for painting all exposed materials to match building finishes.

B. In all exterior areas where conduit, junction boxes, hangers, supports, mounting brackets or device back boxes are exposed and/or surface-mounted, the contractor shall be responsible for painting all exposed materials to match building finishes. Refer to the Architect's specifications for additional requirements. Colors shall be as selected by Architect.

C. Equipment and materials exposed to interior dry environment shall have a minimum of one (1) primer and one (1) finish coat. Equipment and materials mounted in exterior location shall have a minimum of one (1) primer and two (2) finish coats.

D. After installation, damage to painted surfaces of equipment shall be properly prepared and primed with primers equal to factory materials. Finish coating shall be same color and type as factory finish. Where extensive refinishing of factory applied finishes is required, equipment shall be completely repainted. AE will make final determination of extent of refinishing required.

1.20 RECORDING AND REPORTING TESTS AND DATA

A. Record nameplate horsepower, amperes, volts, phase service factor, and other necessary data on motors and other electrical equipment furnished and/or connected under this contract.

B. Record motor starter catalog number, size, rating, and/or catalog number of thermal-overload units installed in all motor starters furnished and/or connected under this contract. See motor starter specification instructions for proper sizing of thermal-overload units.

C. Record amperes-per-phase at normal or near-normal loading of each item of equipment furnished and/or connected.

D. Record current readings of each feeder conductor after energized and normally loaded, and again after balancing of feeder loads as required by current readings.

E. Record voltage and amperes-per-phase readings taken at service entrance equipment after completion of project with building operating at normal electrical load. This reading shall be taken continuously for a 24-hour period and recorded on permanent tape and submitted to A/E.

F. Record voltage and amperes at transformer secondary and primary stations, at normal loading.

Record transformer percentage "taps" finally selected. Transformers shall be connected to produce voltage at building service entrance equipment as follows:

Nominal System Voltage	Service Entrance Voltage
460	480
230	240
200	208

G. Submit at least two (2) copies of data noted above to AE for review prior to final inspection.

H. Keep a record of all deviations made from routes, locations, circuiting, etc., shown on contract drawings. Prior to final inspection, submit one (1) new set of project drawings with all deviations and change clearly indicated.

1.21 SLEEVES

A. Provide proper type and size sleeves for electrical ducts, busses, conduits, etc., passing through building construction. Where sleeves are installed by others, supervise installation to ensure proper sleeve location. Unless indicated or approved, install no sleeves in structural members. Sleeves shall be installed in concrete or masonry walls or floors and where otherwise noted.

B. Each sleeve shall be continuous through wall floor or roof and shall be cut flush on each side except where indicated otherwise. Sleeves shall not be installed in structural member except where indicated or approved. Sleeves shall be required through floors subject to flooding such as toilet rooms, equipment rooms, and kitchens. The contractor shall have the option of:

C. Providing a PVC sleeve with integral flanges extending 1-inch above finished floor. Sleeve shall be cast in concrete when floor is poured. Annular space between sleeve and pipe shall be filled with Kawool. This option can only be used where sleeve does not communicate with supply or return air plenum or provide core-drilled opening in concrete with ThunderlineUnk-Seal or Calpico Sealing Linx between piping and opening.

D. Sleeves passing through floors and exterior walls with waterproof membranes shall be core-drilled (floors only) and sealed with Thunderline Link-Seal or Calpico Sealing Linx.

E. Where electrical ducts, busses, conduits, wiring, etc., pass through fire walls, floors, and smoke partitions, seal annular space between sleeve and item passing through with Kaowool Fire Master Bulk Packing. Packing thickness shall be sized per manufacturer's recommendation for maintaining the integrity of the fire wall/floor or smoke partition. Fire protection system shall be rated per ASTM E 119. Equivalents to Kaowool are 3M, Flame stop, or Flame Safe.

F. Where piping passes through walls serving as supply or exhaust air plenums or chases, seal annular space between pipe and sleeve air tight with Thunderline Link-Seal or Calpico Sealing Linx.

G. Water Seal: Seal penetrations of perimeter walls or floors below grade to prevent entry of water. Seal both exterior of conduit and interior of conduit around cables. Use materials compatible with wall or floor construction and approved by DE.

H. Roof Penetrations: Seal penetrations of roof with flashing compatible with roof design and approved by Roofing System Manufacturer and DE.

1.22 RECORD DOCUMENTS

A. Refer to Division 1, General Requirements.

PART 2 – PRODUCTS (Not Applicable)

PART 3 – EXECUTION (Not Applicable)

END OF SECTION 260000

SECTION 260126 – TESTING FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Electrical Contractor Provide:
   1. Testing of electrical components and systems:
      a. Continuity test.
      b. Voltage test.
      c. Phase relationship verification.
      d. High Potential Testing (MV equipment, cables, splices and connectors).
      e. Insulation Resistance Test (600V equipment and cables).
   2. Test reports.
   3. Correction of defective components or systems.
   4. Retest of corrected components or systems.

1.2 SUBMITTALS

A. Submit Test Reports: submit 3 copies of all test reports to Architect/Engineer.

   1. Type each test report on 8-1/2" x 11" paper. Include:
      a. Project Number.
      b. Project title and location.
      c. Test performed.
      d. Date performed.
      e. Test equipment used.
      f. Contractor's name, address and telephone number.
      g. Testing firm's name, address and telephone number, if other than Contractor.
      h. Name(s) and title(s) of person(s):
         1) Performing test.
         2) Observing test.
      i. Statement verifying each test.
      j. Nameplate data from each motor and equipment item tested.
      k. Test results.
      l. Retest results after correction of defective components, systems.
   2. For each copy, assemble all test reports and bind them in a folder. Label each folder, "Electrical Test Reports" and include Project Number, Title and Location.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Furnish all equipment, manpower and casual labor to perform specified testing.

PART 3 - EXECUTION

3.1 PREPARATION

A. Ensure that all electrical work is complete and ready for testing. All cables shall be terminated prior to testing. No cables shall be energized until all testing and corrections have been satisfactorily completed.

B. Disconnect all devices or equipment that might be damaged by application of test voltages, voltage of reversed phase sequence or other test procedures.

3.2 TESTING

A. Conduct tests and adjust equipment to verify compliance with specified performance.

3.3 HIGH POTENTIAL CABLE TEST (FOR NEW CABLES ONLY)

A. Electrical Contractor shall hire an independent agency to perform DC high potential test using ICEA method for each new 15kV conductor. Electrical Contractor shall provide necessary manpower to isolate the cables and assist in this test, including connecting of test leads, and transportation of test equipment on-site.

B. Electrical Contractor shall schedule the high potential testing and notify the A/E and Owner two weeks in advance.

3.4 VOLTAGE TESTS

A. Make and record voltage tests at the following listed points. Conduct tests under normal load conditions.

1. Equipment connections.

3.5 PHASE RELATIONSHIP

A. Examine connections to equipment for proper phase relationships. Prior to beginning the change over, verify and mark the phase relationships at each service entrance into the buildings. This should be verified again prior to re-energizing main after the change over.

3.6 INSULATION RESISTANCE TESTS

A. Resistance measured; Line-to-ground.

B. Perform testing on the following items:

Item Tested	Voltage	Min. Acceptance of Test Resistance in Megohms
1. No. 2 and larger cables (600V)	1000V	50
2. Motors	500V	5
3. Switchboard, Panelboard Buses	1000V	25

3.7 BRANCH CIRCUIT RECEPTACLES

A. All receptacles shall be tested for:

1. Ground continuity.
2. Polarity of hot and neutral.
3. Correct operation of ground fault circuit interrupting receptacles (where applicable).

B. Test reports may be submitted as exceptions only.

3.8 CORRECTION OF DEFECTS

A. When tests disclose any unsatisfactory workmanship or equipment furnished under this Contract, correct defects and retest. Repeat tests until satisfactory results are obtained.

B. When any wiring or equipment is damaged by tests, repair or replace such wiring or equipment. Test repaired items to ensure satisfactory operation.

END OF SECTION 260126

SECTION 260513 - MEDIUM VOLTAGE CABLES

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Base Bid:

1. Electrical Contractor Provide:

a. Cable terminations and splices.

b. Medium voltage cable.

c. Cable Fire Proofing.

d. Pulling Lubricant.

e. Training materials.

1.2 REFERENCES

A. ANSI/IEEE C2 - National Electrical Safety Code.

B. ANSI/NFPA 70 - National Electrical Code (2011).

C. IEEE 48 - Test Procedures and Requirements for High-Voltage Alternating-Current Cable Terminations.

D. NEMA WC 8 - Ethylene-Propylene-Rubber-Insulated Wire and Cable for the Transmission and Distribution of Electrical Energy.

1.3 SUBMITTALS

A. Submit Product Data: Provide for terminations, connectors and accessories, pulling lubricant and cable preparation tools.

B. Submit Test Reports: Indicate results of cable test in tabular form and in plots of current versus voltage for incremental voltage steps, and current versus time at 30 second intervals at maximum voltage.

C. Manufacturer's Instructions: Indicate application conditions and limitations of use stipulated by Product testing agency specified under Regulatory Requirements.

D. Manufacturer's Instructions: Include instructions for storage, handling, protection, examination, preparation, installation, and starting of Product.

E. Prior to cable installation, the contractor shall determine the exact conduit routing and perform cable pulling calculations with the exact conditions and materials. These calculations shall be submitted to the Engineer prior to cable installation.

1.4 PROJECT RECORD DOCUMENTS

A. Accurately record actual sizes and locations of cables.

1.5 OPERATION AND MAINTENANCE DATA

A. Maintenance Data: Include instructions for testing and cleaning cable and accessories.

1.6 QUALIFICATIONS

A. Manufacturer: Company specializing in manufacturing Products specified in this Section with minimum three years documented experience.

B. Installer: Company specializing in installing Products specified in this Section with minimum three years documented experience.

1.7 REGULATORY REQUIREMENTS

A. Conform to requirements of ANSI/NFPA 70.

B. Furnish products listed and classified by Nationally Recognized Testing Laboratories as suitable for purpose specified and shown.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Deliver, store, protect, and handle Products to site.

B. Accept cable and accessories on site in manufacturer's packaging. Inspect for damage.

C. Store and protect in accordance with manufacturer's instructions.

D. Protect from weather. Provide adequate ventilation to prevent condensation.

1.9 PROJECT CONDITIONS

A. Verify that field measurements are as shown on Drawings.

B. Verify routing and termination locations of cable bank prior to rough-in.

C. Cable routing is shown on Drawings in approximate locations unless dimensioned. Route as required to complete wiring system.

D. Determine exact conduit routing and perform pulling calculations prior to cable installation.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. TF Cable

B. General Cable

C. Okonite

D. Southwire

2.2 MEDIUM VOLTAGE CABLE

A. Description: NEMA WC 8; ethylene propylene rubber insulated cable.

B. Voltage: 15kV, ungrounded.

C. Conductor: Copper stranded, with extruded semi-conducting thermosetting polymeric conductor shield.

D. Construction: Single conductor MV-105 with 133% E.P.R. insulation level as specified on Drawings and an extruded layer of semi-conducting thermosetting material and 5 mil copper tape insulation shielding with minimum 25% overlap.

E. Insulation Jacket: PVC or Polyethylene.

2.3 CABLE TERMINATIONS

A. Manufacturers:

1. 3M.

2. Raychem.

3. Elastimold.

4. RTE.

B. The cable termination must be capable of normal continuous operation at the rated voltage and current on the cable it is to be used on, and it should meet all the requirements of a Class 1 termination as given in the IEEE Standard 48-1996. The termination must be a one-piece cold shrink, molded rubber unit, where the stress relief mechanism uses the concept of high dielectric constant stress relief, and the molded rubber insulator must be made from a track-resistant rubber. A mechanical (non-solder) ground strap assembly shall be included as a part of the kit.

2.4 CABLE SPLICES

A. Cable shall be of continuous lengths and shall not be spliced between the fuse holder and the new switchgear unless indicated otherwise.

2.5 WIRE PULLING LUBRICANT

A. Pulling lubricant shall be a NRTL listed, water-based, polymer solution with a coefficient of friction (COF) of 0.15 when use in PVC conduit with EPR insulated cable. Lubricants containing waxes or soaps are not acceptable.

B. The lubricant shall be compatible with the cable insulation and shall not cause any premature deterioration of the insulation material. When use on high voltage cable, the lubricant shall not affect the volume resistivity of any semi-conducting jacket or insulation shield present.

C. Dried residue from lubricant shall not become tacky or gum-up. Cables shall remain able to pull after lubricant has dried.

D. The lubricant shall be approved by the cable manufacturer for use with their cables.

E. Acceptable Manufacturers/Products:

1. American Polywater/Polywater J.
2. ARNCO/Hydra-Lube.
3. 3M/WL Wire Pulling Lubricant.
4. Gardner-Bender/Poly-Gel
5. Ideal/Aqua-Gel.
6. Other pre-approved equal.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify installation conditions.

B. Examine raceways to receive medium-voltage cables for compliance with installation tolerances and other conditions affecting performance of the cable. Do not proceed with installation until unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Prepare raceway and ensure that is free of obstructions. Pre-lubricate the inside of the duct/conduit by using an Underwriter's Laboratories 50X2 listed wire pulling compound, use split bag wire pulling compound dispenser.

B. Prior to lubrication for pulling new cable, swab duct/conduit and pull a mandrel to assure no bends are out of round and cable will jam.

C. Contractor shall perform a cable pull calculation using the size/type of conduit, number of bends and intervals of length to assure the pull will not exceed the cable manufacturer recommended maximum pulling force. Damaged cables will be replaced by the contractor at no cost. Contractor will setup pulls to reduce the pulling effort based upon the calculation and cable manufacturer recommendations. Provide A/E with a copy of the pulling calculations.

3.3 INSTALLATION

A. Install cable and accessories in accordance with manufacturer's instructions.

B. Provide cable in continuous length between equipment. Cable shall not be spliced.

C. Where more than one cable is indicated to be pulled into a raceway, pull all conductors simultaneously.

D. Pull enough conductor length to allow 4 feet to be cut off of both ends of each conductor. Cut 4 feet off of conductor end when terminating the conductor.

E. Avoid abrasion and other damage to cables during installation.

F. Use suitable lubricants and pulling equipment. CABLE LUBRICANT SHALL BE USED IN ALL PULLS.

G. Ground cable shield at each termination.

1. Feeder conductor shields A, B & C shall be grouped and interconnected at each termination.

2. Connect ground lead to:

a. Ground bus in switchgear.

H. A minimum of 3 feet of primary cable slack shall be left for making proper terminations and splices.

I. When terminating, leave sufficient slack for creep after cable is connected.

J. Perform cable terminations utilizing the necessary cable preparation tools listed below under Training. All cable preparation shall be performed with tools specifically designed for MV EPR cable and per manufacturer recommendations.

3.4 FIELD QUALITY CONTROL

A. Field testing will be performed under provisions of Section 260126.

B. Inspect exposed cable sections for physical damage.

C. Inspect cable for proper connections as shown on Drawings.

D. Inspect shield grounding, cable supports, and terminations for proper installation.

3.5 PROTECTION

A. Protect installed cables from entrance of moisture. Cables which are installed and will not be terminated or energized for more than one week shall be protected against moisture entry by installing cold shrink end caps.

3.6 TRAINING

A. Contractor shall use tools recommended by manufacturer in the preparation of splices and terminations. Typical tools used shall include the following:

1. MV Spiral cut (banana) cable outer jacket stripper.

2. MV cable end stripper with replacement blade.

3. MV cable chamfer tool for EPR semi-conducting insulation.

4. MV cable safety grounding tools (spike type) for three conductors

5. Connector specific insertion tools, wrenches and accessories.

6. Duck bill pliers

B. Training shall be mandatory for all Contractor staff prior to termination or splicing. All contractor personnel who will perform terminations or splices shall be certified as trained by the manufacturer in the methods, tools and materials to install the respective product. No terminations or splices shall be performed by uncertified or untrained personnel. Contractor shall provide a minimum of two spices and two terminations of each type to be used by personnel during training.

END OF SECTION 260513

SECTION 260519 - LOW-VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Copper building wire rated 600 V or less.
2. Low-voltage control cable
3. Control-circuit conductors
4. Connectors, splices, and terminations rated 600 V and less.

B. Related Requirements:

1. Section 26 0000 “General Electrical Requirements”.

1.2 DEFINITIONS

A. Low Voltage: As defined in NFPA 70 for circuits and equipment operating at less than 50 V or for remote-control and signaling power-limited circuits.

1.3 SUBMITTALS

A. Product Data: Provide for each type of conductor intended for use.

PART 2 - PRODUCTS

2.1 COPPER BUILDING WIRE

A. Description: Flexible, insulated and uninsulated, drawn copper current-carrying conductor with an overall insulation layer or jacket, or both, rated 600 V or less.

B. Provide conductors by Encore Wire and Cable, Southwire, Senator Wire and Cable, and Cerro Wire or equivalent.

C. Standards:

1. Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and use.
2. RoHS compliant.
3. Conductor and Cable Marking: Comply with wire and cable marking according to UL's "Wire and Cable Marking and Application Guide."

D. Conductors: Copper, complying with ASTM B3 for bare annealed copper and with ASTM B8 for stranded conductors. Unless noted otherwise conductors referred to are wires and cable.

Provide code grade soft annealed copper conductors with specified insulation type in proper colors to conform to color coding specified. Provide conductors No. 8 gauge and larger stranded and conductors No. 10 gauge and smaller shall be solid.

E. Conductor Insulation all rated for 90 deg C with thermoplastic insulation:

1. Type RHH and Type RHW-2: Comply with UL 44.

2. Type USE-2 and Type SE: Comply with UL 854.

3. Type THHN and Type THWN-2: Comply with UL 83.

4. Type THW and Type THW-2: Comply with NEMA WC-70/ICEA S-95-658 and UL 83.

5. Type XHHW-2: Comply with UL 44.

2.2 LOW-VOLTAGE CONTROL CABLE

A. Plenum-Rated, Paired Cable: NFPA 70, Type CMP. All shall be plenum rated unless noted otherwise.

1. Multi-pair, twisted, No. 18 AWG, stranded (19x30) tinned-copper conductors.

2. PVC insulation.

3. Unshielded.

4. PVC jacket.

5. Flame Resistance: Comply with NFPA 262.

2.3 CONTROL-CIRCUIT CONDUCTORS

A. Class 1 Control Circuits: Stranded copper, Type THHN/THWN-2, complying with UL 83 in raceway.

B. Class 2 Control Circuits: Stranded copper, Type THHN/THWN-2, complying with UL 83 in raceway.

C. Class 3 Remote-Control and Signal Circuits: Stranded copper, Type THHN/THWN-2, complying with UL 83 in raceway.

D. Class 2 Control Circuits and Class 3 Remote-Control and Signal Circuits That Supply Critical Circuits: Circuit Integrity (CI) cable.

2.4 CONNECTORS AND SPLICES

A. Description: Factory-fabricated connectors, splices, and lugs of size, ampacity rating, material, type, and class for application and service indicated; listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and use.

B. Jacketed Cable Connectors: For steel and aluminum jacketed cables, zinc die-cast with set screws, designed to connect conductors specified in this Section.

C. Lugs: One piece, seamless, designed to terminate conductors specified in this Section.

1. Material: Copper.

2. Type: One hole with standard barrels.

3. Termination: Compression or set screw.

PART 3 - EXECUTION

3.1 CONDUCTOR MATERIAL APPLICATIONS

A. Feeders:

1. Copper; solid for No. 10 AWG and smaller; stranded for No. 8 AWG and larger.

B. Branch Circuits:

1. Copper, Solid for No. 10 AWG and smaller; stranded for No. 8 AWG and larger.

C. Power-Limited Fire Alarm and Control: Solid for No. 12 AWG and smaller.

3.2 INSTALLATION OF CONDUCTORS AND CABLES

A. Conceal cables in finished walls, ceilings, and floors unless otherwise indicated.

B. Complete raceway installation between conductor and cable termination points according to Section 26 0533 "Raceways and Boxes for Electrical Systems" prior to pulling conductors and cables.

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

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

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

F. Support cables according to Section 26 0529 "Hangers and Supports for Electrical Systems."

G. Run conductors in conduit continuous between outlets and junction boxes with no splices or taps pulled into conduits.

H. Neatly route, tie, and support conductors terminating at switchboards, motor control centers, panelboards, sound equipment, etc., with Thomas & Betts Ty-Rap cable ties and clamps or equivalent by Electrovert or Panduit.

I. Make circuit conductor splices with Buchanan B- Cap nylon insulated connectors or equivalent by Ideal or 3M.

J. Make fixture and device taps with Scotchlock self-stripping electrical tap connectors.

K. Terminate solid conductors at equipment terminal strips and other similar terminal points with insulated solderless terminal connectors. Terminate all stranded conductor terminal points with insulated solderless terminal connectors. Provide Thomas & Betts Sta-Kon insulated terminals and connectors or equivalent by API/AMP Blackburn, Buchanan, or Scotchlock.

L. Where a total of six (6) or more control and feeder conductors terminate in a multiple device panel or enclosure that has no built-in terminal blocks, provide mounting channel and see-through covers. Equivalent terminal blocks by General Electric, Square D, or approved equal.

M. Wrap conductor taps and connections requiring additional insulation with a minimum of three (3) overlapped layers of 3M Scotch vinyl plastic electrical tape No. 88 or equivalent.

3.3 ELECTRICAL CIRCUITING

A. In general, comply with designated circuiting as shown on the electrical drawings where possible. Where circuiting is changed in the field, the contractor shall document actual circuiting and homerun numbers, and panelboard labels shall accurately indicate field-installed circuiting.

B. All devices indicated as isolated ground (‘IG’ adjacent to receptacles or by note) shall be provided with a dedicated, separate isolated ground from the panelboard, whether specifically indicated on the plans or not.

C. Multi-wire branch circuits (with shared neutral), shall not be allowed per National Electric Code. The electrical drawings and panelboard schedules in the construction documents reflect single-circuit homeruns with single-pole circuit breakers.

D. Provide continuous color coding for feeder, branch, and control circuits. Insulation or identification tape color shall be same color for like circuits throughout. Where specified insulation colors are not available in larger wire sizes, color code conductor at all accessible locations with Scotch 35 all-weather color code tape.

E. Identify the same phase conductor with same color throughout.

3.4 CONDUIT APPLICATION

A. All circuiting on the project shall be in steel conduit unless noted otherwise in this section, or elsewhere within these specifications or construction documents.

B. Provide galvanized rigid steel (GRC) conduit for the following applications:

1. All branch circuits and feeders fed under unpaved areas with vehicular traffic.

2. All branch circuits and feeders susceptible to damage.

3. All feeders exceeding 480V.

C. Provide EMT conduit for the following applications:

1. All panelboard feeders above grade.

2. All branch circuits above grade in mechanical rooms, electrical rooms and rooms with kitchen equipment (including kitchens, bars, banquet prep areas, lounges, etc.).

3. General motor circuits (including, but not limited to, elevators, trash compactors, sewage ejectors, sump pumps, etc.)

4. All emergency and required standby branch circuits and feeders (except as noted above).

5. Telephone, data and/or television conduits above grade.

6. All temperature control wiring.

7. All distributed low voltage wiring fed vertically between floors in multi-floor buildings.

8. Recess in wall to level of structure for all precast walls, gymnasium, and similar normally occupied spaces.

D. Non-metallic, rigid conduit (PVC Schedule 40 or Schedule 80 shall be allowed for the following applications:

1. Secondary Electrical service entrance feeders fed below grade.

2. Panelboard feeders fed below grade.

3. Branch circuits fed below grade.

4. Feeders and branch circuits in tunnels.

5. Generator annunciation and HMI communication conduits in tunnels.

E. MC Cable shall not be allowed.

F. All conduit shall be installed concealed. In areas with exposed structure for walls and/or ceilings, provide EMT conduit routed tight to structural members and concealed in the framing. All turns shall be made with 90-degree bends. MC cable is not allowed where exposed to view.

G. Use no conductors smaller than No. 12 gauge unless specifically called for or approved by D/E. Size wire for 120 volt branch circuits for 3 percent maximum voltage drop. Size feeder circuits for 2 percent maximum voltage drop. Combined voltage drop of feeders and branch circuits shall not exceed 5 percent maximum.

H. All electrical feeders feeding panelboards, distribution equipment and the automatic transfer switches fed from the generator for emergency power shall be routed below grade (under a minimum of 2” concrete), be concrete-encased with a minimum of 2” concrete all the way around the conduit, be installed in shafts with a 2-hour rating, or be protected by a fire-rated assembly listed to achieve a minimum fire rating of 2 hours. Concrete encasement, the 2-hour rated shaft and/or the 2-hour fire-rated assembly are the responsibility of the electrical

contractor – coordinate with the G/C to include all costs in the base bid. All emergency feeders shall be installed in accordance with the National Electric code, section 700. Details for providing the 2-hour protection shall be submitted with the shop drawings.

3.5 CONNECTIONS

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

B. Make splices, terminations, and taps that are compatible with conductor material.

C. Wiring at Outlets: Install conductor at each outlet, with at least 6 inches (150 mm) of slack.

3.6 IDENTIFICATION

A. Identify and color-code conductors and cables according to Section 26 0553 "Identification for Electrical Systems."

B. Identify each spare conductor at each end with identity number and location of other end of conductor, and identify as spare conductor.

3.7 SLEEVE AND SLEEVE-SEAL INSTALLATION FOR ELECTRICAL PENETRATIONS

A. Install sleeves and sleeve seals at penetrations of exterior floor and wall assemblies.

3.8 FIRESTOPPING

A. Apply firestopping to electrical penetrations of fire-rated floor and wall assemblies to restore original fire-resistance rating of assembly.

END OF SECTION 260519

SECTION 260526 - GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes grounding and bonding systems and equipment.

B. Section includes grounding and bonding systems and equipment, plus the following special applications:

1. Underground distribution grounding.

2. Foundation steel electrodes.

C. Related Requirements:

1. Section 26 0000 “General Electrical Requirements”.

1.2 ACTION SUBMITTALS

A. Refer to Section 01 3300.

PART 2 - PRODUCTS

2.1 SYSTEM DESCRIPTION

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

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

2.2 CONDUCTORS

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

B. Bare Copper Conductors:

1. Solid Conductors: ASTM B3.

2. Stranded Conductors: ASTM B8.

3. Tinned Conductors: ASTM B33.

4. Bonding Cable: 28 kcmil, 14 strands of No. 17 AWG conductor, 1/4 inch (6 mm) in diameter.

5. Bonding Conductor: No. 4 or No. 6 AWG, stranded conductor.

6. Bonding Jumper: Copper tape, braided conductors terminated with copper ferrules; 1-5/8 inches (41 mm) wide and 1/16 inch (1.6 mm) thick.

7. Tinned Bonding Jumper: Tinned-copper tape, braided conductors terminated with copper ferrules; 1-5/8 inches (41 mm) wide and 1/16 inch (1.6 mm) thick.

C. Grounding Bus: Predrilled rectangular bars of annealed copper, 1/4 by 4 inches (6.3 by 100 mm) in cross section, with 9/32-inch (7.14-mm) holes spaced 1-1/8 inches (28 mm) apart. Stand-off insulators for mounting shall comply with UL 891 for use in switchboards, 600 V and shall be Lexan or PVC, impulse tested at 5000 V.

2.3 CONNECTORS

A. Listed and labeled by an NRTL acceptable to authorities having jurisdiction for applications in which used and for specific types, sizes, and combinations of conductors and other items connected.

B. Welded Connectors: Exothermic-welding kits of types recommended by kit manufacturer for materials being joined and installation conditions.

C. Bus-Bar Connectors: Compression type, copper or copper alloy, with two wire terminals.

D. Beam Clamps: Mechanical type, terminal, ground wire access from four directions, with dual, tin-plated or silicon bronze bolts.

E. Cable-to-Cable Connectors: Compression type, copper or copper alloy.

F. Cable Tray Ground Clamp: Mechanical type, zinc-plated malleable iron.

G. Conduit Hubs: Mechanical type, terminal with threaded hub.

H. Ground Rod Clamps: Mechanical type, copper or copper alloy, terminal with hex head bolt.

I. Ground Rod Clamps: Mechanical type, copper or copper alloy, terminal with hex head bolt.

J. Lay-in Lug Connector: Mechanical type, copper rated for direct burial terminal with set screw.

K. Service Post Connectors: Mechanical type, bronze alloy terminal, in short- and long-stud lengths, capable of single and double conductor connections.

L. Signal Reference Grid Clamp: Mechanical type, stamped-steel terminal with hex head screw.

M. Straps: Solid copper, copper lugs. Rated for 600 A.

N. Tower Ground Clamps: Mechanical type, copper or copper alloy, terminal two-piece clamp.

O. U-Bolt Clamps: Mechanical type, copper or copper alloy, terminal listed for direct burial.

P. Water Pipe Clamps:

1. Mechanical type, two pieces with zinc-plated bolts.

a. Material: Die-cast zinc alloy.

b. Listed for direct burial.

2. U-bolt type with malleable-iron clamp and copper ground connector.

2.4 GROUNDING ELECTRODES

A. Ground Rods: Copper-clad steel; 3/4 inch by 10 feet (19 mm by 3 m).

PART 3 - EXECUTION

3.1 APPLICATIONS

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

B. Underground Grounding Conductors: Install bare copper conductor, size per drawings.

1. Bury at least 30 inches (750 mm) below grade.

C. Grounding Bus: Install in electrical equipment rooms, in rooms housing service equipment, and elsewhere as indicated.

1. Install bus horizontally, on insulated spacers 2 inches (50 mm) minimum from wall, 6 inches (150 mm) above finished floor unless otherwise indicated.

2. Where indicated on both sides of doorways, route bus up to top of door frame, across top of doorway, and down; connect to horizontal bus.

D. Conductor Terminations and Connections:

1. Pipe and Equipment Grounding Conductor Terminations: Bolted connectors.

2. Underground Connections: Welded connectors except at test wells and as otherwise indicated.

3. Connections to Ground Rods at Test Wells: Bolted connectors.

4. Connections to Structural Steel: Welded connectors.

3.2 GROUNDING AT THE SERVICE

A. Equipment grounding conductors and grounding electrode conductors shall be connected to the ground bus. Install a main bonding jumper between the neutral and ground buses.

3.3 GROUNDING SEPARATELY DERIVED SYSTEMS

A. Generator: Install grounding electrode(s) at the generator location. The electrode shall be connected to the equipment grounding conductor and to the frame of the generator.

3.4 EQUIPMENT GROUNDING

A. Install insulated equipment grounding conductors with the following items, in addition to those required by NFPA 70:

1. Feeder.

2. Receptacle circuits.

3. Single-phase motor and appliance branch circuits.

4. Three-phase motor and appliance branch circuits.

5. Flexible raceway runs.

6. Armored and metal-clad cable runs.

7. Busway Supply Circuits: Install insulated equipment grounding conductor from grounding bus in the switchgear, switchboard, or distribution panel to equipment grounding bar terminal on busway.

B. Air-Duct Equipment Circuits: Install insulated equipment grounding conductor to duct-mounted electrical devices operating at 120 V and more, including air cleaners, heaters, dampers, humidifiers, and other duct electrical equipment. Bond conductor to each unit and to air duct and connected metallic piping.

C. Water Heater, Heat-Tracing, and Antifrost Heating Cables: Install a separate insulated equipment grounding conductor to each electric water heater and heat-tracing cable. Bond conductor to heater units, piping, connected equipment, and components.

D. Poles Supporting Outdoor Lighting Fixtures: Install grounding electrode and a separate insulated equipment grounding conductor in addition to grounding conductor installed with branch-circuit conductors.

3.5 INSTALLATION

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

B. Ground Rods: Drive rods until tops are 2 inches (50 mm) below finished floor or final grade unless otherwise indicated.

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

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

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

2. Bonding to Equipment Mounted on Vibration Isolation Hangers and Supports: Install bonding so vibration is not transmitted to rigidly mounted equipment.

3. Use exothermic-welded connectors for outdoor locations; if a disconnect-type connection is required, use a bolted clamp.

D. Grounding and Bonding for Piping:

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

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

3. Bond each aboveground portion of gas piping system downstream from equipment shutoff valve.

3.6 FIELD QUALITY CONTROL

A. Perform tests and inspections.

B. Tests and Inspections:

1. After installing grounding system but before permanent electrical circuits have been energized, test for compliance with requirements.

2. Inspect physical and mechanical condition. Verify tightness of accessible, bolted, electrical connections with a calibrated torque wrench according to manufacturer's written instructions.

3. Test completed grounding system at each location where a maximum ground-resistance level is specified, at service disconnect enclosure grounding terminal, and at individual ground rods. Make tests at ground rods before any conductors are connected.

a. Measure ground resistance no fewer than two full days after last trace of precipitation and without soil being moistened by any means other than natural drainage or seepage and without chemical treatment or other artificial means of reducing natural ground resistance.

b. Perform tests by fall-of-potential method according to IEEE 81.

C. Grounding system will be considered defective if it does not pass tests and inspections.

D. Prepare test and inspection reports.

E. Excessive Ground Resistance: If resistance to ground exceeds specified values, notify Architect promptly and include recommendations to reduce ground resistance.

END OF SECTION 260526

SECTION 260529 - HANGERS AND SUPPORTS FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Steel slotted support systems.
2. Conduit and cable support devices.
3. Support for conductors in vertical conduit.
4. Structural steel for fabricated supports and restraints.
5. Mounting, anchoring, and attachment components, including powder-actuated fasteners, mechanical expansion anchors, concrete inserts, clamps, through bolts, toggle bolts, and hanger rods.
6. Fabricated metal equipment support assemblies.

B. Related Requirements:

1. Section 26 0000 “General Electrical Requirements”.

1.2 ACTION SUBMITTALS

A. Refer to Section 01 3300.

PART 2 - PRODUCTS

2.1 SUPPORT, ANCHORAGE, AND ATTACHMENT COMPONENTS

A. Steel Slotted Support Systems: Preformed steel channels and angles with minimum 13/32-inch-(10-mm-) diameter holes at a maximum of 8 inches (200 mm) o.c. in at least one surface.

1. Standard: Comply with MFMA-4 factory-fabricated components for field assembly.
2. Material for Channel, Fittings, and Accessories: Steel.
3. Channel Width: Selected for applicable load criteria.
4. Painted Coatings: Manufacturer's standard painted coating applied according to MFMA-4.
5. Protect finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

B. Conduit and Cable Support Devices: Steel hangers, clamps, and associated fittings, designed for types and sizes of raceway or cable to be supported.

C. Support for Conductors in Vertical Conduit: Factory-fabricated assembly consisting of threaded body and insulating wedging plug or plugs for nonarmored electrical conductors or cables in riser conduits. Plugs shall have number, size, and shape of conductor gripping pieces as required to suit individual conductors or cables supported. Body shall be made of malleable iron.

D. Structural Steel for Fabricated Supports and Restraints: ASTM A36/A36M steel plates, shapes, and bars; black and galvanized.

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

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

2. Mechanical-Expansion Anchors: Insert-wedge-type, zinc-coated steel, for use in hardened portland cement concrete, with tension, shear, and pullout capacities appropriate for supported loads and building materials where used.

3. Concrete Inserts: Steel or malleable-iron, slotted support system units are similar to MSS Type 18 units and comply with MFMA-4 or MSS SP-58.

4. Clamps for Attachment to Steel Structural Elements: MSS SP-58 units are suitable for attached structural element.

5. Through Bolts: Structural type, hex head, and high strength. Comply with ASTM F3125/F3125M, Grade A325 (Grade A325M).

6. Toggle Bolts: Steel springhead type.

7. Hanger Rods: Threaded steel.

PART 3 - EXECUTION

3.1 APPLICATION

A. Comply with the following standards for application and installation requirements of hangers and supports, except where requirements on Drawings or in this Section are stricter:

1. NECA 1.

2. NECA 101

3. NECA 102.

4. NECA 105.

B. Comply with requirements for raceways and boxes specified in Section 26 0533 "Raceways and Boxes for Electrical Systems."

C. Maximum Support Spacing and Minimum Hanger Rod Size for Raceways: Space supports for EMT, IMC, and RMC as required by NFPA 70. Minimum rod size shall be 1/4 inch (6 mm) in diameter.

D. Multiple Raceways or Cables: Install trapeze-type supports fabricated with steel slotted support system, sized so capacity can be increased by at least 25 percent in future without exceeding specified design load limits.

1. Secure raceways and cables to these supports with conduit clamps.

E. Spring-steel clamps designed for supporting single conduits without bolts may be used for 1-1/2-inch (38-mm) and smaller raceways serving branch circuits and communication systems above suspended ceilings, and for fastening raceways to trapeze supports.

3.2 SUPPORT INSTALLATION

A. Comply with NECA 1 and NECA 101 for installation requirements except as specified in this article.

B. Strength of Support Assemblies: Where not indicated, select sizes of components so strength will be adequate to carry present and future static loads within specified loading limits. Minimum static design load used for strength determination shall be weight of supported components plus 200 lb (90 kg).

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

1. To Wood: Fasten with lag screws or through bolts.

2. To New Concrete: Bolt to concrete inserts.

3. To Masonry: Approved toggle-type bolts on hollow masonry units and expansion anchor fasteners on solid masonry units.

4. To Existing Concrete: Expansion anchor fasteners.

5. To Steel: Beam clamps (MSS SP-58, Type 19, 21, 23, 25, or 27), complying with MSS SP-69.

6. To Light Steel: Sheet metal screws.

7. Items Mounted on Hollow Walls and Nonstructural Building Surfaces: Mount cabinets, panelboards, disconnect switches, control enclosures, pull and junction boxes, transformers, and other devices on slotted-channel racks attached to substrate.

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

3.3 INSTALLATION OF FABRICATED METAL SUPPORTS

A. Cut, fit, and place miscellaneous metal supports accurately in location, alignment, and elevation to support and anchor electrical materials and equipment.

B. Field Welding: Comply with AWS D1.1/D1.1M.

END OF SECTION 260529

SECTION 260533 - RACEWAYS AND BOXES FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Metal conduits and fittings.
2. Nonmetallic conduits and fittings.
3. Metal wireways and auxiliary gutters.
4. Nonmetal wireways and auxiliary gutters.
5. Surface raceways.
6. Boxes, enclosures, and cabinets.
7. Handholes and boxes for exterior underground cabling.

B. Related Requirements:

1. Section 26 0000 “General Electrical Requirements” and 260519 “Electrical Power Conductors and Cables”

1.2 ACTION SUBMITTALS

A. Refer to Section 01 3300.

PART 2 - PRODUCTS

2.1 METAL CONDUITS AND FITTINGS

A. Metal Conduit:

1. Listing and Labeling: Metal conduits, tubing, and fittings shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
2. GRC (Galvanized Rigid Conduit): Comply with ANSI C80.1 and UL 6.
3. IMC (Intermediate Metal Conduit): Comply with ANSI C80.6 and UL 1242.
4. EMT (Electric Metallic Tubing): Comply with ANSI C80.3 and UL 797.
5. FMC (Flexible Metal Conduit): Comply with UL 1; zinc-coated steel or aluminum.
6. LFMC (Liquid-Tight Flexible Metal Conduit): Flexible steel conduit with PVC jacket and complying with UL 360.

B. Metal Fittings: Comply with NEMA FB 1 and UL 514B.

1. Listing and Labeling: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

2. Fittings, General: Listed and labeled for type of conduit, location, and use.

3. Conduit Fittings for Hazardous (Classified) Locations: Comply with UL 1203 and NFPA 70.

4. Fittings for EMT:

a. Material: Steel or die cast.

5. Expansion Fittings: PVC or steel to match conduit type, complying with UL 651, rated for environmental conditions where installed, and including flexible external bonding jumper.

C. Joint Compound for IMC and GRC: Approved, as defined in NFPA 70, by authorities having jurisdiction for use in conduit assemblies, and compounded for use to lubricate and protect threaded conduit joints from corrosion and to enhance their conductivity.

2.2 NONMETALLIC CONDUITS AND FITTINGS

A. Nonmetallic Conduit:

B. Listing and Labeling: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

1. ENT (Electrical Nonmetallic Tubing): Comply with NEMA TC 13 and UL 1653.

2. RNC (Rigid Nonmetallic Conduit): Type EPC-40-PVC, complying with NEMA TC 2 and UL 651 unless otherwise indicated.

3. LFNC (Liquid-Tight Flexible Nonmetallic Conduit): Comply with UL 1660.

C. Nonmetallic Fittings:

1. Fittings, General: Listed and labeled for type of conduit, location, and use.

2. Fittings for ENT and RNC: Comply with NEMA TC 3; match to conduit or tubing type and material.

3. Fittings for LFNC: Comply with UL 514B.

4. Solvents and Adhesives: As recommended by conduit manufacturer.

2.3 METAL WIREWAYS AND AUXILIARY GUTTERS

A. Description: Sheet metal, complying with UL 870 and NEMA 250, Type 1, Type 3R, Type 4 or Type 12 as required unless otherwise indicated, and sized according to NFPA 70.

1. Metal wireways installed outdoors shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

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

2.4 NONMETALLIC WIREWAYS AND AUXILIARY GUTTERS

A. Listing and Labeling: Nonmetallic wireways and auxiliary gutters shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

B. Description: PVC, extruded and fabricated to required size and shape, and having snap-on cover, mechanically coupled connections, and plastic fasteners.

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

D. Solvents and Adhesives: As recommended by conduit manufacturer.

2.5 BOXES, ENCLOSURES, AND CABINETS

A. General Requirements for Boxes, Enclosures, and Cabinets: Boxes, enclosures, and cabinets installed in wet locations shall be listed for use in wet locations.

B. Sheet Metal Outlet and Device Boxes: Comply with NEMA OS 1 and UL 514A.

C. Cast-Metal Outlet and Device Boxes: Comply with NEMA FB 1, Type FD, with gasketed cover.

D. Nonmetallic Outlet and Device Boxes: Comply with NEMA OS 2 and UL 514C.

E. Provide electrical service outlets, including plug receptacles, lamp receptacles, lighting fixtures, and switches with Steel City, Raco, or equivalent 4-inch code gauge steel knockout boxes galvanized or sheradized of required depth for service or device. Sectional boxes shall not be allowed. Provide gaskets for exterior devices.

F. For telephone, data or A/V junction boxes, provide the Hubbell HBL260 or HBL263 large capacity wall-boxes for all outlets. Provide complete with necessary mud-rings and components for a complete installation. Refer to plan notes for any additional requirements.

G. Floor Boxes:

1. Refer to the drawings for specific floor box specifications and fire rating requirements. Provide all floor boxes with accessories and covers for a complete installation, compatible with the floor finish and type in which they are installed. Provide finish plates for all wiring devices indicated. Provide cast iron boxes, or boxes with epoxy coating for any boxes shown installed in slab-on-grade installations – boxes shall be UL listed for slab-on-grade installation. All floor boxes shall be UL listed for scrub water penetration.

Include any required dividers as required to isolate power and communication compartments when devices are indicated side by side on plans.

2. Where floor boxes are shown but not specifically noted on the drawings, provide concealed service floor boxes with duplex receptacles and communication and data communication brackets as indicated on drawings. Provide gangs as necessary to accommodate the devices and quantity of devices indicated on the plans. Provide all inserts as necessary for the devices indicated and for a complete installation without leaving any unused openings. Where there are spare unused spaces in floor boxes provide blanks for all unused sections.

3. Plastic or PVC floor boxes are not approved.

4. Floor boxes shall be Wiremold model 664-CSTCover colors shall be selected by architect unless indicated otherwise.

5. Equivalent floor boxes by Wiremold, Steel City and Hubbell.

6. For installation location of floor boxes, Contractor shall refer to Architectural plans for associated furniture locations and floor system type.

H. Luminaire Outlet Boxes: Nonadjustable, designed for attachment of luminaire weighing 50 lb (23 kg). Outlet boxes designed for attachment of luminaires weighing more than 50 lb (23 kg) shall be listed and marked for the maximum allowable weight.

I. Paddle Fan Outlet Boxes: Nonadjustable, designed for attachment of paddle fan weighing 70 lb (32 kg).

1. Listing and labeling: Paddle fan outlet boxes shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

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

K. Cast-Metal Access, Pull, and Junction Boxes: Comply with NEMA FB 1 and UL 1773, with gasketed cover.

L. Box extensions used to accommodate new building finishes shall be of same material as recessed box.

M. Device Box Dimensions: 4 inches square by 2-1/8 inches deep or as required for installation.

N. Gangable boxes are allowed.

O. For telephone, data, or A/V junction boxes, provide the Hubbell HBL260 or HBL263 large capacity wall-boxes for all outlets. Provide complete with necessary mud-rings and components for a complete installation. Refer to plan notes for any additional requirements.

2.6 HANDHOLES AND BOXES FOR EXTERIOR UNDERGROUND WIRING

A. General Requirements for Handholes and Boxes:

1. Boxes and handholes for use in underground systems shall be designed and identified as defined in NFPA 70, for intended location and application.

2. Boxes installed in wet areas shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

B. Underground Boxes/Enclosures:

1. Description: In-ground, open bottom boxes furnished with flush, non-skid covers with legend indicating type of service and stainless-steel tamper resistant cover bolts.

2. Size: As indicated on drawings.

3. Depth: As required to extend below frost line to prevent frost upheaval, but not less than 12 inches.

4. Provide logo on cover to indicate type of service.

5. Applications:

a. Sidewalks and Landscape Areas Subject Only to Occasional Nondeliberate Vehicular Traffic: Use polymer concrete enclosures, with minimum SCTE 77, Tier 15 load rating.

b. Areas Subject to Vehicular Traffic: Use steel-reinforced precast concrete enclosures, with a minimum H-20 load rating.

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

a. Provide Quazite, Oldcaste Precast, or approved equal.

b. Standard: Comply with SCTE 77.

c. Configuration: Designed for flush burial with open bottom unless otherwise indicated.

d. Cover: Weatherproof, secured by tamper-resistant locking devices and having structural load rating consistent with enclosure and handhole location.

e. Cover Finish: Nonskid finish shall have a minimum coefficient of friction of 0.50.

f. Cover Legend: Molded lettering, “ELECTRIC”.

g. Conduit Entrance Provisions: Conduit-terminating fittings shall mate with entering ducts for secure, fixed installation in enclosure wall.

7. Steel-Reinforced Precast Concrete Pullboxes:

a. Provide Oldcastle Precast, Jensen Precast, or approved equal.

b. Standard: Comply with ASTM C858

c. Configuration: Designed for flush burial with open bottom unless otherwise indicated.

d. Cover: Traffic hinged spring assist with 180-degree layback, secured by tamper-resistant locking devices and having structural load rating consistent with enclosure and pullbox location.

e. Cover Finish: Nonskid diamond plate finish

f. Cover Legend: Molded lettering, “ELECTRIC”.

g. Conduit Entrance Provisions: Knock-outs to accommodate all conduits.

h. Sump: 6” diameter minimum

PART 3 - EXECUTION

3.1 RACEWAY APPLICATION

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

1. Exposed Conduit: GRC and IMC.

2. Concealed Conduit, Aboveground: GRC IMC and EMT.

3. Underground Conduit: RNC, Type EPC-40-PVC.

4. Connection to Vibrating Equipment (Including Transformers and Hydraulic, Pneumatic, Electric Solenoid, or Motor-Driven Equipment): LFMC and LFNC.

5. Boxes and Enclosures, Aboveground: NEMA 250, Type 3R.

6. Provide all with tracer wire above.

B. General application:

1. All circuiting on the project shall be in steel conduit unless noted otherwise in this section, or elsewhere within these specifications or construction documents.

2. Provide galvanized rigid steel (GRC) conduit for the following applications:

a. All branch circuits and feeders fed under unpaved areas with vehicular traffic.

b. Feeders from the emergency/standby generator to all automatic transfer switches feeding emergency or required standby loads.

c. All feeders above grade exceeding 480V.

3. Provide EMT conduit for the following applications:

   a. Housing Unit feeders within the Service Building Electrical Room and dry spaces leading to the tunnel.

   b. All panelboard feeders above grade.

   c. All branch circuits above grade in mechanical rooms, electrical rooms and rooms with kitchen equipment (including kitchens, bars, banquet prep areas, lounges, etc.).

   d. All HVAC equipment branch circuits (including, but not limited to, rooftop units, air handling units, packaged equipment, chillers, pumps, fan terminal units, VAV boxes, fan coil units, fresh-air units, make-up air units, outside air units, exhaust fans, split systems, etc.).

   e. All smoke control related equipment including any associated motorized dampers and fire/smoke dampers.

   f. All fire alarm wiring from the fire alarm panel to all smoke control related equipment, including smoke detectors at vertical stairwell enclosures and/or directly outside stairwells, fire alarm control modules at smoke fans (exhaust or supply), fire alarm monitor modules at smoke fans (supply or exhaust) and/or any additional fire alarm equipment.

   g. General motor circuits (including, but not limited to, elevators, trash compactors, sewage ejectors, sump pumps, etc.)

   h. All emergency and required standby branch circuits and feeders (except as noted above).

   i. Fire alarm wiring between all fire alarm panels, extender panels or transponder panels.

   j. All fire alarm wiring fed vertically between floors in multi-floor buildings.

   k. Telephone, data and/or television conduits above grade.

   l. All temperature control wiring.

   m. All distributed low voltage wiring fed vertically between floors in multi-floor buildings.

   n. Recess in wall to level of structure for all precast walls, gymnasium, and similar normally occupied spaces.

4. Non-metallic, rigid conduit (flexible ENT is not allowed for any systems) shall be allowed for the following applications (transition to steel conduit shall be made for all applications prior to conduit coming up from below grade – non-metallic conduit is not allowed above grade for any purpose):

a. Housing Unit feeders within tunnels, and within damp/wet areas.

b. Secondary Electrical service entrance feeders fed below grade.

c. Panelboard feeders fed below grade.

d. Branch circuits fed below grade.

e. Branch circuits installed in concrete slabs. Conduits for this application shall be UL listed for concrete encasement.

f. Underground telephone, data and/or television conduits.

C. Minimum Raceway Size: 3/4-inch trade size unless noted otherwise.

D. All conduit and MC cable shall be installed concealed. In areas with exposed structure for walls and/or ceilings, provide EMT conduit routed tight to structural members and concealed in the framing. All turns shall be made with 90-degree bends. MC cable is not allowed where exposed to view.

E. Make conduit connections to motors and equipment mounted on resilient mounts or vibration isolators with Type U.A. liquid-tight flexible conduit manufactured by Anaconda, or “Liquatite” by Electric-Flex Company.

F. Raceway Fittings: Compatible with raceways and suitable for use and location.

G. Do not install aluminum conduits, boxes, or fittings in contact with concrete or earth.

H. Do not install nonmetallic conduit where ambient temperature exceeds 120 deg F (49 deg C).

I. Comply with requirements in Section 26 0529 "Hangers and Supports for Electrical Systems" for hangers and supports.

J. Comply with NECA 1 and NECA 101 for installation requirements except where requirements on Drawings or in this article are stricter. Comply with NECA 102 for aluminum conduits. Comply with NFPA 70 limitations for types of raceways allowed in specific occupancies and number of floors.

K. Do not install raceways or electrical items on any "explosion-relief" walls or rotating equipment.

L. Do not fasten conduits onto the bottom side of a metal deck roof.

M. Keep raceways at least 6 inches (150 mm) away from parallel runs of flues and steam or hot-water pipes. Install horizontal raceway runs above water and steam piping.

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

O. Install no more than the equivalent of four 90-degree bends in any conduit run except for control wiring conduits, for which fewer bends are allowed. Support within 12 inches (300 mm) of changes in direction.

P. Make bends in raceway using large-radius preformed ells. Field bending shall be according to NFPA 70 minimum radii requirements. Use only equipment specifically designed for material and size involved.

Q. Conceal conduit and EMT within finished walls, ceilings, and floors unless otherwise indicated. Install conduits parallel or perpendicular to building lines.

R. Support conduit within 12 inches (300 mm) of enclosures to which attached.

S. Raceways Embedded in Slabs are not allowed unless written approval is provided:

1. Run conduit larger than 1-inch (27-mm) trade size, parallel or at right angles to main reinforcement. Where at right angles to reinforcement, place conduit close to slab support. Secure raceways to reinforcement at maximum 10-foot (3-m) intervals.

2. Arrange raceways to cross building expansion joints at right angles with expansion fittings.

3. Do not embed threadless fittings in concrete.

4. Change from ENT to GRC or IMC before rising above floor.

T. Stub-ups to Above Recessed Ceilings:

1. Use EMT, IMC, or RMC for raceways.

2. Use a conduit bushing or insulated fitting to terminate stub-ups not terminated in hubs or in an enclosure.

U. Threaded Conduit Joints, Exposed to Wet, Damp, Corrosive, or Outdoor Conditions: Apply listed compound to threads of raceway and fittings before making up joints. Follow compound manufacturer's written instructions.

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

W. Terminate threaded conduits into threaded hubs or with locknuts on inside and outside of boxes or cabinets. Install bushings on conduits up to 1-1/4-inch (35-mm) trade size and insulated throat metal bushings on 1-1/2-inch (41-mm) trade size and larger conduits terminated with locknuts. Install insulated throat metal grounding bushings on service conduits.

X. Install pull wires in empty raceways. Use polypropylene or monofilament plastic line with not less than 200-lb tensile strength. Leave at least 12 inches of slack at each end of pull wire. Cap underground raceways designated as spare above grade alongside raceways in use.

Y. Unless noted otherwise in other specification sections or on the drawings, all low voltage wiring systems (including, but not limited to security, access control, telephone, data, television, audio/video, fire alarm, lighting control, intercom, clock system, nurse call, etc.) shall be provided with junction boxes in walls and conduit extended up to above the nearest accessible lay-in ceiling where open, plenum-rated wiring is allowed only above lay-in and/or sheetrock ceilings where wiring will be concealed from view (unless noted otherwise or shown by details

on the drawings as different, minimum junction box for telephone, data and/or television outlets shall be 4”Wx4”Tx3.5”D with 1” conduit. Back-boxes and conduit for other systems shall be as required by the applicable E/M). Where there is no ceiling (exposed structure), conduits shall be provided to conceal all wiring and all conduits shall be concealed in the building construction – exposed conduits are not allowed anywhere on the project. Security, access control, telephone, data, television, audio/video, fire alarm, lighting control, intercom, clock system, nurse call, etc. wiring shall be bundled together by system and supported from the structure at regular intervals with J-hooks and additionally as required by code and the manufacturer where routed as open wiring above ceilings. Wiring shall not be routed unsupported and shall not be strapped to structural members or walls. Fire alarm wiring shall be allowed to be open wiring as allowed by the National Electric Code above areas with lay-in or sheetrock ceilings (except between floors as noted in other sections). Provide conduit for all fire alarm wiring in all mechanical/electrical rooms, janitor’s closets and storage/electrical rooms. Unless noted otherwise, cable tray (where specified) shall be designated for security, access control, telephone, data, television, audio/visual, intercom, clock system, nurse call, etc. Fire alarm and lighting control wiring shall be allowed to be bundled together and tied to the outside of cable trays. Conduit shall be provided for all low-voltage wiring systems where routed between floors, extended from ceiling to ceiling of each floor.

Z. Temperature control wiring (including, but not limited to thermostat wiring, sensor wiring, control wiring, communication wiring, wiring between control panels and wiring to controllers or control devices) shall be installed in conduit. Exterior ground-mounted equipment within 48” of the building shall be provided with a junction box in the wall with a weatherproof cover and water-tight flexible conduit extended to the equipment. Exterior ground-mounted equipment greater than 48” from the building shall have conduit routed below grade and stubbed up adjacent to the equipment and mounted on a post a minimum of 18” above finish grade. Roof-mounted equipment shall have conduit routed up in the roof curb, with a pipe-curb provided at the conduit penetration through the curb top for routing to the equipment.

AA. All electrical feeders feeding panelboards, distribution equipment and the automatic transfer switches fed from the generator for emergency power shall be routed below grade (under a minimum of 2” conduit), be concrete-encased with a minimum of 2” concrete all the way around the conduit, be installed in shafts with a 2-hour rating, or be protected by a fire-rated assembly listed to achieve a minimum fire rating of 2 hours. Concrete encasement, the 2-hour rated shaft and/or the 2-hour fire-rated assembly are the responsibility of the electrical contractor – coordinate with the G/C to include all costs in the base bid. All emergency feeders shall be installed in accordance with the National Electric code, section 700. Details for providing the 2-hour protection shall be submitted with the shop drawings.

BB. Surface Raceways:

1. Install surface raceway with a minimum 2-inch radius control at bend points.

2. Secure surface raceway with screws or other anchor-type devices at intervals not exceeding 48 inches (1200 mm) and with no less than two supports per straight raceway section. Support surface raceway according to manufacturer's written instructions. Tape and glue are not acceptable support methods.

3. Raceways shall be steel and sized for required power and communication cable as noted on drawings. Provide in color to match other deices in room.

CC. Install raceway sealing fittings at accessible locations according to NFPA 70 and fill them with listed sealing compound. For concealed raceways, install each fitting in a flush steel box with a blank cover plate having a finish similar to that of adjacent plates or surfaces.

DD. Install devices to seal raceway interiors at accessible locations. Locate seals so no fittings or boxes are between the seal and the following changes of environments. Seal the interior of all raceways at the following points:

1. Where conduits pass from warm to cold locations, such as boundaries of refrigerated spaces.

2. Where an underground service raceway enters a building or structure.

3. Conduit extending from interior to exterior of building.

4. Conduit extending into pressurized duct and equipment.

5. Conduit extending into pressurized zones that are automatically controlled to maintain different pressure set points.

6. Where otherwise required by NFPA 70.

EE. Flexible Conduit Connections: Comply with NEMA RV 3. Use a maximum of 72 inches (1830 mm) of flexible conduit for recessed and semi-recessed luminaires, equipment subject to vibration, noise transmission, or movement; and for transformers and motors.

1. Use LFMC in damp or wet locations subject to severe physical damage.

2. Use LFMC or LFNC in damp or wet locations not subject to severe physical damage.

FF. Mount boxes at heights indicated on Drawings. If mounting heights of boxes are not individually indicated, give priority to ADA requirements. Install boxes with height measured to center of box unless otherwise indicated.

1. Install light switch or lighting control junction boxes at 48 inches above floor to the top of the box unless otherwise called for or required by Wainscot, counter, moulding, etc – coordinate with millwork contractor and G/C prior to any rough-in. All electrical light switches shall be located as close to door frame as possible. Under no circumstances should switches be located more than 12 inches from the edge of door frames.

2. Install centerline of receptacle outlet boxes 18 inches above floor unless otherwise called for on drawings.

3. All thermostats, temperature sensors and HVAC controls shall be installed at 48” above finish floor to the top of the thermostat or sensor, on the room side of light switches where shown in the same location. None of the controls shall be higher than 48” above finish floor to the operating or visible parts.

4. Locate associated data, telephone and television outlets at the same height as adjacent, associated receptacles, within 6 inches of the associated receptacles, where shown side-by-side on the plans and not noted otherwise.

5. Where wall-mounted telephone outlets are shown on the drawings in the same location as light switches, the telephone outlet shall be installed to the room side of the light switches at 48” above finish floor to the top of the telephone controls (no part of the telephone controls shall be higher than 48” above finish floor. Coordinate phone requirements with the owner prior to any rough-in).Do not locate phone outlet above the switches – locate 8” from the end of the light switches to allow clearance of the phone.

6. Where wall-mounted volume controls, A/V controls, and/or screen switches are shown on the drawings in the same location as light switches, these controls shall be installed on the room side of light switches at 48” to the top of the box.

7. Install clock and other outlet boxes at elevations indicated on drawings or as directed by A/E. Center bracket lights over mirrors with 2-inch clearance above the mirror to the bottom of the installed fixture.

GG. Recessed Boxes in Masonry Walls: Saw-cut opening for box in center of cell of masonry block and install box flush with surface of wall. Prepare block surfaces to provide a flat surface for a raintight connection between the box and cover plate or the supported equipment and box.

HH. Horizontally separate boxes mounted on opposite sides of walls so they are not in the same vertical channel.

II. Locate boxes so that cover or plate will not span different building finishes.

JJ. Support boxes of three gangs or more from more than one side by spanning two framing members or mounting on brackets specifically designed for the purpose.

KK. Fasten junction and pull boxes to or support from building structure. Do not support boxes by conduits.

LL. Set metal floor boxes level and flush with finished floor surface.

MM. Provide code gauge galvanized steel raised covers on outlet boxes installed in plaster finish. Set to plaster grounds with outside edge of cover flush with plaster finish.

NN. Provide 0.375-inch or larger fixture stud in each outlet box scheduled to receive lighting fixture. Select covers with proper opening for device installed in outlet box.

OO. Use of utility or “Handy” boxes acceptable only where single gang flush outlet box in masonry is “dead-end” with only one conduit entering box from end or back.

PP. Use no sectional outlet boxes.

QQ. Provide Appleton FS or FD unilets for surface mounted exterior work. Provide complete with proper device cover and gasket. Provide blank cover and gasket when used as junction box.

RR. Install boxes to maintain all fire ratings, as required by the building code and NEC. At all boxes installed in fire walls throughout the project, provide fire-rated sealing assembly (refer to the other specification sections for additional locations – refer to the architectural specifications for specification of all fire-rated penetration sealing materials and/or assemblies). Putty pads and/or other fire-rated sealing assemblies, where provided, shall fully seal all boxes and conduit entries

(including at the penetration into the top of the wall) and shall be installed per the manufacturer's instructions (including minimum/maximum ambient temperatures at time of install and after installation). Submit fire penetration materials and information with the shop drawings to the architect. Refer to the other specification sections for additional requirements. Putty pads and/or fire-rated sealing assemblies shall have a minimum STC rating per the architectural specifications.

SS. Locate outlet boxes generally from column centers and finished wall lines. Install ceiling outlet boxes at suspended ceiling elevations.

TT. Accurately locate lighting fixtures and appliance outlet boxes mounted in concrete or in plaster finish on concrete. Install outlet boxes in forms to dimensions taken from bench marks, columns, walls, or floors. Rough-in lighting fixtures and appliance outlet boxes to general locations before installation of walls and furring, and reset to exact dimensions as walls and furring are constructed. Set outlet boxes true to horizontal and vertical finish lines of building.

UU. Install outlet boxes accessible. Provide outlet boxes above piping or ductwork with extension stems or offsets as required to clear piping and ductwork.

VV. If a wiring device (including, but not limited to, switches, fire alarm devices, temperature controls, lighting controls, receptacles, television outlets, telephone/data outlets, volume controls, A/V controls, screen switches, etc.) is shown to be installed in or on a column, it shall be centered on the column unless noted otherwise.

WW. Contractor shall be responsible for coordination of all box locations with millwork, wall treatments (mats, chair rails, paneling, special systems, etc.), finishes and architectural elements to maintain full accessibility per NEC and to facilitate installation and operation of all systems. Where conflicts occur with other building components, notify A/E of conflict and get approval to modify box location or rotation prior to any rough-in. It shall be the contractor's responsibility to relocate any boxes, conduits, wiring, etc. installed prior to coordination with any other building system.

3.2 INSTALLATION OF UNDERGROUND CONDUIT

A. Direct-Buried Conduit:

1. Excavate trench bottom to provide firm and uniform support for conduit.

2. After installing conduit, backfill and compact. Start at tie-in point, and work toward end of conduit run, leaving conduit at end of run free to move with expansion and contraction as temperature changes during this process. Firmly hand tamp backfill around conduit to provide maximum supporting strength. After placing controlled backfill to within 12 inches of finished grade, make final conduit connection at end of run and complete backfilling with normal compaction.

3. Install manufactured rigid steel conduit elbows for stub-ups at poles and equipment and at building entrances through floor.

    a. For stub-ups at equipment mounted on outdoor concrete bases and where conduits penetrate building foundations, extend steel conduit horizontally a minimum of

60 inches from edge of foundation or equipment base. Install insulated grounding bushings on terminations at equipment.

4. Underground Warning Tape: Comply with requirements in Section 26 0553 "Identification for Electrical Systems."

3.3 INSTALLATION OF UNDERGROUND HANDHOLES AND BOXES

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

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

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

D. Field-cut openings for conduits according to enclosure manufacturer's written instructions. Cut wall of enclosure with a tool designed for material to be cut. Size holes for terminating fittings to be used, and seal around penetrations after fittings are installed.

3.4 SLEEVE AND SLEEVE-SEAL INSTALLATION FOR ELECTRICAL PENETRATIONS

A. Install sleeves and sleeve seals at penetrations of exterior floor and wall assemblies.

3.5 PROTECTION

A. Protect coatings, finishes, and cabinets from damage and deterioration.

1. Repair damage to galvanized finishes with zinc-rich paint recommended by manufacturer.

2. Repair damage to PVC coatings or paint finishes with matching touchup coating recommended by manufacturer.

END OF SECTION 260533

SECTION 260535 – CABINETS & ENCLOSURES

PART 1 - GENERAL

1.1 WORK INCLUDES

A. Electrical Contractor provide:

1. Hinged cover enclosures.
2. Cabinets.
3. Accessories.

1.2 RELATED SECTIONS

A. Section 260533 – Raceways and Boxes for Electrical Systems

B. Section 260529 – Hangers and Supports for Electrical

1.3 REFERENCES

A. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum).

B. NEMA ICS 4 - Terminal Blocks for Industrial Control Equipment and Systems.

C. ANSI/NFPA 70 - National Electrical Code, 2017 edition.

D. IBC 2009 – International Building Code: seismic hazard and performance.

1.4 SUBMITTALS

A. Product Data: Submit per Division 1. Provide manufacturer's standard data for enclosures and cabinets.

B. Manufacturer's Instructions: Indicate application conditions and limitations of use stipulated by Product testing agency specified under Regulatory Requirements. Include instructions for storage, handling, protection, examination, preparation, installation, and starting of Product.

1.5 REGULATORY REQUIREMENTS

A. Conform to requirements of ANSI/NFPA 70.

B. Furnish products listed and classified by a NRTL as suitable for purpose specified and shown.

1.6 EXTRA MATERIALS

A. Provide 6 of each cabinet key.

PART 2 - PRODUCTS

2.1 HINGED COVER ENCLOSURES

A. Construction: NEMA 250, Type 1 steel enclosure.

B. Covers: Continuous hinge, held closed by flush latch operable by key.

C. Provide interior plywood panel for mounting terminal blocks and electrical components; finish with white enamel.

D. Enclosure Finish: Manufacturer's standard enamel.

2.2 CABINETS

A. Boxes: Galvanized steel.

B. Box Size: As indicated on Drawings.

C. Backboard: Provide 3/4 inch thick plywood backboard for mounting terminal blocks. Paint matte white.

D. Fronts: Steel, surface type with concealed trim clamps, screw cover front, concealed hinge, and flush lock keyed to match branch circuit panelboard. Finish with gray baked enamel

E. Knockouts: Field punch as needed. Do not use factory concentric knockouts.

F. Provide metal barriers to separate compartments containing control wiring operating at less than 50 volts from power wiring.

G. Provide accessory feet for free-standing equipment.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify that surfaces are ready to receive Work.

3.2 INSTALLATION

A. Install Products in accordance with manufacturer's instructions.

B. Install enclosures and boxes plumb. Anchor securely to wall and structural supports at each corner.

C. Install cabinet fronts plumb.

D. Provide support to meet seismic requirements.

END OF SECTION 260535

SECTION 260543 – UNDERGROUND DUCTS & RACEWAYS FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 WORK INCLUDES

A. Electrical Contractor Provides:

1. Conduit.
2. Spacers.
3. Detectable Underground Warning Tape.
4. Excavation, Backfill and Compaction for Ductbanks.
5. Manholes.
6. Hand-holes and boxes.

1.2 RELATED SECTIONS

A. Section 260000 – General Electrical Requirements.

B. Section 260533 – Raceways and Boxes for Electrical Systems.

1.3 REFERENCES

A. ANSI/IEEE C2 - National Electrical Safety Code.

B. ANSI/NEMA FB 1 - Fittings, Cast Metal Boxes, and Conduit Bodies for Conduit and Cable Assemblies.

C. ANSI/NFPA 70 - National Electrical Code.

D. NEMA TC 3 - PVC Fittings for Use with Rigid PVC Conduit and Tubing.

E. NEMA TC 6 - PVC and ABS Plastic Utilities Duct for Underground Installation.

F. NEMA TC 8 - Extra-Strength PVC Plastic Utilities Duct for Underground Installation.

G. NEMA TC 9 - Fittings for ABS and PVC Plastic Utilities Duct for Underground Installation.

H. NEMA TC 10 - PVC and ABS Plastic Communications Duct and Fittings for Underground Installation.

1.4 PROJECT RECORD DOCUMENTS

A. Accurately record actual locations of exact routing and depth of ductbank.

1.5 QUALIFICATIONS

A. Manufacturer: Company specializing in manufacturing Products specified in this Section with minimum three years documented experience.

1.6 REGULATORY REQUIREMENTS

A. Conform to requirements of ANSI/NFPA 70.

B. Furnish products listed and classified by a NRTL.

1.7 PROJECT CONDITIONS

A. Verify that field measurements are as shown on Drawings.

B. Verify routing and termination locations of duct bank prior to excavation for rough-in.

C. Conduit routing is shown on Drawings in approximate locations unless dimensions are indicated. Route as required to complete the duct system.

D. Adjust the elevation of the ductbank or raceway to accommodate the final elevation of the termination points.

1.8 SUBMITTALS

A. Product Data: For the following:

1. Duct-bank materials, including separators and miscellaneous components.
2. Ducts and conduits and their accessories, including elbows, end bells, bends, fittings, and solvent cement.
3. Accessories for manholes, handholes, boxes and other utility structures.
4. Warning tape.

B. Shop Drawings for Precast or Factory-Fabricated Underground Utility Structures: Include plans, elevations, sections, details, attachments to other work, and accessories, including the following:

1. Duct entry provisions, including locations and duct sizes.
2. Reinforcement details.
3. Frame and cover design and manhole frame support rings.
4. Ladder details.
5. Grounding details.
6. Dimensioned locations of cable rack inserts, pulling-in and lifting irons, and sumps.
7. Joint details.

C. Shop Drawings for Factory-Fabricated Polymer Concrete Handholes and Boxes Other Than Precast Concrete: Include dimensioned plans, sections, and elevations, and fabrication and installation details, including the following:

1. Duct entry provisions, including locations and duct sizes.
2. Cover design.
3. Grounding details.
4. Dimensioned locations of cable rack inserts, and pulling-in and lifting irons.

D. Product Certificates: For concrete and steel used in precast concrete manholes and handholes, as required by ASTM C 858.

PART 2 - PRODUCTS

2.1 NONMETALLIC CONDUIT

A. Description: NEMA TC 2; Schedule 40 PVC.

B. Fittings and Conduit Bodies: NEMA TC 3.

2.2 REINFORCED THERMOSETTING RESIN CONDUIT(RTRC)

A. Description: UL 1684 – Fiberglass conduit

B. The fiberglass conduit shall have a winding angle as close as possible to 54.75 degrees. All conduit in diameters 3/4" - 6" shall be manufactured by applying single circuit winding. The resin system shall be epoxy based using an anhydride curing agent. The fiberglass shall consist of continuous E- glass roving. All additives for increasing flame spread and lowering smoke density, shall be halogen free.

C. Carbon black shall be used as ultra violet inhibitor to protect the conduit and fittings

D. Curing shall be done using on oven and shall take place in two steps. First curing zone shall bring the pipe slowly to the gel temperature. The second zone shall post-cure the pipe at no less than 350 degrees F, and the pipe has to be properly cured.

E. Provided with PVC adapter to allow for connection to schedule 40 PVC conduit where applicable.

2.3 ACCESSORIES

A. Underground Warning Tape: 4-inch wide plastic tape, detectable type, colored red with suitable warning legend describing buried electrical lines.

B. Support Saddles: Vertically and horizontally interlocking, high impact plastic base and intermediate spacers providing separation between conduits as shown on the drawings.

C. Steel Reinforcement for Concrete Fill: Provide at all manhole, switchgear vaults and building penetrations, size and type of reinforcement as indicated on plans. Minimum shall be #4 rebar longitudinal placed in duct and supported by high impact plastic spacers. Overlap rebar minimum of 18” and tie for continuous runs. Provide continuous rebar supports around duct bank and tie to longitudinal rebar. Space rebar tie supports at 3’0” intervals.

2.4 POLYMER CONCRETE HAND-HOLES AND BOXES

A. Description:

1. Color: Gray.
2. Configuration: Units shall be designed for flush burial and have open bottom, unless otherwise indicated.
3. Cover: Weatherproof, secured by tamper-resistant locking devices and having
4. Cover Legend: Molded lettering, As indicated for each service.

5. Hand-holes and boxes 30” wide x 48” long and larger shall have factory-installed structural load rating consistent with enclosure.
6. Cover Finish: Nonskid finish shall have a minimum coefficient of friction of 0.50.
7. Provide inserts for cable racks and pulling-in irons; provide pulling cable eyes minimum 8,000 lbs.
8. Material: Underground enclosure made of concrete or polymer concrete and reinforced by a heavy weave fiberglass, concrete gray color and rated 8,000 lbs over a 10" x 10" area and designed and tested to temperatures of -50 Deg. F. Material compressive strength should be no less than 11,000 psi. The box shall be rated for vehicular traffic Load Category A16, Rated 22,568 lbs, 16,000 lbs live load.
9. Covers: Polymer concrete reinforced, rated for 20,800 lbs over a 10” x 20” area. Rated for vehicular traffic load category A16/22, 568 lbs/16,000 lbs live load. Cover shall have embossed labeling as appropriate to the application or as indicated on plans.
10. Size and Depth shall be as indicated on plans.
11. Provide tamper resistant, stainless steel bolts for cover.
12. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
13. Basis-of-Design Product: Subject to compliance with requirements, provide product by one of the following:

    a. Quazite/Hubbell.
    b. CDR.
    c. New Basis.
    d. Pre-approved equal.

2.5 PRECAST MANHOLES

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

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

      a. St. Joe Concrete Products/Ellenberger Concrete Products, LLC.
      b. Pre-approved equivalent.

B. Comply with ASTM C 858, with interlocking mating sections, complete with accessories, hardware, and features.

   1. Windows: Precast openings in walls, arranged to match dimensions and elevations of approaching ducts and duct banks plus an additional 12 inches vertically and horizontally to accommodate alignment variations.

      a. Windows shall be located no less than 6 inches from interior surfaces of walls, floors, or roofs of manholes, but close enough to corners to facilitate racking of cables on walls.
      b. Window opening shall have cast-in-place, welded wire fabric reinforcement for field cutting and bending to tie in to concrete envelopes of duct banks.
      c. Window openings shall be framed with at least two additional No. 4 steel reinforcing bars in concrete around each opening.

2. Duct Entrances in Manhole Walls: Cast end-bell or duct-terminating fitting in wall for each entering duct.

    a. Type and size shall match fittings to duct or conduit to be terminated.
    b. Fittings shall align with elevations of approaching ducts and be located near interior corners of manholes to facilitate racking of cable.

3. Material: Minimum 3000 PSI, air entrained reaching compressive strength in 28 days.
4. Reinforcement: AASHTO H-20, bridge loading,
5. Construction: Modular sections with interlocking joints.
6. Dimensions: Height, Width and Wall Thickness as indicated on plans.
7. Concrete Knockout Panels: 2 inches thick, for future conduit entrance and sleeve for ground rod; verify exact window/KO needs with field conditions.
8. Joint Sealant: Asphaltic-butyl material with adhesion, cohesion, flexibility, and durability properties necessary to withstand maximum hydrostatic pressures at the installation location with the ground-water level at grade.
9. Accessories: Threaded, removable pulling irons/eye bolt on all walls opposite cable entry with 10,000 lbs pull out; inserts for cable racks as indicated on plan/detail; cast-iron collar and cover 30” diameter minimum which meets AASHTO H-20 loading; non-metallic cable brackets and supports; porcelain or non-metallic cable insulator/clamps to retain cables to supports.
10. Manhole Cover Frame and Cover: ASTM A 48/A 48M, Class 30B, gray cast iron; provide cover legend ‘ELECTRIC’.
11. Fixed Manhole Ladders: Arranged for attachment to roof or wall and floor of manhole. Ladder and mounting brackets and braces shall be fabricated from nonconductive, structural-grade, fiberglass-reinforced resin; as indicated on plans.
12. Sump Basin: 18”Diam. x 22”D, injection molded, polyethylene or non-flexing composite; refer to plans for location.

PART 3 - EXECUTION

3.1 PREPARATION

A. Hand dig around all existing utilities and adjacent to buildings.

B. Excavation, base material installation, and compaction shall be completed in accordance with section 31 20 22 - Excavating, Backfilling & Compacting for Utilities.

3.2 CONDUIT INSTALLATION

A. Slope: Pitch ducts a minimum slope of 4” for 100 ft. down toward manholes and hand-holes and away from buildings and equipment. Slope ducts from a high point in runs between two manholes to drain in both directions.

B. Cut duct square using saw or pipe cutter; de-burr cut ends.

C. Curves and Bends: Use 5-degree angle couplings for small changes in direction. Use 15-45 degree fitting for offset or larger directional changes. Use manufactured long sweep bends with a minimum radius of 30 - 48 inches, both horizontally and vertically, at other locations, unless otherwise indicated; radius of sweep shall vary proportional to the duct size. Provide fiberglass fittings for all 90° bends.

D. Joints: Use solvent-cemented joints in ducts and fittings and make watertight according to manufacturer's written instructions. Stagger couplings so those of adjacent ducts do not lie in same plane. Allow a minimum of 20 minutes set time before disturbing joints.

E. Duct Entrances to Manholes and Concrete and Polymer Concrete Hand-holes: Use end bells, spaced approximately 10 inches o.c. for 5-inch ducts, and vary proportionately for other duct sizes.

1. Begin changing from regular spacing to end-bell spacing 10 feet from the end bell without reducing duct line slope and without forming a trap in the line.
2. Core Drilled Entries: Provide 60” of RGC before transitioning to non-metallic conduit in ductbank.
3. Grout end bells into structure walls from both sides to provide watertight entrances.

F. Building Wall Penetrations: Make a transition from underground duct to rigid steel conduit at least 10 feet outside the building wall without reducing duct line slope away from the building, and without forming a trap in the line. Use fittings manufactured for duct-to-conduit transition.

G. Sealing: Provide temporary closure at terminations of ducts that have cables pulled. Seal spare ducts at terminations. Use sealing compound and plugs to withstand at least 15-psig hydrostatic pressure.

H. Pulling Cord: Install 1,250 lb polyester measuring/pulling tape in ducts, including spares.

I. Concrete-Encased Ducts: Support ducts on duct separators.

1. Separator Installation: Space separators close enough to prevent sagging and deforming of ducts, with not less than 4 spacers per 20 feet of duct. Secure separators to earth and to ducts to prevent floating during concreting. Stagger separators approximately 6 inches between tiers.
2. Concreting Sequence: Pour each run of envelope between manholes or other terminations in one continuous operation.

    a. Start at one end and finish at the other, allowing for expansion and contraction of ducts as their temperature changes during and after the pour. Use expansion fittings installed according to manufacturer's written recommendations, or use other specific measures to prevent expansion-contraction damage.
    b. If more than one pour is necessary, terminate each pour in a vertical plane. Assure reinforcement rods extend 18 inches beyond pour to allow overlap for continuation of reinforcement.

3. Pouring Concrete: Spade concrete carefully during pours to prevent voids under and between conduits and at exterior surface of envelope. Do not allow a heavy mass of concrete to fall directly onto ducts. Use a plank to direct concrete down sides of bank assembly to trench bottom. Allow concrete to flow to center of bank and rise up in middle, uniformly filling all open spaces. Rod or manually agitate concrete to eliminate voids. Do not use power-driven agitating equipment unless specifically designed for duct-bank application.
4. Reinforcement: Reinforce concrete-encased duct banks with a minimum of one parallel #4 rod for each conduit. Secure in separators to maintain spacing. Provide a circumferential loop around entire ductbank and tie to parallel rods at an interval not less than one loop per 10 feet of duct. Support central tiers by cross rods from central rods to outside loops.

5. Forms: Use walls of trench to form side walls of duct bank where soil is self-supporting and concrete envelope can be poured without soil inclusions; otherwise, use forms.
6. Minimum Space between Ducts: 3 inches between ducts and exterior envelope wall, 2 inches between ducts for like services, and 24 inches between power and signal ducts unless indicated otherwise.
7. Depth: Install top of duct bank at least 36 inches below finished grade in areas not subject to deliberate traffic, and at least 60 inches below finished grade in deliberate traffic paths for vehicles, unless otherwise indicated.
8. Stub-Ups: Use manufactured rigid steel conduit elbows and RGC for all conduit extensions/stubs above grade or above slab/floor or pad.

    a. Couple steel conduits to ducts with adapters designed for this purpose, and encase coupling in concrete.
    b. Stub-Ups to Equipment: For equipment mounted on outdoor concrete bases, extend steel conduit horizontally a minimum of 60 inches from edge of base. Install insulated grounding bushings on terminations at equipment.

9. Warning Tape: Bury warning tape approximately 12 inches above all concrete-encased ducts and duct banks. Align tape parallel to and within 3 inches of the centerline of duct bank. Provide an additional warning tape for each 12-inch increment of duct-bank width over a nominal 18 inches. Space additional tapes 12 inches apart, horizontally.

J. Sand/Fill Encased Duct Banks (Where Indicated):

1. Support ducts on duct separators coordinated with duct size, duct spacing, and outdoor temperature.
2. Space separators close enough to prevent sagging and deforming of ducts, with not less than 5 spacers per 20 feet of duct. Secure separators to earth and to ducts to prevent displacement during backfill and yet permit linear duct movement due to expansion and contraction as temperature changes. Stagger spacers approximately 6 inches between tiers.
3. Excavate trench bottom to provide firm and uniform support for duct bank.
4. After installing first tier of ducts, backfill with sand and compact. Start at tie-in point and work toward end of duct run, leaving ducts at end of run free to move with expansion and contraction as temperature changes during this process. Repeat procedure after placing each tier. After placing last tier, hand-place sand backfill to 4 inches over ducts and hand tamp. Firmly tamp sand backfill around ducts to provide maximum supporting strength. Use hand tamper only. If flowable fill is used in lieu of sand backfill, follow same procedure of installing per tier. Rod or manually agitate fill at each tier to eliminate voids. Do not use power-driven agitation equipment unless specifically designed for duct bank application. After placing controlled backfill over final tier, make final duct connections at end of run and complete backfilling with normal compaction as specified in Division 31 Section "Earth Moving."
5. Install ducts with a minimum of 3 inches between ducts for like services and 24 inches between power and signal duct unless indicated otherwise.
6. Depth: Install top of duct bank at least 36 inches below finished grade, unless otherwise indicated.
7. Set elevation of bottom of duct bank below the frost line.
8. Install manufactured rigid steel conduit elbows for stub-ups at poles and equipment and at building entrances through the floor. Encase elbows for stub-up ducts throughout the length of the elbow.

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

9. Warning Tape: Bury warning tape approximately 12 inches above all sand/fill-encased ducts and duct banks. Align tape parallel to and within 3 inches of the centerline of duct bank. Provide an additional warning tape for each 12-inch increment of duct-bank width over a nominal 18 inches. Space additional tapes 12 inches apart, horizontally.

3.3 INSTALLATION OF CONCRETE MANHOLES, HAND-HOLES AND BOXES

A. Precast Concrete Hand-hole and Manhole Installation:

1. Comply with ASTM C 891, unless otherwise indicated.
2. Install unit level and plumb and with orientation and depth coordinated with connecting ducts to minimize bends and deflections required for proper entrances.
3. Unless otherwise indicated, support units on a level bed of crushed stone or gravel, graded from 1-inch sieve to No. 4 sieve and compacted to same density as adjacent undisturbed earth; minimum bed depth of 12 inches.

B. Elevations:

1. Manhole Roof: Install with rooftop at least 15 inches below finished grade.
2. Manhole Frame: In paved areas and traffic ways, set frames flush with finished grade. Set other manhole frames 1 inch above finished grade unless indicated otherwise.
3. Install hand-holes with bottom below the frost line, no less than 18” below grade.
4. Hand-hole Covers: In paved areas and traffic ways, set surface flush with finished grade. Set covers of other hand-holes ½ inch above finished grade unless indicated otherwise.
5. Polymer concrete hand-holes shall be encased in a concrete curb around the full circumference and flush with the frame and surrounding grade. The concrete curb shall be 3000 psi minimum of 4” depth and 4” width; curb shall not be required if handhole is encased in a concrete walk or pad.

C. Manhole Access: Circular opening in manhole roof; sized to match cover size.

1. Manholes with Fixed Ladders: Offset access opening from manhole centerlines to align with ladder; minimum manhole size with ladders shall be 36” diameter.
2. Install cover frame, constructed of precast concrete collars and rings to support frame and cover and to connect cover with manhole roof opening. Provide moisture-tight masonry joints and waterproof grouting for cast-iron frame to chimney.

D. Hardware: Install removable hardware, including pulling eyes, cable stanchions, cable arms, and insulators, as required for installation and support of cables and conductors and as indicated.

E. Fixed Manhole Ladders: Arrange to provide for safe entry with maximum clearance from cables and other items in manholes.

F. Anchors in Manholes and Concrete Hand-holes: All anchors for cable stanchions shall be factory installed inserts. Provide a minimum of two anchors for each stanchion.

G. Warning Sign: Install "Confined Space Hazard" warning sign on the inside surface of each manhole cover.

3.4 GROUNDING

A. Ground underground ducts and utility structures according to Division 26 Section "Grounding and Bonding for Electrical Systems."

B. Accessory Grounding: All cast-iron or conductive material manhole cover collars shall be grounded to a listed 5/8" x 10' ground rod and #6 bare copper lead in the manhole; the ground rod shall be bonded to circuit ground which passes through the manhole; unless otherwise indicated on plans.

3.5 FIELD QUALITY CONTROL

A. Perform the following tests and inspections and prepare test reports:

1. Demonstrate capability and compliance with requirements on completion of installation of underground ducts and utility structures.
2. Pull test mandrel through duct to prove joint integrity and test for out-of-round duct. Provide mandrel equal to 80 percent fill of duct. If obstructions are indicated, remove obstructions and retest.
3. Test manhole grounding to ensure electrical continuity of grounding and bonding connections. Measure and report ground resistance as specified in Division 26 Section "Grounding and Bonding for Electrical Systems."

B. Correct deficiencies and retest as specified above to demonstrate compliance.

3.6 CLEANING

A. Pull leather-washer-type duct cleaner, with graduated washer sizes, through full length of ducts. Follow with rubber duct swab for final cleaning and to assist in spreading lubricant throughout ducts.

B. Clean internal surfaces of manholes, including sump. Remove foreign material.

END OF SECTION 260543

SECTION 260553 - IDENTIFICATION FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Section 26 0000 “General Electrical Requirements”.

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

1.2 SUMMARY

A. Section Includes:

1. Color and legend requirements for raceways, conductors, and warning labels and signs.
2. Labels.
3. Bands and tubes.
4. Tapes and stencils.
5. Tags.
6. Signs.
7. Cable ties.
8. Paint for identification.
9. Fasteners for labels and signs.

1.3 ACTION SUBMITTALS

A. Refer to Section 01 3300.

B. Samples: For each type of label and sign to illustrate composition, size, colors, lettering style, mounting provisions, and graphic features of identification products.

C. Delegated-Design Submittal: For arc-flash hazard study.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Comply with ASME A13.1 and IEEE C2.

B. Comply with NFPA 70.

C. Comply with 29 CFR 1910.144 and 29 CFR 1910.145.

D. Comply with ANSI Z535.4 for safety signs and labels.

E. Comply with NFPA 70E and Section 26 0573.19 "Arc-Flash Hazard Analysis" requirements for arc-flash warning labels.

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

G. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes.

1. Temperature Change: 120 deg F ambient; 180 deg F, material surfaces.

2.2 COLOR AND LEGEND REQUIREMENTS

A. Raceways and Cables Carrying Circuits at 600 V or Less:

1. Black letters on an orange field.

2. Legend: Indicate voltage and system or service type.

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

1. Color shall be factory applied or field applied for sizes larger than No. 8 AWG if authorities having jurisdiction permit.

2. Colors for 208/120-V Circuits:

a. Phase A: Black.

b. Phase B: Red.

c. Phase C: Blue.

3. Colors for 480/277 V Circuits:

a. Phase A: Brown.

b. Phase B: Orange

c. Phase C: Yellow

4. Color for Neutral: White or gray.

5. Color for Equipment Grounds: Bare copper, Green (120/208).

6. Colors for Isolated Grounds: Green two or more yellow stripes.

7. Switch leg: Same a phase color with white stripe.

8. 3-way switch runner:

C. Warning Label Colors:

1. Identify system voltage with black letters on an orange background.

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

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

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

3. Arc Flash Warning: Nominal system voltage, available fault current, service overcurrent protective device clearing time, and the label date must be included in the arc-flash warning label per requirements of NEC 110.16.

4. Multiple Services: Labels must denote all service disconnects per NEC230.2E.

a. Example:
SERVICE NO. 1 – SUITE 10
SERVICE NO. 2 LOCATED AT NORTHEAST CORNER OF BUILDING.

E. Equipment Identification Labels:

1. Black letters on a white field.

2.3 LABELS

A. Vinyl Wraparound Labels: Preprinted, flexible labels laminated with a clear, weather- and chemical-resistant coating and matching wraparound clear adhesive tape for securing label ends.

1. Equivalent to Brady or approved equal.

B. Snap-around Labels: Slit, pretensioned, flexible, preprinted, color-coded acrylic sleeves, with diameters sized to suit diameter and that stay in place by gripping action.

1. Equivalent to Brady or approved equal.

C. Self-Adhesive Wraparound Labels: Preprinted or written, 3-mil thick vinyl flexible label with acrylic pressure-sensitive adhesive.

1. Equivalent to Brady or approved equal.

2. Self-Lamination: Clear; UV-, weather- and chemical-resistant; self-laminating, protective shield over the legend. Labels sized such that the clear shield overlaps the entire printed legend.

3. Marker for Labels: Permanent, waterproof, black ink marker recommended by tag manufacturer.

4. Marker for Labels: Machine-printed, permanent, waterproof, black ink recommended by

printer manufacturer.

D. Self-Adhesive Labels: Vinyl, thermal, transfer-printed, 3-mil thick, multicolor, weather- and UV-resistant, pressure-sensitive adhesive labels, configured for intended use and location.

1. Equivalent to Brady or approved equal.

2. Minimum Nominal Size:

a. 1-1/2 by 6 inches for raceway and conductors.

b. 3-1/2 by 5 inches for equipment.

c. As required by authorities having jurisdiction.

2.4 BANDS AND TUBES

A. Snap-around, Color-Coding Bands: Slit, pretensioned, flexible, solid-colored acrylic sleeves, 2 inches long, with diameters sized to suit diameter and that stay in place by gripping action.

B. Heat-Shrink Preprinted Tubes: Flame-retardant polyolefin tubes with machine-printed identification labels, sized to suit diameters of and shrunk to fit firmly around item being identified. Full shrink recovery occurs at a maximum of 200 deg F. Comply with UL 224.

2.5 TAPES AND STENCILS

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

B. Self-Adhesive Vinyl Tape: Colored, heavy duty, waterproof, fade resistant; not less than 3 mil thick by 1 to 2 inches wide; compounded for outdoor use.

C. Tape and Stencil: 4-inch wide black stripes on 10-inch centers placed diagonally over orange background and is 12 inches wide. Stop stripes at legends.

D. Floor Marking Tape: 2-inchwide, 5-mil pressure-sensitive vinyl tape, with yellow and black stripes and clear vinyl overlay.

E. Underground-Line Warning Tape:

1. Tape:

a. Recommended by manufacturer for the method of installation and suitable to identify and locate underground electrical and communications utility lines.

b. Printing on tape shall be permanent and shall not be damaged by burial operations.

c. Tape material and ink shall be chemically inert and not subject to degradation when exposed to acids, alkalis, and other destructive substances commonly found in soils.

2. Color and Printing:

   a. Comply with ANSI Z535.1, ANSI Z535.2, ANSI Z535.3, ANSI Z535.4, and ANSI Z535.5.

   b. Inscriptions for Red-Colored Tapes: "ELECTRIC LINE, HIGH VOLTAGE"

   c. Inscriptions for Orange-Colored Tapes: "TELEPHONE CABLE, CATV CABLE, COMMUNICATIONS CABLE, OPTICAL FIBER CABLE".

3. Tag: Standard

   a. Pigmented polyolefin, bright colored, continuous-printed on one side with the inscription of the utility, compounded for direct-burial service.

   b. Width: 3 inches.

   c. Thickness: 4 mils.

   d. Weight: 18.5 lb/1000 sq. ft.

   e. Tensile according to ASTM D882: 30 lbf and 2500 psi.

4. Tag: Detectable

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

   b. Width: 3 inches.

   c. Overall Thickness: 5 mils.

   d. Foil Core Thickness: 0.35 mil.

   e. Weight: 28 lb/1000 sq. ft..

   f. Tensile according to ASTM D882: 70 lbf and 4600 psi.

F. Stenciled Legend: In nonfading, waterproof, black ink or paint. Minimum letter height shall be 1 inch.

2.6 TAGS

A. Write-on Tags:

1. Polyester Tags: 0.010 inch thick, with corrosion-resistant grommet and cable tie for attachment.

2. Marker for Tags: Permanent, waterproof, black ink marker recommended by tag manufacturer.

3. Marker for Tags: Machine-printed, permanent, waterproof, black ink marker recommended by printer manufacturer.

2.7 SIGNS

A. Baked-Enamel Signs:

1. Preprinted aluminum signs, punched or drilled for fasteners, with colors, legend, and size required for application.

2. 1/4-inch grommets in corners for mounting.

3. Nominal Size: 7 by 10 inches.

B. Metal-Backed Butyrate Signs:

1. Weather-resistant, nonfading, preprinted, cellulose-acetate butyrate signs, with 0.0396-inch galvanized-steel backing, punched and drilled for fasteners, and with colors, legend, and size required for application.

2. 1/4-inch grommets in corners for mounting.

3. Nominal Size: 10 by 14 inches.

C. Laminated Acrylic or Melamine Plastic Signs:

1. Engraved legend.

2. Thickness:

a. For signs up to 20 sq. in., minimum 1/16 inch thick.

b. For signs larger than 20 sq. in., 1/8 inch thick.

c. Engraved legend with black letters on white face.

d. Self-adhesive.

e. Framed with mitered acrylic molding and arranged for attachment at applicable equipment.

2.8 CABLE TIES

A. General-Purpose Cable Ties: Fungus inert, self-extinguishing, one piece, self-locking, and Type 6/6 nylon.

1. Minimum Width: 3/16 inch.

2. Tensile Strength at 73 Deg F according to ASTM D638: 12,000 psi.

3. Temperature Range: Minus 40 to plus 185 deg F.

4. Color: Black, except where used for color-coding.

B. UV-Stabilized Cable Ties: Fungus inert, designed for continuous exposure to exterior sunlight, self-extinguishing, one piece, self-locking, and Type 6/6 nylon.

1. Minimum Width: 3/16 inch.

2. Tensile Strength at 73 Deg F according to ASTM D638: 12,000 psi.

3. Temperature Range: Minus 40 to plus 185 deg F.

4. Color: Black.

C. Plenum-Rated Cable Ties: Self-extinguishing, UV stabilized, one piece, and self-locking.

1. Minimum Width: 3/16 inch.

2. Tensile Strength at 73 Deg F according to ASTM D638: 7000 psi.

3. UL 94 Flame Rating: 94V-0.

4. Temperature Range: Minus 50 to plus 284 deg F.

5. Color: Black.

2.9 MISCELLANEOUS IDENTIFICATION PRODUCTS

A. Paint: Comply with requirements in painting Sections for paint materials and application requirements. Retain paint system applicable for surface material and location (exterior or interior).

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

PART 3 - EXECUTION

3.1 INSTALLATION

A. Verify and coordinate identification names, abbreviations, colors, and other features with requirements in other Sections requiring identification applications, Drawings, Shop Drawings, manufacturer's wiring diagrams, and operation and maintenance manual. Use consistent designations throughout Project.

B. Install identifying devices before installing acoustical ceilings and similar concealment.

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

D. Coordinate identification with Project Drawings, manufacturer's wiring diagrams, and operation and maintenance manual.

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

F. Install signs with approved legend to facilitate proper identification, operation, and maintenance of electrical systems and connected items.

G. Self-Adhesive Identification Products: Before applying electrical identification products, clean substrates of substances that could impair bond, using materials and methods recommended by manufacturer of identification product.

H. System Identification for Raceways and Cables under 600 V: Identification shall completely encircle cable or conduit. Place identification of two-color markings in contact, side by side.

1. Secure tight to surface of conductor, cable, or raceway.

I. System Identification for Raceways and Cables over 600 V: Identification shall completely encircle cable or conduit. Place adjacent identification of two-color markings in contact, side by side.

1. Secure tight to surface of conductor, cable, or raceway.

J. Auxiliary Electrical Systems Conductor Identification: Identify field-installed alarm, control, and signal connections.

K. Emergency Operating Instruction Signs: Install instruction signs with white legend on a red background with minimum 3/8-inch high letters for emergency instructions at equipment used for power transfer, load shedding and testing.

L. Elevated Components: Increase sizes of labels, signs, and letters to those appropriate for viewing from the floor.

M. Accessible Fittings for Raceways: Identify the covers of each junction and pull box of the following systems with the wiring system legend and system voltage. System legends shall be as follows:

1. "EMERGENCY POWER."

2. "POWER."

3. "UPS."

N. Vinyl Wraparound Labels:

1. Secure tight to surface at a location with high visibility and accessibility.

2. Attach labels that are not self-adhesive type with clear vinyl tape, with adhesive appropriate to the location and substrate.

O. Snap-around Labels: Secure tight to surface at a location with high visibility and accessibility.

P. Self-Adhesive Wraparound Labels: Secure tight to surface of raceway or cable at a location with high visibility and accessibility.

Q. Self-Adhesive Labels:

1. On each unit of equipment, install unique designation label that is consistent with wiring diagrams, schedules, and operation and maintenance manual.

2. Unless otherwise indicated, provide a single line of text with 1/2-inch high letters on 1-1/2-inch high label; where two lines of text are required, use labels 2 inches high.

R. Snap-around Color-Coding Bands: Secure tight to surface at a location with high visibility and accessibility.

S. Heat-Shrink, Preprinted Tubes: Secure tight to surface at a location with high visibility and accessibility.

T. Marker Tapes: Secure tight to surface at a location with high visibility and accessibility.

U. Self-Adhesive Vinyl Tape: Secure tight to surface at a location with high visibility and accessibility.

1. Field-Applied, Color-Coding Conductor Tape: Apply in half-lapped turns for a minimum distance of 6 inches where splices or taps are made. Apply last two turns of tape with no tension to prevent possible unwinding.

V. Tape and Stencil: Comply with requirements in painting Sections for surface preparation and paint application.

W. Floor Marking Tape: Apply stripes to finished surfaces following manufacturer's written instructions.

X. Underground Line Warning Tape:

1. During backfilling of trenches, install continuous underground-line warning tape directly above cable or raceway at 6 to 8 inches below finished grade. Use multiple tapes where width of multiple lines installed in a common trench exceeds 16 inches overall.

2. Limit use of underground-line warning tape to direct-buried cables.

3. Install underground-line warning tape for direct-buried cables and cables in raceways.

Y. Write-on Tags:

1. Place in a location with high visibility and accessibility.

2. Secure using general-purpose, UV-stabilized or plenum-rated cable ties as required.

Z. Baked-Enamel Signs:

1. Attach signs that are not self-adhesive type with mechanical fasteners appropriate to the location and substrate.

2. Unless otherwise indicated, provide a single line of text with 1/2-inch high letters on minimum 1-1/2-inch high sign; where two lines of text are required, use signs minimum 2 inches high.

AA. Metal-Backed Butyrate Signs:

1. Attach signs that are not self-adhesive type with mechanical fasteners appropriate to the location and substrate.

2. Unless otherwise indicated, provide a single line of text with 1/2-inch high letters on minimum 1-1/2-inch high sign; where two lines of text are required, use signs minimum 2 inches high.

BB. Laminated Acrylic or Melamine Plastic Signs:

1. Attach signs and plastic labels that are not self-adhesive type with mechanical fasteners appropriate to the location and substrate.

2. Unless otherwise indicated, provide a single line of text with 1/2-inch high letters on minimum 1-1/2-inch high sign; where two lines of text are required, use signs minimum 2 inches high.

CC. Cable Ties: General purpose, for attaching tags, except as listed below:

1. Outdoors: UV-stabilized nylon.

2. In Spaces Handling Environmental Air: Plenum rated.

3.2 IDENTIFICATION SCHEDULE

A. Install identification materials and devices at locations for most convenient viewing without interference with operation and maintenance of equipment. Install access doors or panels to provide view of identifying devices.

B. Identify conductors, cables, and terminals in enclosures and at junctions, terminals, pull points, and locations of high visibility. Identify by system and circuit designation.

C. Accessible Raceways and Metal-Clad Cables, 600 V or Less, for Service, Feeder, and Branch Circuits, More Than 30A and 120V to Ground: Identify with self-adhesive raceway labels or vinyl tape applied in bands.

1. Locate identification at changes in direction, at penetrations of walls and floors, at 50-foot maximum intervals in straight runs, and at 25-foot maximum intervals in congested areas.

D. Accessible Fittings for Raceways and Cables within Buildings: Identify the covers of each junction and pull box of the following systems with self-adhesive labels containing the wiring system legend and system voltage. System legends shall be as follows:

1. "EMERGENCY POWER."

2. "POWER."

3. "UPS."

E. Control-Circuit Conductor Identification: For conductors and cables in pull and junction boxes, manholes, and handholes, use] self-adhesive wraparound labels with the conductor or cable designation, origin, and destination.

F. Control-Circuit Conductor Termination Identification: For identification at terminations, provide self-adhesive wraparound labels with the conductor designation.

G. Locations of Underground Lines: Underground-line warning tape for power, lighting, communication, and control wiring and optical-fiber cable.

H. Workspace Indication: Apply floor marking tape or tape and stencil to finished surfaces. Show working clearances in the direction of access to live parts. Workspace shall comply with NFPA 70 and 29 CFR 1926.403 unless otherwise indicated. Do not install at flush-mounted panelboards and similar equipment in finished spaces.

I. Instructional Signs: Self-adhesive labels, including the color code for grounded and ungrounded conductors.

J. Warning Labels for Indoor Cabinets, Boxes, and Enclosures for Power and Lighting: Self-adhesive equipment labels.

1. Apply to exterior of door, cover, or other access.

2. For equipment with multiple power or control sources, apply to door or cover of equipment, including, but not limited to, the following:

a. Power-transfer switches.

b. Controls with external control power connections.

K. Arc Flash Warning Labeling: Self-adhesive labels.

L. Operating Instruction Signs: Self-adhesive labels.

M. Emergency Operating Instruction Signs: Self-adhesive labels with white legend on a red background with minimum 3/8-inch-high letters for emergency instructions at equipment used for power transfer, load shedding and testing.

N. Equipment Identification Labels:

1. Indoor Equipment: Self-adhesive label.

2. Outdoor Equipment: Laminated acrylic or melamine sign 4 inches high.

END OF SECTION 260553

SECTION 261216 – LIQUID FILLED, MEDIUM-VOLTAGE TRANSFORMERS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Liquid filled, medium-voltage transformers (step up), with primary and secondary bushings within or without air-terminal enclosures.
2. Concrete Pad for transformer
3. Ground rods and buried ground field around the transformer per the drawings.
4. Warning labels and signs.

1.2 ACTION SUBMITTALS

A. Product Data:

1. For each type of product.

a. Include rated capacities, operating characteristics, and furnished specialties and accessories.

B. Shop Drawings:

1. For liquid-filled, medium-voltage transformers.

a. Include plans and elevations showing major components and features.

1) Include plan view and cross section of equipment base, showing clearances, manufacturer's recommended workspace, and locations of penetrations for grounding and conduits.

b. Include details of equipment assemblies and indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of field connections.
c. Include single-line diagram.
d. Include list of materials.
e. Include nameplate legends.

C. Submittals:

1. Field quality-control reports.

1.3 INFORMATIONAL SUBMITTALS

A. Product Certificates: For transformers, signed by product manufacturer.

B. Source quality-control reports.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Schnieder Electric, Square D.

B. ABB

C. Eaton

D. Maddox

E. MGM Transformer Company

F. Federal Pacific

G. Virginia Transformer Corp

2.2 SYSTEM DESCRIPTION

A. Electrical Components, Devices, and Accessories: Listed and labeled in accordance with NFPA 70, by qualified electrical testing laboratory recognized by authorities having jurisdiction, and marked for intended location and application.

B. Transformer shall be specifically designed for voltage step up operation.

C. Comply with IEEE C2.

D. Comply with IEEE C57.12.22.

2.3 PERFORMANCE REQUIREMENTS

A. Windings Material: Copper or Aluminum.

B. Surge Arresters: Comply with IEEE C62.11, Distribution Class; metal-oxide-varistor type, connected in each phase of incoming circuit and ahead of disconnecting device.

C. Cooling Systems: Comply with IEEE C57.12.22 for cooling class.

1. Self-Cooled Rating: 2000 kVA.

D. Coils Insulation Systems:

1. Primary and secondary coil assemblies must be manufactured using polyester VPI system.

E. Winding Connections: Connection of windings and terminal markings must comply with IEEE C57.12.70.

F. Efficiency: Comply with 10 CFR 431, Subpart K.

G. Bushings must comply with IEEE C57.19.01 requirements for impulse and low-frequency insulation levels.

H. Enclosure:

1. Provide with provisions for lifting and anchoring frame to concrete pad.
2. With integral skid-mounting frame, suitable to allow skidding or rolling of transformer in any direction.
3. Enclosure Finish:
   a. Same as switchgear.

I. Sound level must comply with requirements of NEMA TR 1.

J. Capacities and Characteristics:

1. Enclosure: Enclosure to be part of switchgear lineup.

2. Liquid: Less flammable liquid as defined per National Electric Code.

3. Efficiency: Meets or exceeds DOE 2010, 10CFR, part 431.

4. Provide each transformer with three metal oxide surge arrestors: 15 kV overvoltage system protection, conforming to ANSI/IEEE standard 386; 15 kV duty cycle, 4160V MCOV, 44.0 kV equivalent front-of-wave

5. Connections:

   a. Low Voltage: Tin plated 8-hole spade type utilizing vertical takeoff or incoming cables.
   b. High Voltage: Dead-front, including load break elbows.
   c. High Voltage Overcurrent Protection: Bayonet type current limiting fuse.

6. StepUp Transformer Ratings.

   a. Impedance: Not less than 5.75 percent.
   b. Temperature Rise: ANSI C57.12.22; Class OA, 65 deg C, self cooled.
   c. Coils Connection:

      1) Nominal primary phase-to-phase voltage; 480Y/277
      2) Nominal secondary voltage and BIL: 12,470 V 95 kV

7. Taps: Two 2-1/2 percent, full-capacity taps above and two 2-1/2 percent, full-capacity taps below rated voltage. Comply with IEEE C57.12.51 requirements.
8. Transformer Accessories:

    a. Dial-type analog thermometer with alarm contacts.
    b. Dial-type liquid level indicator.
    c. Dial-type pressure/vacuum gauge.
    d. Pressure relief valve (manual).
    e. Drain valve with sampler
    f. At least four stainless steel ground connection pads.
    g. Provisions for jacking, lifting, and towing.
    h. Machine-engraved nameplate made of anodized aluminum or stainless steel.

9. Heaters: Where outdoor cast-coil transformers are shown on Drawings, they must include thermostatically controlled space heaters powered from a fused control power transformer connected to primary side of substation transformer.

2.4 WARNING LABELS AND SIGNS

A. Comply with requirements for labels and signs specified in Section 260553 "Identification for Electrical Systems."

1. Warning signs: Preprinted aluminum with baked enamel finish.
2. Equipment Identification Labels: Engraved, laminated-acrylic label 4 inch high.

2.5 SOURCE QUALITY CONTROL

A. Testing Administrant: Engage factory representative to evaluate transformer.

B. Testing: Test and inspect transformer in accordance with IEEE C57.12.91.

C. Factory Tests and Inspections: Perform the following factory-certified routine tests by, or under supervision of, qualified electrical testing laboratory recognized by authorities having jurisdiction, before delivering to site. Affix label with name and date of certification of system compliance on control units.

1. Tests for transformers 501 kVA and larger:

    a. Resistance measurements of windings on rated voltage tap and at tap extremes.
    b. Turns ratio, polarity, and phase relation on rated voltage connection.
    c. Transformer no-load losses and excitation current at 100 percent of ratings.
    d. Impedance voltage and load loss at rated current and rated frequency on rated voltage connection and at tap extremes.
    e. Applied voltage and induced voltage.
    f. Partial discharge.
    g. Temperature rise at minimum and maximum ratings.
    h. Impulse.

D. Nonconforming Work:

1. Equipment that does not pass tests and inspections will be considered defective.

E. Prepare test and inspection reports.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine liquid-filled, medium-voltage transformers upon delivery.

1. Upon delivery of transformers and prior to unloading, inspect equipment for damage that may have occurred during shipment or storage.
2. Verify that tie rods and chains are undamaged and tight, and that blocking and bracing is tight. Verify that there is no evidence of load shifting in transit, and that readings from transportation shock recorders, if equipped, are within manufacturer's recommendations.
3. Verify that there is no indication of external damage and no dents or scratches in doors and sill, tank walls, radiators and fins, or termination provisions.
4. Compare transformers and accessories received with bill of materials to verify that shipment is complete. Verify that transformers and accessories conform with manufacturer's quotation and shop drawings. If shipment is incomplete or does not comply with Project requirements, notify manufacturer in writing immediately.
5. Unload transformers carefully, observing packing label warnings and handling instructions.
6. Open termination compartment doors and inspect components for damage or displaced parts, loose or broken connections, cracked or chipped insulators, bent mounting flanges, dirt or foreign material, and water or moisture.

B. Handling:

1. Handle transformers carefully, in accordance with manufacturer recommendations, to avoid damage to enclosure, termination compartments, base, frame, and internal components. Do not subject transformers to impact, jolting, jarring, or rough handling.
2. Protect transformer against entrance of dust, rain, and snow.
3. Transport transformers upright, to avoid internal stresses on core and coil mounting assembly and transformer case.
4. Verify that transformer weights are within rated capacity of handling equipment.
5. Use only manufacturer-recommended points for lifting, jacking, and pulling. Use lifting lugs when lifting transformers.
6. Use jacks only at corners of base plate of transformer case.
7. Use nylon straps of same length to balance and distribute weight when handling transformers with crane.
8. Use spreaders or lifting beam to obtain vertical lift and to protect transformer from straps bearing against enclosure. Lifting cable pull angles may not be greater than 15 degrees from vertical.
9. Exercise care not to damage base structure of case when handling transformer using skids or rollers. Use skids to distribute stresses over case base when using rollers under large transformers.

C. Storage:

1. Store transformers in accordance with manufacturer's recommendations.
2. Transformers may be stored outdoors. If possible, store transformers at final installation locations on concrete pads. If dry concrete surfaces are unavailable, use pallets of adequate strength to protect transformers from direct contact with ground. Ensure transformer is level.
3. Ensure that transformer storage location is clean and protected from severe conditions. Protect transformers from dirt, water, contamination, and physical damage. Do not store transformers in presence of corrosive or explosive gases. Protect transformers from weather when stored for more than three months.
4. Store transformers with compartment doors closed.
5. Regularly inspect transformers while in storage and maintain documentation of storage conditions, noting discrepancies or adverse conditions. Visually check for rust spots.

D. Examine areas and space conditions for compliance with requirements for liquid-filled, medium-voltage transformers and other conditions affecting performance of the Work.

E. Examine roughing-in of conduits and grounding systems to verify the following:

1. Wiring entries comply with layout requirements.
2. Entries are within conduit-entry tolerances specified by manufacturer, and no feeders may cross section barriers to reach load or line lugs.

F. Examine walls, floors, roofs, and concrete bases for suitable conditions for transformer installation.

G. Pre-Installation Checks:

1. Verify removal of shipping bracing after placement.

H. Verify that ground connections are in place and that requirements in Section 260526 "Grounding and Bonding for Electrical Systems" have been met. Ground resistance at transformer location may not be greater than 5 Ω.

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

3.2 INSTALLATION

A. Maintain minimum clearances and workspace at equipment in accordance with manufacturer's published instructions and NFPA 70.

3.3 CONNECTIONS

A. Ground equipment in accordance with Section 260526 "Grounding and Bonding for Electrical Systems."

1. At Interior Locations: For grounding to grounding electrodes, provide bare copper cable not smaller than 4/0 AWG. Bond surge arrester and neutrals directly to transformer

enclosure and then to grounding electrode system with bare copper conductors. Keep leads as short as practicable, with no kinks or sharp bends. Make joints in grounding conductors and loops by exothermic weld or compression connector.

2. At Exterior Locations:

    a. For counterpoise, provide tinned bare copper cable not smaller than 4/0 AWG, buried not less than 30 inch below grade interconnecting grounding electrodes. Bond surge arrester and neutrals directly to transformer enclosure and then to grounding electrode system with bare copper conductors. Keep lead lengths as short as practicable, with no kinks or sharp bends.
    b. Fence and equipment connections may not be smaller than 4 AWG. Ground fence at gate posts and corner post and at intervals not exceeding 10 ft. Bond gate sections to fence posts using 1/8 by 1 inch flexible braided copper strap and clamps.
    c. Make joints in grounding conductors and loops by exothermic weld or compression connector.

3. Terminate grounding and bonding conductors on common equipment grounding terminal on transformer enclosure. Install supplemental terminal bars, lugs, and bonding jumpers as required to accommodate number of conductors for termination.
4. Complete transformer tank grounding and lightning arrester connections prior to making other electrical connections.

B. Connect wiring in accordance with Section 260519 "Low-Voltage Electrical Power Conductors and Cables."

1. Maintain air clearances between energized live parts and between live parts and ground for exposed connections in accordance with manufacturer recommendations.
2. Bundle associated phase, neutral, and equipment grounding conductors together within transformer enclosure. Arrange conductors such that there is not excessive strain that could cause loose connections. Allow adequate slack for expansion and contraction of conductors.

C. Terminate medium-voltage cables in incoming section of transformer in accordance with Section 260513 "Medium-Voltage Cables."

3.4 SIGNS AND LABELS

A. Comply with installation requirements for labels and signs specified in Section 260553 "Identification for Electrical Systems."

B. Install warning signs as required to comply with 29 CFR 1910.269.

3.5 FIELD QUALITY CONTROL

A. Field tests and inspections must be witnessed by Design Engineer.

B. Tests and Inspections:

1. General Field-Testing Requirements:

    a. Comply with provisions of "Testing and Test Methods" Chapter in NFPA 70B.
    b. Perform visual and mechanical inspections and electrical tests. Certify compliance with test parameters.
    c. After installing transformer but before primary is energized, verify that grounding system at substation is tested at specified value or less.
    d. After installing transformer and after electrical circuitry has been energized, test for compliance with requirements.
    e. Visual and Mechanical Inspection:

        1) Verify equipment nameplate data complies with Contract Documents.
        2) Inspect bolted electrical connections for high resistance using one of the following two methods:

            a) Use low-resistance ohmmeter to compare bolted connection resistance values to values of similar connections. Investigate values that deviate from those of similar bolted connections by more than 50 percent of lowest value.
            b) Verify tightness of accessible bolted electrical connections by calibrated torque-wrench method in accordance with manufacturer's published data or NETA ATS, Table 100.12. Bolt-torque levels must be in accordance with manufacturer's published data. In absence of manufacturer's published data, use NETA ATS, Table 100.12.

2. Medium-Voltage Surge Arrester Field Tests:

    a. Visual and Mechanical Inspection:

        1) Inspect physical and mechanical condition.
        2) Inspect anchorage, alignment, grounding, and clearances.
        3) Verify arresters are clean.
        4) Verify that ground leads on devices are individually attached to ground bus or ground electrode.
        5) Verify that stroke counter is correctly mounted and electrically connected if applicable. Record stroke counter reading.

    b. Electrical Test:

        1) Perform insulation-resistance test on arresters, phase terminal-to-ground. Apply voltage in accordance with manufacturer's published data. In the absence of manufacturer's published data, comply with NETA ATS, Table 100.1. Replace units that fail to meet recommended minimum insulation resistance listed in that table.
        2) Perform watts-loss test. Evaluate watts-loss values by comparison with similar units and test equipment manufacturer's published data.

3. Liquid-filled Transformer Field Tests:

    a. Visual and Mechanical Inspection:

1) Test dew point of tank gases if applicable.
2) Inspect anchorage, alignment, and grounding.
3) Verify that resilient mounts are free and that shipping brackets have been removed.
4) Verify bushings are clean.
5) Verify that alarm, control, and trip settings on temperature and level indicators are set and operate within manufacturer's recommended settings.
6) Verify that cooling fans operate correctly and have appropriate overcurrent protection.
7) Perform specific inspections and mechanical tests recommended by manufacturer.
8) Verify that as-left tap connections are as specified.

b. Electrical Tests:

1) Perform insulation-resistance tests winding-to-winding and each winding-to-ground. Apply voltage in accordance with manufacturer's published data. In the absence of manufacturer's published data, comply with NETA ATS, Table 100.5. Calculate polarization index; value of index may not be less than 1.0.
2) Perform power-factor or dissipation-factor tests on windings in accordance with test equipment manufacturer's published data.
3) Perform turns-ratio tests at tap positions. Turns-ratio test results may not deviate by more than one-half percent from either adjacent coils or calculated ratio. If test fails, replace transformer.
4) Measure resistance of windings at tap connections, and record temperature-corrected winding-resistance values in Operations and Maintenance Manual.
5) Perform applied-voltage test on high- and load-side windings-to-ground. Comply with IEEE C57.12.91 provisions for field-deployed dielectric teats. Measurements must be made only when voltage and current have reached stable value. Test must be discontinued immediately in the event current begins to increase without stabilizing. Record test values in Operations and Maintenance Manual.
6) Verify correct secondary voltage, phase-to-phase and phase-to-neutral, after energization and prior to loading.

C. Nonconforming Work:

1. Equipment and devices will be considered defective if they do not pass tests and inspections.
2. Remove and replace malfunctioning units and retest.

D. Assemble and submit test and inspection reports. Record as-left set points of adjustable devices.

E. Manufacturer Services:

1. Engage factory-authorized service representative to support field tests and inspections.

3.6 FOLLOW-UP SERVICE

A. Infrared Inspection: Perform survey during periods of maximum possible loading. Remove necessary covers prior to inspection.

1. After Substantial Completion, but not more than 60 days after Final Acceptance, perform infrared inspection of transformer's electrical power connections.
2. Instrument: Inspect distribution systems with imaging equipment capable of detecting a minimum temperature difference of 1 deg C at 30 deg C.
3. Record of Infrared Inspection: Prepare a certified report that identifies testing technician and equipment used, and lists results as follows:

    a. Description of equipment to be tested.
    b. Discrepancies.
    c. Temperature difference between area of concern and reference area.
    d. Probable cause of temperature difference.
    e. Areas inspected. Identify inaccessible and unobservable areas and equipment.
    f. Identify load conditions at time of inspection.
    g. Provide photographs and thermograms of deficient area.

4. Act on inspection results in accordance with recommendations of NETA ATS, Table 100.18. Correct possible and probable deficiencies as soon as Owner's operations permit. Retest until deficiencies are corrected.

END OF SECTION 261216

SECTION 262313 - EMERGENCY/STANDBY POWER SYSTEMS AND AUTOMATIC TRANSFER EQUIPMENT

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Project drawings and contract documents requirements apply to this section.

1.2 SUMMARY

A. This section describes requirements for controls and switchgear for automatic transfer system and distributing alternate source power. The equipment provided shall be new factory assembled automatic transfer equipment with dedicated purpose microprocessor-based controls designed for fast, reliable operation and including the functions described herein.

B. Related sections of the project specifications include:

1. Division 26, Emergency/Standby Power System, Generator Sets

1.3 DEFINITIONS

A. ATS: Automatic Transfer Switch

B. GFP: Ground Fault Protection.

C. HMI: Human-Machine Interface

D. PLC: Programmable Logic Controller. A device with associated accessory components that is designed to accept programmable inputs and provide completely field-programmable logically controlled outputs.

E. Manufacturer: The entity that maintains engineering design control for the equipment provided, provides service and maintenance documentation, provides service direction, and provides warranty support.

F. Supplier: The entity that provides manufacturer-authorized local sales and service support for the manufacturer’s equipment.

1.4 SUBMITTALS

A. Product Data: Provide the noted technical data for the controls, switchgear, and transfer equipment described in this section. Materials required include:

1. Technical data fully describing the critical design features of the equipment proposed, and substantiating compliance to the requirements of this specification. This material shall include 3rd party certifications and listing details for all equipment provided, including seismic certifications described herein.

2. Data shall include a complete description of the features and function of the proposed equipment, described on the manufacturer’s published literature or manufacturer’s letterhead with a manufacturer’s employee signature validating its accuracy.

3. Include a listing of all setting ranges and factory default settings.

B. Include a detailed sequence of operation for the specific equipment provided.

C. Shop Drawings: For each control enclosure, switchgear section, or independent piece of equipment provide:

1. Elevation and other Drawings: Describing physical dimensions, weights, mounting provisions and requirements, mechanical and wiring access points.

2. Wiring Diagrams: Interconnecting wiring details including recommended control conduit configurations.

3. Submit names, qualifications, and locations of individuals who will service and support the equipment.

D. Source Quality Control Test Reports: Provide sample factory test report plan for integrated generator controls and automatic transfer system.

1.5 QUALITY ASSURANCE

A. Testing Agency Qualifications

B. The automatic transfer equipment manufacturer shall be certified to ISO 9001 International Quality Standard

C. Source Limitations: The automatic transfer switchgear shall be designed, manufactured, and warranted by the generator set manufacturer to provide a single source of responsibility for all the products provided. Warranty documents shall be provided verifying compliance to this requirement. Supplier shall directly employ service technicians specifically trained and qualified on the diagnosis and repair of engines, alternators, power transfer equipment, and automatic transfer equipment. The technicians shall be trained in the installation and commissioning of complex generator systems, including line voltage generator automatic transfer equipment. Switchgear manufacturer shall have more than (15) years experience to ensure quality. Documentation for similar projects shall be provided upon request.

D. The system, including generator sets and automatic transfer equipment, shall be serviced by a single local service organization that is trained and factory certified in both generator set and automatic transfer equipment service. The technicians serving the site shall be specifically trained and certified by the manufacturer in the diagnosis and repair of the synchronizing, automatic transfer, and load sharing equipment provided. The supplier shall maintain an inventory of critical replacement parts at the local service organization, and in service vehicles. The service organization shall be on call 24 hours per day, 365 days per year.

E. The manufacturer shall maintain model and serial number records for the automatic transfer equipment for at least 20 years.

F. Equipment provided shall conform to the requirements of the following codes and standards to the extent that they are applicable:

1. ANSI/IEEE C37.20.2 - Standard for Metal-Clad Switchgear.

2. ANSI/IEEE C37.04 and .06 - Standard ratings and preferred ratings for Indoor AC Medium-Voltage Circuit Breakers used in Metal-Clad Switchgear.

3. ANSI/IEEE C37.11 - Requirements for electrical control for AC High-Voltage Circuit Breakers rated on a symmetrical current basis or a total current basis.

4. ANSI/IEEE C37.09 - Standard Design and Production Testing.

5. ANSI Z55.1 - Gray Finishes for Industrial Apparatus and Equipment.

6. ANSI/IEEE C57.13 - Requirements for Instrument Transformers.

7. NEMA SG4 - Alternating Current High Voltage Circuit Breakers.

8. NEMA SG5 - Power Switchgear Assemblies.

9. EN55011, Class B Radiated Emissions

10. EN55011, Class B Conducted Emissions

11. EN60947-6-1 Standard for Low-voltage switchgear IEC 1000-4-5 (EN 61000-4-5); AC Surge Immunity. Similar waveforms are described in ANSI/IEEE 62.41-1991

12. IEC 1000-4-4 (EN 61000-4-4) Fast Transients Immunity

13. IEC 1000-4-2 (EN 61000-4-2) Electrostatic Discharge Immunity

14. IEC 1000-4-3 (EN 61000-4-3) Radiated Field Immunity

15. IEC 1000-4-6 Conducted Field Immunity

16. IEC 1000-4-11 Voltage Dip Immunity

17. NFPA70 – National Electrical Code. Equipment shall be suitable for use in systems in compliance to Article 700, 701, and 702.

18. NFPA110 – Emergency and Standby Power Systems. All equipment provided shall meet all requirements for Level 1 systems.

19. IEEE446 – Recommended Practice for Emergency and Standby Power Systems for Commercial and Industrial Applications

20. UL891 – Controls. Control equipment provided in switchgear enclosures shall be listed and labeled under this standard.

1.6 DELIVERY, STORAGE AND HANDLING

A. Deliver automatic transfer system equipment in section sizes that can be moved past all obstructions in the physical site.

B. All automatic transfer equipment shall be stored indoors in a temperature controlled environment, in accordance with manufacturers temporary storage instructions. At a minimum, equipment shall be protected from moisture, dirt, and physical damage.

C. With written approval of the equipment manufacturer, equipment may be stored outdoors, as long as it is protected according to the manufacturer's instructions, including protection from condensation, rain, dust/dirt, and physical damage.

1.7 EXTRA MATERIALS.

A. Provide additional items to support the automatic transfer system equipment, completely programmed and tested, packaged and labeled consistently with designations in system drawings.

1. One set of fuses of each type used in the system

2. Submit one racking handle(s) with equipment. A charging handle shall be furnished on each breaker mechanism.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Acceptable Manufacturers: Only approved bidders shall supply equipment provided under this contract. Equipment specifications for this project are based on microprocessor-based automatic transfer equipment manufactured by companies listed below. Digital Automatic Transfer Equipment by other suppliers that meets the requirements of this specification is acceptable, if approved not less than 2 weeks before scheduled bid date. Proposals must include a line by line compliance statement based on this specification.

2.2 GENERATOR AUTOMATIC TRANSFER MONITOR AND CONTROL SYSTEM

A. Acceptable Manufacturers

1. Square D, Schneider Electric

2. Eaton

3. ABB

4. Basis of Design: Equipment specifications for this project are based on microprocessor-based automatic transfer equipment manufactured by Schneider Square D.

B. Transfer Control System and Monitoring Equipment: Provide system control to monitor and control the operation of the entire automatic transfer system.

1. Operator Panel. The master control panel shall be provided with at least a 15 Inch full color high resolution resistive touch Advantech HMI (Human Machine Interface) operator panel to allow the operator to view the status and control the operation of system. The operator panel shall be provided with the following features and capabilities.

a. Main One Line Screen shall give a graphical display of the power system components directly controlled by the automatic transfer system. System status displays a combination of multi-color animation, messages and pop-up indicators.

b. System Control Screen shall provide the operator with the ability to:

1) Initiate test (with or without load);

c. Genset Control Screen.

1) Allow the operator to manually start and stop the genset.

2) Display generator set status and percent load.

3) Allow the operator to attempt to reset generator faults from the HMI.

d. Genset Summary Screen shall provide numeric and graphical displays of critical operating parameters for genset.

e. Network ATS Data Display shall provide numeric and graphical displays of critical operating parameters for genset.

f. Generator Set Metering shall include the following parameters for each generator set:

1) Line to line voltage (all three phases simultaneously),

2) Line to Neutral voltage (all three phases simultaneously),

3) Bus Line to Line voltage (all three phases simultaneously),

4) Bus Line to Neutral voltage (all three phases simultaneously),

5) Alternator frequency,

6) Alternator output current (all three phases simultaneously),

7) Power Factor,

8) KW output of generator and as a percentage of rated KW,

9) KVA,

10) KVAR,

11) Alternator line to line voltage (all three phases simultaneously) (graphical format),

12) Alternator output current (all three phases simultaneously) (graphical format),

13) Power Factor (graphical format),

14) KW output of generator, (graphical format),

15) Frequency (graphical format).

g. Bus metering display shall include the following parameters for each bus segment:

1) Bus Line to Line voltage (all three phases simultaneously),

2) Bus Line to Neutral voltage (all three phases simultaneously),

3) Bus output current (all three phases simultaneously),

4) KW output of bus and as a percentage of rated KW,

5) KVA,

6) KVAR,

7) KW hours

8) KVAR hours

9) Bus line to line voltage (all three phases simultaneously) (graphical format),

10) Power Factor (graphical format), F

11) Bus output current (all three phases simultaneously) (graphical format),

h. KW output of bus, (graphical format) Frequency (graphical format).

i. Active Alarm Screen shall display the date, time, alarm description and acknowledged date and time for system alarms (alarm horn shall be located on master control).

j. Historical Alarm Log Screen shall display the date, time, alarm description and acknowledged date and time for genset and system alarms (alarm horn shall be located on master control). These alarms should be stored and displayed in the master control for 30 days or 50 alarms.

k. Real Time Trending Screen should monitor and display four parameters simultaneously. Display parameters should include voltage, current, power, and frequency for each bus.

l. Scheduler Screen should allow for entering all setup parameters for the scheduler function

m. Historical Trending Screen The system shall include historical trending which collects, displays, and stores data. The historical data base shall be a FIFO file with storage capacity up to 26 days, or saved to a USB flash drive. Data will be saved in ".csv" file format. Each trend pen will have stop/pause/zoom features to allow the operator to magnify the trend, and also scroll back in time to view history. Historical Trend properties shall include: Refresh rate = on data change or every 2 seconds Buffering for extra data = 360 data points Continuous scrolling with pause and sliding time Time span on display = 8 hours (normal view) Time span on display = 2 hours (zoon view) USB data storage = 1 Year (with Minimum 1 Gig) Maximum and Minimum scale values = selectable by operator via touch screen Print screen function Required Trend pens required: Total KW Total KVAR Average Amps Average L-L Voltage.

n. User Login Security shall consist of 3 levels of security: Guest, Operator, and Technician. Automatic logout feature will reset access to “Guest” after defined period of time.

o. Event Log Screen shall be capable of logging all breaker operations, security level changes, and system status changes with a time and date stamp.

p. All screens on the master control shall be available on the Remote Web Interface without any additional software or licensing required in the future.

q. The plant test report function shall provide a record that System generator sets have been operated above 30% load for a particular duration. The report duration shall be adjustable between 5 – 240 minutes. The control will store at least 12 reports per generator. The operator may select, view, and print any and all of the 12 available reports. Reports shall be available via the remote web interface or FTP site. Each report shall contain the following information: Generator Set Name, Generator Set Model, 3 Phase L-L Voltage, 3 Phase Amps, Frequency, Power Factor, % KW, KW, KVAR, KVA, Oil Pressure, Coolant Temperature, Battery Voltage, Engine Hours

r. Modbus TCP/IP over Ethernet for BMS Interface

2. Internal Controls. The following internal control components or functions shall be provided for the master control:

a. The master functions shall include:

1) Automatic and manual start/stop commands for generator sets as well as automatic transfer breaker control.

2) System test with and without load initiated locally or remotely

3. Provide all other components required, such as properly sized current transformers, transducers, terminal blocks, etc., for proper and reliable system operation.

4. Master control equipment shall contain a system of diagnostic LED’s to assist in analyzing proper system function.

C. Construction

1. Manufacturer shall supply drawings that note dimensions, access requirements, and conduit entry details.

2. The master control system shall be listed and labeled under the requirements of UL891 including all covers, barriers, and supports. Individual control sections shall be isolated from each other by metal or insulating barriers.

3. All wiring shall be IEC UL891 listed 105 deg C, 600 volt rated and sized as required. Each wire, device or function shall be suitably identified by silk screen or similar permanent identification.

4. The framework and all other sheet metal components of the system shall be primed with a rust inhibiting primer, and finished with two coats of satin finish ANSI 61 gray enamel and must meet corrosion requirements of IEC 61439

5. All door mounted control shall be IEC UL891 listed 105 deg C, 600 volt rated and sized as required. Each wire, device or function shall be suitably identified by silk screen or similar permanent identification.

6. The framework and all components shall be industrial type oil tight devices with contact ratings a minimum of twice the maximum circuit ampacity they are controlling. Toggle switches and other light duty control devices are not acceptable. Indicator lamps shall be high intensity LED type devices. Indicator lamp condition (on or off) shall be easily visible in bright outdoor lighting conditions.

7. AC control circuits in the switchgear shall be protected with properly sized fuses or circuit breakers. Potential transformers shall be protected on line and load side.

8. All CT installations shall include 6 place shorting type terminal blocks using 12 gauge wire with ring terminal connectors.

9. All active control system components in the system shall be suitable for operation in ambient temperatures ranging from 0 to +50 degrees C. The controls shall be suitable for operation in an ambient ranging from 5-95% relative humidity, and shall be protected from the effects of equipment vibration.

10. The Touchscreen and other non-LED displays specified shall be suitable for operation from 0 to 50 degrees C. The controls shall be suitable for operation in an ambient ranging from 5-95% relative humidity.

D. System Control Power

1. Control power for the automatic transfer system controls shall be derived from the generator set 24VDC starting batteries or switchgear station batteries. A solid state, no break "best battery" selector system shall be provided so that control voltage is available as long as any battery bank in the system is available, and that all battery banks are isolated to prevent the failure of one battery from disabling the entire system. The power transfer control shall be supplied with redundant DC control power from two independent sources.

E. SEQUENCE OF OPERATION

1. Normal Standby Conditions

a. Genset Breakers are open and the Genset is not running. Main Generator breaker is open. Utility Source U1 is available and its respective utility main breaker is closed powering the Load Bus. Feeder Breakers are closed. The system is in Automatic Mode.

2. Open Transition

a. Loss of Normal Power

1) When the genset is online, and the Transfer Time Delay has expired utility main breaker opens. The Program Transition Time Delay starts timing. When the Program Transition Time Delay expires, Generator Main breaker closes and the entire plant is fed by the generator source.

b. Return of Normal Power

1) The externally supplied utility monitoring device or the protective relay monitoring the utility source U1 on the utility main breaker removes the start signal. The Retransfer Time Delay starts timing. If the utility source fails during the retransfer time delay, the timer resets and starts again when the utility returns. When the retransfer time delay expires, Generator Main breaker open as the program transition timer starts. When the program transition timer expires, Utility Main breaker closes. The genset runs in cool down mode and then shuts down. The system returns to a Standby mode of operation.

3. Test with Load

a. The operator initiates this sequence by selecting the Test with Load checkbox on the System Control screen or via dry contact inputs located on the customer's interconnect terminal block. The ON checkbox in the Remote Enable section on the System Control-page 1 screen must be selected for the dry contacts to be active. When the System receives a 'Test With Load' (Test Load Bus) signal, the Genset starts automatically, accelerates to rated voltage and frequency. When genset is online, Utility Main breaker opens. The Program Transition Time Delay starts timing. When the program transition timer expires, Generator Main breaker closes. When the 'Test with Load signal is removed, Generator Main breaker opens as the program transition timer starts. When the program transition timer expires, Utility Main breaker closes. The Genset runs in cool down mode and then shuts down. The system returns to a Standby mode of operation.

2.3 MANUFACTURED UNITS

A. The automatic transfer/distribution power equipment shall be configured as shown on the contract drawings, and rated for operation at voltage and current levels as shown on the contract drawings. It shall contain devices and equipment as shown on the drawings, in addition to meeting the requirements of this section.

B. Construction (Medium Voltage Automatic transfer and Power Distribution Equipment):

1. Ratings

a. The metal-clad switchgear shall consist of an outdoor enclosure containing circuit breakers and the necessary accessory components all factory assembled (except for necessary shipping splits) and operationally checked.

b. The assembly shall be a self-supporting and capable of being floor mounted on a level concrete pad.

c. The integrated switchgear assembly shall withstand the effects of closing, carrying and interrupting currents up to the assigned maximum short circuit rating.

d. The switchgear described in this specification shall be designed for operation on a 12,470V, Series Wye, 3 Phase 3 Wire, Solidly Grounded, 60Hz system.

e. Each circuit breaker shall have the following ratings:

1) Maximum Voltage 15 kV

2) BIL Rated 95 kV

3) Continuous Current (5/15 kV) 1200A

4) Three phase fault current available is 2.2 kA.

5) L-G fault current available is 3.36 kA

6) Nominal 3-Phase MVA Class 500 MVA

7) Rated Interrupting Time 3 cycles

C. Construction

1. Stationary Structure

a. The sections are divided by metal barriers into the following separate compartments: Circuit breaker, instrument, main bus, auxiliary device and cable. Each feeder section may have up to two circuit breaker compartments.

2. Circuit Breaker Compartment

a. Each circuit breaker compartment shall be designed to house a horizontal drawout metal-clad vacuum circuit breaker.

b. The stationary primary disconnecting contacts are to be silver-plated copper and mounted within Glass/Polyester support bushings. The movable contacts and springs shall be mounted on the circuit breaker element for ease of inspection/maintenance.

c. Entrance to the stationary primary disconnecting contacts shall be automatically covered by metal shutters when the circuit breaker is withdrawn from the connected position to the test or disconnected position or removed from the circuit breaker compartment.

d. Extend a ground bus into the circuit breaker compartment to automatically ground the breaker frame with high-current spring type grounding contacts located on the breaker chassis when in the test and connected positions.

e. Guide rails for positioning the circuit breaker and all other necessary hardware are to be an integral part of the circuit breaker compartment.

f. Blocking devices shall interlock breaker frame sizes to prevent installation of a lower ampere rating or interrupting capacity element into a compartment designed for one of a higher rating.

g. It shall be possible with indoor or outdoor walk-in switchgear to install a circuit breaker into a bottom compartment without use of a transport truck or lift device.

3. Cable Compartment/Ground Bus

a. Compression type cable lugs shall be furnished by the installing contractor as shown on plans.

b. The ground bus shall extend through this compartment for the full length of the switchgear.

c. Auxiliary bus, if needed, and load bus support NEMA Class A-20 standoff insulators shall be epoxy. Glass/Polyester insulators available on optional basis.

4. Main Bus Compartment

a. The main bus is to be rated 1200A amps and be fully insulated for its entire length with an epoxy coating by the fluidized bed process.

b. The conductors are to be Silver Plated Copper and be of a bolted design.

c. Access to this compartment is gained from the front or rear of the structure by removing a steel barrier.

d. Provide standard provisions for future extension, as applicable.

e. Cable conduit entry shall be as shown on the drawings.

5. Doors and Panels

a. Relays, meters, control switches, etc., shall be mounted on a formed front-hinged panel for each circuit breaker compartment.

b. Rear access shall be bolt on panels or hinged doors to assist in installation and maintenance of bus and cables

c. Provide keyed locking mechanism for doors.

6. Fabrication

a. Each equipment bay shall be a separately constructed cubicle assembled to form a rigid freestanding unit.

b. Minimum sheet metal thickness shall be 11 gauge steel on all exterior surfaces.

c. Rear Access Type - Panels

d. Front Access Type - Bolt, Right, non-lockable

e. Adjacent bays shall be securely bolted together to form an integrated rigid structure.

f. Each individual unit shall be braced to prevent distortion.

g. The metal-clad switchgear shall be fully assembled, inspected and tested at the factory prior to shipment.

h. Large line-ups shall be split to permit normal shipping and handling as well as for ease of rejoining at the job site.

7. Dimensions

a. Standard dimensions per indoor section are: 36 in W x 95 in H x 92 in D

8. Factory Finishing

a. All steel parts, except galvanized (if used), shall be cleaned and a zinc-phosphate (outdoor equipment) or iron phosphate (indoor equipment) pre-treatment applied prior to paint application.

b. Paint color shall be ANSI-61 [light grey]; TGIC polyester powder, applied electrostatically through air. Following paint application, parts shall be baked to produce a hard durable finish. The average thickness of the paint film shall be 2.0 mils.

c. Paint film shall be uniform in color and free from blisters, sags, flaking and peeling.

d. Adequacy of paint finish to inhibit the buildup of rust on ferrous metal materials shall be tested and evaluated per paragraphs 5.2.8.1-7 of ANSI C37.20.2-1987.

e. Salt spray withstand tests in accordance with ASTM #D-1654 and #B-117 shall be performed on a periodic basis to provide conformance with the corrosion resistance standard of at least 2500 hours minimum (outdoor equipment) or 600 hours minimum (indoor equipment) .

D. Components

1. Circuit Breakers

a. The circuit breakers shall be rated 12,470V, Series Wye, 15 maximum kV, 60 Hz, with a continuous current rating of 1200A and a maximum symmetrical interrupting rating* of at least 3kA RMS SYM.

b. Furnish circuit breakers with one vacuum interrupter per phase.

c. Breakers of same type and rating shall be completely interchangeable.

d. The circuit breaker shall be operated by means of a stored energy mechanism which is normally charged by a universal motor but can also be charged by the

manual handle supplied on each breaker for manual emergency closing or testing.

e. The closing speed of the moving contacts is to be independent of both the control voltage and the operator.

f. Provide a full front shield on the breaker.

g. Secondary control circuits shall be connected automatically with a self-aligning, self-engaging plug and receptacle arrangement when the circuit breaker is racked into the connected position.

h. Provision shall be made for secondary control plug to be manually connected in test position.

i. A minimum of 4 auxiliary contacts (2a 2b), shall be provided for external use.

j. Provisions shall be made for 10 additional cell-mounted auxiliary contacts both MOC and TOC type for external use.

k. Provide a normally open and normally closed contact set that changes state when the medium voltage transfer calls for generator start.

l. The racking mechanism to move the breaker between positions shall be operable with the front door closed and position indication shall be visible with door closed.

m. An interlocking system shall be provided to prevent racking a closed circuit breaker to or from any position. An additional interlock shall automatically discharge the stored-energy operating mechanism springs upon removal of the breaker out of the compartment.

n. The breakers shall be electrically operated by the following control voltages: 125 VDC.

2. Instrument Transformers

a. Current transformers: Each breaker compartment shall have provision for front- accessible mounting of up to four current transformers per phase* (ANSI standard relay accuracy), two on bus side and two on cable side of circuit breaker. The current transformer assembly shall be insulated for the full voltage rating of the switchgear. The current transformers wiring shall be Type SIS #12 AWG. Relaying and metering accuracy shall conform to ANSI Standards.

b. Voltage transformers are drawout mounted with primary current-limiting fuses and shall have ratio as indicated. The transformers shall have mechanical rating equal to the momentary rating of the circuit breakers and shall have metering accuracy per ANSI Standards.

c. Control power transformers up to 15 kV, 15 kVA, single-phase shall be mounted in drawout drawers.

3. Control Wiring

a. The switchgear control circuits shall be wired with type SIS #14 AWG, except where larger size wire is specified. All control components shall be wired within manufacturer specifications.

b. The switchgear shall be provided with terminal blocks for outgoing control connections.

c. Wire markers shall be provided for each end of all control wires.

4. Station Battery System

a. 125 Volt DC.

5. Protective Relays

a. The switchgear manufacturer shall furnish and install, in the metal-clad switchgear, the quantity, type and rating of protection relays as indicated on the drawings and described hereafter in this specification.

b. Protective relays shall be provided with drawout construction or test switches for testing and maintenance.

c. Generator main circuit breaker shall include the following relays:

1) One – Set of three Current Transformers connected on the load side of the utility circuit breaker.

2) One – Circuit breaker control switch with red and green indicating lights

3) One –Schweitzer SEL-751A Multifunction relay

4) One – Manually reset lockout relay, ANSI device number 86

5) One – Circuit breaker control switch with red and green indicating lights

d. Each utility main circuit breaker section for control of a utility main circuit breaker shall include the following relays:

1) One – Set of three Potential Transformers connected to the line side of the circuit breaker with a secondary voltage of 120 volts.

2) One – Set of three Potential Transformers connected to the bus side of the circuit breaker with a secondary voltage of 120 volts.

3) One – Set of three Current Transformers connected on the line side of the utility circuit breaker.

4) One – Schweitzer SEL-751

5) One – Auto/Manual control switch with red and green indicating lights

6) One – Circuit breaker control switch with red and green indicating lights

7) One – Manually reset lockout relay, ANSI device number 86

e. Each switchgear feeder breaker section for control of a feeder circuit breaker shall include the following relays:

1) One – Circuit breaker control switch with red and green indicating lights

2) One – Schweitzer SEL-751A

3) One – Manually reset lockout relay, ANSI device number 86

6. Surge Arrestors

a. The generator set automatic transfer breakers shall each be provided with intermediate class surge arresters ratings as shown on the contract drawings.

7. Accessories

a. Submit 1 racking handle(s) with equipment. Charging handle to be furnished on each breaker mechanism.

b. Provide 1 set(s) of spare control fuses for each rating type installed.

c. Provide 1 set(s) of spare primary PT/CPT fuses for each rating type installed.

2.4 HUMAN MACHINE INTERFACE (HMI)

A. Display information on the Human Machine Interface with LCD screen shall include, but not be limited to the following information:

1. Interface with Generator:

a. Phase currents, each phase.

b. Phase-to-phase voltages, three phase.

c. Phase-to-ground voltages, three phase.

d. Three-phase real power.

e. Three-phase reactive power.

f. Power factor.

g. Frequency.

h. Integrated demand, with demand interval selectable from 5 to 60 minutes.

i. Accumulated energy, in megawatt hours.

j. Coolant temperature gauge.

k. High coolant temperature warning.

l. High coolant temperature alarm.

m. Oil pressure gauge.

n. Low oil pressure warning.

o. Low oil pressure alarm.

p. Low coolant level warning.

q. Low coolant level alarm.

r. Overcrank

s. Overspeed.

t. CB battery charger failure.

u. Overcurrent trip.

v. Battery charger failure.

w. Emergency stop.

x. Control power failure.

y. Ground overcurrent.

z. Differential trip.

aa. Engine lock-out shutdown.

bb. Engine running.

cc. Engine cooldown.

dd. Reset switch.

ee. Speed control.

ff. Voltage control.

2. Interface with automatic source transfer switch:

a. Remote auto / remote manual.

b. Automatic mode indicator.

c. Manual mode indicator.

d. Preferred source (normal power) available.

e. Alternate source (emergency power) available.

f. Preferred source (normal power) status.

g. Alternate source (emergency power) status.

h. Signal before transfer.

i. Ready light status.

j. Overcurrent lockout.

k. Event light.

l. Generator start command.

B. The Human Machine Interface shall operate at 24V DC and be connected to the 24V DC battery system.

C. The HMI shall allow the user to perform manual or scheduled run tests for the generator. The run tests shall be selectable for either of the following.

1. No load, no transfer.

2. Under load with transfer.

PART 3 - EXECUTION

3.1 EXAMINATION

A. The installer shall be responsible for inspection of the site and verification that the equipment can be installed and operated as required by the manufacturer.

3.2 INSTALLATION

A. The equipment shall be installed as recommended by the equipment manufacturer.

B. Remove temporary lifting provisions prior to commissioning.

3.3 IDENTIFICATION

A. Mount permanent operating instructions at each transfer point, and at the system master control. Instructions shall include a one-line system drawing, description of the operating sequences of the system and the manual operation instructions for the panel where they are installed.

B. A notice indicating location of the operation and maintenance manual shall be provided.

C. A notice indicating service support information including supplier name, telephone numbers, and manufacturer’s contact information shall be provided on each major piece of equipment.

3.4 CONNECTIONS

A. Ground each piece of equipment according to the requirements elsewhere in Division 26 “Grounding and Bonding for Electrical Systems”, and in compliance with instructions in the drawings.

B. Connect power conductors in compliance to appropriate instructions based on voltage class, elsewhere in Division 26.

C. Provide control interconnection wiring and connect all control interconnections in strict compliance to the equipment manufacturers’ instructions.

3.5 FIELD QUALITY CONTROL

A. Prior to acceptance testing, test insulation resistance of each switchgear bus, component, connecting supply, feeder, and control circuit (in compliance with equipment manufacturer(s).) Test continuity of each circuit. Retain permanent records of this testing.

B. A factory-authorized and certified service technician shall inspect all control wiring for type of wiring material and installation practice, verify that the wiring is properly installed by point to point testing, and complete installation and startup checks as required by the equipment manufacturer.

3.6 ADJUSTING

A. Set all protective relaying according to the results as required by a coordination study. Set all other settings as recommended by the equipment manufacturer.

B. Record all settings and provide in system operation and maintenance manuals.

3.7 CLEANING

A. All equipment is to be thoroughly cleaned, with any shipping or installation damage repaired, prior to equipment commissioning and final test.

3.8 PROTECTION

A. Equipment shall be protected from the environment in compliance to manufacturer’s recommendations. As a minimum, equipment shall be protected from moisture, dirt, and condensation.

3.9 DEMONSTRATION.

A. Factory Testing. Before shipment of the equipment to the jobsite, the entire control system (including generator set controls) and all the new switchgear directly controlled by the control system shall have sequence of operation tested at the manufacturer's facility to demonstrate that it is fully functional prior to shipment to the jobsite. No exceptions to the requirements of this paragraph will be accepted.

B. Factory acceptance testing shall be executed successfully prior to shipment from factory.

C. The supplier of the automatic transfer system shall provide a manufacturer-certified representative to train the owners personnel in the proper operation and maintenance of the automatic transfer system.

END OF SECTION 262313

SECTION 262413 - SWITCHBOARDS

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

Section Includes:

1. Service and distribution switchboards rated 600 V and less.
2. Transient voltage suppression devices.
3. Disconnecting and overcurrent protective devices.
4. Instrumentation.
5. Accessory components and features.
6. Identification.

1.3 ACTION SUBMITTALS

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

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

1. Include dimensioned plans, elevations, sections, and details, including required clearances and service space around equipment. Show tabulations of installed devices, equipment features, and ratings.
2. Detail enclosure types for types other than NEMA 250, Type 1.
3. Detail bus configuration, current, and voltage ratings.
4. Detail short-circuit current rating of switchboards and overcurrent protective devices.
5. Include descriptive documentation of optional barriers specified for electrical insulation and isolation.
6. Detail utility company's metering provisions with indication of approval by utility company.
7. Include evidence of NRTL listing for series rating of installed devices.
8. Detail features, characteristics, ratings, and factory settings of individual overcurrent protective devices and auxiliary components.
9. Include time-current coordination curves for each type and rating of overcurrent protective device included in switchboards. Submit on translucent log-log graph paper; include selectable ranges for each type of overcurrent protective device.
10. Include schematic and wiring diagrams for power, signal, and control wiring.

1.4 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For switchboards and components to include in emergency, operation, and maintenance manuals. In addition to items specified in Division 01 Section "Operation and Maintenance Data," include the following:

1. Routine maintenance requirements for switchboards and all installed components.
2. Manufacturer's written instructions for testing and adjusting overcurrent protective devices.
3. Time-current coordination curves for each type and rating of overcurrent protective device included in switchboards. Submit on translucent log-log graph paper; include selectable ranges for each type of overcurrent protective device.

1.5 QUALITY ASSURANCE

A. Installer Qualifications: An employer of workers qualified as defined in NEMA PB 2.1 and trained in electrical safety as required by NFPA 70E.

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

C. Product Selection for Restricted Space: Drawings indicate maximum dimensions for switchboards including clearances between switchboards and adjacent surfaces and other items. Comply with indicated maximum dimensions.

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

E. Comply with NEMA PB 2.

F. Comply with NFPA 70.

G. Comply with UL 891.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Deliver switchboards in sections or lengths that can be moved past obstructions in delivery path.

B. Remove loose packing and flammable materials from inside switchboards.

C. Handle and prepare switchboards for installation according to NEMA PB 2.1.

1.7 PROJECT CONDITIONS

A. Environmental Limitations:

1. Do not deliver or install switchboards until spaces are enclosed and weathertight, wet work in spaces is complete and dry, work above switchboards is complete, and temporary HVAC system is operating and maintaining ambient temperature and humidity conditions at occupancy levels during the remainder of the construction period.
2. Rate equipment for continuous operation under the following conditions unless otherwise indicated:

    a. Ambient Temperature: Not exceeding 104 deg F (40 deg C).

b. Altitude: Not exceeding 6600 feet (2000 m).

B. Service Conditions: NEMA PB 2, usual service conditions, as follows:

1. Ambient temperatures within limits specified.
2. Altitude not exceeding 6600 feet (2000 m).

1.8 COORDINATION

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

Coordinate sizes and locations of concrete bases with actual equipment provided. Cast anchor-bolt inserts into bases.

1.9 WARRANTY

A. Installer warrants that fabricated and installed switchboard perform in accordance with specified requirements and agrees to repair or replace components that fail to perform as specified within extended-warranty period. Extended warranty period shall be two five years from the date of Substantial Completion; full coverage for labor, materials and equipment.

PART 2 - PRODUCTS

2.1 SWITCHBOARDS

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

1. Square D; Schneider Electric
2. Eaton Electrical Inc.;
3. Siemens Energy & Automation, Inc.
4. ABB/General Electric

B. Front-Connected, Front-Accessible Switchboards:

1. Main Devices: Fixed, individually mounted.
2. Branch Devices: Panel mounted.
3. Sections front and rear aligned.

C. Provide dead front type metal enclosed indoor switchboard rated 600 VAC arranged for 480/277 volt, 4-wire incoming service. Switchboards shall be designed and tested in accordance with current applicable IEEE, ANSI standards and equipped with devices built in accordance with latest UL and NEMA standards. Mount switchboard on a reinforced concrete pad as detailed on the drawings.

D. Switchboards shall be self-supporting NEMA class construction with front accessibility with the required number of vertical sections bolted together to form one metal enclosed rigid switchboard 90 inches high. Sides, top, and rear shall be covered with removable screw-on code

gauge steel panels. Provide switchboards with protective devices and equipment as listed in schedule complete with necessary inter-connections.

E. Main Bus Continuous: as indicated on drawings.

F. Provide coordinated current transformers, ammeters, voltmeter, and selector switches to read main bus voltage and current on all phases. Current transformers shall be rated for switchboard use and be fully rated for ampere capacity indicated. Meters shall be switchboard quality plus or minus 1 percent accuracy.

G. Outdoor Enclosures: Steel, NEMA 250, Type 3R.

1. Finish: Factory-applied finish in manufacturer's standard color; undersurfaces treated with corrosion-resistant undercoating.
2. Enclosure: Downward, rearward sloping roof; rear hinged doors for each section, with provisions for padlocking.

H. Enclosure Finish for Outdoor Units: Factory-applied finish in manufacturer's standard gray finish over a rust-inhibiting primer on treated metal surface.

I. Barriers: Between adjacent switchboard sections.

J. Provide space heaters, factory installed electric space heaters of sufficient wattage in each vertical section to maintain enclosure temperature above expected dew point.

K. Hinged Front Panels: Allow access to circuit breaker, metering, accessory, and blank compartments.

L. The main disconnect device on the 277/480V equipment shall be a solid-state trip, molded case circuit breaker with ground fault protection as specified below. Switchboard group-mounted circuit breaker branch devices shall be totally front accessible and front connectable. The circuit breaker connections to the distribution panel bussing shall be of a "blow-on" design such that the connectors grip the bus bars firmly under high fault conditions. Individually mounted branch circuit breakers shall be of the molded case type and be positioned vertically with the operating handles extending through the hinged front cover plates of the section. Each circuit breaker shall be individually fed by connectors from the main bus of the switchboard. The load side of each circuit breaker is to be bussed to cable lugs pointed toward the rear of the switchboard.

M. Provide UL listed ground sensor relay (GSR) system with Ground-Break components for each protective device indicated on schedule. Each unit shall consist of a coordinated ground sensor (CT) with integral test winding, solid state relay to operate shunt trip circuit on circuit protective device and Monitor panel. Relay shall be of the zone selective interlock type and have continuously adjusted current pick-up settings of 100-1200 ampere and continuously adjustable time delay setting from Inst. (0.03 sec) to 1 second. Relay shall provide two (2) independent output contacts and each rated 5 amperes continuous and 30 amperes inrush at (24, 36, 48, 125 V dc or 120, 120/240 V ac). Relay shall include a memory function to recognize and initiate tripping on intermittent ground faults. Monitor panels shall indicate relay operation and provide means for testing system with or without interruption of service and must not permit ground fault system to be inadvertently left in an inactive or OFF state. Ground sensor shall be installed for ground return or zero sequence arrangement as required on main service device. On feeder and branch devices, furnish zero sequence sensor arrangements.

N. Bracing shall be rated 75,000 AIC or as indicated on the drawings.

O. The switchboard shall be provided with surge suppression as specified in other sections of these specifications or as shown on the drawings. Surge suppression devices integral to the switchboard shall not be allowed.

P. Unless scheduled otherwise, provide a minimum of three 100-amp spare spaces, two 225-amp spare spaces and one 400-amp spare space in the switchboard.

Q. Buses and Connections: Three phase, four wire unless otherwise indicated.

1. Phase- and Neutral-Bus Material: Copper.
2. Load Terminals: Insulated, rigidly braced, runback bus extensions, of same material as through buses, equipped with compression connectors for outgoing circuit conductors. Provide load terminals for future circuit-breaker positions at full-ampere rating of circuit-breaker position.
3. Ground Bus: Copper
4. Main Phase Buses and Equipment Ground Buses: Uniform capacity for entire length of switchboard's main and distribution sections. Provide for future extensions.
5. Neutral Buses: 100 percent of the ampacity of phase buses unless otherwise indicated, equipped with compression connectors for outgoing circuit neutral cables. Brace bus extensions for busway feeder neutral bus.

R. Future Devices: Equip compartments with mounting brackets, supports, bus connections, and appurtenances at full rating of circuit-breaker compartment.

2.2 DISCONNECTING AND OVERCURRENT PROTECTIVE DEVICES

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

1. Electronic trip circuit breakers with rms sensing; field-replaceable rating plug or field-replicable electronic trip; and the following field-adjustable settings:

a. Long- and short-time pickup levels.
b. Ground-fault pickup level, time delay, and I^2t response.

2. Ground-Fault Equipment Protection (GFEP) Circuit Breakers: Class B ground-fault protection (30-mA trip).
3. Molded-Case Circuit-Breaker (MCCB) Features and Accessories:

a. Standard frame sizes, trip ratings, and number of poles.
b. Lugs: Compression style, suitable for number, size, trip ratings, and conductor material.
c. Undervoltage Trip: Set to operate at 35 to 75 percent of rated voltage without intentional time delay.

2.3 IDENTIFICATION

A. Service Equipment Label: NRTL labeled for use as service equipment for switchboards with one or more service disconnecting and overcurrent protective devices.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Receive, inspect, handle, and store switchboards according to NEMA PB 2.1.

B. Examine switchboards before installation. Reject switchboards that are moisture damaged or physically damaged.

C. Examine elements and surfaces to receive switchboards for compliance with installation tolerances and other conditions affecting performance of the Work.

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

3.2 INSTALLATION

A. Install switchboards and accessories according to NEMA PB 2.1.

B. Equipment Mounting: Install switchboards on reinforced concrete base, 4-inch nominal thickness or as detailed on the drawings.

1. Place and secure anchorage devices. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
2. Install anchor bolts to elevations required for proper attachment to switchboards.

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

D. Install overcurrent protective devices, transient voltage suppression devices, and instrumentation.

1. Set field-adjustable switches and circuit-breaker trip ranges.

E. Comply with NECA 1.

3.3 IDENTIFICATION

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

B. Switchboard Nameplates: Label each switchboard compartment with a nameplate complying with requirements for identification specified in Division 26 Section "Identification for Electrical Systems."

C. Device Nameplates: Label each disconnecting and overcurrent protective device and each meter and control device mounted in compartment doors with a nameplate complying with requirements for identification specified in Division 26 Section "Identification for Electrical Systems."

3.4 ADJUSTING

A. Adjust moving parts and operable components to function smoothly and lubricate as recommended by manufacturer.

B. Set field-adjustable circuit-breaker trip ranges as indicated or as calculated in the Coordination Study.

3.5 PROTECTION

A. Temporary Heating: Apply temporary heat, to maintain temperature according to manufacturer's written instructions, until switchboard is ready to be energized and placed into service.

3.6 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain switchboards, overcurrent protective devices, instrumentation, and accessories, and to use and reprogram microprocessor-based trip, monitoring, and communication units.

END OF SECTION 262413

SECTION 262416 - PANELBOARDS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Circuit breaker panelboards.

2. Distribution panelboards.

1.2 DEFINITIONS

A. MCCB: Molded-case circuit breaker.

B. SPD: Surge protective device.

1.3 ACTION SUBMITTALS

A. Refer to Section 01 3300.

B. Product Data: For each type of panelboard.

C. Shop Drawings: For each panelboard and related equipment.
1. Include dimensioned plans, elevations, sections, and details.
2. Detail enclosure types including mounting and anchorage, environmental protection, knockouts, corner treatments, covers and doors, gaskets, hinges, and locks.
3. Detail bus configuration, current, and voltage ratings.
4. Short-circuit current rating of panelboards and overcurrent protective devices.
5. Include evidence of NRTL listing for series rating of installed devices.
6. Include evidence of NRTL listing for SPD as installed in panelboard.
7. Detail features, characteristics, ratings, and factory settings of individual overcurrent protective devices and auxiliary components.
8. Include wiring diagrams for power, signal, and control wiring.
9. Key interlock scheme drawing and sequence of operations.
10. Include time-current coordination curves for each type and rating of overcurrent protective device included in panelboards.

1.4 INFORMATIONAL SUBMITTALS

A. Refer to Section 01 3300.

B. Panelboard schedules for installation in panelboards.

1.5 CLOSEOUT SUBMITTALS

A. Refer to Closeout requirements in Division 1, General Requirements.

PART 2 - PRODUCTS

2.1 PANELBOARDS COMMON REQUIREMENTS

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

B. Comply with NEMA PB 1.

C. Comply with NFPA 70.A

D. Enclosures: Flush and surface mounted, dead-front cabinets.

1. Rated for environmental conditions at installed location.

a. Indoor Dry and Clean Locations: NEMA 250, Type 1.

b. Outdoor Locations: NEMA 250, Type 3R.

2. Height: 84 inches (2.13 m) maximum.

3. Front: Secured to box with concealed trim clamps. For surface-mounted fronts, match box dimensions; for flush-mounted fronts, overlap box. Trims shall cover all live parts and shall have no exposed hardware.

E. Future Devices: Panelboards shall have mounting brackets, bus connections, filler plates, and necessary appurtenances required for future installation of devices.

2.2 CIRCUIT BREAKER PANELBOARDS:

A. Provide dead-front panelboards with bolt-in or plug-on molded case circuit breakers. Panelboards shall comply with NEMA Publication PB-1, UL 67 and UL50.

B. Boxes shall be galvanized steel standard width and depth except where scheduled otherwise. Fronts shall be code gauge steel finish with rust inhibiting primer and based enamel finish. Fronts shall have flush doors with flush cylinder tumbler-type locks, spring loaded door pulls, and concealed door hinges. Panel door locks shall be keyed alike. Provide fronts designed for flush or surface mounting as indicated and attached to box by adjustable trim clamps.

C. Doors: The front trim shall have full-length hinged outer door designed to expose the wiring raceways and breakers, when open. Another, inner hinged door shall expose breakers only, when open, making this a door-in-door construction. Both doors shall open to the right.

D. Both doors shall be provided with concealed butt or piano hinges. A suitable latch, which can be operated without tools, shall be provided to properly hold the inner door closed. For doors 30 inches (765 mm) high or less, a flush-type latch is satisfactory. For doors more than 30 inches (765 mm) high, a vault-type handle shall be provided with a three-point latch that holds the door closed at the top and bottom. The outer door shall be secured with at least 4 captured oval head machine screws.

E. Provide tin-finished copper bars full length of panel with rating listed in schedule. Bus bar connections to branch circuit breakers shall be “Phase Sequence” type designed and assembled so circuit breakers can be replaced without disturbing adjacent breakers or without removing main bus or branch circuit connectors. Provide bus bars with wire lugs suitable or copper or aluminum conductors. Provide each panel with equipment grounding bus grounded to box and neutral bus insulated from box.

F. Branch circuit breakers shall be quick-make, quick-break with trip indication. Circuit breakers shall operate both manually for normal switch functions and automatically under overload and short circuit conditions. They shall provide circuit and self-protection when applied within their rating. Operating mechanisms shall be entirely trip free so that contacts cannot be held closed against a short circuit. Operating handle of circuit breaker shall simultaneously open and close all poles of a multiple breaker. Circuit breakers shall conform to NEMA AB1, NEMA AB3 and UL489. Circuit breaker shall have a thermal magnetic trip unit for each pole for inverse time delayed overload protection and an instantaneous magnetic element for short circuit protection. Trip elements shall operate a common internally connected trip bar to open all poles in case of overload or short circuit through any one (1) pole. Panel shall provide for branch circuit breakers up to 100 amperes, and unless indicated otherwise, shall have 10,000 RMS short circuit amperes symmetrical interrupting capacity. Breakers shall be one, two, or three pole types as indicated in panel schedule.

G. Panels shall have branch circuit directory holders with clear plastic cover. Provide neatly typed circuit directory listing loads corresponding to branch circuit numbers.

H. Provide one spare 0.75-inch conduit for every three (3) spaces and/or blank spaces with a minimum of three (3) spare conduits per panel. Terminate conduit above ceilings unless indicated otherwise.

I. Panelboard shall be ABB, ITE/Siemens, Square D, or Eaton/Cutler-Hammer.

J. See schedule.

2.3 CIRCUIT BREAKER DISTRIBUTION PANELBOARDS:

A. Panelboards shall be based on the I-Line distribution panelboards as manufactured by Square-D.

B. Provide distribution and power panelboards as indicated in the panelboard schedule and where shown on the plans. Panelboards shall be equipped with thermal-magnetic, molded case circuit breakers of frame and trip ratings as shown on the schedule. Panelboard shall conform to NEMA PB1, UL 67 and UL 50.

C. Panelboard bus structure and main breaker shall have current ratings as shown on the panelboard schedule. Such ratings shall be established by heat rise tests with maximum hot spot temperature on any connector or bus bar not to exceed 50 deg C rise above ambient. Heat rise tests shall be conducted in accordance with UL 67. The use of conductor dimensions will not be accepted in lieu of actual heat tests.

D. Branch circuit breakers shall be Square D FA, KA, LA, MA, NH, PA and/or PC 1-, 2-, or 3-pole molded case circuit breakers rated 15 through 2500 amperes, (120 V ac) (240 V ac) (277 v ac) (480 V ac), as specified on the drawings. Breakers shall be standard construction. All circuit breakers shall be UL and CSA listed, IEC 157-1 rated, meet NEMA AB1, and Federal

Specification W-C 375B/GEN, when applicable. Molded case circuit breakers shall have over center toggle-type mechanisms, providing quick-make, quick-break action. Breakers shall be calibrated for operation in an ambient temperature of 40 deg C. Each circuit breaker shall have trip indication by handle position and shall be trip-free. 2- and 3-pole breakers shall be common trip. Each circuit breaker shall have a permanent trip unit containing individual thermal and magnetic trip elements in each pole. Circuit breakers with frame sizes greater than 100 amperes shall have variable magnetic trip elements which are set by a single adjustment (to assure uniform tripping characteristics in each pole). A push-to-trip button shall be provided on the cover from mechanically tripping the circuit breaker. The circuit breaker shall have reverse connection capability and be suitable for mounting and operating in any position. Unless otherwise indicated, branch circuit breakers up to 100 amperes shall have 10,000 RMS short circuit amperes symmetrical interrupting capacity. Circuit breakers above 100 amperes shall have 42,000 RMS capacities.

E. Each panelboard, a complete unit, shall have a short circuit rating equal to or greater than the integrated equipment rating shown on the panelboard schedule or on the plans. This rating shall be established by testing with the overcurrent devices mounted in the panelboard. The short circuit tests on the overcurrent devices and on the panelboard structure shall be made simultaneously by connecting the fault to each overcurrent device with the panelboard connected to its rated voltage source. Method of testing shall be per UL 67. The source shall be capable of supplying the specified panelboard short circuit current or greater. Testing of panelboard overcurrent devices for short circuit rating only while individually mounted is not acceptable. Also, testing of the bus structure by applying a fixed fault to the bus structure alone is not acceptable. Panelboards shall be marked with their maximum short circuit current rating at the supply voltage and shall be UL listed.

F. Panelboard assembly shall be enclosed in a steel cabinet. The rigidity and gauge of steel to be as specified in UL 50 for cabinets. The size of wiring gutters shall be in accordance with UL 67. Cabinets to be equipped with latch and tumbler-type lock on door of trim. Doors over 48 inches long shall be equipped with three-point latch and vault lock. All locks shall be keyed alike. Endwalls shall be removable. Fronts shall be of code gauge steel. Gray baked enamel finish electro-deposited over clean phosphatized steel.

G. The panelboard interior assembly shall be dead front with panelboard front removed. Main lugs or main breakers shall have barriers on five sides. The barrier in front of the main lugs shall be hinged to a fixed part of the interior. The end of the bus structure opposite the mains shall have barriers.

H. Equivalent manufacturers shall be ABB, ITE/Siemens, Square D, or Eaton/Cutler-Hammer.

2.4 IDENTIFICATION

A. Panelboard Label: Manufacturer's name and trademark, voltage, amperage, number of phases, and number of poles shall be located on the interior of the panelboard door.

B. Breaker Labels: Faceplate shall list current rating, UL and IEC certification standards, and AIC rating.

C. Circuit Directory: Directory card inside panelboard door, mounted in transparent card holder.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Comply with NECA 1.

B. Install panelboards and accessories according to NECA 407 and NEMA PB 1.1.

C. Mount top of trim 90 inches (2286 mm) above finished floor unless otherwise indicated.

D. Mount panelboard cabinet plumb and rigid without distortion of box.

E. Mount recessed panelboards with fronts uniformly flush with wall finish and mating with back box.

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

G. Make grounding connections and bond neutral for services and separately derived systems to ground. Make connections to grounding electrodes, separate grounds for isolated ground bars, and connections to separate ground bars.

H. Install filler plates in unused spaces.

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

3.2 IDENTIFICATION

A. Identify field-installed conductors, interconnecting wiring, and components; install warning signs complying with requirements in Section 26 0553 "Identification for Electrical Systems."

B. Create a directory to indicate installed circuit loads; incorporate Owner's final room designations. Obtain approval before installing. Handwritten directories are not acceptable. Install directory inside panelboard door.

C. Panelboard Nameplates: Label each panelboard with a nameplate complying with requirements for identification specified in Section 26 0553 "Identification for Electrical Systems."

D. Device Nameplates: Label each branch circuit device in distribution panelboards with a nameplate complying with requirements for identification specified in Section 26 0553 "Identification for Electrical Systems."

E. Install warning signs complying with requirements in Section 26 0553 "Identification for Electrical Systems" identifying source of remote circuit.

3.3 FIELD QUALITY CONTROL

A. Perform tests and inspections.

B. Acceptance Testing Preparation:

1. Test insulation resistance for each panelboard bus, component, connecting supply, feeder, and control circuit.

2. Test continuity of each circuit.

C. Tests and Inspections:

1. Perform each visual and mechanical inspection and electrical test for low-voltage air circuit breakers stated in NETA ATS. Certify compliance with test parameters.

2. Correct malfunctioning units on-site, where possible, and retest to demonstrate compliance; otherwise, replace with new units and retest.

D. Panelboards will be considered defective if they do not pass tests and inspections.

E. Prepare test and inspection reports, including a certified report that identifies panelboards included and that describes scanning results, with comparisons of the two scans. Include notation of deficiencies detected, remedial action taken, and observations after remedial action.

END OF SECTION 262416

SECTION 262550 - GENERATOR DOCKING STATION (DUAL PURPOSE)

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:

1. Equipment for docking a temporary generator and portable load bank.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of Generator Docking Station indicated, include dimensioned elevations, sections, weights, and manufacturers' technical data on features, performance, electrical characteristics, ratings, accessories, enclosure types, and finishes.

B. Shop Drawings: Include plans, elevations, sections, details, and attachments to other work.

1. Wiring Diagrams: For power, signal, and control wiring.

1.4 INFORMATIONAL SUBMITTALS

A. Qualification Data: For qualified testing agency.

B. Field quality-control reports.

1. Test procedures used.

2. Test results that comply with requirements.

3. Results of failed tests and corrective action taken to achieve test results that comply with requirements.

1.5 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data:

1. Manufacturer's written instructions for maintaining Generator Docking Station.

1.6 QUALITY ASSURANCE

A. Testing Agency Qualifications: Member company of NETA or an NRTL.

1. Testing Agency's Field Supervisor: Currently certified by NETA to supervise on-site testing.

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

C. UL (Underwriters Laboratories, Inc.) Standards

D. Comply with NFPA 70.

1.7 PROJECT CONDITIONS

A. Environmental Limitations: Rate equipment for continuous operation under the following conditions unless otherwise indicated:

1. Ambient Temperature: Not less than minus 22 deg F and not exceeding 104 deg F.

2. Altitude: Not exceeding 6600 feet.

1.8 COORDINATION

A. Coordinate layout and installation of Generator Docking Station, and components with equipment served and adjacent surfaces. Maintain required workspace clearances and required clearances for equipment access doors and panels.

1.9 GUARANTEE/WARRANTY

A. The equipment installed under this contract shall be left in proper working order. Replace, without additional charge, new work or material which develops defects from ordinary use within five years from substantial completion.

B. New materials and equipment shall be guaranteed against defects in composition, design or workmanship. Guarantee certificates shall be furnished.

PART 2 - PRODUCTS

2.1 GENERATOR DOCKING STATION

A. Manufacturers: Subject to compliance with requirements, provide dual purpose docking station by one of the following:

1. Power Logics/Trystar (Basis of Design, Model SBDS-6)

2. Power Temp Systems, Inc.

3. Eaton

4. PSI Power & Controls

2.2 GENERAL REQUIREMENTS

A. Enclosures:

1. Cabinet shall be pad mounted per the drawings.

2. Top, side, bottom, & back accessible for conduit cabling.

3. Front & side accessible for maintenance.

4. Rated for environmental conditions at installed location:

5. Outdoor Locations: NEMA 250, Type 3R

    a. 3 Point Latching Handle for Front Door, Must be Padlockable

    b. All Aluminum construction.

6. Front Cover:

    a. Hinged.

    b. Gasketed.

    c. Pad-lockable latch

7. Finishes:

    a. Powder Coat Only.

    b. Hammer Gray ANSI 61.

B. Phase, Neutral, and Ground Buses:

1. Material: Silver-plated hard-drawn copper

2. Equipment Ground Bus: 100% of Phase Size

3. Ground Bus: 25% of phase size.

4. Round edges on bus.

C. Bus Connectors:

1. Located behind access plate inside front cover.

2. Lugs: Number and size as indicated on project drawings.

D. Inputs Connectors:

1. Located inside front cover.

2. Camlock w/ Bus Bar Style Connections - no Cabling is Acceptable.

E. Hinged cable access door on bottom of unit.

F. Padlockable front access cable trap door to reduce cable theft.

G. Kirk Key Interlock System

H. Voltage & Phase:

1. 480/277 Volt, 3 Phase, 4 wire.

I. Amperage

1. 2500 Amp

J. Accessories

1. 2 Wire Auto Start
2. 120V 20A Duplex GFCI
3. 120V, 30A power connection for battery charger and coolant heater.
4. LSI Electronic Trip circuit breakers, number and size as shown on drawings.
5. Phase rotation meter with signage of site rotation.
6. Extra depth for bottom conduit access.
7. Kirk Key door interlock.
8. Strip heater and thermostat.

K. Short Circuit and Withstand Rating

1. Must be Factory Rated at 65,000 AIC or Higher

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine elements and surfaces to receive Generator Docking Station for compliance with installation tolerances and other conditions affecting performance of the Work.

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

3.2 INSTALLATION

A. Pad Mounted: Install Generator Docking Station on poured concrete pad per detail on the drawings. Secure with anchor bolts in accordance with manufacturer’s instructions.

3.3 IDENTIFICATION

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

B. Identify field-installed conductors, interconnecting wiring, and components; provide warning signs.

C. Label each enclosure with engraved metal or laminated-plastic nameplate.

D. Label with the type of Bonding System for Ground.

3.4 FIELD QUALITY CONTROL

A. Testing Agency: A qualified testing agency to perform tests and inspections.

B. Perform tests and inspections.

C. Acceptance Testing Preparation:

1. Test insulation resistance for each Generator Docking Station, component, connecting supply, feeder, and control circuit.

2. Test continuity of each circuit.

D. Tests and Inspections:

1. Perform each visual and mechanical inspection and electrical test stated in NETA Acceptance Testing Specification. Certify compliance with test parameters.

2. Correct malfunctioning units on-site, where possible, and retest to demonstrate compliance; otherwise, replace with new units and retest.

3. Perform the following infrared scan tests and inspections and prepare reports:

a. Initial Infrared Scanning: After Substantial Completion, but not more than 60 days after Final Acceptance, perform an infrared scan of each Generator Docking Station. Remove front panels so joints and connections are accessible to portable scanner.

4. Test and adjust controls, remote monitoring, and safeties. Replace damaged and malfunctioning controls and equipment.

E. Prepare test and inspection reports, including a certified report that identifies Generator Docking Station and that describes scanning results. Include notation of deficiencies detected, remedial action taken, and observations after remedial action.

END OF SECTION 262550

SECTION 262816 - ENCLOSED SWITCHES AND CIRCUIT BREAKERS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Safety switches.

2. Molded-case circuit breakers (MCCBs).

3. Enclosures.

B. Related Requirements:

1. Section 26 0000 “General Electrical Requirements”.

1.2 ACTION SUBMITTALS

A. Refer to Section 01 3300.

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

1. Include time-current coordination curves (average melt) for each type and rating of overcurrent protective device; include selectable ranges for each type of overcurrent protective device. Provide in [PDF] [and] <Insert calculation program format> electronic format.

C. Shop Drawings: For enclosed switches and circuit breakers.

1. Include plans, elevations, sections, details, and attachments to other work.

2. Include wiring diagrams for power, signal, and control wiring.

1.3 CLOSEOUT SUBMITTALS

A. Refer to Closeout requirements in Division 1, General Requirements.

1.4 WARRANTY

A. Manufacturer's Warranty: Manufacturer and Installer agree to repair or replace components that fail in materials or workmanship within specified warranty period.

1. Warranty Period: One year from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 GENERAL REQUIREMENTS

A. Source Limitations: Obtain enclosed switches and circuit breakers, overcurrent protective devices, components, and accessories, within same product category, from single manufacturer.

B. Product Selection for Restricted Space: Drawings indicate maximum dimensions for enclosed switches and circuit breakers, including clearances between enclosures, and adjacent surfaces and other items. Comply with indicated maximum dimensions.

C. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by an NRTL, and marked for intended location and application.

D. Comply with NFPA 70.

2.2 SAFETY SWITCHES

A. Provide switches by Eaton/Cutler-Hammer, ABB, ITE/Siemens, or Square D.

B. Provide heavy duty horsepower rated safety switches rated in accordance with NEMA enclosed Switch Standard KS-1 – 1975 and UL 98 and as scheduled.

C. Enclosure shall be NEMA type required by switch location and environment. Enclosure door shall have latch with means for padlocking and cover interlock with defeater to prevent opening door when switch is energized or closing switch with door open. Switch shall have an embossed nameplate permanently attached to door front with switch rating, short circuit interrupting capacity, and application information.

D. Line terminals shall be permanently marked and shielded. Contacts shall be tin plated, equipped with arc chutes, and have moving contacts visible in off-position with door open. Wiring terminals shall be pressure type suitable for copper or aluminum wire. Switching mechanism shall be quick-make, quick-break, spring driven, anti-tease mechanism, and be integral part of box. All current carrying parts shall be plated.

E. Fuse holders for 1 to 600 amperes shall be high pressure type for use with Class R current limiting fuses. Fuse holders shall be completely accessible from front of switch.

F. Provide switches by Eaton/Cutler-Hammer, ABB, ITE/Siemens, or Square D.

G. See schedule.

H. Accessories:

1. Equipment Ground Kit: Internally mounted and labeled for copper and aluminum ground conductors.

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

3. Isolated Ground Kit: Internally mounted; insulated, labeled for copper and aluminum neutral conductors.

4. Class R Fuse Kit: Provides rejection of other fuse types when Class R fuses are specified.

5. Service-Rated Switches: Labeled for use as service equipment.

2.3 MOLDED-CASE CIRCUIT BREAKERS

A. Circuit breaker shall be ABB, ITE/Siemens, Square D, or Eaton/Cutler-Hammer.

B. Circuit breakers shall be constructed using glass-reinforced insulating material. Current carrying components shall be completely isolated from the handle and the accessory mounting area.

C. Circuit breakers shall have a toggle operating mechanism with common tripping of all poles, which provides quick-make, quick-break contact action. The circuit-breaker handle shall be over center, be trip free, and reside in a tripped position between on and off to provide local trip indication. Circuit-breaker escutcheon shall be clearly marked on and off in addition to providing international I/O markings. Equip circuit breaker with a push-to-trip button, located on the face of the circuit breaker to mechanically operate the circuit-breaker tripping mechanism for maintenance and testing purposes.

D. MCCBs shall be equipped with a device for locking in the isolated position.

E. Standards: Comply with UL 489 with interrupting capacity to comply with available fault currents.

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

2.4 ENCLOSURES

A. Enclosed Switches and Circuit Breakers: UL 489, NEMA KS 1, NEMA 250, and UL 50, to comply with environmental conditions at installed location.

B. Enclosure Finish: The enclosure shall be finished with gray baked enamel paint, electrodeposited.

PART 3 - EXECUTION

3.1 ENCLOSURE ENVIRONMENTAL RATING APPLICATIONS

A. Enclosed Switches and Circuit Breakers: Provide enclosures at installed locations with the following environmental ratings.

1. Indoor, Dry and Clean Locations: NEMA 250 Type 1.

2. Outdoor Locations: NEMA 250, type 3R.

3.2 INSTALLATION

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

B. Install individual wall-mounted switches and circuit breakers with tops at uniform height unless otherwise indicated.

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

D. Install fuses in fusible devices.

E. Comply with NFPA 70 and NECA 1.

3.3 IDENTIFICATION

A. Comply with requirements in Section 26 0553 "Identification for Electrical Systems."

1. Identify field-installed conductors, interconnecting wiring, and components; provide warning signs.

2. Label each enclosure with engraved metal or laminated-plastic nameplate.

3.4 FIELD QUALITY CONTROL

A. Perform tests and inspections.

B. Tests and Inspections for Switches:

1. Visual and Mechanical Inspection:

a. Inspect physical and mechanical condition.

b. Inspect anchorage, alignment, grounding, and clearances.

c. Verify that the unit is clean.

d. Verify blade alignment, blade penetration, travel stops, and mechanical operation.

e. Verify that fuse sizes and types match the Specifications and Drawings.

f. Verify that each fuse has adequate mechanical support and contact integrity.

g. Verify lubrication of moving current-carrying parts and moving and sliding surfaces.

2. Correct malfunctioning units on-site, where possible, and retest to demonstrate compliance; otherwise, replace with new units and retest.

C. Tests and Inspections for Molded Case Circuit Breakers:

1. Visual and Mechanical Inspection:

    a. Verify that equipment nameplate data are as described in the Specifications and shown on the Drawings.

    b. Inspect physical and mechanical condition.

    c. Inspect anchorage, alignment, grounding, and clearances.

    d. Verify that the unit is clean.

    e. Operate the circuit breaker to ensure smooth operation.

    f. Inspect operating mechanism, contacts, and chutes in unsealed units.

2. Correct malfunctioning units on-site, where possible, and retest to demonstrate compliance; otherwise, replace with new units and retest.

D. Enclosed switches and circuit breakers will be considered defective if they do not pass tests and inspections.

END OF SECTION 262816

SECTION 263213.13 - DIESEL-ENGINE-DRIVEN GENERATOR SETS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes packaged engine-generator sets suitable for use in mission critical applications with the features as specified and indicated. Engine generators will be used as the Standby power source for the system but shall be capable of providing reliable power with no run-time limitations while the primary source of power is unavailable.

1.3 DEFINITIONS

A. Operational Bandwidth: The total variation from the lowest to highest value of a parameter over the range of conditions indicated, expressed as a percentage of the nominal value of the parameter.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of packaged engine generator indicated. Include rated capacities, operating characteristics, and furnished specialties and accessories. In addition, include the following:

1. Thermal damage curve for generator.
2. Time-current characteristic curves for generator protective device.
3. Sound test data, based on a free field requirement.

B. Shop Drawings: Detail equipment assemblies and indicate dimensions, weights, and location and size of each field connection.

1. Dimensioned outline plan and elevation drawings of engine-generator set and other components specified.
2. Wiring Diagrams: Control interconnection, Customer connections.

C. Certifications:

1. Submit statement of compliance which states the proposed product(s) is certified to the emissions standards required by the location for EPA, stationary emergency application.
2. Submit statement of compliance which states the proposed product(s) are seismically certified in compliance with local requirements signed and sealed by a qualified professional engineer.
3. Generator manufacturer to supply documentation supporting 100% nameplate rating when utilized in standby application during a utility power outage.

1.5 INFORMATIONAL SUBMITTALS

A. Manufacturer Seismic Qualification Certification: Submit certification that the 72 Hour(s) fuel tank, the Sound Attenuated enclosure, engine-generator set, and components will withstand seismic forces defined in Division 26 Section "Vibration and Seismic Controls for Electrical Systems." Include the following:

1. Dimensioned Outline Drawings of Equipment Unit: Identify center of gravity and locate and describe mounting and anchorage provisions.

2. Detailed description of equipment anchorage devices on which the certification is based and their installation requirements.

B. Source quality-control test reports.

1. Certified summary of prototype-unit test report. See requirements in Part 2 "Source Quality Control" Article Part A. Include statement indicating torsional compatibility of components.

2. Certified Test Report: Provide certified test report documenting factory test per the requirements of this specification, as well as certified factory test of generator set sensors per NFPA110 Level 1.

3. List of factory tests to be performed on units to be shipped for this Project.

4. Report of exhaust emissions and compliance statement certifying compliance with applicable regulations.

C. Warranty:

1. Submit the manufacturer’s warranty statement to be provided for this Project.

1.6 QUALITY ASSURANCE

A. Installer Qualifications: Manufacturer’s authorized representative who is trained and approved for installation of units required for this Project.

B. Manufacturer Qualifications: A qualified manufacturer. Maintain, within 150 miles of Project site, a service center capable of providing training, parts, and emergency maintenance repairs.

C. Source Limitations: Obtain packaged generator sets and auxiliary components through one source from a single manufacturer.

D. Comply with NFPA 37 (Standard for the Installation and Use of Stationary Combustion Engines and Gas Turbines).

E. Comply with NFPA 70 (National Electrical Code. Equipment shall be suitable for use in systems in compliance to Article 700, 701, and 702).

F. Comply with NFPA 110 (Emergency and Standby Power Systems) requirements for Level 1 emergency power supply system.

G. Comply with UL 2200.

1.7 PROJECT CONDITIONS

A. Environmental Conditions: Engine-generator system shall withstand the following environmental conditions without mechanical or electrical damage or degradation of performance capability:

1. Ambient Temperature: -10 deg F to104 deg F.

2. Relative Humidity: 0 to 95 percent.

3. Altitude: Sea level to 1000 feet (305.0 m).

1.8 WARRANTY

A. Base Warranty: Manufacturer shall provide base warranty coverage on the material and workmanship of the generator set for a minimum of twenty-four (24) months for Standby product and twelve (12) months for Prime/Continuous product from registered commissioning and start-up.

B. Extended Warranty: Manufacturer shall offer extended coverage of 5 years from date of registered commissioning and start-up.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

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

1. Cummins Power Generation
2. Caterpillar, Inc.; Electric Power Division
3. Kohler Power Systems

2.2 ENGINE-GENERATOR SET

A. Factory assembled and tested, engine-generator set.

B. Mounting Frame: Maintain alignment of mounted components without depending on concrete foundation; and have lifting attachments.

1. Rigging Information: Indicate location of each lifting attachment, generator-set center of gravity, and total package weight in submittal drawings.

C. Capacities and Characteristics:

1. Power Output Ratings: Electrical output power rating for Standby operation of not less than 1500kW, at 80 percent lagging power factor, 277/480 VAC, Series Wye, 3-phase, 4-wire, 60 hertz.

2. Alternator shall be capable of accepting maximum 6,486 kVA in a single step and be capable of recovering to a minimum of 90% of rated no load voltage. Following the application of the specified kVA load at 0.4 power factor applied to the generator set.

3. Nameplates: For each major system component to identify manufacturer's name and address, and model and serial number of component. The engine-generator nameplate shall include information on the power output rating of the equipment.

D. Generator-Set Performance:

1. Steady-State Voltage Operational Bandwidth: 0.5 percent of rated output voltage from no load to full load.

2. Transient Voltage Performance: Not more than 18 percent variation for 50 percent step-load increase or decrease. Voltage shall recover and remain within the steady-state operating band within 4 seconds. On application of a 100% load step the generator set shall recover to stable voltage within 10 seconds.

3. Steady-State Frequency Operational Bandwidth: 0.25 percent of rated frequency from no load to full load.

4. Steady-State Frequency Stability: When system is operating at any constant load within the rated load, there shall be no random speed variations outside the steady-state operational band and no hunting or surging of speed.

5. Transient Frequency Performance: Not more than 6 percent variation for 50 percent step-load increase or decrease. Frequency shall recover and remain within the steady-state operating band within 3 seconds. On application of a 100% load step the generator set shall recover to stable frequency within 10 seconds.

6. Output Waveform: At full load, harmonic content measured line to line or line to neutral shall not exceed 5 percent total and 3 percent for any single harmonic. Telephone influence factor, determined according to NEMA MG 1, shall not exceed 50 percent.

7. Sustained Short-Circuit Current: For a 3-phase, bolted short circuit at system output terminals, system shall supply a minimum of 300 percent of rated full-load current for not less than 8 seconds without damage to generator system components. For a 1-phase, bolted short circuit at system output terminals, system shall regulate both voltage and current to prevent over-voltage conditions on the non-faulted phases.

8. Start Time: Comply with NFPA 110, Level 1, Type 10, system requirements.

9. Ambient Condition Performance: Engine generator shall be designed to allow operation at full rated load in an ambient temperature under site conditions, based on highest ambient condition. Ambient temperature shall be as measured at the air inlet to the engine generator for enclosed units, and at the control of the engine generator for machines installed in equipment rooms.

2.3 ENGINE

A. Fuel: ASTM D975 #2 Diesel Fuel

B. Rated Engine Speed: 1800RPM.

C. Lubrication System: The following items are mounted on engine or skid:

1. Lube oil pump: shall be positive displacement, mechanical, full pressure pump.

2. Filter and Strainer: Provided by the engine manufacturer of record to provide adequate filtration for the prime mover to be used.

3. Crankcase Drain: Arranged for complete gravity drainage to an easily removable container with no disassembly and without use of pumps, siphons, special tools, or appliances.

D. Engine Fuel System: The engine fuel system shall be installed in strict compliance to the engine manufacturer's instructions.

E. Fuel Filtering: Remove water and contaminants larger than 2 microns.

F. Main Fuel Pump: Mounted on engine. Pump ensures adequate primary fuel flow under starting and load conditions.

G. Coolant Jacket Heater: Electric-immersion type, factory installed in coolant jacket system. Comply with NFPA 110 requirements for Level 1 equipment for heater capacity and performance.

1. Designed for operation on single phase, 60Hz power connection. Heater voltage shall be compatible with the electrical panel described in paragraph 2.8.B.4 of this specification section.

2. Installed with isolation valves to isolate the heater for replacement of the element without draining the engine cooling system or significant coolant loss.

3. Provided with a 24VDC thermostat, installed at the engine thermostat housing

H. Governor: Adjustable isochronous, with speed sensing. The governing system dynamic capabilities shall be controlled as a function of engine coolant temperature to provide fast, stable operation at varying engine operating temperature conditions. The control system shall actively control the fuel rate as appropriate to the state of the engine generator. Fuel rate shall be regulated as a function of starting, accelerating to rated speed, and operating in various isochronous states.

I. Cooling System: Closed loop, liquid cooled

1. The generator set manufacturer shall provide prototype test data for the specific hardware proposed demonstrating that the machine will operate at rated standby load in an outdoor ambient condition of 109 deg F.

2. Coolant: Solution of 50 percent ethylene-glycol-based antifreeze and 50 percent water, with anticorrosion additives as recommended by engine manufacturer.

3. Size of Radiator overflow tank: Adequate to contain expansion of total system coolant from cold start to 110 percent load condition.

4. Expansion Tank: Constructed of welded steel plate and rated to withstand maximum closed-loop coolant system pressure for engine used. Equip with gage glass and petcock.

5. Temperature Control: Self-contained, thermostatic-control valve modulates coolant flow automatically to maintain optimum constant coolant temperature as recommended by engine manufacturer.

J. Air-Intake Filter: Engine-mounted air cleaner with replaceable dry-filter element and restriction indicator.

K. Starting System: 24VDC, with negative ground.

1. Components: Sized so they will not be damaged during a full engine-cranking cycle with ambient temperature at maximum specified in Part 1 "Project Conditions" Article.

2. Provide dual 24VDC starter motors.

3. Cranking Cycle: As required by NFPA 110 for Level 1 systems.

4. Provide (4) 12V batteries, each rated at 1500CCA and 210 amp-hours.

5. Battery Cable: Size as recommended by engine manufacturer for cable length as required. Include required interconnecting conductors and connection accessories.

6. Battery Compartment: Factory fabricated of metal with acid-resistant finish.

7. Battery-Charging Alternator: Factory mounted on engine with solid-state voltage regulation. The battery charging alternator shall have sufficient capacity to recharge the batteries with all parasitic loads connected within 4 hours after a normal engine starting sequence.

8. Battery Chargers: Unit shall comply with UL 1236, provide fully regulated, constant voltage, current limited, battery charger for each battery bank. It will include the following features:

   a. Operation: Equalizing-charging rate based on generator set manufacturer's recommendations shall be initiated automatically after battery has lost charge until an adjustable equalizing voltage is achieved at battery terminals. Unit shall then be automatically switched to a lower float-charging mode and shall continue to operate in that mode until battery is discharged again.

   b. Automatic Temperature Compensation: Adjust float and equalize voltages for variations in ambient temperature from minus 20 deg C to plus 40 deg C to prevent overcharging at high temperatures and undercharging at low temperatures.

   c. Automatic Voltage Regulation: Maintain constant output voltage regardless of input voltage variations up to plus or minus 10 percent.

   d. Safety Functions: Sense abnormally low battery voltage and close contacts providing low battery voltage indication on control and monitoring panel. Sense high battery voltage and loss of ac input or dc output of battery charger. Either condition shall close contacts that provide a battery-charger malfunction indication at system control and monitoring panel.

   e. Provide LED indication of general charger condition, including charging, faults, and modes. Provide a LCD display to indicate charge rate and battery voltage. Charger shall provide relay contacts for fault conditions as required by NFPA110.

   f. Enclosure and Mounting: NEMA, Type 1, wall-mounted cabinet.

2.4 FUEL OIL STORAGE

A. Comply with NFPA 30 and 37.

B. Sub Base-Mounted Fuel Oil Tank: Provide a double wall secondary containment type sub base fuel storage tank. The tank shall be constructed of corrosion resistant steel and shall be UL 142 listed and labeled. The fuel tank shall include the following features:

   1. Capacity: Fuel for 72 Hour(s) continuous operation at 100 percent rated power output.

2. Tank rails and lifting eyes shall be rated for the full dry weight of the tank, genset, and enclosure.
3. Electrical stub up(s)
4. Normal & emergency vents
5. Lockable fuel fill
6. Mechanical fuel level gauge
7. High and low level switches to indicate fuel level
8. Leak detector switch
9. Sub base tank shall include a welded steel containment basin, sized at a minimum of 110% of the tank capacity to prevent escape of fuel into the environment in the event of a tank rupture.
10. Fill port with overfill prevention valve (OFPV)
11. 5-gallon fill/spill dam or bucket
12. Tank design shall meet the regional requirements for the Project location

2.5 CONTROL AND MONITORING

A. Engine generator control shall be microprocessor based and provide automatic starting, monitoring, protection and control functions for the unit.

B. Automatic Starting System Sequence of Operation: When mode-selector switch on the control and monitoring panel is in the automatic position, remote-control contacts in one or more separate automatic transfer switches initiate starting and stopping of generator set. When mode-selector switch is switched to the on position, generator set starts. The off position of same switch initiates generator-set shutdown. (Switches with different configurations but equal functions are acceptable.) When generator set is running, specified system or equipment failures or derangements automatically shut down generator set and initiate alarms. Operation of the local (generator set-mounted) and/or remote emergency-stop switch also shuts down generator set.

C. Manual Starting System Sequence of Operation: Switching on-off switch on the generator control panel to the on position starts generator set. The off position of same switch initiates generator-set shutdown. When generator set is running, specified system or equipment failures or derangements automatically shut down generator set and initiate alarms. Operation of the local (generator set-mounted) and/or remote emergency-stop switch also shuts down generator set.

D. Configuration: Operating and safety indications, protective devices, system controls, engine gages and associated equipment shall be grouped in a common control and monitoring panel. Mounting method shall isolate the control panel from generator-set vibration. AC output power circuit breakers and other output power equipment shall not be mounted in the control enclosure.

E. Indicating and Protective Devices and Controls: As required by NFPA 110 for Level 1 system, and the following:

1. AC voltmeter (3-phase, line to line and line to neutral values).
2. AC ammeter (3-phases).
3. AC frequency meter.
4. AC kW output (total and for each phase). Display shall indicate power flow direction.
5. AC kVA output (total and for each phase). Display shall indicate power flow direction.
6. AC Power factor (total and for each phase). Display shall indicate leading or lagging condition.
7. Ammeter-voltmeter displays shall simultaneously display conditions for all three phases.
8. Emergency Stop Switch: Switch shall be a red “mushroom head” pushbutton device complete with lock-out/tag-out provisions. Depressing switch shall cause the generator set to immediately stop the generator set and prevent it from operating.
9. Fault Reset Switch: Supply a dedicated control switch to reset/clear fault conditions.
10. DC voltmeter (alternator battery charging).
11. Engine-coolant temperature gauge.
12. Engine lubricating-oil pressure gauge.
13. Running-time meter.
14. Generator-voltage and frequency digital raise/lower switches. Rheostats for these functions are not acceptable. The control shall adjustment of these parameters in a range of plus or minus 5% of the voltage and frequency operating set point (not nominal voltage and frequency values.)
15. Fuel tank derangement alarm.
16. Fuel tank high-level shutdown of fuel supply alarm.
17. AC Protective Equipment: The control system shall include over/under voltage, reverse kVAR, reverse kW, overload (kW) short circuit, over current, loss of voltage reference, and over excitation shut down protection. There shall be a ground fault alarm for generator sets rated over 1000 amps, overload warning, and overcurrent warning alarm.
18. Status LED indicating lamps to indicate remote start signal present at the control, existing shutdown condition, existing alarm condition, not in auto, and generator set running.
19. A graphical display panel with appropriate navigation devices shall be provided to view all information noted above, as well as all engine status and alarm/shutdown conditions (including those from an integrated engine emission control system). The display shall also include integrated provisions for adjustment of the gain and stability settings for the governing and voltage regulation systems.

20. Panel lighting system to allow viewing and operation of the control when the generator room or enclosure is not lighted.

21. Data Logging: The control system shall log the latest 20 different alarm and shut down conditions, the total number of times each alarm or shutdown has occurred, and the date and time the latest of these shutdown and fault conditions occurred.

22. DC control Power Monitoring: The control system shall continuously monitor DC power supply to the control and annunciate low or high voltage conditions. It shall also provide an alarm indicating imminent failure of the battery bank based on degraded voltage recovery on loading (engine cranking).

F. Control Heater: Generator sets shall be provided with control heaters for anti-condensation protection.

G. Remote Alarm Annunciator: Comply with NFPA 110. An LED labeled with proper alarm conditions shall identify each alarm event and a common audible signal shall sound for each alarm condition.

H. The generator set shall be provided with a network communication module to allow real time communication with the generator set control by remote devices. The control shall communicate all engine and alternator data; alarm, shutdown and status conditions; and allow starting and stopping of the generator set via the network in both test and emergency modes. The generator controls system shall provide the necessary equipment to communicate with the existing BAS system via BACnet to transmit status information and error codes. BACnet ethernet/IP protocol shall be utilitzed.

I. Remote Emergency-Stop Switch: Surface mounted, unless otherwise indicated; and labeled. Push button shall be protected from accidental operation and shall be protected in a NEMA 3R housing.

2.6 GENERATOR OVERCURRENT AND FAULT PROTECTION

A. Generator Overcurrent Protection: The generator set shall be provided with a UL Listed/CSA Certified protective device that is coordinated with the alternator provided to prevent damage to the generator set on any possible overload or overcurrent condition external to the machine. The protective device shall be listed as a utility grade protective device under UL category NRGU. The overcurrent protective device shall be molded case, electronic-trip type, 100% rated, LSI with shunt trip capability, complying with UL 489. The control system shall be subject to UL follow-up service at the manufacturing location to verify that the protective system is fully operational as manufactured. Protector shall perform the following functions:

1. Initiates a generator kW overload alarm when generator has operated at an overload equivalent to 110 percent of full-rated load for 60 seconds. Indication for this alarm is integrated with other generator-set malfunction alarms.

2. Under single phase or multiple phase fault conditions, or on overload conditions, indicates an alarm condition when the current flow is in excess of 110% of rated current for more than 10 seconds.

3. Under single phase or multiple phase fault conditions, operates to switch off alternator excitation at the appropriate time to prevent damage to the alternator.

4. The operator panel shall indicate the nature of the fault condition as either a short circuit or an overload.

5. Senses clearing of a fault by other overcurrent devices and controls recovery of rated voltage to avoid overshoot greater than 120% of nominal voltage.

6. The protective system provided shall not include an instantaneous trip function.

2.7 GENERATOR, EXCITER, AND VOLTAGE REGULATOR

A. Comply with NEMA MG 1.

B. Drive: Generator shaft shall be directly connected to engine shaft. Exciter shall be rotated integrally with generator rotor.

C. Electrical Insulation: Class H

D. Temperature Rise: 105 C / Class H environment.

E. Construction shall prevent mechanical, electrical, and thermal damage due to vibration, over speed up to 125 percent of rating, and heat during operation at 110 percent of rated capacity.

F. Permanent Magnet Generator (PMG) shall provide excitation power for optimum motor starting and short circuit performance.

G. Enclosure: Drip-proof.

H. Voltage Regulator: Solid-state type, separate from exciter, providing performance as specified. The voltage regulation system shall be microprocessor-controlled, 3-phase true RMS sensing, full wave rectified, and provide a pulse-width modulated signal to the exciter. No exceptions or deviations to these requirements will be permitted.

I. The alternator shall be provided with anti-condensation heater(s) in all applications where the generator set is provided in an outdoor enclosure.

J. Windings: 2/3rd pitch stator winding and fully linked amortisseur winding.

K. Subtransient Reactance: 14 percent maximum, based on the rating of the engine generator set.

2.8 OUTDOOR GENERATOR-SET ENCLOSURE STEEL WALK-IN HOUSING

A. Description: Sound Attenuated Outdoor Generator Set Steel Walk in Enclosure. Multiple panels shall be lockable and provide adequate access to components requiring maintenance. Instruments, control, and battery system shall be mounted within enclosure.

B. Construction:

1. Louvers: Motorized inlet louvers and gravity discharge louvers required.

2. Enclosure shall conform to UL2200 Standards.

3. Provide enclosure space heater.

4. Enclosure shall be equipped with a generator auxiliary panelboard rated 100A, 480/277 Volt, three phase with main circuit breaker. Panelboard shall be prewired to

all enclosure ancillary components including but not limited to engine jacket water heater, battery charger, anti-condensation heater, enclosure space heater, louvers, lighting, receptacles, etc.

5. Hinged Doors: With padlocking provisions. Restraint/Hold back hardware to prevent door to keep door open at 180 degrees during maintenance. Rain lips over all doors.

6. Exhaust System:

   a. Muffler Location: Within enclosure.

7. Hardware: All hardware and hinges shall be stainless steel.

8. Wind Rating: Wind rating shall be 150 mph

9. Mounting Base: Suitable for mounting on sub-base fuel tank.

10. A weather protective, sound attentuated enclosure shall be provided which allows the generator set to operate at full rated load with a static pressure drop equal to or less than 0.5 inches of water. Walk-in type enclosures shall be provided with aluminum constructed platforms. 48” wide, with step access and handrails.to each personnel door and interior latch release. Platform and handrails shall conform to OHSA standards with railings constructed of 1-1/2” aluminum tube. Steps and walkways shall be extruded aluminum construction.

11. Provide grated metal stairs for human access to all enclosure doors from the concrete base to the enclosure door opening or platform.

C. Engine Cooling Airflow through Enclosure: Housing shall provide ample airflow for engine generator operation at rated load in an ambient temperature of 40 deg C.

   1. Louvers: Motorized inlet and gravity discharge dampers.

   2. Motorized Louvers: At engine cooling-air inlet. Dampers shall be closed to reduce enclosure heat loss in cold weather when unit is not operating. Dampers shall be of a “fail open” design to allow airflow in the event of failure

D. Sound Performance: Reduce the sound level of the engine generator while operating at full rated load to a maximum of 75 dBA measured at any location 7 m from the engine generator in a free field environment.

E. Electrical Provisions

   1. Compliance with NEC: Package shall comply with the requirements of the National Electrical Code for all wiring materials and component spacing.

   2. External Electrical Connections: All power and control interconnections shall be made within the perimeter of the enclosure.

2.9 VIBRATION ISOLATION DEVICES

A. Vibration Isolation: Generators installed on grade shall be provided with elastomeric isolator pads integral to the generator, unless the engine manufacturer requires use of spring isolation.

1. IBC Compliance: Isolators complying with IBC requirements shall be specified in the equipment documentation, as well as the installation requirements for the unit.

2. Restrained Spring Isolators: Freestanding, steel, open-spring isolators with seismic restraint. Overload capacity shall support 200 percent of rated load, fully compressed, without deformation or failure.

3. Vibration isolation devices shall not be used to accommodate misalignments or to make bends.

2.10 FINISHES

A. Indoor and Outdoor Enclosures and Components: Powder-coated and baked over corrosion-resistant pretreatment and compatible primer. Manufacturer's standard color or as directed on the drawings.

2.11 SOURCE QUALITY CONTROL

A. Prototype Testing: Factory test engine-generator set using same engine model, constructed of identical or equivalent components and equipped with identical or equivalent accessories.

1. Tests: Comply with NFPA 110, Level 1 Energy Converters. In addition, the equipment engine, skid, cooling system, and alternator shall have been subjected to actual prototype tests to validate the capability of the design under the abnormal conditions noted in NFPA110. Calculations and testing on similar equipment which are allowed under NFPA110 are not sufficient to meet this requirement.

B. Project-Specific Equipment Tests: Before shipment, factory test engine-generator set manufactured specifically for this Project. Tests shall comply with IEEE 115 and NFPA 110, Level 1 Energy Converters. Perform tests at rated load and power factor. Include the following tests:

1. Test engine generator set manufactured for this Project to demonstrate compatibility and functionality.

2. Full load run.

3. Maximum power.

4. Voltage regulation.

5. Steady-state governing.

6. Single-step load pickup.

7. Simulated safety shutdowns.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Comply with packaged engine-generator manufacturers' written installation, application, and alignment instructions and with NFPA 110.

B. Equipment shall be installed by the contractor in accordance with final submittals and contract documents. Installation shall comply with applicable state and local codes as required by the authority having jurisdiction. Install equipment in accordance with manufacturer's instructions and instructions included in the listing or labeling of UL listed products.

C. Installation of equipment shall include furnishing and installing all interconnecting wiring between all major equipment provided for the on-site power system. The contractor shall also perform interconnecting wiring between equipment sections (when required), under the supervision of the equipment supplier.

D. Equipment shall be installed on concrete housekeeping pads. Equipment shall be permanently fastened to the pad in accordance with manufacturer’s instructions and seismic requirements of the site.

E. Equipment shall be initially started and operated by representatives of the manufacturer. All protective settings shall be adjusted as instructed by the consulting engineer.

F. All equipment shall be physically inspected for damage. Scratches and other installation damage shall be repaired prior to final system testing. Equipment shall be thoroughly cleaned to remove all dirt and construction debris prior to initial operation and final testing of the system.

G. On completion of the installation by the electrical contractor, the generator set supplier shall conduct a site evaluation to verify that the equipment is installed per manufacturer’s recommended practice.

3.2 ON-SITE ACCEPTANCE TEST

A. The complete installation shall be tested to verify compliance with the performance requirements of this specification following completion of all site work. Testing shall be conducted by representatives of the manufacturer, with required fuel supplied by Contractor. The Engineer shall be notified in advance and shall have the option to witness the tests. The generator set manufacturer shall provide a site test specification covering the entire system. Tests shall include:

B. Prior to start of active testing, all field connections for wiring, power conductors, and bus bar connections shall be checked for proper tightening torque.

C. Installation acceptance tests to be conducted on site shall include a "cold start" test, a two hour full load (resistive) test, and a one-step rated load pickup test in accordance with NFPA 110. Provide a resistive load bank and make temporary connections for full load test, if necessary.

D. Perform a power failure test on the entire installed system. This test shall be conducted by opening the power supply from the utility service and observing proper operation of the system for at least 2 hours. Coordinate timing and obtain approval for start of test with site personnel.

E. Refill fuel tank upon completion of all Testing and Demonstrations.

3.3 TRAINING

A. The equipment supplier shall provide training for the facility operating personnel covering operation and maintenance of the equipment provided. The training program

shall be not less than 8 hours in duration. Training date shall be coordinated with the facility owner. Refer to Section 017900, Demonstration and Training.

3.4 FIELD QUALITY CONTROL

A. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect components, assemblies, and equipment installations, including connections, and to assist in testing.

3.5 SERVICE AND SUPPORT

A. The generator set supplier shall maintain service parts inventory for the entire power system at a central location which is accessible to the service location 24 hours per day, 365 days per year. The manufacturer of the generator set shall maintain a central parts inventory to support the supplier, covering all the major components of the power system, including engines, alternators, control systems, and power transfer equipment.

B. The generator set shall be serviced by a local service organization that is trained and factory certified in generator set service. The supplier shall maintain an inventory of critical power system replacement parts in the local service location. Service vehicles shall be stocked with critical replacement parts. The service organization shall be on call 24 hours per day, 365 days per year. The service organization shall be physically located within 150 miles of the site.

C. The manufacturer shall maintain model and serial number records of generator set provided for at least 20 years.

3.6 SERVICE AGREEMENT:

A. The supplier shall include in the base price, a one-year service agreement. The maintenance shall be performed by factory authorized service technicians capable of servicing both the engine generator set and the transfer switch (es). This agreement shall include the following:

1. Generator supplier must have an in-house rental fleet with equipment sized to back up this project site.

2. All engine maintenance as recommended by the service manual.

3. All electrical controls, maintenance and calibrations as recommended by the manufacturer.

4. All auxiliary equipment is a part of the emergency systems.

5. The supplier shall guarantee emergency service.

6. All expendable maintenance items are to be included in this agreement.

7. A copy of this agreement and a schedule shall be given to the Owner at the time of his acceptance, showing what work is to be accomplished and when.

END OF SECTION 263213.13

SECTION 312022 – EXCAVATING, BACKFILLING & COMPACTING FOR UTILITIES

PART 1 - GENERAL

1.1 WORK INCLUDES

A. Electrical Contractor provide:

1. Location and protection.
2. Recording (electronic pictures and dimensioned plan markups) utility locations.
3. Compacted bed and compacted fill over utilities.
4. Compaction.
5. Match existing surfaces and materials.
6. Excavation of trench for electrical service lines and electrical distribution lines to all equipment.
7. Compacted fill over electrical primary and secondary to subgrade elevations.
8. Locating, protecting and repairing existing utilities.
9. Utility coordination.
10. Aggregate for trench backfill.
11. Tree and Plant Protection

1.2 RELATED WORK

A. Specified elsewhere:

1. Section 26 05 43 - Underground Ducts and Raceways for Electrical Systems.

1.3 REFERENCES

A. National Fire Protection Association (NFPA):

1. National Electrical Code, NFPA 70.

1.4 QUALITY ASSURANCE

A. Work shall conform to this section and final review of work by Owner representative, unless specifically indicated otherwise.

1.5 PROTECTION

A. Protect excavations by shoring, bracing, sheet piling, underpinning or other methods to prevent cave-in or loose soil from falling into excavation.

B. Underpin adjacent structures which may be damaged by excavation work, including service utilities and pipe chases.

C. Notify Architect/Engineer immediately of unexpected subsurface conditions. Confirm notification in writing. Discontinue work until Architect/Engineer issues written notification to resume work.

D. Protect bottom of excavations and soil adjacent to and beneath foundations from frost.

E. Grade excavation top perimeter to prevent surface water runoff into excavation.

F. Trees, shrubs, fences and all other property and surface structures shall be protected during construction unless their removal is called for in the contract documents. All properties destroyed shall be restored to original conditions.

PART 2 -PRODUCTS

2.1 SELECT BED AND FILL MATERIALS

A. Trench Backfill: Mixture of site excavated select soil. No refuse or rubble from paving or construction foreign materials or waste products shall be allowed in the backfill.

B. Granular bedding: Naturally or artificially graded mixture of natural or crushed gravel, crushed stone, and natural or crushed sand; ASTM D 2940/D 2940M; 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.

C. Select soil shall be native soil excavated from trench free of rocks, frozen earth and foreign material.

D. Sand: Clean natural, river or bank sand free from silt, clay, loam friable or soluble materials and organic matter.

PART 3 - EXECUTION

3.1 INSPECTION

A. Verify all existing underground utility markers have not been removed or destroyed. Replace markers if this work necessitates removal. Prior to construction the contractor shall make an electronic record (digital video or photo) of the placement of underground markers by locators to provide a permanent means of reproducing the marker locations without repetitive locating. This record shall be provided to the Owner at completion of the project.

B. Verify stockpiled fill to be reused as approved in writing by Architect/Engineer.

C. Verify that areas to be backfilled are free of debris, snow, ice or water, and surfaces are not frozen.

3.2 PREPARATION

A. Identify specified lines, levels, contours and data.

B. Prior to excavation, investigation shall be made, including hand excavation, to the extent necessary to determine the location of existing underground structures, utilities and conflicts. Include in contract all costs associated with locating and identifying all underground utilities, structures and obstructions. Take necessary measures to avoid service interruptions. Repair all utilities which have been damaged as a result of this work. The Contractor is fully responsible for all repairs to damaged utilities and will complete repairs at no extra cost to the Owner.

C. Prior to trenching, contact Missouri One Call System (1-800-DIG-RITE/ 1-800-344-7483 or 811) and the Owner site manager to aid in locating all existing utilities. Also, contact the electrical utility for relocation of underground distribution and metering. It is the responsibility of the contractor to locate, uncover and protect all underground utilities. All underground public utilities damaged as a result of the work shall be repaired as specified by the affected utility company. All costs for this repair work shall be the contractor’s responsibility.

D. Compact sub-grade surfaces to density specified for backfill materials.

3.3 EXCAVATION

A. Trenches for underground direct buried secondary wiring shall be of the width required (uniform from top to bottom, where possible) to a minimum depth of 30" below finished grade. Trenches shall be routed according to drawings in such a manner as to minimize damage to trees and their roots. Contractor shall also contact the site manager to obtain his approval of routing around trees.

B. Excavate in straight lines between alignment change points. Layout work as generally shown on the drawings making changes where required to avoid trees, structures, and major drainage swales. Surface mark proposed routing and obtain Architect/Engineer approval prior to beginning work.

C. Maintain minimum depths as shown on the drawings regardless of contour changes.

D. Cut trenches wide enough to enable utility installation and allow inspection.

E. Hand trim excavation and leave free of loose matter.

F. Remove lumped subsoil, boulders and rock up to 1/3 cubic yard, measured by volume.

G. Correct unauthorized excavation.

H. Fill over-excavated areas under pipe or conduit bearing surfaces in accord with Architect/Engineer's directions.

I. Stockpile excavated material in area designated by Using Agency; remove excess subsoil not being reused, from site.

J. Existing Underground Utilities:

1. Using available information an attempt has been made to indicate underground conduits, service lines, sewers, utilities, etc., along or across the line of the proposed electrical lines. However, the contractor shall determine, to the best of his ability, the amount of underground lines to be encountered in the execution of the work. Whenever, existing lines may be present the contractor shall hand expose all work before extensive machine digging is undertaken.

3.4 BACKFILLING

A. Support conduit as indicated on the plans during placement and compaction of bedding fill.

B. Backfill trenches to contours and elevations required. Backfill systematically, as early as possible to allow maximum time for natural settlement. Do not backfill over porous, wet or spongy subgrade surfaces. Use select soil for backfill material in unimproved areas.

C. Where it is necessary to install work in or across pads or sidewalks, saw cut the surface and remove as necessary for trenching then restore the present construction to its original or better condition.

D. Place and compact fill material in continuous layers not exceeding 12 in. loose depth unless otherwise specified.

E. Use a placement method that will not disturb or damage existing or new conditions.

F. Maintain optimum moisture content of backfill materials, determined by laboratory analysis, to obtain specified compaction density.

G. Dewater trench to eliminate spongy wet trench bottom.

H. Backfill and compact with select fill materials as specified herein all excavation for existing underground utilities which have been uncovered as a result of this work.

I. Stockpile excavated material in a manner that will not endanger the work or obstruct access to other utilities.

J. Do not excavate more than what can be backfilled in one day. Provide temporary barriers for all construction.

K. Should the trench pass over previous excavation, the trench bottom shall be sufficiently compacted to provide support equal to that of native soil so as to prevent damage to the pipe.

L. Burial depths are measured from the top of the conduit or conductor to the ground finish grade surface.

M. Backfilling in unimproved areas from an elevation of one foot above the top of conductors to the surface of the ground may be deposited by bulldozer or other suitable equipment. Sufficient surplus excavated material shall be neatly rounded over the trench to compensate for later settlement.

1. Backfilling under existing roads, parking areas, other improved surfaces or at locations shown on the drawings shall be entirely aggregate for trench backfill. From a depth of one foot above the top of conduits to the surface, aggregate for trench backfill may be deposited in uniform layers not to exceed 12 inches loose measure and compacted to 95% of the Standard Proctor Density.
2. When rock is encountered, the rock removed may be used as part of the backfill material; but fine material must first be filled from the bottom of the trench to at least 12 inches over the barrel of the pipe. When rock is used for backfill, it shall be well distributed so that each rock shall be completely surrounded by earth. Location of rock fills shall be noted as Record Construction Drawings.
3. Backfilling shall not be done in freezing weather without the permission of the Architect/Engineer, and it shall not be made with frozen materials. No backfill shall be made where the materials already in the trench are frozen.

N. Remove surplus backfill materials from site and dispose of legally.

O. Leave stockpile areas completely free of excess fill materials.

3.5 TOLERANCES: Top surface of backfilling: Plus 1 in.

3.6 FILL TYPES AND COMPACTION: Compact all fill and backfill to specified values based on Modified Proctor Test.

A. Backfill Materials:

AREA/CONDITION	MAXI. LIFT	PERCENT OF COMPACTION
1. Pavements: camp pads, living areas, sidewalks:		
a. Top 8 in. below slab.	8 in.	95%
b. 8 in. and below slab.	12 in.	92%
2. Cross lot fill - landscaping.	12 in.	88%
3. Trenches:		
a. Under footings.	8 in.	95%
b. Inside buildings:		
1) Top 2 ft. below slab.	8 in.	95%
2) 2 ft. & more below slab.	12 in.	95%
c. Under camp pads, living areas, sidewalks:		
1) Top 8 in. under slab.	8 in.	95%
2) 8 in. & below slab.	12 in.	95%
d. Cross lot landscaping	12 in.	88%

B. Moisture Content: Not less than 2% below optimum moisture content determined in accord with:

1. Standard Proctor Test: ASTM D698 or AASHTO T-99, or
2. Modified Proctor Test: ASTM D1557 or AASHTO T-180.

3.7 COMPACTION TESTING: Testing will be performed in accord with ANSI/ASTM D1556-64 and with 01 45 23.

3.8 SURPLUS MATERIALS

A. Remove surplus materials from site.

B. Leave stockpile areas completely free of all excess fill materials.

3.9 SAFETY

A. All local, federal and state rules and regulations pertaining to safety and protection of workmen, public and private property shall be observed during all work.

END OF SECTION 312022

SECTION 329219 - SEEDING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions, Division Specification sections, and the Approved DNR Land Disturbance Permit, apply to the Work specified in this Section.

1.2 DESCRIPTION OF WORK

A. The contractor shall be responsible for reseeding all disturbed soft-scape areas excavated for the installation of new buried natural gas piping. Refer to drawings for pipe routes and lengths.

B. Furnish all materials, labor, equipment and services necessary to perform all Work.

C. Work included in this Section includes clearing of weeds, seed bed preparation, installation of erosion control fabric and seeding operations required for seeding of the areas shown on Drawings.

1.3 SPECIFICATIONS AND STANDARDS

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.

PART 2 - PRODUCTS

2.1 SEED

A. All seed shall be furnished in sealed, standard containers, unless otherwise approved. Seed which has become wet, moldy, or otherwise damaged will not be acceptable.

B. Each container of seed shall be fully labeled in accordance with the Federal Seed Act and seed certifications shall be signed and made part of seed invoices.

C. Seed shall be Fescue, 97 percent pure live seed

D. Invoices and tags for seed shall show type furnished. Upon acceptance of the seeded areas, a final check of total quantities of seed used will be made against total area seeded and if minimum rates of application or specified quantities have not been met, the Architect will require distribution of additional quantities of these materials to make up minimum application specified.

2.2 FERTILIZER

A. Fertilizer shall be uniform in composition, free-flowing, suitable for application with approved equipment and delivered to the site unopened in original containers each bearing the

manufacturer's guaranteed analysis and in conformity with state fertilizer laws. Fertilizer shall contain the following minimum percentage of plant food by weight.

1. 12 percent available nitrogen
2. 12 percent available phosphoric acid
3. 12 percent available potash

B. Fertilizer application rates shall be 600 pounds per acre with a minimum of_____lbs applied.

C. Invoices for fertilizer shall show grade furnished. Upon acceptance of the seeded areas, a final check of total quantities of fertilizer used will be made against total area seeded and if minimum rates of application or specified quantities have not been met, the Architect will require distribution of additional quantities of these materials to make up minimum application specified.

2.3 EROSION CONTROL FABRIC

A. Fabric shall be "Soil Saver" as is distributed by Jim Walls Company in Dallas, Texas (214) 239-8577; or "Curlex Blankets" as is distributed by 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 are to be seeded and fertilized as indicated on the Drawings and/or as specified herein. Equipment necessary for the proper preparation of the ground surface and for handling and placing all required materials shall be on hand, in good condition and shall be approved before the Work is started.

B. Clearing: Prior to tillage, seeding or other specified operations, all vegetation which might interfere with the indicated treatment of the areas shall be mowed, grubbed, raked and the debris removed from the site. Prior to or during grading and tillage operations, the ground surface shall be cleared of materials which might hinder final operations. Areas which have been disturbed shall be finish graded and/or developed as indicated on the Drawings or as specified.

C. Tillage: After the areas required to be seeded have been brought to the finish grades as specified, they shall be thoroughly tilled to a depth of at least 6 inches by plowing, disking, harrowing or other approved methods until the condition of the soil is acceptable to the Architect. Work shall be performed only during period when beneficial results are likely to be obtained. When conditions are such by reason of drought, excessive moisture, or other factors that satisfactory results are not likely to be obtained, Work shall be stopped. Work shall be resumed only when desired results are likely to be obtained.

D. Leveling: Any undulations or irregularities in the surface resulting from tillage, fertilizing or other operations shall be leveled with a float drag before seeding operations are begun.

E. Fertilizing: Fertilizer shall be distributed uniformly at the rate previously specified per 1,000 square feet over the areas to be seeded and shall be incorporated into the soil to a depth of at least 3 to 4 inches by disking, harrowing or other approved methods. The incorporation of fertilizer may be a part of the tillage operation hereinbefore specified. Distribution by means of an approved seed drill equipped to sow seed and distribute fertilizer at the same time will not be accepted. Fertilizer shall be incorporated into the soil a minimum of 10 days before seed is planted.

F. Inspection: A minimum of 48 hours prior notice must be given to the Construction Administrator before fertilizing may commence.

G. Planting Time: All seeding Work shall be done between the dates of April 1 to May 15 for spring planting and from August 15 to October 15 for fall planting except as otherwise directed in writing by the Construction Administrator.

H. Planting Condition: No planting shall be done until a permanent source of water is available at the site for use by the Owner.

3.2 SEEDING

A. General: Prior to seeding, any previously prepared seedbed areas compacted or damaged by interim rains, traffic, or other cause shall be reworked to restore the ground condition previously specified. Seed shall be planted by drill seeding.

B. Drill Seeding: Seed shall be uniformly drilled to an average depth of ½ inch and at the rate of 8 pounds per 1,000 square feet using equipment having drills not more than 6 ½ inches apart. Row markers shall be used with the drill seeder.

C. Rolling: Immediately after seeding, except for slopes 3 horizontal to 1 vertical and greater, the entire area shall be firmed with a roller not exceeding 90 pounds for each foot of roller width. Do not roll areas seeded with seed drills equipped with rollers.

D. Inspection: A minimum of 48 hours prior notice must be given to the Construction Administrator before seeding may commence.

3.3 INSTALLATION OF EROSION CONTROL FABRIC

A. Fabric shall be rolled out in place. Fabric shall be applied without stretching and shall lie smoothly but loosely on the soil surface. The Contractor shall refer to the Drawings for details of fabric fastening.

B. Application of the erosion control fabric shall occur the same day that the seeding of an area has taken place.

C. Fabric shall completely cover all areas which are shown on the Drawings to be protected from erosion. After fabric installation, the entire area shall be rolled with a smooth roller weighing between 200 to 250 pounds. After rolling, the fabric shall be in intimate contact with the soil surface at all points. Any clods, etc., which hold the fabric off the ground should be removed. The fabric shall be forced down into any depressions and held there with a staple.

3.4 MAINTENANCE

A. General: The project areas shall be kept clean at all times and care shall be taken that use of the premises shall not be unduly hampered by Work herein specified. The intent of this Section is to ensure a healthy, well-established turf, and prevent soil erosion in compliance with the Land Disturbance Permit issued by the Missouri Department of Natural Resources.

B. Responsibility: The Owner shall be responsible for maintenance of all seeded areas upon completion of seeding and general acceptance by the Construction Administrator.

C. Damage: Damage to seeded areas during the project shall be repaired by the persons responsible for causing such damage.

3.5 GENERAL ACCEPTANCE

A. The Construction Administrator shall make an inspection of the seeded areas upon completion of seeding. Seeded areas shall be considered acceptable if the specified quantities of fertilizer & seed have been properly applied.

3.6 GUARANTEE

A. The Contractor is responsible for the proper application of the fertilizer & seeding. Watering, weeding, re-seeding, and mowing will be the responsibility of the Owner after proper application of the seed.

END OF SECTION 329219