PROJECT MANUAL

Service Generator, Replace ATS & Recondition Switchgear

Southeast Correctional Center

Charleston, Missouri

Designed By: Introba
6 South Old Orchard
St. Louis, MO 63119

Date Issued: September 9, 2024

Project No.: C2329-01

STATE *of* MISSOURI

OFFICE *of* ADMINISTRATION
Facilities Management, Design & Construction

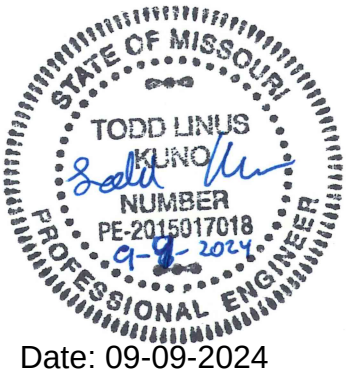
SECTION 000107 - PROFESSIONAL SEALS PAGE

PROJECT NUMBER: (C2329-01)

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

A. Electrical Engineer

1. Todd L. Kuno
2. PE2015017018
3. Responsible for Division 26.



Date: 09-09-2024
Exp. Date: 12-31-2025

TABLE OF CONTENTS

SECTION	TITLE	NUMBER OF PAGES
DIVISION 00 – PROCUREMENT AND CONTRACTING INFORMATION		
000000	**INTRODUCTORY INFORMATION**	
000101	Project Manual Cover	1
000107	Professional Seals and Certifications	1
000110	Table of Contents	2
000115	List of Drawings	1
001116	**INVITATION FOR BID (IFB)** plus Missouri Buys instructions	2
002113	**INSTRUCTIONS TO BIDDERS (Includes MBE/WBE/SDVE Information)**	8
003144	MBE/WBE/SDVE Directory	1
****The following documents may be found on MissouriBUYS at https://missouribuys.mo.gov/****		
004000	**PROCUREMENT FORMS & SUPPLEMENTS**	
004113	Bid Form	*
004336	Proposed Subcontractors Form	*
004337	MBE/WBE/SDVE Compliance Evaluation Form	*
004338	MBE/WBE/SDVE Eligibility Determination Form for Joint Ventures	*
004339	MBE/WBE/SDVE Good Faith Effort (GFE) Determination Forms	*
004340	SDVE Business Form	*
004541	Affidavit of Work Authorization	*
004545	Anti-Discrimination Against Israel Act Certification Form	*
005000	**CONTRACTING FORMS AND SUPPLEMENTS**	
005213	Construction Contract	3
005414	Affidavit for Affirmative Action	1
006000	**PROJECT FORMS**	
006113	Performance and Payment Bond	2
006325	Product Substitution Request	2
006519.16	Final Receipt of Payment and Release Form	1
006519.18	MBE/WBE/SDVE Progress Report	1
006519.21	Affidavit of Compliance with Prevailing Wage Law	1
007000	**CONDITIONS OF THE CONTRACT**	
007213	General Conditions	20
007300	Supplementary Conditions	1
007346	Wage Rate	4
DIVISION 1 - GENERAL REQUIREMENTS		
011000	Summary of Work	1
012300	Alternates	2
012600	Contract Modification Procedures	2
013100	Coordination	2
013115	Project Management Communications	4
013200	Schedules – Bar Chart	3
013300	Submittals	4
013513.16	Site Security and Health Requirements (DOC)	7
015000	Construction Facilities and Temporary Controls	4
017400	Cleaning	2
017900	Demonstration and Training	6
DIVISION 26 – ELECTRICAL		
260500	Common Work Results for Electrical	17
260519	Conductors and Cables	5
260526	Grounding and Bonding	4
260533	Raceways	9
260534	Boxes, Cabinets and Enclosures	3

260553	Identification for Electrical Systems	5
260600	Electrical Demolition	3
261326	Medium-Voltage Metal-Clad Switchgear	14
263213	Engine Generators	5

APPENDICES

Appendix A	GWI 527-49R11 Installation, Operation and Maintenance Instructions: Triad Series 2 SF6 Switches Padmount Style	30
Appendix B	FABICK/CAT EPG PM1 Inspection	12

SECTION 000115 – LIST OF DRAWINGS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

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

PART 2 - PRODUCTS (NOT APPLICABLE)

PART 3 - EXECUTION

3.1 LIST OF DRAWINGS

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

	TITLE	SHEET #	DATE	CAD #
1.	Cover Sheet	Sheet G-00	09/09/2024	G-00
2.	Electrical Symbols and Legend	Sheet E-00	09/09/2024	E-00
3.	Demo Enlarged Electrical Plan	Sheet E-10	09/09/2024	E-10
4.	New Work-Enlarged Electrical Plan	Sheet E-11	09/09/2024	E-11
5.	Demo Campus One-Line	Sheet E-60	09/09/2024	E-60
6.	New Work Campus One-Line	Sheet E-61	09/09/2024	E-61

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. Service Generator, Replace ATS & Recondition Switchgear
Southeast Correctional Center
Charleston, Missouri
Project No.: C2329-01

3.0 BIDS WILL BE RECEIVED:

A. Until: 1:30 PM, October 31, 2024

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

4.0 DESCRIPTION:

A. Scope: The project includes replacing the Medium Voltage (15kv) switchgear, and generator controllers. Including replacing MV Relay's, CTs, PTs, Control wiring, Generator PLCs, and 48v DC battery and chargers.

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, October 17, 2024, at Southeast Correctional Center - Administration Building, 300 Pedro Simmons Drive, Charleston, MO.

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

6.0 HOW TO GET PLANS & SPECIFICATIONS:

A. View Only Electronic bid sets are available at no cost or paper bid sets for a deposit of $200.00 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: Introba, Todd Kuno, 800-404-7677, email: todd.kuno@introba.com

B. Project Manager: Chris DeVore, 573-526-7922, email: Chris.Devore@oa.mo.gov

8.0 GENERAL INFORMATION:

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

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

Very Important MissouriBUYS Instructions to Help Submit a Bid Correctly

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

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

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

D. Any time a bidder wants to modify the bid, he or she will have to retract, make revisions, and then submit again. Please ensure that "draft" status is not shown. FMDC will open the last response the bidder submits. The bidder may revise and submit the bid up to the close of the solicitation (bid date and time). Be sure to allow for uploading time so that the bid is successfully uploaded prior to the 1:30 PM deadline; we can only accept the bid if it is uploaded before the deadline.

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

F. If you are experiencing login issues, please contact Web Procure Support (Proactis) at 866-889-8533 anytime from 7:00 AM to 7:00 PM Central Time, Monday through Friday. If you try using a userid or password several times that is incorrect, the system will lock you out. Web Procure Support is the only option to unlock you! If you forget your userid or password, Web Procure Support will provide a temporary userid or password. Also, if it has been a while since your last successful login and you receive an “inactive” message, contact Web Procure (Proactis). If you are having a registration issue, you may contact Office of Administration Division of Accounting at 573-751-2971 and ask for the MissouriBUYS vendor team.

SECTION 002113 – INSTRUCTIONS TO BIDDERS

1.0 - SPECIAL NOTICE TO BIDDERS

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

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

2.0 - BID DOCUMENTS

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

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

3.0 - BIDDERS' OBLIGATIONS

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

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

4.0 - INTERPRETATIONS

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

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

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

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

5.0 - BIDS AND BIDDING PROCEDURE

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

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

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

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

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

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

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

6.0 - SIGNING OF BIDS

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

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

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

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

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

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

7.0 - RECEIVING BID SUBMITTALS

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

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

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

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

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

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

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

8.0 - MODIFICATION AND WITHDRAWAL OF BIDS

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

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

9.0 - AWARD OF CONTRACT

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

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

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

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

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

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

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

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

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

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

10.0 - CONTRACT SECURITY

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

11.0 - LIST OF SUBCONTRACTORS

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

12.0 - WORKING DAYS

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

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

13.0 - AMERICAN AND MISSOURI - MADE PRODUCTS AND FIRMS

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

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

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

14.0 – ANTI-DISCRIMINATION AGAINST ISRAEL ACT CERTIFICATION:

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

15.0 - MBE/WBE/SDVE INSTRUCTIONS

A. Definitions:

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

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

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

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

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

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

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

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

B. MBE/WBE/SDVE General Requirements:

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

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

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

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

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

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

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

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

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

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

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

D. Certification of MBE/WBE/SDVE Subcontractors:

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

2. The Bidder may determine the certification status of a proposed MBE or WBE subcontractor or supplier by referring to the Office of Equal Opportunity (OEO)'s online MBE/WBE directory (https://apps1.mo.gov/MWBCertifiedFirms/). The Bidder may determine the eligibility of a SDVE subcontractor or supplier by referring to the Division of Purchasing and Materials Management's online SDVE directory (https://oeo.mo.gov/sdve-certification-program/) or the Department of Veterans Affairs' directory (https://veterans.certify.sba.gov/#search).

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

E. Waiver of MBE/WBE/SDVE Participation:

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

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

   a. The amount of actual participation obtained;

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

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

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

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

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

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

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

F. Contractor MBE/WBE/SDVE Obligations

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

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

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

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

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

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

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

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

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

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

https://oeo.mo.gov/sdve-certification-program/

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

State of Missouri Construction Contract

THIS AGREEMENT is made (DATE) by and between:

Contractor Name and Address

hereinafter called the "Contractor,"

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

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:	**Service Generator, Replace ATS & Recondition Switchgear** **Southeast Correctional Center** **Charleston, Missouri**
Project Number:	**C2329-01**

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 **350 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 $700** per day for each and every day, Sunday and legal holidays excepted, during which the work remains incomplete and unfinished. Any sum which may be due the Owner for such damages shall be deducted and retained by the Owner from any balance which may be due the Contractor when said work shall have been finished and accepted. But such provisions shall not release the Bond of the Contractor from liability according to its terms. In case of failure to complete, the Owner will be under no obligation to show or prove any actual or specific loss or damage.

ARTICLE 4. CONTRACT SUM

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

Base Bid:	$
Alternate No. 1:	$
Alternate No. 2:	$
Alternate No. 3:	$
Alternate No. 4:	$

TOTAL CONTRACT AMOUNT: ($CONTRACT AMOUNT)

ARTICLE 5. PREVAILING WAGE RATE

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

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

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

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

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

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

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

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

ARTICLE 7. CONTRACT DOCUMENTS

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

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

c. Supplementary Instructions to Bidders (if applicable) (Section 002213)
d. The following documents as completed and executed by the Contractor and accepted by the Owner, if applicable:
    i. Bid Form (Section 004113)
    ii. Unit Prices (Section 004322)
    iii. Proposed Contractors Form (Section 004336)
    iv. MBE, WBE, SDVE Compliance Evaluation Form(s) (Section 004337)
    v. MBE, WBE, SDVE Eligibility Determination Form for Joint Ventures (Section 004338)
    vi. MBE, WBE, SDVE Good Faith Effort (GFE) Determination Form (Section 004339)
    vii. Missouri Service Disabled Veteran Business Form (Section 004340)
    viii. Affidavit of Work Authorization (Section 004541)
    ix. Affidavit for Affirmative Action (Section 005414)
e. Performance and Payment Bond, completed and executed by the Contractor and surety (Section 006113)
f. General Conditions (Section 007213)
g. Supplementary Conditions (Section 007300)
h. Supplementary General Conditions for Federally Funded/Assisted Construction Projects (Section 007333)
i. Wage Rate(s) (Section 007346)

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

ARTICLE 8 – CERTIFICATION

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

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

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

APPROVED:

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

_____
Contractor's Authorized Signature

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

_____
Corporate Secretary

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

AFFIDAVIT FOR AFFIRMATIVE ACTION

PROJECT NUMBER

NAME

First being duly sworn on oath states: that

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

NAME

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

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

PROJECT TITLE

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

PRINT NAME & SIGNATURE

DATE

NOTARY INFORMATION

NOTARY PUBLIC EMBOSSER SEAL

STATE OF

COUNTY (OR CITY OF ST. LOUIS)

SUBSCRIBED AND SWORN BEFORE ME, THIS

DAY OF YEAR

NOTARY PUBLIC SIGNATURE

MY COMMISSION EXPIRES

NOTARY PUBLIC NAME (TYPED OR PRINTED)

USE RUBBER STAMP IN CLEAR AREA BELOW

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

Bond No._____

SECTION 006113 - PERFORMANCE AND PAYMENT BOND FORM

KNOW ALL MEN BY THESE PRESENTS, THAT we _____

as principal, and _____

_____as Surety, are held and firmly bound unto the

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

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

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

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

_____

_____

_____

(Insert Project Title and Number)

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

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

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

AS APPLICABLE:

AN INDIVIDUAL

Name: _____

Signature: _____

A PARTNERSHIP

Name of Partner: _____

Signature of Partner: _____

Name of Partner: _____

Signature of Partner: _____

CORPORATION

Firm Name: _____

Signature of President: _____

SURETY

Surety Name: _____

Attorney-in-Fact: _____

Address of Attorney-in-Fact: _____

_____

Telephone Number of Attorney-in-Fact: _____

Signature Attorney-in-Fact: _____

NOTE: Surety shall attach Power of Attorney

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

PRODUCT SUBSTITUTION REQUEST

PROJECT NUMBER

PROJECT TITLE AND LOCATION

CHECK APPROPRIATE BOX

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

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

FROM: BIDDER/CONTRACTOR (PRINT COMPANY NAME)

TO: ARCHITECT/ENGINEER (PRINT COMPANY NAME)

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

SPECIFIED PRODUCT OR SYSTEM

SPECIFICATION SECTION NO.

SUPPORTING DATA

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

☐ Sample ☐ Sample will be sent, if requested

QUALITY COMPARISON

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

PREVIOUS INSTALLATIONS

PROJECT	ARCHITECT/ENGINEER	
LOCATION		DATE INSTALLED

SIGNIFICANT VARIATIONS FROM SPECIFIED PRODUCT

REASON FOR SUBSTITUTION

DOES PROPOSED SUBSTITUTION AFFECT OTHER PARTS OF WORK?

☐ YES ☐ NO

IF YES, EXPLAIN

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

☐ YES ☐ NO

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

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

BIDDER/CONTRACTOR	DATE

REVIEW AND ACTION

☐ Resubmit Substitution Request with the following additional information:

☐ Substitution is accepted.

☐ Substitution is accepted with the following comments:

☐ Substitution is not accepted.

ARCHITECT/ENGINEER	DATE

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

FINAL RECEIPT OF PAYMENT AND RELEASE

PROJECT NUMBER

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

(PROJECT TITLE, PROJECT LOCATION, AND PROJECT NUMBER)

at

(ADDRESS OF PROJECT)

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

DOES HEREBY:

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

DATED this day of , 20 .

NAME OF SUBCONTRACTOR

BY (TYPED OR PRINTED NAME)

SIGNATURE

TITLE

ORIGINAL: FILE/Closeout Documents

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

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

MBE/WBE/SDVE PROGRESS REPORT

Remit with **ALL** Progress and Final Payments

(Please check appropriate box) ☐CONSULTANT ☐CONSTRUCTION

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

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

SELECT MBE, WBE, SDVE	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

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

ARTICLE:

1. General Provisions

1.1. Definitions

1.2. Drawings and Specifications

1.3. Compliance with Laws, Permits, Regulations and Inspections

1.4. Nondiscrimination in Employment

1.5. Anti-Kickback

1.6. Patents and Royalties

1.7. Preference for American and Missouri Products and Services

1.8. Communications

1.9. Separate Contracts and Cooperation

1.10. Assignment of Contract

1.11. Indemnification

1.12. Disputes and Disagreements

2. Owner/Designer Responsibilities

3. Contractor Responsibilities

3.1. Acceptable Substitutions

3.2. Submittals

3.3. As-Built Drawings

3.4. Guaranty and Warranties

3.5. Operation and Maintenance Manuals

3.6. Other Contractor Responsibilities

3.7. Subcontracts

4. Changes in the Work

4.1. Changes in the Work

4.2. Changes in Completion Time

5. Construction and Completion

5.1. Construction Commencement

5.2. Project Construction

5.3. Project Completion

5.4. Payments

6. Bond and Insurance

6.1. Bond

6.2. Insurance

7. Termination or Suspension of Contract

7.1. For Site Conditions

7.2. For Cause

7.3. For Convenience

SECTION 007213 - GENERAL CONDITIONS

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

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

ARTICLE 1 – GENERAL PROVISIONS

ARTICLE 1.1 - DEFINITIONS

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

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

ARTICLE 1.2 DRAWINGS AND SPECIFICATIONS

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

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

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

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

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

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

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

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

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

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

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

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

forfeit as a penalty to the public body on whose behalf the contract is made or awarded, two thousand five hundred dollars plus one hundred dollars for each employee employed by the contractor or subcontractor, for each calendar day, or portion thereof, such employee is employed without the required training.

ARTICLE 1.4 - NONDISCRIMINATION IN EMPLOYMENT

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

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

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

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

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

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

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

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

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

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

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

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

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

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

ARTICLE 1.5 - ANTI-KICKBACK

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

insurance contract, or any other contract pertaining to the project.

ARTICLE 1.6 - PATENTS AND ROYALTIES

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

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

ARTICLE 1.7 - PREFERENCE FOR AMERICAN AND MISSOURI PRODUCTS AND SERVICES

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

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

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

ARTICLE 1.8 - COMMUNICATIONS

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

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

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

ARTICLE 1.9 - SEPARATE CONTRACTS AND COOPERATION

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

B. The Contractor shall consult the drawings for all other contractors in connection with this work. Any work conflicting with the above shall be brought to the attention of the Owner’s Representative before the work is performed. If the Contractor fails to do this, and constructs any

work which interferes with the work of another contractor, the Contractor shall remove any part so conflicting and rebuild same, as directed by the Owner's Representative at no additional cost to the Owner.

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

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

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

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

ARTICLE 1.10 - ASSIGNMENT OF CONTRACT

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

ARTICLE 1.11 - INDEMNIFICATION

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

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

ARTICLE 1.12 - DISPUTES AND DISAGREEMENTS

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

ARTICLE 2 -- OWNER/DESIGNER RESPONSIBILITIES

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

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

C. All materials and workmanship used in the work shall be subject to the inspection of the Designer and Construction Representative, and any work which is deemed defective shall be removed, rebuilt or made good immediately upon notice.

The cost of such correction shall be borne by the Contractor. Contractor shall not be entitled to an extension of the contract completion date in order to remedy defective work. All rejected materials shall be immediately removed from the site of the work.

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

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

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

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

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

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

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

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

ARTICLE 3 -- CONTRACTOR RESPONSIBILITIES

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

ARTICLE 3.1 -- ACCEPTABLE SUBSTITUTIONS

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

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

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

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

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

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

2. Material delivered fails to comply with contract requirements.

ARTICLE 3.2 -- SUBMITTALS

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

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

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

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

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

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

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

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

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

ARTICLE 3.3 – AS-BUILT DRAWINGS

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

ARTICLE 3.4 – GUARANTY AND WARRANTIES

A. General Guaranty

   1. Neither the final certificate of payment nor any provision in the contract documents nor partial use or occupancy of the premises by the Owner shall constitute an acceptance of work not done in accordance with contract requirements.
   2. The Contractor or surety shall remedy any defects in the work and pay for any damage to property resulting there from which shall appear within a period of one (1) year from the date of substantial completion unless a longer period is otherwise specified or a differing guaranty period has been established in the substantial completion certificate. The Owner will give notice of observed defects with reasonable promptness.
   3. In case of default on the part of the Contractor in fulfilling this part of this contract, the Owner may correct the work or repair the

damage and the cost and expense incurred in such event shall be paid by or recoverable from the Contractor or surety.

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

B. Extended Warranty

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

ARTICLE 3.5 -- OPERATION AND MAINTENANCE MANUALS

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

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

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

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

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

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

   b. Belt sizes, types, and lengths.

   c. Wiring diagrams.

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

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

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

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

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

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

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

ARTICLE 3.6 – OTHER CONTRACTOR RESPONSIBILITIES

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

B. Contractor shall, at all times, enforce strict discipline and good order among his employees,

and shall not employ on the work any unfit person or anyone not skilled in the work assigned to him/her.

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

ARTICLE 3.7 -- SUBCONTRACTS

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

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

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

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

ARTICLE 4 -- CHANGES IN THE WORK

4.1 CHANGES IN THE WORK

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

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

C. The amount of any adjustment in this contract price for authorized changes shall be agreed upon

before such changes become effective and shall be determined, through submission of a request for proposal, as follows:

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

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

1. The overhead and profit charge by the Contractor and all subcontractors shall be considered to include, but is not limited to: incidental job burdens, small truck (under 1 ton) expense, mileage, small hand tools, warranty costs, company benefits and general office overhead. Project supervision including field supervision and job site office expense shall be considered a part of overhead and profit unless a compensable time extension is granted.
2. The percentages for overhead and profit charged on Contract Changes shall be 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 2% and shall be allowed on the total cost of the added work, including overhead and profit.
4. On proposals covering both increases and decreases in the amount of this contract, the application of overhead and profit shall be on the net change in the cost of the work.
5. The percentage(s) for overhead and profit to be credited to the Owner on Contract Changes that are solely decreases in the quantity of work or materials shall be the same as those for additive Contract Changes provided above.

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

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

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

compensation for such emergency work in writing to the Owner's Representative.

ARTICLE 4.2 – CHANGES IN COMPLETION TIME

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

1. The contractor documents that proposed Changes in the work, as provided in Article 4.1, extends construction activities critical to contract completion date, OR
2. The Owner suspends all work for convenience of the Owner as provided in Article 7.3, OR
3. An Owner caused delay extends construction activities critical to contract completion (except as provided elsewhere in these General Conditions). The Contractor is to review the work activities yet to begin and evaluate the possibility of rescheduling the work to minimize the overall project delay.

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

1. Weather-related delays occur, subject to provisions for the inclusion of a specified number of "bad weather" days when provided for in Section 012100-Allowances, OR
2. Labor strikes or acts of God occur, OR
3. The work of the Contractor is delayed on account of conditions which were beyond the control of the Contractor, subcontractors or suppliers, and were not the result of their fault or negligence.

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

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

ARTICLE 5 - CONSTRUCTION AND COMPLETION

ARTICLE 5.1 – CONSTRUCTION COMMENCEMENT

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

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

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

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

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

ARTICLE 5.2 -- PROJECT CONSTRUCTION

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

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

ARTICLE 5.3 -- PROJECT COMPLETION

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

1. Once the Contractor has reached what they believe is Substantial Completion, the Contractor shall notify the Designer and the Construction Representative of the following:

   a. That work is essentially complete with the exception of certain listed work items. The list shall be referred to as the "Contractor's Punch."

   b. That all Operation and Maintenance Manuals have been assembled and submitted in accordance with Article 3.5A.

   c. That the Work is ready for inspection by the Designer and Construction Representative. The Owner shall be entitled to a minimum of ten working days notice before the inspection shall be performed.

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

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

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

C. Final Completion. The Project is finally complete when the Certificate of Substantial Completion has been issued and all work items identified therein as incomplete have been completed, and when all administrative items required by the contract have been completed. Final Completion entitles the Contractor to payment of the outstanding balance of the contract amount including all change orders and retainage. Within five (5) working days of the date of the Certificate of Substantial Completion, the Contractor shall identify the cost to complete any outstanding items of work. The Designer shall review the Contractor's estimate and either approve it or provide an independent estimate for all such items. If the Contractor fails to complete the remaining items within the time specified in the Certificate, the Owner may terminate the contract and go to the surety for project completion in accordance with Article 7.2 or release the contract balance to the Contractor less 150% of the

approved estimate to complete the outstanding items. Upon completion of the outstanding items, when a final cost has been established, any monies remaining shall be paid to the Contractor. Failure to complete items of work does not relieve the Contractor from the obligation to complete the administrative requirements of the contract, such as the provisions of Article 5.3 FAILURE TO COMPLETE ALL ITEMS OF WORK UNDER THE CONTRACT SHALL BE CONSIDERED A DEFAULT AND BE GROUNDS FOR CONTRACT TERMINATION AND DEBARMENT.

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

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

ARTICLE 5.4 -- PAYMENT TO CONTRACTOR

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

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

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

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

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

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

E. The Contractor shall be allowed to include in the Application and Certification for Payment, one hundred (100%) of the value, subject to retainage,

of major equipment and material stored off the site if all of the following conditions are met:

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

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

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

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

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

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

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

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

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

c) Certified copies of all payrolls

d) As-built drawings

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

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

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

ARTICLE 6 -- INSURANCE AND BONDS

ARTICLE 6.1 -- BOND

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

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

ARTICLE 6.2 – INSURANCE

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

B. Minimum Scope and Extent of Coverage

1. General Liability

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

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

2. Automobile Liability

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

3. Workers' Compensation and Employer's Liability

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

4. Builder's Risk or Installation Floater Insurance

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

to Contractor and Owner as their respective interests may appear.

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

C. Minimum Limits of Insurance

1. General Liability

Contractor

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

2. Automobile Liability

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

3. Workers' Compensation and Employers Liability

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

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

D. Deductibles and Self-Insured Retentions

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

E. Other Insurance Provisions and Requirements

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

1. General Liability

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

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

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

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

2. Automobile Insurance

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

performance of services or the delivery of goods called for by the Contract.

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

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

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

3. Workers' Compensation/Employer's Liability

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

4. All Coverages

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

F. Insurer Qualifications and Acceptability

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

G. Verification of Insurance Coverage

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

ARTICLE 7 – SUSPENSION OR TERMINATION OF CONTRACT

ARTICLE 7.1 - FOR SITE CONDITIONS

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

ARTICLE 7.2 - FOR CAUSE

A. Termination or Suspension for Cause:

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

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

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

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

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

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

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

ARTICLE 7.3 -- FOR CONVENIENCE

A. The Owner may terminate or suspend the Contract or any portion of the Work without cause at any time, and at the Owner's convenience. Notification of a termination or suspension shall be in writing and shall be given to the Contractor and their surety. If the Contract is suspended, the notice will contain the anticipated duration of the suspension or the conditions under which work will be permitted to resume. If appropriate, the Contractor will be requested to demobilize and re-mobilize and will be reimbursed time and costs associated with the suspension.

B. Upon receipt of notification, the Contractor shall:

1. Cease operations when directed.

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

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

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

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

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

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

SECTION 007300 - SUPPLEMENTARY CONDITIONS

1.0 GENERAL:

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

2.0 CONTACTS:

Designer:
Todd Kuno
Introba
6 South Old Orchard
St. Louis, Missouri 63119
Telephone: 800-404-7677
Email: todd.kuno@introba.com

Construction Representative:
Randy Duncan
Division of Facilities Management, Design and Construction
301 West High Street, Room 730
Jefferson City, Missouri 65102
Telephone: 573-526-0582
Email: Randy.Duncan@oa.mo.gov

Project Manager:
Chris DeVore
Division of Facilities Management, Design and Construction
301 West High Street, Room 730
Jefferson City, Missouri 65101
Telephone: 573-526-7922
Email: Chris.Devore@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 3 complete sets of drawings and specifications at no charge.

B. The Owner will furnish the Contractor with approximately 3 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 067
MISSISSIPPI 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	$23.22*
Boilermaker	$23.22*
Bricklayer-Stone Mason	$23.22*
Carpenter	$23.22*
Lather	
Linoleum Layer	
Millwright	
Pile Driver	
Cement Mason	$23.22*
Plasterer	
Communication Technician	$23.22*
Electrician (Inside Wireman)	$23.22*
Electrician Outside Lineman	$23.22*
Lineman Operator	
Lineman - Tree Trimmer	
Groundman	
Groundman - Tree Trimmer	
Elevator Constructor	$23.22*
Glazier	$23.22*
Ironworker	$23.22*
Laborer	$42.00
General Laborer	
First Semi-Skilled	
Second Semi-Skilled	
Mason	$23.22*
Marble Mason	
Marble Finisher	
Terrazzo Worker	
Terrazzo Finisher	
Tile Setter	
Tile Finisher	
Operating Engineer	$23.22*
Group I	
Group II	
Group III	
Group III-A	
Group IV	
Group V	
Painter	$44.89
Plumber	$23.22*
Pipe Fitter	
Roofer	$23.22*
Sheet Metal Worker	$23.22*
Sprinkler Fitter	$23.22*
Truck Driver	$23.22*
Truck Control Service Driver	
Group I	
Group II	
Group III	
Group IV	

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

Heavy Construction Rates for
MISSISSIPPI County

Section 067

OCCUPATIONAL TITLE	**Prevailing Hourly Rate
Carpenter	$56.78
Millwright	
Pile Driver	
Electrician (Outside Lineman)	$23.22*
Lineman Operator	
Lineman - Tree Trimmer	
Groundman	
Groundman - Tree Trimmer	
Laborer	$47.88
General Laborer	
Skilled Laborer	
Operating Engineer	$62.44
Group I	
Group II	
Group III	
Group IV	
Truck Driver	$23.22*
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 01 Specification Sections apply to this Section.

1.2 WORK COVERED BY CONTRACT DOCUMENTS

A. The Project consists of Replacing the MV (15kv) switchgear, and Generator Controllers.

1. Project Location : 300 Pedro Simmons Dr, Charleston, MO 63834.
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 09/09/2024 were prepared for the Project by Introba Inc. 6 South Old Orchard, St. Louis, MO 63119.

C. The Work consists of replacing the MV (15kv) switchgear, and generator controllers.

1. The Work includes**:**

a. Replacing MV Relays, CTs, PTs, Control wiring, Generator PLCs, and 48v DC battery and chargers.
b. Replacing MV switch gear.
c. Replacing existing generator control panels.

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

1.3 OCCUPANCY REQUIREMENTS

A. Partial Owner Occupancy: The working area is outside the security fence. Inmates may have access to the working area. Contractor to lock all vehicles when not in use. All tools need to be secured (locked) or near contactor and within line of sight.

PART 2 - PRODUCTS (NOT APPLICABLE)

PART 3 - EXECUTION (NOT APPLICABLE)

END OF SECTION 011000

SECTION 012300 - ALTERNATES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

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

1.3 DEFINITIONS

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

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

B. No additional time will be allowed for alternate work unless the number of workdays 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: *Provide maintenance for existing generator. Refer to Appendix B, contractor to provide all recommendations int the latest testing report from Fabick.*

B. Alternate No. 2: *Provide maintenance for G&W pad mount switch. Refer to Appendix A for G&W pad mount maintenance requirements.*

C. Alternate No 3*: Provide chiller load shedding controls refer to sheet E-61 for additional information. MV gear shall be programmed for load shedding and the BAS shall be programed shut mechanical equipment down to prevent overloading existing generator.*

D. Alternate No 4*: Provide Generator remote annunciator panel refer to sheet E-61 for location and additional information.*

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 01 Specification Sections apply to this Section.

1.2 SUMMARY

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

B. Related Sections include the following:

1. Division 01, Section 013115 “Project Management Communications” for administrative requirements for communications.
2. Division 00, Section 007213, Article 3.1 "Acceptable Substitutions" for administrative procedures for handling Requests for Substitutions made after Contract award.
3. Division 00, Section 007213, Article 4.0 "Changes in the Work" for Change Order requirements.

1.3 REQUESTS FOR INFORMATION

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

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

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

1.4 MINOR CHANGES IN THE WORK

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

1.5 PROPOSAL REQUESTS

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

1. Proposal Requests issued by the Designer or Owner Representative are for information only. Do not consider them instructions either to stop work in progress or to execute the proposed change.
2. Within ten (10) working days after receipt of Proposal Request, submit a proposal for the cost adjustments to the Contract Amount and the Contract Time necessary to execute the Change. The Contractor shall submit his proposal on the appropriate Change Order Detailed Breakdown form. Subcontractors may use the appropriate Change Order Detailed Breakdown form or submit their proposal on their letterhead provided the same level of detail is included. All proposals shall include:

    a. A detailed breakdown of costs per Article 4.1 of the General Conditions.
    b. If requesting additional time per Article 4.2 of the General Conditions, include an updated Contractor's Construction Schedule that indicates the effect of the Change including, but not limited to, changes in activity duration, start and finish times, and activity relationship.

1.6 CHANGE ORDER PROCEDURES

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

PART 2 - PRODUCTS (NOT APPLICABLE)

PART 3 - EXECUTION (NOT APPLICABLE)

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 01 Specification Sections apply to this Section.

1.2 SUMMARY

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

1. Project meetings.

B. Related Sections include the following:

1. Division 01, 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.

1.4 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.

PART 2 - PRODUCTS (NOT APPLICABLE)

PART 3 - EXECUTION (NOT APPLICABLE)

END OF SECTION 013100

SECTION 013115 - PROJECT MANAGEMENT COMMUNICATIONS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

B. Division 01, Section 013300 - Submittals

C. Division 01, 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. ComOA.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 party's 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.

1. 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.
2. 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.
3. The Owner and his representatives, the Designer and his consultants, and the Contractor and his Sub Contractors and suppliers at every tier reserves the right to

and shall copy any paper document into electronic form and make same available on the web site.

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

1. Providing suitable computer systems for each licensed user at the users normal work location[1] with high-speed Internet access, i.e. DSL, local cable company's Internet connection, or T1 connection.
2. Each of the above referenced computer systems shall have the following minimum system[2] and software requirements:

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

1) Operating System: Windows XP or newer
2) Internet Browser: Internet Explorer 6.01SP2+ (Recommend IE7.0+)
3) Minimum Recommend Connection Speed: 256K or above.
4) Processor Speed: 1 Gigahertz and above
5) RAM: 512 mb
6) Operating system and software shall be properly licensed.
7) Internet Explorer version 7 (current version is a free distribution for download). This specification is not intended to restrict the host server or client computers provided that industry standard HTTP clients may access the published content.
8) Adobe Acrobat Reader (current version is a free distribution for download).
9) Users should have the standard Microsoft Office Suite (current version must be purchased) or the equivalent.

PART 2 - PRODUCTS (NOT APPLICABLE)

PART 3 - EXECUTION (NOT APPLICABLE)

END OF SECTION 013115

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 01 Specification Sections apply to this Section.

1.2 SUMMARY

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

PART 2 - PRODUCTS – (NOT APPLICABLE)

PART 3 - EXECUTION

3.1 SUBMITTAL PROCEDURES

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

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

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

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

   b. Close Out Documents

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

   c. General Conditions

      1) No more than 10%

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

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

3.2 CONSTRUCTION PROGRESS SCHEDULE – BAR CHART SCHEDULE

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

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

1. Subcontract awards.
2. Submittals
3. Purchases
4. Deliveries
5. Installation
6. Testing
7. Adjusting

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

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, 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 01 Specification Sections apply to this Section.

B. Division 01, 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. Operating and Maintenance Manuals
4. 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 dimensions established by field measurement.
5. 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 recognized Testing Agency standards
   c. Notation of dimensions verified by field measurement.
   d. Notation of coordination requirements

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

1.6 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. 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.

1.7 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
261326	Medium-Voltage Metal-Clad Switchgear	Shop Drawings
261326	Medium-Voltage Metal-Clad Switchgear	Product Data
261326	Medium-Voltage Metal-Clad Switchgear	Test Report
261326	Medium-Voltage Metal-Clad Switchgear	Operation / Maintenance Manual
261326	Medium-Voltage Metal-Clad Switchgear	Warranty
261326	Medium-Voltage Metal-Clad Switchgear	As-Builts
263213	Engine Generators	Shop Drawings
263213	Engine Generators	Product Data
263213	Engine Generators	Test Report
263213	Engine Generators	Operation / Maintenance Manual
263213	Engine Generators	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 01 Specification Sections apply to this Section.

1.2 SUBMITTALS

A. List of required submittals:

1. Materials Safety Data Sheets for all hazardous materials to be brought onsite.
2. Schedule of proposed shutdowns, if applicable.
3. 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; 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 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. Support facilities include, but are not limited to, the following:

1. Storage
2. Waste disposal services.
3. Construction aids and miscellaneous services and facilities

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

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. 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. 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.

B. 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.

C. 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 SUPPORT FACILITIES INSTALLATION

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

3.3 SECURITY AND PROTECTION FACILITIES INSTALLATION

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

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

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

3.4 OPERATION, TERMINATION AND REMOVAL

A. 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.

B. 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 01 Specification Sections apply to this Section.

1.2 SUMMARY

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

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

1. Do not dispose of volatile wastes such as mineral spirits, oil, or paint thinner in storm or sanitary drains.
2. Burning or burying of debris, rubbish, or other waste material on the premises is not permitted.

PART 2 - PRODUCTS

2.1 MATERIALS

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

PART 3 - EXECUTION

3.1 PROGRESS CLEANING

A. General

1. Retain all stored items in an orderly arrangement allowing maximum access, not impending drainage or traffic, and providing the required protection of materials.
2. Do not allow the accumulation of scrap, debris, waste material, and other items not required for construction of this Work.
3. Provide adequate storage for all items awaiting removal from the jobsite, observing all requirements for fire protection and protection of the ecology.

B. Site

1. Daily, inspect the site and pick up all scrap, debris, and waste material. Remove all such items to the place designated for their storage.
2. Weekly, inspect all arrangements of materials stored onsite. Re-stack, tidy, or otherwise service all material arrangements.
3. Maintain the site in a neat and orderly condition at all times.

3.2 FINAL CLEANING

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

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

1. Clean the Project Site, yard and grounds, in areas disturbed by construction activities including landscape development areas, of rubbish, waste material, litter, and foreign substances.
2. Sweep paved areas broom clean. Rake grounds that are neither planted nor paved to a smooth, even-textured surface.
3. Remove petrochemical spills, stains, and other foreign deposits.
4. Remove tools, construction equipment, machinery, and surplus material from the site.
5. Remove labels that are not permanent labels.

C. 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 Engineer.
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.

B. Set up instructional equipment at instruction location.

3.2 INSTRUCTION

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

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

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

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

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

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

3.3 DEMONSTRATION AND TRAINING VIDEO RECORDINGS

A. General: Engage a qualified commercial videographer to record demonstration and training video recordings. Record each training module separately. Include classroom instructions and demonstrations, board diagrams, and other visual aids, but not student practice.

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

B. Video: Provide minimum 640 x 480 video resolution converted to format file type acceptable to Owner, on electronic media.

1. Electronic Media: Read-only format compact disc acceptable to Owner, with commercial-grade graphic label.
2. File Hierarchy: Organize folder structure and file locations according to project manual table of contents. Provide complete screen-based menu.
3. File Names: Utilize file names based upon name of equipment generally described in video segment, as identified in Project specifications.
4. Contractor and Installer Contact File: Using appropriate software, create a file for inclusion on the Equipment Demonstration and Training DVD that describes the following for each Contractor involved on the Project, arranged according to Project table of contents:

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

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

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

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

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

1. Furnish additional portable lighting as required.

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

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

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

END OF SECTION 017900

SECTION 260500 - COMMON WORK RESULTS FOR ELECTRICAL

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. This Section specifies the basic requirements for electrical installations and includes requirements common to all sections of Division 26. It expands and supplements the requirements specified in sections of Division 00.

B. Drawings and general provisions of the Contract, including general and supplementary conditions and specification sections Divisions 00 through 01, apply to this Section.

C. Codes and Standards: All equipment, material and installations shall comply with applicable codes, standards, and installation practices. Comply with the requirements of the applicable local building codes, the applicable NEC, all local rules and regulations including those of the fire authorities. Comply with all applicable NFPA standards. All material and equipment shall be listed by the Underwriters Laboratories (UL) standard that is applicable for the specific purpose of the material and equipment. The National Electrical Code, National Electrical Manufacturer's Association (NEMA) Standards, and applicable ANSI and IEEE standards shall apply to the pertinent materials, equipment, and installation practices. Testing shall be in accordance with the applicable International Electrical Testing Association (NETA) standards.

1. These specifications include references to the 2014 edition of the NFPA 70 "National Electrical Code." Where a different edition of the NEC has been adopted by the local Authority Having Jurisdiction, the references associated with that edition of the Code shall be applicable.

1.2 SUMMARY OF WORK

A. The word "furnish" means supply for use, the word "install" means install in its proper location and connect up complete and ready for operation, and the word "provide" means to furnish and install.

B. Provide all new materials as indicated on the drawings and specifications and all items required to make the electrical system complete and in working order.

C. System descriptions included in scope of work are as follows:

1. Modifying medium voltage (12.47 kv) equipment.
2. Maintenance of existing electrical equipment.

1.3 WORK SEQUENCE

A. All work that produces excessive noise or interference with normal building operations shall be coordinated and scheduled with the Owner. Such work may require scheduling of work after occupied hours or weekends. The Owner reserves the right to determine when such work is conducted.

1.4 ELECTRICAL COORDINATION DRAWINGS

A. Prepare a set of coordination drawings showing major elements, components, and systems of electrical equipment and materials in relationship with other building components. Prepare drawings to an accurate scale of 1/4 inch = 1 foot-0 inches or larger. Indicate the locations of all equipment and materials, including clearances for servicing and maintaining equipment.

B. Prepare floor plans, reflected ceiling plans, elevations, sections and details to conclusively coordinate and integrate all installations. Indicate locations where space is limited and where sequencing and coordination of installations are of importance to the efficient flow of the Work, including (but not necessarily limited to) the following:

1. Equipment room layouts.
2. Specific equipment installations, including, but not limited to the following:

    a. Control panels
    b. Engine-Generator Systems
    c. Equipment connections
    d. Neutral Grounding Resistors and Controllers

3. Wiring diagrams: Indicating field-installed electrical power and control wiring and cabling layouts, overcurrent protective devices, equipment and equipment connections.
4. Work in pipe spaces, chases, trenches and tunnels.
5. Exterior wall penetrations.
6. Exterior underground lines.
7. Locate, identify and protect electrical services passing through remodeling or demolition area and serving other areas required to be maintained operational. When transit services must be interrupted, provide temporary services for the affected areas and notify the Owner prior to changeover.

C. Coordinate installation of required supporting devices and set sleeves in cast-in-place concrete, masonry walls and other structural components as they are constructed.

1.5 QUALITY ASSURANCE

A. Responsibility Prior to Submitting Pricing or Bid Data:

1. Thoroughly review the contract documents and specifications and visit the site prior to issuing bid. Resolve all reported deficiencies with the Engineer prior to awarding any subcontracts, ordering material, or starting any work.

B. Qualifications:

1. Only products of specified manufacturers, or approved equals as determined by the Engineer, are acceptable.
2. Employ only workmen who are skilled in their trades.

C. Compliance with Codes, Laws, and Ordinances:

1. Conform to all requirements of the state, city and local codes, laws and ordinances and other regulations having jurisdiction over this installation.

2. If there are any discrepancies between the codes and regulations and these specifications, the Engineer shall determine the method or equipment to be used.
3. Inform the Engineer in writing, requesting a clarification at the time of the bidding, if any parts of the drawings or specifications are found not to comply with the codes or regulations. Submit a separate price to make the system comply if there is insufficient time for this procedure.
4. Inform the Engineer in writing requesting a clarification if there is any discrepancy between a manufacturer's recommendation and these specifications.
5. Follow the current issue of NFPA 70 "National Electrical Code" if there are no local codes having jurisdiction.

D. Utility Company Requirements:

1. Secure all applicable requirements from the private or public Utility Company.
2. Comply with all Utility Company requirements for service equipment, installation and metering.
3. Make application for and pay for new electrical service equipment and installation. Coordinate schedule and requirements with the Owner and Utility Company.

E. Examination of Drawings:

1. The drawings for the indicated work are diagrammatic, intended to convey the scope of the electrical work and to indicate the general arrangements and locations of equipment, wiring devices, etc., and the approximate sizes of equipment. Field verification of dimensions on plans is required. The actual conditions, including heights, lengths and orientation shall be the basis of the work.
2. The architectural, structural, mechanical and electrical drawings and specifications shall be considered as mutually explanatory and complementary. Any electrical work called for by one and not by the other shall be performed as though required by all. All sections and subsections of the Electrical work shall be governed by and subject to the general and supplementary conditions. Report any discrepancies in or between the drawings and specifications, or between the drawings and actual field conditions to the Engineer in sufficient time to issue an addendum for clarification.
3. Determine the exact locations for equipment and rough-ins, and the exact routing of raceways.
4. Do not scale drawings to determine equipment and system locations.
5. Not all required components are shown on the documents, including junction boxes, pull boxes, conduit fittings, etc. Provide all components required for proper installation of the work.
6. Any item either shown on the drawings or called for in the specifications shall be included in this contract.
7. Determine quantities and quality of material and equipment required from the documents. Provide the more expensive or higher quality amount where discrepancies arise among drawings, schedules or specifications.

F. Electronic Media and Files:

1. Electronic media files of the contract drawings in AutoCAD or PDF format and copies of the specifications in PDF format may be requested.
2. Complete and return a signed "Electronic File Transmittal" form provided by Introba upon request for electronic media.

3. Obtain approval from the appropriate Design Professional for use of their part of the documents if the information requested includes information prepared by other than Introba.
4. The electronic contract documents may be used for preparation of shop drawings and record drawings only. The information may not be used in whole or in part for any other project.
5. The drawings prepared by Introba for bidding purposes may not be used directly for raceway layout drawings or coordination drawings.
6. The use of these documents does not allow relief from the responsibility for coordination of work with other trades and verification of space available for the installation.
7. The information is provided to expedite the project with no guarantee by Introba as to the accuracy or correctness of the information provided. Introba accepts no responsibility or liability for the use of the provided information.

1.6 ROUGH-IN

A. Verify final locations for rough-ins with field measurements and with the requirements of the actual equipment to be connected.

1.7 SUBMITTAL REVIEW RESPONSIBILITIES

A. General: Submittals are not requested for all products covered in the specifications. Submit only the data requested under the submittals portion of each specification section or where indicated in a Submittal Log, if included within Division 01. Un-requested submittals will not be processed or reviewed and will be returned to the submitter. Refer to “Submittal Register” for all required submissions of each specification section. All required submissions of that specification section are to be submitted for review in one all-inclusive submission. Any deviation from specified items is considered a substitution.

1. Non-requirement of submittals, when so noted, is not to be construed as an allowance for substitutions and does not provide relief from full compliance with the contract documents.
2. Any deviation from specified items is considered a substitution. A formal request for substitution must be submitted prior to bid date (no exceptions), in accordance with the procedures and time limitations set forth in Division 02, if the use of other than specified items is being proposed. Where not defined in Division 01, requests for substitutions shall be submitted no less than ten (10) working days prior to bid date. The submitter must pay the engineer for review of substitution requests. Charges for this substitution review will be calculated based on the Engineer’s standard hourly rates, as defined in their contract with the Owner.

B. Definitions:

1. Product Data: Pre-printed manufacturer's data.
2. Shop Drawings: Drawings made specifically for the manufacture of a particular piece of equipment to be used on this project.
3. Operation and Maintenance Data: Information containing instructions on the proper operation, maintenance and repair of the equipment, complete with written text, diagrams, photos, exploded views and parts lists.
   Record Documents: Information indicating the actual installed conditions of the project on Mylar, electronic media, photographs or typed paper. Photographs are not allowed as a

substitute for correcting the construction documents; the photographs are for the Owner's future reference. Submit type, quantities and on media specified where indicated to be submitted.

C. Where more than one model is shown on a manufacturer's sheet, clearly indicate exactly which item and which data is relevant to the work.

D. Where the manufacturer lists multiple part numbers or options on a single data sheet, the part number and options to be used shall be clearly set apart from other part numbers shown on that sheet.

E. Ensure that all submittals have been reviewed for total completeness and accuracy as to the requirements of the specifications and drawings before being submitted to the Engineer for review. The Contractor's approval stamp is required on all submittals before submittal to the Engineer. Approval will indicate the Contractor's review of all material and a complete understanding of exactly what is to be furnished. Clearly mark all deviations from the contract documents on all submittals. The item shall be required to meet all drawing and specification requirements if deviations are not clearly marked.

1. One comprehensive submittal shall be provided for each individual specification section. All required submittal information called for in each individual specification section shall be included in the submittal. Partial or incomplete submissions will be rejected.
2. The Engineer shall not be responsible for informing the submitter on items that have not been included and are necessary for a complete review of the required submittal information for a specification section.
3. The Engineer shall have the option of returning any submittal, unmarked, if all required documentation called for in the specifications has not been provided in the submittal.
4. The Engineer shall review each submittal no more than two times and return to the submitter with the appropriate disposition.
5. If the Engineer is required to review a submittal a second time, it will be limited to review of the changed information, which must clearly be highlighted by the submitter. The submittal will be returned to the submitter with the appropriate disposition.
6. If the submittal is required to be reviewed a third time, it shall be done at the expense of the submitter. Charges for this additional submittal review will be calculated based on the Engineer's standard hourly rates, as defined in their contract with the Owner.

F. Operation and Maintenance Manuals: All items required for insertion into each Operation and Maintenance (O&M) Manual are called out in the submittals portion of each specification section or in a Submittal Log, if included within Division 01. Ensure that the O&M submittal has been reviewed and includes all the requirements of the specifications. Submit only the data requested under the submittals portion of each specification section. FAX or photo copies are not allowed as submittals for operating and maintenance manuals. The Engineer will review the submittal for the Operation and Maintenance Manual one time and return to the submitter with the appropriate disposition.

1. If the submittal is required to be reviewed a second time, it shall be done at the expense of the submitter. Charges for this additional submittal review will be calculated based on the Engineer's standard hourly rates, as defined in their contract with the Owner.
2. Submittals for the Operation and Maintenance Manual must be original documentation.
3. Photo copies of marked up Operations and Maintenance submittals are not acceptable.

G. Coordination Drawings: Prepare and submit Coordination Drawings as further described herein and as indicated in the Special Conditions. Provide the Engineer with one copy of all coordination drawings supplied to the Owner when required in this specification. Coordinate the work as outlined herein. Receipt by the Engineer of a copy of the coordination drawings is to verify conformance to the submittal requirements set forth in this specification section. It is not an admission by the Engineer as to the accuracy or completeness of the coordination proposed.

H. Refer to Division 01 and each individual Division 26 Section for additional submittal requirements.

1.8 PRODUCT OPTIONS AND MATERIAL SUBSTITUTIONS

A. Where two or more materials are listed in the "Part 2 – Products" subsection of any Division 26 section, do not assume that the selection of materials is an option. Refer to "Part 3 – Execution" subsection of that same specification section for an explanation of which specific material(s) shall be used for which specific application(s). For example, Part 2 may list several types and grades of conductors, and Part 3 will describe which type and grade of conductors to use for a given application.

B. When two or more items of same material or equipment are required they shall be of the same manufacturer. Product manufacturer uniformity does not apply to raw materials, bulk materials, wire, conduit, fittings, sheet metal, steel bar stock, welding rods, solder, fasteners, motors for dissimilar equipment units, and similar items used in Work except as otherwise indicated.

C. Provide products which are compatible within systems and other connected items.

D. Substitutions: Products other than those specified must be submitted, approved and secured in writing from the Engineer via Addendum. If requested, a sample of the proposed substitution must be submitted to the Engineer for evaluation. This sample shall be supplied at no cost to the Engineer, and will be returned to the submitter, at the submitter's expense at the end of the evaluation period.

E. Where several manufacturers' names are given, the manufacturer for which a catalog number is given is the basis of design and establishes the quality required.

F. Any material, article or equipment of other unnamed manufactures which will adequately perform the services and duties imposed by the design and is of a quality equal to or better than the material, article or equipment identified by the drawings and specifications may be used if approval is secured in writing from the Engineer via Addendum. Assume all costs incurred as a result of using the offered material, article or equipment, including the part of other Divisions whose work is affected.

G. Voluntary add or deduct prices for alternate materials may be listed on the bid form. These items will not be used in determining the low bidder. Assume all costs incurred as a result of using the offered material or equipment on his part or on the part of other Divisions whose work is affected.

H. All material substitutions requested after the final Addendum must be listed as voluntary changes on the bid form.

1.9 PRODUCT, DELIVERY, STORAGE, HANDLING AND MAINTENANCE

A. Deliver products to project properly identified with names, model numbers, types, grades, compliance labels and similar information needed for distinct identifications; adequately packaged and protected to prevent damage during shipment, storage and handling. Protect stored equipment and materials from damage.

B. Coordinate deliveries of electrical materials and equipment to minimize construction site congestion. Limit each shipment of materials and equipment to the items and quantities needed for the smooth and efficient flow of installations. Review the site prior to bid for path locations and any required building modifications to allow movement of equipment.

C. Exercise care in transporting and handling to avoid damage to materials. Store materials on the site to prevent damage.

D. Keep all materials clean, dry and free from damaging environments.

1.10 MISCELLANEOUS MATERIALS

A. Miscellaneous Materials Include:

1. Miscellaneous metals for support of electrical materials and equipment.
2. Wood grounds, nailers, blocking, fasteners and anchorage for support of electrical materials and equipment.
3. Concrete bases for equipment.
4. Sealers for sealing around electrical materials and equipment; and for sealing penetrations in floors and walls.
5. Access panels and doors in walls, ceilings, and floors for access to electrical materials and equipment.

1.11 WARRANTIES

A. Refer to the Division 01 “Closeout Procedures” for procedures and submittal requirements for warranties. Refer to individual equipment specifications for warranty requirements.

B. Compile and assemble the warranties specified in Divisions 26 into a separated set of vinyl covered, three-ring binders, tabulated and indexed for easy reference.

C. Provide complete warranty information for each item to include product or equipment, date of beginning of warranty or bond; duration of warranty or bond; and names, addresses, telephone numbers and procedures for filing a claim and obtaining warranty services.

D. Warranty requires correction of all work found to be defective or nonconforming to the Contract Documents, without cost to the Owner. Bear all costs associated with corrective measures and damage due to defects or nonconformance with the Contract Documents, excluding repairs required as a result of improper maintenance or operation, or normal wear and tear as determined by the Engineer.

PART 2 - PRODUCTS

2.1 MISCELLANEOUS LUMBER

A. All lumber shall be fire-treated.

B. Framing Materials: Standard Grade, light-framing-size lumber of any species. Number 3 Common or Standard Grade boards complying with WCLIB or AWPA rules, or Number 3 boards complying with SPIB rules. Lumber shall be preservative-treated in accordance with AWPB LP-2, and kiln-dried to a moisture content of not more than 19 percent.

PART 3 - EXECUTION

3.1 COMMON REQUIREMENTS FOR ELECTRICAL INSTALLATION

A. Comply with NECA 1.

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

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

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

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

F. Jobsite Safety: The Contractor is the sole entity responsible for jobsite safety.

3.2 EXAMINATION

A. Examine substrates, areas, and conditions, with installer present, for compliance with requirements for installation tolerances and other conditions affecting installation and application of sealants and access panels. Do not proceed with installation until unsatisfactory conditions have been corrected.

3.3 ROUGH-IN

A. Verify final locations for rough-ins with field measurements and with the requirements of the actual equipment to be connected.

B. Coordinate equipment rough-in requirements with Divisions 01 through 28.

3.4 ELECTRICAL INSTALLATIONS

A. Coordinate electrical equipment and materials installation with other building components.

B. Verify all dimensions by field measurements.

C. Arrange for chases, slots, and openings in other building components to allow for electrical installations.

D. Coordinate the installation of required supporting devices and sleeves to be set in poured-in-place concrete and other structural components as they are constructed.

E. Sequence, coordinate and integrate installations of electrical materials and equipment for efficient flow of the Work. Give particular attention to large equipment requiring positioning prior to closing-in the building.

F. Coordinate connection of electrical systems with exterior underground and overhead utilities and services. Comply with requirements of governing regulations, franchised service companies, and controlling agencies. Provide required connection for each service.

G. Install systems, materials and equipment to conform to project requirements and approved submittal data, including coordination drawings, to greatest extent possible. Conform to arrangements indicated by the Contract Documents, recognizing that portions of the Work are shown only in diagrammatic form. Where coordination requirements conflict with individual system requirements, refer conflict to the Engineer.

H. Systems, materials and equipment which will be exposed in finished areas shall be installed level and plumb, parallel and perpendicular to other building systems and components.

I. Install electrical services and overhead equipment to provide the maximum headroom possible where mounting heights are not detailed or dimensioned.

J. Install electrical equipment to facilitate maintenance and repair or replacement of equipment components. Maintain code clearances in front of and about all electrical equipment. As much as practical, connect equipment for ease of disconnecting with minimum of interference with other installations.

K. Coordinate the installation of electrical materials and equipment above ceilings with suspension system, mechanical equipment and systems and structural components.

L. Include in the Work all labor, materials, equipment, services, apparatus and drawings (in addition to the Contract Documents) as required to complete the intended Work.

M. Control and interlock wiring shall be installed in a separate raceway and shall not be installed in the same raceway as power conductors.

N. Only new, clean and perfect equipment, apparatus, materials and supplies of latest design and manufacture shall be incorporated in the Work in order to assure an electrical system of high quality.

O. The Work required in order to obtain utility services such as telephone and electric, is delineated in these specifications and on the drawings. Unless otherwise noted, construction or connection charges (except for temporary power) by those companies shall be paid by the Owner.

3.5 CONNECTIONS TO EQUIPMENT AND APPLIANCES

A. In many instances the drawings show an outlet box and power supply for specific equipment, be it Owner- or Contractor-furnished. It is to be understood, unless otherwise noted, that the Work includes a connection from the box to the equipment or appliance. Verify circuit conductor quantities and sizes and overcurrent device number of poles and rating as well as any special grounding requirements, for all Owner-furnished equipment and adjust the required work accordingly.

3.6 CUTTING AND PATCHING

A. General: Perform cutting and patching in accordance with Division 01 Section "Execution." In addition to the requirements specified in Division 01, the following requirements apply:

1. Perform cutting, fitting and patching of electrical equipment and materials required to:

    a. Uncover Work to provide for installation of ill-timed Work.
    b. Remove and replace defective Work.
    c. Remove and replace Work not conforming to requirements of the Contract Documents.
    d. Remove samples of installed Work as specified for testing.
    e. Install equipment and materials in existing structures.
    f. Cut, remove, and legally dispose of selected electrical equipment, components, and materials as indicated, including but not limited to, removal of electrical items indicated to be removed and items made obsolete by the new Work.

2. Coordinate the cutting and patching of building components to accommodate the installation of electrical equipment and materials.

    a. Protect the structure, furnishings, finishes and adjacent materials not indicated or scheduled to be removed.
    b. Provide and maintain temporary partitions or dust barriers adequate to prevent the spread of dust and dirt to adjacent areas.

3.7 CONCRETE BASES

A. Provide concrete bases for all floor-mounted electrical equipment, except that stand alone dry type transformers with integral floor channels may be placed without equipment bases when located in finished areas and electrical closets.

B. Form concrete equipment bases using nominal 2 inch by 4 inch framing lumber (use larger framing if larger pads, such as for engine-generators are required) with form release compounds. Locate as indicated and construct 4 inches larger in both directions than supported unit. Except where otherwise indicated, pour bases 4 inches higher than surrounding slab. Anchor or key to floor slab in accordance with Section 20 0800 "Seismic Protection." Chamfer top edges and corners.

C. Include all concrete materials and workmanship required for the electrical work. Materials and workmanship shall conform to the applicable standards of the Portland cement Association. Reinforce with 6-inch x 6-inch, W1.4-W1.4 welded wire fabric. Concrete shall withstand 3,000 pounds compression per square inch at twenty-eight days.

D. Where the base is less than 12-inches from a wall, the base shall be carried to the wall to prevent a “dirt-trap.”

E. Place concrete and allow to cure before installation of equipment.

3.8 PAINTING

A. Paint all electrical equipment that is marred or damaged prior to the Owner’s acceptance. Paint and color shall match original equipment paint and shall be obtained from the equipment supplier if available. All equipment shall have a finished coat of paint applied unless specifically allowed to be provided with a prime coat only.

3.9 ADJUST AND CLEAN

A. Thoroughly clean all equipment and systems prior to the Owner’s final acceptance of the project.

B. Clean all foreign paint, grease, oil, dirt, labels, stickers, etc., from all equipment.

C. Remove all rubbish, debris, etc., accumulated during construction from the premises.

D. Refer to the Division 01 Section "Closeout Procedures" for general requirements for final cleaning.

3.10 SPECIAL REQUIREMENTS

A. Coordinate the installation of all equipment, controls, devices, etc., with other trades to maintain clear access area for servicing.

B. Install all equipment to maximize access to parts needing service or maintenance. Review the final location, placement and orientation of equipment with the Owner’s representative prior to setting equipment.

C. Include removal and reinstallation of equipment and devices if they were installed without regard to coordination of access requirements and without previous confirmation with the Owner’s representative.

3.11 SYSTEM COMMISSIONING

A. The electrical systems shall be complete and operating. Include system start-up, testing, balancing and satisfactory system performance. This includes all calibration and adjustment of electrical controls, balancing of loads, troubleshooting and verification of software, and final adjustments that may be needed.

B. All operating conditions and control sequences shall be tested during the start-up period. Testing all interlocks, safety shut-downs, controls and alarms.

1. Utilize only skilled technicians to ensure that all systems perform properly. Reimburse the Owner on a time and materials basis for services rendered at the Engineer’s standard hourly rates in effect when the services are requested if the Engineer is requested to visit the job site for troubleshooting, assisting in start-up, obtaining satisfactory equipment operation, resolving installation, workmanship problems, equipment substitution issues or

unsatisfactory system performance, including call backs during the warranty period, through no fault of the design. Pay the Owner for services required that are project-, installation- or workmanship-related. Payment is due within 30 days after services are rendered.

3.12 FIELD QUALITY CONTROL

A. General:

1. All required equipment and systems tests shall be made during and post-Construction as required.
2. All required testing instruments, meters, etc., shall be provided.
3. Technicians operating testing equipment shall be trained in testing procedures.
4. Testing shall confirm that equipment and systems provided by the Contractor have been installed properly.
5. Unsatisfactory test results shall result in revisions or replacement of equipment or settings as required to provide a system capable of meeting test requirements. Tests shall be repeated or additional tests made as necessary to confirm system capability as required by the Owner, Engineer or Authority Having Jurisdiction.

3.13 EXCAVATION, FILL, BACKFILL, COMPACTION, AND RESTORATION

A. General:

1. Prior to any excavation or digging, verify all underground utility locations. Contact all location services with sufficient time allowance for completion of utility location documentation.
2. Unless noted otherwise provide all excavation, fill, backfill, compaction and restoration required for the scope of work.

B. Excavation:

1. Excavations shall be made to proper dimensions and to accurate, solidate and undisturbed earth.
2. Provide all excavations that exceed the depth requirements with concrete of the same characteristics for foundations or compacted sand gravel fill. The type of fill shall be determined by the Engineer.
3. Do not damage surrounding structures, equipment or buried pipe. Do not undermine footing or foundation.
4. Protect all excavations to prevent cave-ins and risk to workmen.
5. Saw-cut pavement or concrete surfaces where required for excavation with clean edges.
6. Notify Engineer if bearing soil is not found to be adequate and halt excavation operation until given direction from the Architect or Engineer.
7. Confirm the soil conditions at their own cost. Excavations shall be conducted as required in the documents.
8. A compacted bed of sand and gravel (minimum of 3 inches deep) shall be provided where trench is excavated in rock.

C. Dewatering:

1. All trenches and pits shall be kept free of accumulation of water. Provide all required equipment.

D. Underground Obstructions:

1. The electrical drawings do not necessarily show all underground piping, conduit, feeders, foundations, and other obstructions in the vicinity of the construction. Review the documents of all Divisions to determine other obstructions. Take applicable precautions in making installations near underground obstructions.
2. If objects not indicated on the drawings are encountered, remove, relocate or perform extra work as indicated by the Engineer.

E. Fill and Backfilling:

1. Furnish all necessary sand and material for backfilling. Waste material and garbage are not acceptable materials.
2. Remove excess excavated earth as directed.
3. Backfill materials shall be suitable for required compaction, clean and free of perishable materials, frozen earth, debris, earth with a high void content, and stones greater than 4 inches in diameter. Water is not permitted to remain in un-backfilled trenches.
4. All trenches and excavations shall be backfilled immediately after completion of conduit installation or forms removal unless otherwise noted.
5. Areas around piers, independent foundations or structures shall have backfilled on all sides to prevent displacement. Fill and backfill shall be spread uniformly.
6. All conduits that are not concrete encased shall be provided with a bed of a minimum of 3 inches depth of compacted sand. Backfill shall be provided with compacted layers above the conduits.
7. Provide sand backfill to grade for all conduits under slabs or paved areas. All other conduits shall have sand backfill to 6 inches above the top of the conduit.
8. Backfill shall be made in layers of sand not exceeding 6 inches in depth.
9. Protect surface to prevent loads from the top of the surface for a minimum of 48 hours after backfilling operation.

F. Surface Restoration:

1. Areas shall be restored to the original condition, including areas that are landscaped. Replace all planting and landscaping features removed or damaged to its original condition. At least 6 inches of topsoil shall be applied where disturbed areas are to be seeded or sodded. All lawn areas shall be sodded unless seeding is called out in the drawings or specifications.
2. Concrete or asphalt type pavement and other surfaces removed or damaged shall be replaced to original condition. Broken edges shall be saw cut and repaired as directed by Architect or Engineer.

3.14 OPERATION AND MAINTENANCE DATA

A. Refer to the Division 01 Section: “Closeout Procedures” for procedures and requirements for preparation and submittal of maintenance manuals.

B. In addition to the information required by Division 01 for Maintenance Data, include the following information:

1. Description of function, normal operating characteristics and limitations, performance curves, engineering data and tests, and complete nomenclature and commercial numbers of all replaceable parts.
2. Manufacturer's printed operating procedures to include start-up, break-in, routine and normal operating instructions, regulation, control, stopping, shut-down, and emergency instructions; and summer and winter operating instructions.
3. Maintenance procedures for routine preventive maintenance and troubleshooting; disassembly, repair, and reassembly; aligning and adjusting instructions.
4. Servicing instructions and lubrication charts and schedules.

C. Submit three (3) properly indexed and bound copies in “D” ring style notebooks, of the Operations and Maintenance Instructions to the Architect or Engineer. Make all corrections or additions required.

D. Operation and Maintenance Instructions shall include:

1. Notebooks shall be heavy duty locking three-ring binders, black in color, and incorporate clear vinyl sheet sleeves on the front cover and spine for slip-in labeling. “Peel and stick” labels are not acceptable. Sheet lifters shall be supplied at the front of each notebook. Size notebooks a minimum of 1/2 inch thicker than the material for future inserts. Label the spine and front cover of each notebook. If more than one notebook is required, label in consecutive order. For example; 1 of 2, 2 of 2. No other forms of binding will be acceptable.
2. Prepare binder covers (front and spine) with printed title “Operation and Maintenance Instructions,” title of project, and subject matter of binder when multiple binders are required.
3. Title page with project title, Architect, Engineer, Contractor, and Subcontractor with addresses, telephone numbers, and contacts.
4. Table of Contents describing all index tabs.
5. Listing of all Subcontractors and major equipment suppliers with addresses, telephone numbers and contacts.
6. Index tabs dividing information by specification section, major equipment, or systems. All tab titles shall be clearly printed under reinforced plastic tabs. Label all equipment to match the identification in the construction documents.
7. Copies of warranties.
8. Copies of all final approved shop drawings and submittals. Copy of power system study and overcurrent protective device settings.
9. Copies of all factory inspections and or equipment start-up reports.
10. Schematic wiring diagrams of the equipment that have been updated for field conditions. Field wiring shall have label numbers to match drawings.
11. Dimensional drawings of equipment.
12. Detailed parts lists, each with a list of suppliers.
13. Operating procedures for each system.
14. Maintenance schedule and procedures. Include a chart listing maintenance requirements and frequency.
15. Repair procedures for major components.
16. Replacement parts and service material requirements for each system and the frequency of service required.

17. Instruction books, cards, and manuals furnished with the equipment.

E. Operation and maintenance data shall consist of written instructions for the care, maintenance, and operation of the equipment and systems. Instruction books, cards, manuals furnished with the equipment shall be included.

F. In addition to the information required by Division 01 for Maintenance Data, include the following information:

1. Description of function, normal operating characteristics and limitations, performance curves, engineering data and tests, and complete nomenclature and commercial numbers of all replaceable parts.
2. Manufacturer's printed operating procedures to include start-up, break-in, routine and normal operating instructions, regulation, control, stopping, shut-down, and emergency instructions; and summer and winter operating instructions.
3. Maintenance procedures for routine preventive maintenance and troubleshooting; disassembly, repair, and reassembly; aligning and adjusting instructions.
4. Servicing instructions and lubrication charts and schedules.

G. Adequately instruct the Owner’s designated representative in the maintenance, care, and operation of the complete systems installed under this contract.

H. Provide verbal and written instructions to the Owner’s representatives by factory personnel in the care, maintenance and operation of the equipment and systems.

I. Make DVD format compact disc of the instructions to the Owner while explaining the system so additional personnel may view the instructions at a later date. The video shall become the property of the Owner.

J. The instructions shall include:

1. Maintenance of equipment.
2. Start-up procedures for all major equipment.
3. Description of emergency system operation.

K. Notify the Engineer of the time and place for the verbal instructions to the Owner’s representative so his representative can be present if desired.

L. Minimum hours of instruction time for each item and/or system shall be as indicted in each individual specification section.

M. Operating Instructions:

1. Include instructions to the Owner’s representatives for the electrical and specialized systems, using factory-authorized technical representatives.

3.15 RECORD DOCUMENTS

A. Prepare record documents in accordance with the requirements in Division 01 Section "Closeout Procedures." In addition to the requirements specified in Division 01, indicate installed conditions for:

1. Raceways of 2-inches and larger, indicating size and location, for both exterior and interior; locations of control devices; distribution and branch electrical circuitry; and fuse and circuit breaker size and arrangements.
2. Equipment locations (exposed and concealed), dimensioned from prominent building lines.
3. Location of every home run point, such as receptacle, lighting fixture, or switch.
4. Approved substitutions, Contract modifications, and actual equipment and materials installed.
5. Mark Drawings to indicate revisions to conduit size and location both exterior and interior; actual equipment locations, dimensioned from column lines; concealed equipment, dimensioned to column lines; distribution and branch electrical circuitry; fuse and circuit breaker size and arrangements; support and hanger details; change orders; concealed control system devices.
6. Mark Specifications to indicate approved substitutions, change orders, actual equipment and materials used.

B. Maintain at the job site a separate and complete set of electrical drawings and specifications with all changes made to the systems clearly and permanently marked in complete detail.

C. Mark Drawings to indicate revisions to conduit size and location both exterior and interior; actual equipment locations, dimensioned from column lines; concealed equipment, dimensioned to column lines; distribution and branch electrical circuitry; fuse and circuit breaker size and arrangements; support and hanger details; Change Orders; concealed control system devices.

D. Mark drawings and specifications to indicate approved substitutions; Change Orders, and actual equipment and materials used. Mark all Change Orders, RFI responses, clarifications, and other supplemental instructions on the documents. Record documents that merely reference the existence of the above items are not acceptable. Reimburse the Engineer for all costs for the Engineer to develop record documents which comply with this requirement if unable to comply with said above requirements. Reimbursement shall be made at the Architect or Engineer's hourly rates in effect at the time of the work.

E. Record changes daily and keep the marked drawings available for the Architect or Engineer's examination at any normal work time.

F. Upon completing the job, and before final payment is made, give the marked-up drawings to the Engineer.

3.16 PROJECT CLOSEOUT

A. The following paragraphs supplement the requirements of Division 01:

B. Final Jobsite Observation:

1. Certify that the project jobsite is ready for the final jobsite observation.
2. Reimburse the Engineer, based on the Engineer's standard hourly rates as defined in their contract with the Owner, for additional time and expenses when additional trips are required because the project jobsite was not ready for final observation and additional trips are required by the Engineer for review of final conditions.
3. Notify the Engineer a minimum of two working days prior to installation of ceiling tiles or lay-in ceilings to allow the Engineer to visit the project site.

C. Submit the following documents to the Architect or Engineer prior to requesting final payment:

1. Operation and maintenance manuals with copies of approved shop drawings.
2. Record documents including electronic AutoCAD or REVIT drawings and specifications.
3. Documentation of completion of all required training of Owner's personnel.
4. Provide spare parts, maintenance and extra materials in quantities specified in individual specification sections.
5. Inspection and testing reports.
6. Start-up reports on all equipment requiring a factory installation or start-up.

END OF SECTION 260500

SECTION 260519 - CONDUCTORS AND CABLES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes the following:

1. Conductors and Cables.
2. Remote Control and Signal Cable.

1.3 SUBMITTALS

A. Submittals for approval by the Engineer are not required for this section. Unrequested submittals will not be processed or reviewed. Non-requirement of submittals is not to be construed as an allowance for substitutions and does not allow relief from full compliance with the contract documents.

1.4 QUALITY ASSURANCE

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

B. Comply with NFPA 70 “National Electrical Code.”

1. Conform to applicable codes and regulations regarding toxicity of combustion products of insulating materials.

C. UL Compliance: Provide components which are listed and labeled by Underwriters Laboratories under the following standards.

1. UL Std. 83 Thermoplastic-Insulated Wires and Cables.
2. UL Std. 486A Wire Connectors and Soldering Lugs for Use with Copper Conductors.

D. NEMA and ICEA Compliance: Provide components which comply with the following standards:

1. WC-70: Power Cables Rated 2,000V or Less for the Distribution of Electrical Energy.

E. IEEE Compliance: Provide components which comply with the following standard.

1. Std. 82: Test procedures for Impulse Voltage Tests on Insulated Conductors.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

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

1. American Insulated Wire Corp.; a Leviton Company.
2. General Cable Corporation.
3. Senator Wire & Cable Company.
4. Southwire Company.
5. Cerro Wire.
6. Superior Essex.
7. Encore Wire Corporation.

B. Copper Conductors: Comply with NEMA WC 70.

C. Conductor Insulation: Comply with NEMA WC 70 for Types THHN-THWN and XHHW.

2.2 CONDUCTORS AND CABLES

A. General: Provide wire and cable suitable for the temperature, conditions and location where installed.

B. Feeders: Copper, 600 volt insulation. Solid for No. 10 AWG and smaller; stranded for No. 8 AWG and larger.

C. Branch Circuits: Copper, 600 volt insulation. Solid for No. 10 AWG and smaller; stranded for No. 8 AWG and larger.

D. Control Circuits: Copper, stranded conductor, 600 volt insulation.

E. Wire for the following specialized systems shall be as shown on drawings or as dictated within these specifications. Where not designated, the systems manufacturer’s recommendations shall be adhered to for the following systems:

1. Electronic Control.

2.3 REMOTE CONTROL AND SIGNAL CABLE

A. Control Cable for Class 1 Remote Control and Signal Circuits: Copper conductor, 600 volt insulation, rated 60 degrees C, individual conductors twisted together, shielded, and covered with a PVC jacket.

B. Control Cable for Class 2 or Class 3 Remote Control and Signal Circuits: Copper conductor, 300 volt insulation, rated 60 degrees C, individual conductors twisted together, shielded, and covered with a PVC jacket; UL listed.

C. Plenum Cable for Class 2 or Class 3 Remote Control and Signal Circuits: Copper conductor, 300 volt insulation, rated 60 degrees C, individual conductors twisted together, shielded and covered with a nonmetallic jacket; UL listed for use in air handling ducts, hollow spaces used as ducts, and plenums.

2.4 CONNECTORS AND SPLICES

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. AFC Cable Systems, Inc.
2. Hubbell Power Systems, Inc.
3. O-Z/Gedney; EGS Electrical Group LLC.
4. 3M; Electrical Products Division.
5. Tyco Electronics Corp.

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

PART 3 - EXECUTION

3.1 CONDUCTOR INSULATION, APPLICATIONS AND WIRING METHODS

A. Class 1 Control Circuits: Install per NEC Article 725.

B. Class 2 Control Circuits: Install per NEC Article 725.

3.2 DEVIATION FROM CONTRACT DRAWINGS

A. Basis of Design is copper conductors installed in raceway, based on 30 degrees C ambient temperature (NEC Table 310.15(B)(16)). If materials or methods selected for installation differ from the basis of design, size conductors and conduits to meet or exceed the ampacity of circuits selected for the basis of design.

3.3 INSTALLATION OF CONDUCTORS AND CABLES

A. Install products in accordance with manufacturer's instructions.

B. 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.

C. Use pulling means including fish tape, cable, rope, and basket weave wire and cable grips which will not damage cables or raceways. Do not use rope hitches for pulling attachment to wire or cable. Do not exceed maximum tensile strength of conductor or grip. Do not exceed maximum sidewall pressure limitations of cables.

D. Pull conductors simultaneously where more than one is being installed in the same raceway.

E. Provide adequate length of conductors within electrical enclosures and train the conductors to terminal points with no excess. Bundle multiple conductors, with conductors larger than Number 10 AWG cabled in individual circuits. Make terminations so there is no more than 1/8 inch of exposed bare conductor at the terminal. Observe NEC 310.15 (B)(2)(a) adjustment factors.

F. Identify and color-code conductors and cables according to Division 26 Section "Identification for Electrical Systems."

3.4 CONNECTIONS AND TERMINATIONS

A. Tighten electrical connectors and terminals, including screws and bolts, in accordance with manufacturer's published torque tightening values. Where manufacturer's torquing requirements are not indicated, tighten connectors and terminals to comply with tightening torques specified in UL 486A.

B. Clean conductor surfaces before installing lugs and connectors.

C. Utilize solderless compression terminals applied with circumferential compression for conductor sizes 8 AWG and larger and crimp in accordance with manufacturer instructions. Indenter compression method may be used for conductor sizes 10 AWG and smaller.

D. Phase Sequence: Connections to phase conductors at electrical equipment shall be made such that the A-B-C conductors, when facing the equipment, are oriented top to bottom, or left to right.

E. Wiring at Outlets: Install conductor at each outlet, with at least 6 inches (150 mm) of slack.

3.5 SPLICES AND TAPS

A. Conductor splices shall be kept to a minimum.

B. Only splice within accessible junction boxes or enclosures.

C. Make splices and taps that are compatible with conductor material and that possess equivalent or better mechanical strength and insulation ratings than unspliced conductors. Splices and taps shall be capable of carrying the full ampacity of the conductors without perceptible temperature rise.

D. Above Grade:

1. Use copper compression connectors applied with circumferential compression for conductor sizes 6 AWG and larger.
2. Use pre-molded insulated tap connectors for copper conductor splices and taps, Number 8 AWG and smaller. Insulate with UL listed insulating cover supplied by same manufacturer as connector.
3. Use insulated spring wire connectors with plastic caps for copper conductor splices and taps, Number 10 AWG and smaller.
4. Tape uninsulated conductors and connectors with electrical tape to 150 percent of insulation rating of conductor, or three layers of tape, whichever is greater.

E. Below Grade:

1. Use specified insulated connectors suitable and approved for below grade wiring connectors. Ensure that conductors do not apply tension to splice.

3.6 FIELD QUALITY CONTROL

A. Inspect wire for physical damage and proper connection.

B. Measure tightness of bolted connections with properly scaled and calibrated torque tool and compare torque measurements with manufacturer's recommended values.

C. Before energizing, test wires and cables for electrical continuity and for short circuits.

D. Remove and replace malfunctioning conductors and retest as specified above.

END OF SECTION 260519

SECTION 260526 - GROUNDING AND BONDING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes solid grounding of electrical systems and equipment. It includes basic requirements for grounding for protection of life, equipment, circuits and systems. Grounding requirements specified in this Section may be supplemented in other sections of these Specifications.

1.3 QUALITY ASSURANCE

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.

C. Listing and Labeling: Provide products specified in this Section that are listed and labeled for the specific purposes by Underwriters Laboratories.

D. 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.

PART 2 - PRODUCTS

2.1 GROUNDING AND BONDING PRODUCTS

A. Products: Of types indicated and of sizes and ratings to comply with NEC. Where types, sizes, ratings and quantities indicated are in excess of NEC requirements, the more stringent requirements and the greater size, rating, and quantity indications govern.

2.2 CONDUCTORS

A. General: Comply with Division 26 Section "Conductors and Cables" for insulated grounding conductors. Conform to NEC Table 8, except as otherwise indicated, for conductor properties, including stranding.

B. Equipment Grounding Conductor: Green insulated; conductor metal shall match branch circuit conductor metal.

C. Grounding Electrode Conductor: Stranded cable.

D. Underground Conductors: Bare, stranded copper except as otherwise indicated.

E. Copper Conductors: Conform to the following:

1. Bonding Cable: 28 kcmil, 14 strands of No. 17 AWG conductor, 1/4 inch (6 mm) in diameter.
2. Bonding Conductor: No. 4 or No. 6 AWG, stranded conductor.
3. 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.
4. Bonding Strap Conductor/Connectors: Soft copper, 0.05 inch thick and 2 inches wide, except as indicated.

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. Bolted Connectors for Conductors and Pipes: Copper or copper alloy, pressure (clamp) type with at least two bolts.

C. Bus-bar Connectors: Mechanical type, cast silicon bronze, solderless compression type wire terminals, and long-barrel, two-bolt connection to ground bus bar.

D. Pressure Connectors: High-conductivity-plated units.

E. Bolted Clamps: Heavy-duty units listed for the application.

F. Exothermic Welded Connections: Provided in kit form and selected for the specific types, sizes, and combinations of conductors and other items to be connected.

G. Compression Connectors: Irreversible compression connectors must be factory filled with oxide inhibitor and fully crimped with a 14-ton or larger hydraulic tool so that index number is embossed on the connector. May be used above or below grade.

2.4 GROUNDING ELECTRODES

A. Ground Rods: Copper-clad steel.

1. Size: 3/4-inch diameter by 10 feet length.

PART 3 - EXECUTION

3.1 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. Route grounding electrode conductors within rigid polyvinyl chloride (PVC) conduit.

C. Seal all exterior wall penetrations airtight.

D. Do not use aluminum conductors in direct contact with earth, concrete, masonry or similar materials.

3.2 GROUNDING ELECTRODES

A. Ground Rods: Provide a minimum of two ground rods separated no less than 20 feet from each other.

1. Drive rods until tops are 2 inches (50 mm) below finished floor or final grade unless otherwise indicated.
2. Interconnect ground rods with grounding electrode conductor below grade and as otherwise indicated. Make connections without exposing steel or damaging coating if any. Utilize exothermic welds where ground rods are not provided within test wells.

3.3 GROUNDING BUS

A. Grounding Bus: Install in electrical and telephone equipment rooms, in rooms housing service equipment and elsewhere as indicated.

1. Install bus 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 to specified height above floor; connect to horizontal bus.

3.4 CONNECTIONS

A. General: Select connectors, hardware and conductors and make connections in such a manner as to minimize possibility of galvanic action or electrolysis.

1. Make connections with clean bare metal at points of contact.
2. Aluminum to steel connections shall be with stainless steel separators and mechanical clamps.
3. Aluminum to galvanized steel connections shall be with tin-plated copper jumpers and mechanical clamps.
4. Coat and seal connections involving dissimilar metals with inert material to prevent future penetration of moisture to contact surfaces.
5. Exothermic Welded Connections or Compression-type Connections: Use for connections to structural steel and for underground connections except those at test wells. Install at connections to ground rods and plate electrodes. Comply with manufacturer's written recommendations. Welds that are puffed up or that show convex surfaces indicating improper cleaning are not acceptable. Compression connections should be inspected for visible die index number matching the die and connector used. Connections that do not show this are not acceptable.

B. Conductor Terminations and Connections:

1. Pipe and Equipment Grounding Conductor Terminations: Bolted connectors.
2. Underground Connections: Exothermic-welded or compression-type connectors except at test wells and as otherwise indicated.
3. Connections to Ground Rods at Test Wells: Bolted connectors.

4. Connections to Structural Steel: Exothermic-welded or compression-type ground stud connector.

C. Equipment Grounding Conductors: Terminate insulated equipment grounding conductors for feeders and branch circuits with pressure-type grounding lugs.

D. Metallic Raceway Continuity: Where metallic raceways terminate at metallic housings without mechanical and electrical connection to the housing, terminate each conduit with a grounding bushing. Connect grounding bushings with a bare grounding conductor to the ground bus in the housing. Bond electrically non-continuous conduits at both entrances and exits with grounding bushings and bare grounding conductors.

E. Tighten grounding and bonding connectors and terminals, including screws and bolts, in accordance with manufacturer's published torque tightening values for connectors and bolts. Where manufacturer's torquing requirements are not indicated, tighten connections to comply with torque tightening values specified in UL 486A.

F. Compression-Type Connections: Use hydraulic compression tools of at least 14-ton size to provide the correct circumferential pressure for compression connectors. Use tools and dies recommended by the manufacturer of the connectors. Provide embossing die code or other standard method to make a visible indication that a connector has been adequately compressed on the ground conductor.

END OF SECTION 260526

SECTION 260533 - RACEWAYS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes the following raceways electrical wiring:

1. Metallic Conduit and Tubing.
2. Non-Metallic Conduit and Tubing.
3. Metal Wireways.
4. Non-Metallic Wireways.

1.3 QUALITY ASSURANCE

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

B. Comply with NFPA 70 "National Electrical Code" for components and installation.

C. Comply with NECA "Standard of Installation."

D. Listing and Labeling: Provide products specified in this Section that are listed and labeled by Underwriters Laboratories for the specific purpose and comply with the following standards:

1. ANSI C80.1 - Rigid Steel Conduit, Zinc Coated.
2. ANSI C80.3 - Electrical Metallic Tubing, Zinc Coated.
3. ANSI/NEMA FB 1 - Fittings, Cast Metal Boxes, and Conduit Bodies for Conduit and Cable Assemblies.
4. ANSI C80.5 – Aluminum Rigid Conduit.
5. ANSI C80.6 – Intermediate Metal Conduit, Zinc Coated.
6. ANSI/NFPA 70 - National Electrical Code.
7. ANSI/NEMA FB 1 – Fittings, Cast Metal Boxes, and Conduit Bodies for Conduit, Electrical Metallic Tubing and Cable.
8. NECA "Standard of Installation."
9. NEMA RN 1 - Polyvinyl Chloride (PVC) Externally Coated Galvanized Rigid Steel Conduit and Intermediate Metal Conduit.
10. NEMA TC 2 - Electrical Plastic Tubing (EPT) and Conduit (EPC-40 and EPC-80).
11. NEMA TC 3 - PVC Fittings for Use with Rigid PVC Conduit and Tubing.
12. NEMA TC 6 - PVC and ABS Plastic Utilities Duct for Underground Installation.
13. NEMA TC 9 – Fittings for PVC Plastic Utilities Duct for Underground Installation.

PART 2 - PRODUCTS

2.1 GENERAL REQUIREMENTS

A. Provide conduit, tubing and fittings of types, grades, sizes and weights (wall thicknesses) for each service indicated. Where types and grades are not indicated, provide proper selection determined by installer to fulfill wiring requirements, and comply with applicable portions of NFPA 70 for raceways.

B. Bushings: Bushings for terminating conduits smaller than 1-1/4 inches are to have flared bottom and ribbed sides, with smooth upper edges to prevent injury to cable insulation. Install insulated type bushings for terminating conduits 1-1/4 inches and larger. Upper edge to have phenolic insulating ring molded into bushing. Bushings to have screw type grounding terminal.

C. Raintight Sealing Hubs: Two piece type with outer internally-threaded hub to receive conduit, inner locking ring with bonding screw, insulated throat, and V-shaped ring or O-ring.

2.2 METAL CONDUIT AND TUBING

A. Rigid Steel (Metallic) Conduit:

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

    a. Allied Tube & Conduit.
    b. LTV Steel Tubular Products Company.
    c. O-Z Gedney.
    d. Wheatland Tube Company.

2. Description: Conduit to be seamless, hot dipped galvanized rigid steel. Threads to be cut and ends chamfered prior to galvanizing. Galvanizing to provide zinc coating fused to inside and outside walls of conduit. Provide an enamel lubricating coating on the inside of the conduit. Conduit to conform to ANSI C80.1 and listed and labeled under UL 6.
3. Fittings and Conduit Bodies: NEMA FB 1, single piece threaded, cadmium plated malleable iron.
4. Joint Compound: Listed for use in cable connector assemblies, and compounded for use to lubricate and protect threaded raceway joints from corrosion and enhance their conductivity.

B. Intermediate Metal Conduit:

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

    a. Allied Tube & Conduit.
    b. Republic Conduit.
    c. Wheatland Tube Company.

2. Description: Conduit to be seamless, hot dipped galvanized rigid steel. Threads to be cut and ends chamfered prior to galvanizing. Galvanizing to provide zinc coating fused to

outside walls of conduit. Provide an enamel lubricating coating on the inside of the conduit. Conduit to be listed and labeled under UL 1242.

3. Fittings and Conduit Bodies: NEMA FB 1, single piece threaded, cadmium plated malleable iron.
4. Joint Compound: Listed for use in cable connector assemblies, and compounded for use to lubricate and protect threaded raceway joints from corrosion and enhance their conductivity.

C. PVC-Coated Steel Conduit: PVC-coated rigid steel conduit.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following: Thomas & Betts Ocal or equivalent.
2. Comply with NEMA RN 1, ANSI C80.1, UL6.
3. Coating Thickness: 0.040 inch (1 mm), minimum. The external zinc coating shall not be disturbed prior to application of PVC.
4. Both the PVC and zinc coating alone shall meet minimum requirement to be listed as a Primary Protective Coating per UL6.
5. Fittings and Conduit Bodies: Minimum thickness, 0.040 inch (1 mm), with overlapping sleeves protecting threaded joints. All fitting and conduit bodies used in a wet or wash-down application shall be NEMA 4X rated.

D. Electrical Metallic Tubing:

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

    a. Allied Tube & Conduit.
    b. Republic Conduit.
    c. Wheatland Tube Company.

2. Description: Conduit to be seamless, hot dipped or electro-galvanized steel tubing. Galvanizing to provide zinc coating fused to outside walls of conduit. Provide an enamel lubricating coating on the inside of the conduit. Conduit to conform to ANSI C80.3 - 1983 and listed and labeled under UL 797.
3. Fittings and Conduit Bodies: Compression or steel set screw.
4. Expansion fittings for use with EMT shall allow for a minimum of four inches of movement and shall be similar to O-Z Gedney TX series, complete with bonding jumpers and hardware.

E. Flexible Metal Conduit: Zinc-coated steel Aluminum.

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

    a. AFC Cable Systems.
    b. Alflex Inc.
    c. Electri-Flex Co.

2. Description: Interlocked steel or aluminum construction, consisting of spirally wrapped, convoluted hot dip galvanized steel strip. Zinc coating to cover both sides and all edges

of steel strip. Convolutions to be interlocked to prevent separation when conduit is bent at radius equal to 4-1/2 times conduit O.D. Conduit to be listed and labeled under UL 1.

3. Fittings: ANSI/NEMA FB 1 -1988. Threadless hinged clamp type, galvanized zinc coated cadmium plated malleable cast iron.

F. Liquidtight Flexible Metal Conduit:

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

   a. AFC Cable Systems.
   b. Alflex Inc.
   c. Electri-Flex Co.

2. Description: Flexible steel conduit with PVC jacket, listed and labeled under UL 360
3. Fittings: and Conduit Bodies: Watertight, compression type, galvanized zinc coated cadmium plated malleable cast iron. Conduit to be listed and labeled under UL 360.

2.3 NONMETALLIC CONDUIT AND TUBING

A. Rigid Non-Metallic Conduit:

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

   a. Cantex.
   b. J.M. Manufacturing.
   c. Allied Tube & Conduit.
   d. Lamson & Sessions; Carlon Electrical Products.

2. Description: Conduit to be PVC, Schedule 40 or Schedule 80 as indicated, rated for use with 90 degrees C conductors and suited for direct burial and above ground use in direct sunlight, whether encased in concrete or not. Conduit to conform to latest edition of ASTM F512, NEMA TC-2, and be listed and labeled under UL 651.
3. Fittings and Conduit Bodies: Manufactured per NEMA TC-3 and UL 651 listed to match conduit, type and material. Expansion fittings shall allow for six inch movement, and shall be similar to Carlon E945 series. Patch and seal all joints, nicks, and scrapes in PVC coating after installing conduits and fittings. Use sealant recommended by fitting manufacturer.

B. Reinforced Thermosetting Resin Conduit (fiberglass)

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

   a. Champion Fiberglass.
   b. FRE Composites.
   c. United Fiberglass.

2. Description: Conduit shall comply with UL 2420 Below Ground standard, UL 2515 Above Ground standard and NEMA TC 14.

3. Fittings, adaptors and elbows shall be manufactured from the same materials and shall meet the same standards as the conduit.

2.4 METAL WIREWAYS

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

1. Cooper B-Line, Inc.
2. Hoffman.
3. Square D; Schneider Electric.

B. Description: Sheet metal sized and shaped as indicated, NEMA 250, Type 1, 12, or 3R as environmental conditions dictate, unless otherwise indicated.

C. Material: Primed and painted sheet steel for indoor locations, galvanized sheet steel for outdoor locations sized as indicated or required, whichever is greater.

1. Wireway up to 6 inch by 6 inch cross section shall be minimum 16 gage.
2. Wireway larger than 6 inch by 6 inch cross section shall be minimum 14 gage.

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

E. Wireway Covers: Screw-cover type. Utilize flanged-and-gasketed type for outdoor locations.

F. Finish: Manufacturer's standard gray enamel finish.

2.5 NONMETALLIC WIREWAYS

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

1. Cooper B-Line, Inc.
2. Hoffman.
3. Lamson & Sessions; Carlon Electrical Products.

B. Indoor Application Description: PVC plastic, extruded and fabricated to size and shape indicated, with snap-on cover and mechanically coupled connections with plastic fasteners.

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

PART 3 - EXECUTION

3.1 METALLIC AND NON-METALLIC CONDUIT APPLICATION

A. The following schedule shall be followed for all installations, unless it creates a violation of applicable codes or is otherwise specifically dictated otherwise within the drawings.

1. Outdoor Locations Above Grade (Including Roofs): RMC
2. Indoor Locations:

    a. Exposed, not subject to physical damage, or above 7 feet-0 inches of finished floor: RMC, IMC or EMT.
    b. Exposed, subject to physical damage, or within 7 feet-0 inches of finished floor: RMC, IMC.
    c. Finished spaces, concealed above suspended ceilings and interior walls and partitions: EMT.
    d. Wet or Damp Locations: RMC or IMC.

3. Connections to vibrating equipment: FMC, except use LFMC in wet or damp locations.
4. Power Circuits Operating above 60Hz: RNC.

B. Conduit Size:

1. Conduits shall be sized as shown on drawings. Where conduit sizes are not indicated, conduits shall be sized in accordance with the latest version of the National Electrical Code (NFPA 70) and shall be limited to a 40 percent conductor fill percentage. Conductor ampacities must be maintained; therefore adjustment factors for temperature and quantity derating values must be observed.

    a. Minimum Conduit Size: Unless otherwise noted, 3/4-inch (21-mm) trade size with the following exceptions:

        1) Switchlegs, Luminaire Whips and Control Wiring: 1/2-inch.
        2) Below Grade: 1-inch.

    b. Conduit sizes may change only at the entrance or exit of a junction box.

3.2 METALLIC AND NON-METALLIC CONDUIT INSTALLATION

A. General Installation Requirements

1. Conduits shall be mechanically and electrically continuous from source of current to all outlets unless a properly sizes grounding conductor is routed within the conduit. All metallic conduits shall be bonded per NFPA 70.
2. Do not reduce the indicated sizes of raceways. Conduit sizes may only change junction and pull boxes.
3. Complete raceway installation before starting conductor installation.
4. Use temporary closures to prevent foreign matter from entering raceway.
5. Avoid moisture traps; provide junction box with drain fitting at low points in raceway system.
6. Install pull wires in empty raceways. Use polypropylene or monofilament plastic line with not less than 200-lb (90-kg) tensile strength. Leave at least 12 inches (300 mm) of slack at each end of pull wire. Empty raceways shall be labeled at each end indicating origin of the raceway. Labels shall be self-adhesive vinyl labels.

B. Conduit Routing:

1. Conduit shall be concealed in walls and above ceilings within finished spaces and may be exposed within unfinished spaces (such as mechanical and utility areas) where conditions dictate and as practical. Where routed exposed, headroom shall be maintained for pedestrian and vehicular traffic.
2. Raceway routing proposed on Drawings is diagrammatic in nature and shown in approximate locations unless dimensioned. Coordinate conduit routing with beams, joists, columns, windows, etc., as required to complete wiring system. Verify field measurements, routing and termination locations of raceway with obstructions and other trades prior to rough-in.
3. Conduit installation shall be coordinated with all other systems on the project. The Construction Team shall exchange details of their work in order to ensure adequate and coordinated fit of all systems within ceiling spaces and exposed unfinished areas.
4. Run concealed raceways with a minimum of bends in the shortest practical distance considering the type of building construction and obstructions, except as otherwise indicated.
5. Route exposed conduit and conduits above ceilings parallel and perpendicular to building structural lines, and as close to building structure as possible.
6. Raceways are not to cross pipe shafts or ventilating duct openings, nor are they to pass through HVAC ducts. Support riser raceway at each floor level with clamp hangers. Maintain adequate clearance between raceway and piping.
7. Coordinate layout and installation of conduit with other construction elements to ensure adequate headroom, working clearance and access.
8. Route conduit through roof openings provided for piping and ductwork or rooftop unit curbs where possible. Where unavoidable, route conduit through suitable roof jack with pitch pocket. Coordinate roof penetrations with other trades.
9. 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.
10. Do not install aluminum conduits in contact with concrete.
11. Raceways routed under-slab on grade must be a minimum of 12 inches below the concrete slab.

C. Conduit Supports:

1. Install raceways level and square and at proper elevations. Provide adequate headroom. Group related conduits; support using conduit rack. Construct rack using steel channel. All conduit supports shall be secured to walls, structural members, slabs and bar joists. Do not support conduits from non-structural members, such as ductwork, water or fire suppression piping, or ceiling grid support system.
2. Run parallel or banked raceways together, on common support racks where practical and make bends from same center line to make bends parallel. Use factory elbows only where they can be installed parallel; otherwise, provide field bends for parallel raceways. Provide space within each rack for 20 percent additional conduits.
3. Support raceways as specified.

D. Conduit Fittings and Terminations:

1. 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.
2. Raceway Terminations at Locations Subject to Moisture or Vibration: Use insulating bushings to protect conductors, including conductors smaller than No. 4 AWG.

3. Install raceway sealing fittings according to the manufacturer's written instructions. Locate fittings at suitable, approved, accessible locations and fill them with UL-listed sealing compound. For concealed raceways, install each fitting in a flush steel box with a blank coverplate having a finish similar to that of adjacent plates or surfaces. Install raceway sealing fittings where conduits enter or leave hazardous locations, where conduits pass from warm locations to cold locations, such as the boundaries of refrigerated spaces, such as kitchen cold boxes, air-conditioned spaces and other places indicated on the drawings or required by NFPA 70.
4. Flexible Connections: Use maximum of 6 feet of flexible metal conduit for recessed and semi-recessed lighting fixtures; for equipment subject to vibration, noise transmission, or movement and for all motors. Use Liquidtight flexible metal conduit in wet or damp locations. Install ground conductor across flexible connections.
5. PVC Externally Coated Rigid Steel Conduit: Use only fittings approved for use with that material. Patch all nicks and scrapes in PVC coating after installing conduit. All installations shall be completed by a factory certified installer.
6. Avoid use of dissimilar metals throughout system to eliminate possibility of electrolysis. Where dissimilar metals are in contact, coat surfaces with corrosion inhibiting compound before assembling.

E. Conduit Bends:

1. Install no more than the equivalent of three 90-degree bends in any conduit run except for communications conduits, for which fewer bends are allowed.
2. Make bends and offsets so the inside diameter is not reduced. Unless otherwise indicated, keep the legs of a bend in the same plane and the straight legs of offsets parallel.
3. Use conduit bodies to make sharp changes in direction, as around beams. Use hydraulic one-shot bender when field-fabricated elbows are required for bends in metal conduit larger than 2 inch size.
4. Stub-Up Connections: Use type of conduit described for stub-ups from slab. Extend conduit through concrete floor for connection to freestanding equipment to a distance 6-inches above the floor. Arrange stub-ups so curved portions of bends are not visible above the finished slab.

3.3 WIREWAY INSTALLATION

A. Wireway shall be securely fastened to walls using steel channels. Mount plumb and level.

B. Raintight wireways may only be installed in horizontal orientations.

3.4 PROTECTION

A. Provide final protection and maintain conditions that ensure coatings, finishes, and cabinets are without damage or deterioration at time of Substantial Completion.

1. Repair damage to galvanized finishes with zinc-rich paint recommended by manufacturer.
2. Repair damage to PVC or paint finishes with matching touchup coating recommended by manufacturer.

3.5 CLEANING

A. Upon completion of installation of system, including outlet fittings and devices, inspect exposed finish. Remove burrs, dirt, and construction debris and repair damaged finish, including chips, scratches and abrasions.

3.6 MARKING AND IDENTIFICATION

A. Mark and identify conduits in accordance with Section 260553 “Identification for Electrical Systems.”

B. Mark and identify communications conduits.

3.7 RECORD DOCUMENTS

A. Accurately record actual routing of all feeder and sub-feeder conduits regardless of size and branch circuits conduits larger than 2-inches.

END OF SECTION 260533

SECTION 260534 – BOXES, CABINETS AND ENCLOSURES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

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

1.3 SUBMITTALS

A. Submittals for approval by the Engineer are not required for this section. Unrequested submittals will not be processed or reviewed. Non-requirement of submittals is not to be construed as an allowance for substitutions and does not allow relief from full compliance with the contract documents.

1.4 QUALITY ASSURANCE

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

B. Comply with the following standards:

1. NECA "Standard of Installation."
2. NEMA OS 1: Sheet-Steel Outlet Boxes, Device Boxes, Covers and Box Supports.
3. NEMA OS 2: Non-Metallic Outlet Boxes, Device Boxes, Covers and Box Supports.
4. NEMA FB 1: Fittings, Cast Metal Boxes, and Conduit Bodies for Conduit, Electrical Metallic Tubing and Cable.
5. NEMA 250: Enclosures for Electrical Equipment (1000 Volts Maximum).

PART 2 - PRODUCTS

2.1 JUNCTION AND PULL BOXES

A. Small Sheet Metal Pull and Junction Boxes: Comply with NEMA OS 1, galvanized steel. Flush-mounted boxes shall have an overlapping cover.

B. Cast-Metal Access, Pull, and Junction Boxes: Comply with NEMA FB 1, galvanized, cast iron or aluminum with gasketed cover.

C. Covers: Covers shall be the same material as the box. Covers shall be on the largest access side of the box, unless otherwise indicated.

1. Less than 12 inches in any dimension: Screw-on cover.
2. Greater than 12 inches in any dimension: Hinged cover.

D. Hinged-Cover Enclosures: Comply with NEMA 250, Type 1 with continuous-hinge cover with flush latch, unless otherwise indicated.

1. Metal Enclosures: Steel, finished inside and out with manufacturer's standard enamel.
2. Nonmetallic Enclosures: Plastic finished inside with radio-frequency-resistant paint.

2.2 CABINETS AND ENCLOSURES

A. Comply with NEMA 250, Type 1, galvanized-steel box with removable interior panel and removable front, finished inside and out with manufacturer's standard enamel.

B. Provide metal barriers to separate wiring of different systems and voltage.

C. Hinged Cover: Hinged door in front cover with flush latch and concealed hinge.

D. Where lockable cabinets are provided, key latch to match panelboards.

E. Provide accessory feet where required for freestanding equipment.

PART 3 - EXECUTION

3.1 BOX AND CABINET INSTALLATION

A. General Installation Requirements:

1. Electrical boxes are shown on drawings in approximate locations unless dimensioned.
2. Provide boxes as shown and for splices, taps, wire pulling, equipment and fixture connections and where required by applicable codes and installation practices.
3. Locate boxes to maintain headroom and present a neat appearance. Locate to allow proper access. Provide access doors for boxes located above inaccessible ceilings.
4. Provide knockout closures to cap unused knockout holes where blanks have been removed.
5. Support all boxes, cabinets and enclosures rigidly and independently of conduit except where specifically allowed by the National Electrical Code. Use supports suitable for the purpose.
6. Boxes located outdoors above ground shall be raintight and gasketed cast aluminum.
7. Provide covers for all boxes.
8. Do not install boxes back-to-back in same wall. Provide at least 6 inch separation or greater where required by the building code. In hollow fire walls, maintain minimum 24 inch horizontal separation between outlets on opposite sides. As an alternate to the 24 inch separation, the use of listed putty pads or other listed materials and methods approved by the Authority Having Jurisdiction are acceptable.

B. Pull and Junction Boxes:

1. Locate above accessible ceilings or in unfinished areas.
2. Locate pull or junction boxes to limit conduit runs to no more than 150 linear feet of four (4) 90 degree bends between pulling points. For telephone/ data limit bends to no more than three (3) 90 degree bends to pulling points.

C. Cabinets and Enclosures:

1. Install hinged cover enclosures and cabinets plumb. At a minimum, support at each corner.
2. Provide knockout closures to cap unused knockout holes where blanks have been removed.

3.2 PROTECTION

A. Provide final protection and maintain conditions that ensure coatings, finishes, and cabinets are without damage or deterioration at time of Substantial Completion.

3.3 CLEANING

A. Upon completion of installation of system, including outlet fittings and devices, inspect exposed finish. Remove burrs, dirt, and construction debris and repair damaged finish, including chips, scratches, and abrasions.

3.4 MARKING AND IDENTIFICATION

A. Mark and identify boxes, cabinets and enclosures in accordance with Section 260553 “Identification for Electrical Systems.”

END OF SECTION 260534

SECTION 260553 - IDENTIFICATION FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:

1. Identification for medium voltage systems.
2. Identification for wires, cables and conductors.
3. Warning labels and signs.
4. Instruction signs.

1.3 QUALITY ASSURANCE

A. Comply with the following standards:

1. ANSI A13.1 and IEEE C2.
2. NFPA 70.
3. 29 CFR 1910.144 and 29 CFR 1910.145.
4. ANSI Z535.4 for safety signs and labels.

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

1.4 COORDINATION

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

B. Coordinate installation of identifying devices with completion of covering and painting of surfaces where devices are to be applied.

C. Coordinate installation of identifying devices with location of access panels and doors.

D. Install identifying devices before installing acoustical ceilings and similar concealment.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

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

1. Electromark - Wolcott, New York.

2. Ideal Industries, Inc.
3. 3M.
4. Panduit Corp.
5. Seton Name Plate Co.
6. Thomas & Betts.
7. W. H. Brady, Co. - Signmark Division - Milwaukee, Wisconsin.

2.2 ELECTRICAL IDENTIFICATION PRODUCTS

A. Self-Adhesive Vinyl Labels (Raceways and Boxes): Preprinted, flexible label laminated with a clear, weather- and chemical-resistant coating and matching wraparound adhesive tape for securing ends of legend label.

B. Self-Adhesive Vinyl Tape for Banding (Raceway, Wire and Cable): Colored, heavy duty, waterproof, fade resistant; 2 inches wide.

C. Self-Adhesive Tape Markers (Wire and Cable): Vinyl or vinyl-cloth, self-adhesive, wraparound, cable and conductor markers with preprinted numbers and letters.

D. Metal Tags: Brass or aluminum, 2 by 2 by 0.05 inch (50 by 50 by 1.3 mm), with stamped legend, punched for use with self-locking cable tie fastener.

E. Write-On Tags: Polyester tag, 0.015 inch (0.38 mm) thick, with corrosion-resistant grommet and cable tie for attachment to conductor or cable.

1. Marker for Tags: Machine-printed, permanent, waterproof, black ink marker recommended by printer manufacturer.

F. Snap-Around, Color-Coding Bands (Raceways and Cables): Slit, pre-tensioned, flexible, solid-colored acrylic sleeve, 2 inches (50 mm) long, with diameter sized to suit diameter of raceway or cable it identifies and to stay in place by gripping action.

G. Colored Adhesive Marking Tape (Raceways, Wires, and Cables): Self-adhesive plastic-coated cloth tape similar to Brady 441XX or 442XX series.

H. Conductor Identification Products:

1. Color-Coding Conductor Tape: Colored, self-adhesive vinyl tape not less than 3 mils (0.08 mm) thick by 1 to 2 inches (25 to 50 mm) wide.
2. Marker Tapes: Vinyl or vinyl-cloth, self-adhesive wraparound type, with circuit identification legend machine printed by thermal transfer or equivalent process.

2.3 WARNING LABELS AND SIGNS

A. Comply with NFPA 70 and 29 CFR 1910.145.

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

C. Baked-Enamel Warning Signs: Preprinted aluminum signs, punched or drilled for fasteners, with colors, legend, and size required for application with 1/4-inch (6.4-mm) grommets in corners for mounting, nominal 7 by 10 inches in size unless noted otherwise.

D. Metal-Backed, Butyrate Warning Signs: Weather-resistant, non-fading, preprinted, cellulose-acetate butyrate signs with 0.0396-inch (1-mm) galvanized-steel backing; and with colors, legend, and size required for application. Provide 1/4-inch (6.4-mm) grommets in corners for mounting, nominal 10 by 14 inches in size unless noted otherwise.

E. Plasticized Card Stock Tags: Vinyl cloth with preprinted and field-printed legends to suit the application. Orange background, except as otherwise indicated, with eyelet for fastener.

F. Engraved, Plastic-Laminated Labels, Signs, and Instruction Plates: Engraving stock melamine plastic laminate, 1/16-inch minimum thick for signs up to 20 square inches, or 8 inches in length; 1/8-inch thick for larger sizes. Engraved legend in black letters on white face and punched for mechanical fasteners.

2.4 EQUIPMENT IDENTIFICATION LABELS

A. Engraved, Laminated Acrylic or Melamine Label: Punched or drilled for screw mounting. White letters on a dark-gray background. Labels shall be at least 2-1/4 inches high. Where space does not permit this label size, smaller stock and lettering is permitted.

2.5 CABLE TIES

A. Cable Ties: Fungus-inert, self-extinguishing, nylon one-piece, self-locking cable ties, 0.18-inch minimum width, 50-lb minimum tensile strength, and suitable for a minimum temperature range from minus 50 degrees F to 350 degrees F. Provide ties in specified colors when used for color-coding.

B. Identification Cable Ties: Same as "Cable Ties" above, except with integral tab of suitable size for marking requirements.

PART 3 - EXECUTION

3.1 INSTALLATION

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

B. Location: Install identification materials and devices at locations for most convenient viewing without interference with operation and maintenance of equipment. Increase size of labels and letters to those appropriate for viewing from the floor for elevated components.

C. Lettering and Graphics: Coordinate names, abbreviations, colors and other designations used in electrical identification work with corresponding designations specified or indicated. Install numbers, lettering and colors as required by code.

D. Install identification devices in accordance with manufacturer's written instructions and requirements of NEC.

E. Clean and degrease surfaces prior to applying identification products. Apply identification to surfaces that require finish after finish work is completed. Utilize primer for metal surfaces, heavy-duty acrylic resin block filler for concrete masonry, and clear alkali-resistant alkyd binder-type sealer for concrete surfaces.

F. Attach signs and plastic labels that are not self-adhesive type with mechanical fasteners appropriate to the location and substrate.

G. System Identification Color-Coding Bands for Raceways and Cables: Each color-coding band shall completely encircle cable or conduit. Place adjacent bands of two-color markings in contact, side by side. Locate bands at changes in direction, at penetrations of walls and floors, at 50-foot (15-m) maximum intervals in straight runs, and at 25-foot (7.6-m) maximum intervals in congested areas.

H. Aluminum Wraparound Marker Labels and Metal Tags: Secure tight to surface of conductor or cable at a location with high visibility and accessibility.

I. Cable Ties: For attaching tags. Use general-purpose type, except as listed below:

1. Outdoors: UV-stabilized nylon.

3.2 LABEL COLOR CODE LEGEND

A. Provide the following color-coding scheme for each label based on the power system it is identifying:

1. Normal Power: Black letters on white background.

3.3 MEDIUM VOLTAGE IDENTIFICATION

A. Medium Voltage Power Circuit Identification: Securely fasten identifying metal tags or aluminum wraparound marker bands to cables, feeders and power circuits in vaults, pull boxes, junction boxes, manholes, and switchboard rooms with 1/4 inch steel letter and number stamps with legend to correspond with designations on Drawings. If metal tags are provided, attach them with approximately 55-pound test monofilament line or one-piece self-locking nylon cable ties.

3.4 CONDUCTOR COLOR CODING

A. Power-Circuit Conductor Identification, 600 V or Less: For conductors in vaults, pull and junction boxes, panelboards, manholes, handholes, switches, etc., use color-coding conductor tape to identify the phase.

1. Color-Coding for Conductors rated 600 V or Less: Use colors listed below for all conductors.

a. Color shall be factory-applied, or field-applied for sizes larger than No. 6 AWG, if Authorities Having Jurisdiction permit

1) Field-Applied, Color-Coding Conductor Tape: Apply in half-lapped turns for a minimum distance of 6 inches (150 mm) from terminal points and in

boxes where splices or taps are made. Apply last two turns of tape with no tension to prevent possible unwinding. Locate bands to avoid obscuring factory cable markings.

b. Colors for 208/120V Circuits:

1) Phase A: Black.
2) Phase B: Red.
3) Phase C: Blue.
4) Neutral: White.
5) Ground Bond: Green.

c. Colors for 480/277V Circuits:

1) Phase A: Brown.
2) Phase B: Orange.
3) Phase C: Yellow.
4) Neutral: Gray.
5) Ground Bond: Green.

B. Auxiliary Electrical Systems Conductor Identification: Identify field-installed alarm, control and signal connections.

1. Identify conductors, cables and terminals in enclosures and at junctions, terminals and pull points. Identify by system and circuit designation.
2. Use system of marker tape designations that is uniform and consistent with system used by manufacturer for factory-installed connections.
3. Coordinate identification with Project Drawings, manufacturer's wiring diagrams, and the Operation and Maintenance Manual.

END OF SECTION 260553

SECTION 260600 - ELECTRICAL DEMOLITION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:

1. Electrical coordination, materials and methods for electrical demolition associated with remodeling of an existing area or facility for re-use.

1.3 SELECTIVE DEMOLITION

A. This Section includes limited scope general construction materials and methods for application with electrical installations as follows:

B. Selective demolition including:

1. Nondestructive removal of materials and equipment for reuse or salvage as indicated.
2. Dismantling electrical materials and equipment made obsolete by these installations.
3. Miscellaneous metals for support of electrical materials and equipment required to remain.

1.4 PROJECT CONDITIONS

A. Conditions Affecting Selective Demolition: The following project conditions apply:

1. Protect adjacent materials indicated to remain. Install and maintain dust and noise barriers to keep dirt, dust and noise from being transmitted to adjacent areas. Remove protection and barriers after demolition operations are complete.
2. Locate, identify and protect electrical services passing through demolition area and serving other areas outside the demolition limits. Maintain services to areas outside demolition limits. When services must be interrupted, install temporary services for affected areas.
3. Maintain and protect existing building services that transit the area affected by selective demolition.

1.5 SEQUENCE AND SCHEDULING

A. Coordinate the shut-off and disconnection of electrical with the Owner and the utility companies. Coordinate any electrical outages required for service switchovers or connections with the Owner a minimum of 2 weeks prior to the interruption. Comply with Owner's specific requirements for partial or complete outage requests.

B. All work that produces excessive noise and/or interference with normal building operations, as indicated on the drawings, shall be coordinated and scheduled with the Owner.

C. Assume that all required re-connection of existing systems or equipment not indicated for demolition must remain operational unless otherwise noted. Provide temporary connections to maintain electrical services and systems serving adjacent areas during required outages.

D. Maintain existing electrical service, electrical distribution, equipment in operation until the new electrical service or distribution equipment is energized, tested and accepted.

1.6 DRAWINGS AND SPECIFICATIONS

A. The electrical drawings are diagrammatic and the drawings indicate the general layout of the electrical systems. Field verification of scale dimensions on plans is directed since actual locations, distance and levels will be governed by actual field conditions.

PART 2 - PRODUCTS

2.1 MATERIALS AND METHODS

A. Materials and methods required for removing, patching, connections, etc., shall be as specified in the associated specification sections.

PART 3 - EXECUTION

3.1 COMMON REQUIREMENTS FOR ELECTRICAL DEMOLITION

A. Comply with NECA 1.

3.2 EXAMINATION AND COORDINATION

A. Examine substrates, areas and conditions with Installer present for compliance with requirements for conditions affecting demolition.

B. Coordinate the demolition scope of work with the Owner and other Contractors to confirm that all required electrical demolition is addressed and scheduled to avoid disputes.

3.3 SELECTIVE DEMOLITION

A. The Electrical Contractor shall remove, cap and/or relocate equipment, outlets, conduit, wire, etc., as shown and specified on drawings and as may become necessary because of existing field conditions. It shall be the responsibility of the Electrical Contractor to visibly examine all existing walls designated for removal to determine the conduit and the wiring that will require capping and/or removal, whether or not such conditions are indicated on the drawings. The contractor shall be held to having visited the site and taken all existing conditions into consideration.

B. In addition to the foregoing, comply with the following:

1. Maintain circuit continuity to all existing fixtures, equipment, outlets, etc., to remain in use whether noted on the plans or not. Field-verify existing items to remain in use. Wiring for existing circuits which must be re-routed or which are partially abandoned, shall be reconnected to service the remaining outlets on the circuit.

2. In the demolition work, remove all unused wiring and cables and unused conduit that is exposed or within accessible ceilings which is affected by and is in the area of the work of this contract.

C. The intention of the electrical demolition drawings is to disconnect and remove all electrical work made void by the scope of the construction and alteration. Field-verify exact material quantities required to be removed.

D. Abandoned electrical power distribution equipment, including switchboards, motor controllers, panelboards, lighting fixtures and controls and wiring devices shall be disconnected and removed unless otherwise noted.

E. All existing electrical work and associated raceway and wiring, which has been made obsolete by the work and/or is shown dashed on the electrical demolition drawings shall be disconnected and removed back to the source of power unless otherwise noted. Although an attempt has been made to indicate all of this work, total accuracy is not guaranteed. Contractor shall visibly examine all areas and walls and ceilings scheduled for removal to determine existing electrical items to remain.

F. Where buried conduits extending out of a concrete slab become abandoned, cut and grind the conduits off flush with top of slab and plug with non-shrink waterproof grout fill.

G. All removed materials, other than removed materials to be relocated, or stored or turned over to the Owner shall become the property of the Contractor and shall be removed from the project site.

H. Acceptance of contract means installer accepts existing conditions.

I. Contractor shall coordinate all demolition work with all other trades.

J. In areas where the partitions, ceilings, etc., are indicated to be temporarily removed, the Electrical Contractor shall be responsible for the disconnection, storage, re-installation and re-connection of equipment or devices within that partition, ceiling, etc., unless otherwise noted.

K. Legally dispose of hazardous materials or other equipment containing PCBs or equipment containing oil. Comply with all Federal, state, and local laws.

L. Provide manifests and travel and disposal forms and documents to Owner when required by Owner or regulatory agencies.

3.4 CLEANING

A. Clean existing electrical distribution equipment affected by the project, including switchboards, motor controllers, panelboards, etc. Clean exposed surfaces and check tightness of electrical connections. Replace damaged circuit breakers and provide coverplates for openings. Modify existing panelboard directories (or replace) for panelboards which have had alterations to the circuits originating therein. Describe the load and location.

END OF SECTION 260600

SECTION 261326 - MEDIUM-VOLTAGE METAL-CLAD SWITCHGEAR

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Protective relays.
2. Control power supply.
3. Battery system control power supply.
4. Warning labels and signs.

B. This section specifies the furnishing, installation, connection, and testing of the replacement of switchgear relays, circuit breakers, and PLCs.

C. Replacements, integrate, and program all the controls, MV circuit breakers, breaker doors, electro-switch controls, CT's, PT's, relays, and programing of relays, PLCs and generator PLC.

D. Contractor shall be responsible for coordination and replacement of all interconnecting controls, switchgear wiring, pad mount switch and generator controls, etc with the replacement of the switchgear components as required by the manufacture.

E. All new and replacement components shall be U.L. Listed.

1.2 DEFINITIONS

A. NETA ATS: International Electrical Testing Association, Acceptance Testing Specification.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include rated capacities, operating characteristics, and furnished specialties and accessories.
2. Time-current characteristic curves for overcurrent protective devices.

B. Shop Drawings: For each medium-voltage, metal-clad switchgear.

1. Include control power wiring diagrams.
2. Include batteries, battery rack, equipment base, and room layout.
3. Test results of enclosure corrosion resistant finish.
4. Wiring Diagrams: For each switchgear assembly include the following:

    a. Power, signal, and control wiring.
    b. Three-line diagrams of current and future secondary circuits showing device terminal numbers and internal diagrams.
    c. Schematic control diagrams.
    d. Diagrams showing connections of component devices and equipment.

1.4 INFORMATIONAL SUBMITTALS

A. Product Certificates: For switchgear and batteries, signed by product manufacturer.

B. Source quality-control reports.

C. Field quality-control reports.

PART 2 - PRODUCTS

2.1 SYSTEM DESCRIPTION

A. Manufactured Unit: Existing walk-in enclosure, metal-clad switchgear, designed for application in solidly grounded neutral system.

B. Comply with IEEE ANSI C37.20.2.

C. The switchgear ratings must comply with IEEE ANSI C37.04 and must be the preferred ratings of IEEE ANSI C37.06.

D. Switchgear Components, Devices, and Accessories: Listed and labeled in accordance with NFPA 70, by a qualified electrical testing laboratory, and marked for intended location and application.

2.2 MANUFACTURERS

A. Protective Relay, Circuit Breaker, Enclosure.

1. Schweitzer
2. Eaton
3. ABB
4. Schneider

2.3 SWITCHGEAR ENCLOSURE

A. New enclosure.

1. Eaton
2. ABB
3. Cat Medium-Voltage
4. Schneider

2.4 SWITCHGEAR CONSTRUCTION

A. Deadfront, metal-clad, drawout, switchgear assembly of vertical sections, with vacuum circuit breakers. Provide additional vertical sections to house accessories related to the switchgear functions.

1. Front and rear access switchgear.
2. Front and rear vertical section covers with full-length hinges. The front cover must be a flanged door with latching hardware. The rear cover may be bolted.

B. Bus: Silver-plated copper.

1. Electrically Operated:

a. 48 V(dc) close and trip.

C. Capacities and Characteristics:

1. Comply with IEEE ANSI C37.06.
2. Switchgear Assembly:

a. Rated Maximum Design Voltage and BIL (Dielectric Test): 15 kV, 95 kV.
b.
c. Rated Continuous Current: 1200 A.
d. Switchgear must be arc resistant, complying with IEEE ANSI C37.20.7, **Type 2C.**

3. Bus: Tin-plated copper.

a. Ground Bus: Sized to carry the rated short-time withstand current, extended full length of the switchgear assembly, and connected to the metal enclosures of each vertical section.

4. Circuit Breakers: Horizontally mounted, drawout, vacuum circuit breakers, operated by a motor-charged stored-energy mechanism, and having manual means of charging the mechanism.

a. Electrically Operated:

1) **48** V(dc) close and trip. Powered from an external power source.

5. Accessory Set: Tools and miscellaneous items required for interrupter switchgear test, inspection, maintenance, and operation.

a. One of each size handling device to remove the circuit breaker from metal-clad switchgear and to move the breaker about on the floor.

D. Capacities and Characteristics:

1. Comply with IEEE ANSI C37.06.
2. Switchgear Assembly:

a. Rated Maximum Design Voltage and BIL (Dielectric Test): 15 kV, 95 kV
b. Rated Continuous Current: 1200 A.
c. Rated Short-Circuit Current and Short-Time Current: 40 kA RMS

3. Circuit Breakers:

a. Same capacities and characteristics as the switchgear assembly, and as follows:

1) Rated Continuous Current and Load Switching Current: 1200 A
2) Rated Closing and Latching Current: 104 kA, peak.
3) Rated Interrupting Time: 50 ms.

2.5 SURGE ARRESTERS

A. Comply with IEEE ANSI C62.11, distribution class; metal-oxide-varistor type, connected in each phase of incoming circuit and ahead of disconnecting device.

2.6 INSTRUMENTS

A. Instrument Transformers: Comply with IEEE ANSI C57.13.

1. Potential Transformers: Secondary voltage rating of 120 V and NEMA C 12.11 accuracy class of 0.3 with burdens of W, X, and Y.
2. Current Transformers: Burden and accuracy class suitable for connected relays, meters, and instruments.

B. Multifunction Digital Meter and Monitor: Microprocessor-based unit suitable for three- or four-wire systems.

1. Inputs from sensors or 5 A current-transformer secondaries, and potential terminals rated to 600 V.
2. Switch-selectable digital display with the following features:

    a. Phase Currents, Each Phase: Plus or minus 1 percent.
    b. Phase-to-Phase Voltages, Three Phase: Plus or minus 1 percent.
    c. Phase-to-Neutral Voltages, Three Phase: Plus or minus 1 percent.
    d. Three-Phase Real Power: Plus or minus 2 percent.
    e. Three-Phase Reactive Power: Plus or minus 2 percent.
    f. Power Factor: Plus or minus 2 percent.
    g. Frequency: Plus or minus 0.5 percent.
    h. Integrated Demand, with Demand Interval Selectable from 5 to 60 Minutes: Plus or minus 2 percent.

3. Mounting: Display and control unit that is flush or semiflush mounted in instrument compartment door.
4. Voltmeter Selector Switch: Rotary type with off position to provide readings of phase-to-phase voltages.
5. Ammeters: Cover an expanded scale range of bus rating plus 10 percent.
6. Ammeter Selector Switch: Permits current reading in each phase and keeps current-transformer secondary circuits closed in off position.
7. Locate meter and selector switch on circuit-breaker compartment door for indicated feeder circuits only.
8. Watt-Hour Meters: Flush- or semiflush-mounting type, 5 A, 120 V, three phase, three wire; with three elements, **15-minute** indicating demand register, and provision for testing and adding pulse initiation.
9. Recording Demand Meter: Usable as totalizing relay or indicating and recording maximum demand meter with **15-minute** interval.

    a. Operation: Counts and records a succession of pulses entering two channels.
    b. Housing: Drawout, back-connected case arranged for semiflush mounting.

2.7 PROTECTIVE RELAYS

A. Multifunctional, solid-state microprocessor-based relay systems, complying with IEEE ANSI C37.90.

B. Relay Mounting:

1. Each relay must be mounted in a drawout case with a two-stage quick-release operation.
2. Removal of the relay from the case must disconnect the trip circuits and short the current-transformer secondaries before the unit control power is disconnected.
3. When the relay is inserted into the case, control power connections must be made before the trip circuits are activated.
4. Include a self-shorting contact on the case terminal block for alarm indication and tripping of circuit breaker upon removal of the relay from the case.

C. Overcurrent and Ground-Fault Protective Relays:

1. Generator Relay Auto Synchronize: IEEE ANSI C37.2 device functions. (Not all will be used, refer to drawings)

a. Generator 52 - Bus Side:

1) Overvoltage 59S
2) Undervoltage 27S
3) Tie Synchronism Check 25

b. Generator 52 - Generator Side:

1) Volts per hertz, 24
2) Overvoltage 59
3) Undervoltage 27
4) Generator Sync Check and Autosync 25 (Phase, Ground, Neq Seq)
5) Frequency 81 (Over Under Rate)
6) Overcurrent, 50 (Phase, Ground, Neq Seq)
7) Neutral Overcurrent, 50N
8) Time Overcurrent, 51 (Phase, Ground, Neq Seq)
9) Neutral Time Overcurrent, 51N
10) Ground Time-Overcurrent, 51G
11) Voltage Restrained Controlled Time-Overcurrent, 51V/C
12) Directional Power, 32
13) Directional Neutral Overcurrent, 67N
14) Directional Ground Current, 67G
15) Theral Model, 49T
16) Loss of Field, 40
17) Breaker Failure, BF
18) Loss of Potential, 60 LOP

c. Generator:

1) Field Ground 64F
2) RTD Thermal, 49R

3) Neutral Current Different, 87N
4) Ground Current Different, 87G
5) Restricted Earth Fault, REF

2. Generator Relay: The following control functions shall be provided by internal solid-state based timers or relays:

a. Incomplete sequence delay.
b. Limitation on number of starts per time period in minutes.
c. Anti-backspin time delay.
d. Programmable transition relay based on current and/or time.
e. Time between starts.
f. Number of cold starts.
g. Mechanical load shedding and restore function with timers.
h. Zero speed switch input timer for use with long accelerating time motors.

3. Generator Relay: The relay shall have a LCD display with LED background illumination capable of displaying the following information with metering accuracy of +/- half (0.5) percent of measured value (l_n) for $l_n < 2\ l_n$ and +/- one (1) percent of measured value (l_n) for $l_n > 2$:

a. Individual phase and ground currents with phase angles
b. Phase-to-ground and phase-to-phase voltages with phase angles
c. Watts
d. Vars
e. VA
f. Frequency
g. Power factor – apparent and displacement
h. Forward, reverse and net watt-hours with start date and time stamp
i. Lead, lag and net var hours with start date and time stamp.
j. VA-hours with start date and time stamp
k. Minimum/maximum values of current, voltage, watts, vars, VA, frequency, apparent
l. pf and displacement pf
m. Percent THD of voltage and current
n. Positive, negative and zero sequence components of voltage and current with phase angles

2.8 DC CONTROL POWER SUPPLY

A. Dedicated 48 V(dc) battery system.

B. System Requirements: Battery must have number of cells and ampere-hour capacity based on an initial specific gravity of 1.210 at 77 deg F (25 deg C) with electrolyte at normal level and minimum ambient temperature of 55 deg F (13 deg C). Cycle battery before shipment to guarantee rated capacity on installation. Arrange to operate ungrounded. Battery system capacity must be as recommended by switchgear manufacturer to operate the circuit breakers for intended duty.

C. Battery:

1. Standard VRLA batteries, with system disconnect and overcurrent protective device.
2. Accessories:

    a. Set of cell numerals.
    b. Monitoring system.

3. Charger: Static-type silicon rectifier equipped with automatic regulation and provision for manual and automatic adjustment of charging rate. Unit must automatically maintain output voltage within 0.5 percent from no load to rated charger output current, with ac input-voltage variation of plus or minus 10 percent and input-frequency variation of plus or minus 3 Hz.

    a. DC ammeter.
    b. DC Voltmeter: Maximum error of 5 percent at full-charge voltage, with toggle switch to select between battery and charger voltages.
    c. Ground Indication: Two appropriately labeled lights to indicate circuit ground, connected in series between negative and positive terminals, with midpoint junction connected to ground by NO push-button contact.
    d. Capacity: Sufficient to supply steady load, float-charge battery between 2.20 and 2.25 V per cell and equalizing charge at 2.33 V per cell.
    e. Charging-Rate Switch: Manually operated switch to transfer to higher charging rate. Charger operation must be automatic until manually reset.
    f. AC Power Supply: 120 V, 60 Hz, subject to plus or minus 10 percent variation in voltage and plus or minus 3 Hz variation in frequency. Automatic charger operation must resume after loss of ac power supply for interval.
    g. Charging Regulator: Protect charger from damage due to overload, including short circuit on output terminals. The device must regulate charging current but must not disconnect charger from either battery or ac supply.
    h. Charger's Audible Noise: Less than 26 dB.

D. Battery Ground-Fault Detector: Initiates alarm when resistance to ground of positive or negative bus of battery is less than 5000 ohms.

E. Control Wiring: complete with bundling, lacing, and protection.

1. Conductors across Hinges and for Interconnections between Shipping Units: Flexible conductors for No. 8 AWG and smaller.
2. Conductors: Sized in accordance with NFPA 70 for duty required.

2.9 WARNING LABELS AND SIGNS

A. Install appropriate precautionary labels to warn about potential hazards that are inherent to the equipment. Comply with requirements for labels and signs specified in Section 260553 "Identification for Electrical Systems."

1. Warning signs must be baked enamel signs.
2. Equipment Identification Labels: Laminated acrylic or melamine plastic signs.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Upon delivery of switchgear and prior to unloading, inspect equipment for damage.

1. Examine tie rods and chains to verify they are undamaged and tight and that blocking and bracing are tight.
2. 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. Examine switchgear for external damage, including dents or scratches in doors and sill, and termination provisions.
4. Compare switchgear and accessories received with the bill of materials to verify that the shipment is complete. Verify that switchgear and accessories conform to the manufacturer's quotation and shop drawings. If the shipment is not complete or does not comply with project requirements, notify the manufacturer in writing immediately.
5. Unload switchgear, observing packing label warnings and handling instructions.
6. Open 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 switchgear in accordance with manufacturer's recommendations, avoid damage to the enclosure, termination compartments, base, frame, tank, and internal components. Do not subject switchgear to impact, jolting, jarring, or rough handling.
2. Protect switchgear compartments against the entrance of dust, rain, and snow.
3. Transport switchgear upright to avoid internal stresses on equipment mounting assemblies. Do not tilt or tip switchgear.
4. Use spreaders or a lifting beam to obtain a vertical lift and to protect switchgear from straps bearing against the enclosure. Lifting cable pull angles may not be greater than 15 degrees from vertical.
5. Do not damage structure when handling switchgear.

C. Storage:

1. Store switchgear in a location that is clean and protected from weather. Protect switchgear from dirt, water, contamination, and physical damage. Do not store switchgear in the presence of corrosive or explosive gases.
2. Store switchgear with compartment doors closed.
3. Regularly inspect switchgear while in storage and maintain documentation of storage conditions, noting discrepancies or adverse conditions.

D. Examine roughing-in of conduits and grounding systems to verify the following:

1. Wiring entries comply with layout requirements.
2. Entries are within conduit-entry tolerances specified by manufacturer, and no feeders will have to cross section barriers to reach load or line lugs.

E. Pre-Installation Checks:

1. Verify removal of shipping bracing after placement.

F. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 SIGNS AND LABELS

A. Comply with the 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.

3.3 FIELD QUALITY CONTROL

A. General Field-Testing Requirements:

1. Comply with the provisions of NFPA 70B, "Testing and Test Methods."

B. Microprocessor-Based Protective Relay Field Tests:

1. Visual and Mechanical Inspection:

a. Record model number, style number, serial number, firmware revision, software revision, and rated control voltage.
b. Verify operation of light-emitting diodes, display, and targets.
c. Record passwords for each access level.
d. Clean the front panel and remove foreign material from the case.
e. Check tightness of connections.
f. Verify that the frame is grounded in accordance with manufacturer's instructions.
g. Download settings from the relay. Print a copy of the settings for the report and compare the settings to those specified in the coordination study.

2. Electrical Tests:

a. Perform insulation-resistance tests from each circuit to the grounded frame in accordance with manufacturer's published data.
b. Apply voltage or current to analog inputs and verify correct registration of the relay meter functions.
c. Functional Operation: Check functional operation of each element used in the protection scheme as follows:

1) Timing Relay:

a) Determine time delay.
b) Verify operation of instantaneous contacts.

2) Volts/Hertz Relay:

a) Determine pickup frequency at rated voltage.
b) Determine pickup frequency at a second voltage level.
c) Determine time delay.

3) Undervoltage Relay:

a) Determine dropout voltage.
b) Determine time delay.
c) Determine time delay at a second point on the timing curve for inverse time relays.

4) Directional Power Relay:

a) Determine minimum pickup at maximum torque angle.
b) Determine closing zone.
c) Determine maximum torque angle.
d) Determine time delay.
e) Verify time delay at a second point on the timing curve for inverse time relays.

5) Current Balance Relay:

a) Determine pickup of each unit.
b) Determine percent slope.
c) Determine time delay.

6) Negative Sequence Current Relay:

a) Determine negative sequence alarm level.
b) Determine negative sequence minimum trip level.
c) Determine maximum time delay.
d) Verify two points on the I-two-squared-t curve.

7) Phase Sequence or Phase Balance Voltage Relay:

a) Determine positive sequence voltage to close the NO contact.
b) Determine positive sequence voltage to open the NC contact (undervoltage trip).
c) Verify negative sequence trip.
d) Determine time delay to close the NO contact with sudden application of 120 percent of pickup.
e) Determine time delay to close the NC contact upon removal of voltage when previously set to rated system voltage.

8) Instantaneous Overcurrent Relay:

a) Determine pickup.
b) Determine dropout.
c) Determine time delay.

9) Time Overcurrent:

a) Determine minimum pickup.
b) Determine time delay at two points on the time current curve.

10) Ground Detector Relay:

a) Determine maximum impedance to ground causing relay pickup.

11) Directional Overcurrent Relay:

a) Determine directional unit minimum pickup at maximum torque angle.
b) Determine closing zone.
c) Determine maximum torque angle.
d) Plot operating characteristics.
e) Determine overcurrent unit pickup.
f) Determine overcurrent unit time delay at two points on the time current curve.

d. Control Verification:

1) Functional Tests:

a) Check operation of active digital inputs.
b) Check output contacts or silicone-controlled rectifiers (SCRs), preferably by operating the controlled device, such as circuit breaker, auxiliary relay, or alarm.
c) Check internal logic functions used in protection scheme.
d) Upon completion of testing, reset min/max recorders, communications statistics, fault counters, sequence-of-events recorder, and event records.

2) In-Service Monitoring: After the equipment is initially energized, measure magnitude and phase angle of inputs and verify expected values.

C. DC System VRLA Batteries Field Test:

1. Visual and Mechanical Inspection:

a. Verify that batteries are adequately located.
b. Verify that battery area ventilation system is operable.
c. Verify existence of suitable eyewash equipment.
d. Verify equipment nameplate data complies with Contract Documents.
e. Inspect physical and mechanical condition.
f. Verify adequacy of battery support racks, mounting, anchorage, alignment, grounding, and clearances.
g. Verify the units are clean.
h. Inspect spill containment installation.
i. Verify application of an oxide inhibitor on battery terminal connections.

2. Electrical Tests:

a. Measure charger float and equalizing voltage levels. Adjust to battery manufacturer's recommended levels.
b. Verify charger functions and that alarms comply with system manufacturer's recommendations.

c. Measure negative post temperature. Negative post temperature must comply with manufacturer's published data or IEEE Std 1188.
d. Measure charger float and equalizing voltage levels. Charger float and equalizing voltage levels must be in accordance with the battery manufacturer's published data.
e. Measure each monoblock/cell voltage and total battery voltage with charger energized and in float mode of operation. Monoblock/cell voltages must be in accordance with manufacturer's published data.
f. Measure intercell connection resistances.
g. Perform internal ohmic measurement tests. Cell internal ohmic values (resistance, impedance, or conductance) must not vary by more than 25 percent between identical cells that are in a fully charged state. Monoblock/cell internal ohmic values (resistance, impedance, or conductance) must not vary by more than 25 percent between identical monoblocks/cells in a fully charged state.
h. Perform a load test in accordance with manufacturer's published data or IEEE Std 1188. Replace units that fail to pass the test.
i. Measure the battery system voltage from positive to ground and negative to ground. Voltage measured from positive to ground must be equal in magnitude to the voltage measured from negative to ground.

3.4 SYSTEM FUNCTION TESTS

A. System function tests must prove the correct interaction of sensing, processing, and action devices. Perform system function tests after field quality control tests have been completed and components have passed specified tests.

1. Develop test parameters and perform tests for the purpose of evaluating performance of integral components and their functioning as a complete unit within design requirements and manufacturer's published data.
2. Verify the correct operation of interlock safety devices for fail-safe functions in addition to design function.
3. Verify the correct operation of sensing devices, alarms, and indicating devices.

3.5 FOLLOW-UP SERVICE

A. Voltage Monitoring and Adjusting: After Substantial Completion, but not more than six months after Final Acceptance, if requested by Owner, perform the following voltage monitoring:

1. During a period of normal load cycles as evaluated by Owner, perform seven days of three-phase voltage recording at the outgoing section of each switchgear. Use voltmeters with calibration traceable to NIST standards and with a chart speed of not less than 1 inch (25 mm) per hour. Voltage unbalance greater than 1 percent between phases, or deviation of phase voltage from the nominal value by more than plus or minus 5 percent during the test period, is unacceptable.
2. Corrective Action: If test results are unacceptable, perform the following corrective action, as appropriate:

a. Adjust switchgear taps.
b. Prepare written request for voltage adjustment by electric utility.

3. Retests: Repeat monitoring, after corrective action has been performed, until specified results are obtained.
4. Report:

    a. Prepare a written report covering monitoring performed and corrective action taken.

B. Infrared Inspection: Perform the survey during periods of maximum possible loading. Remove covers prior to the inspection.

1. After Substantial Completion, but not more than 60 days after Final Acceptance, perform infrared inspection of the electrical power connections of the switchgear.
2. Instrument: Inspect distribution systems with imaging equipment capable of detecting a minimum temperature difference of 1 deg C at 86 deg F (30 deg C).
3. Record of Infrared Inspection: Prepare a certified report that identifies the testing technician and equipment used and lists the results as follows:

    a. Description of equipment to be tested.
    b. Discrepancies.
    c. Temperature difference between the area of concern and the 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 the deficient area.

4. Act on inspection results in accordance with the recommendations of NETA ATS, Table 100.18. Correct possible and probable deficiencies as soon as Owner's operations permit. Retest until deficiencies are corrected.

PART 4 - SEQUENCE OF OPERATION

INTRODUCTION

Project scope is to provide a phased replacement of existing relay and provide automatic transformer from main to generator.

Legends		Description	Normal Condition
52-G1		Campus Generator Circuit Breaker	Open
ATS-S		Pad Mount Switch – Service (Existing)	Closed
ATS-G		Pad Mount Switch – Generator (Existing)	Open
ATS-C		Pad Mount Switch Controller (Existing)	

PAD MOUNT CONTROL INPUT / OUTPUT			
Output	Normal Condition Pad Mount Side	Input	Normal Condition MV Switch Side
Engine Start	Open	Ready To Transfer Signal	Open
Switch in Normal (ATS-S)	Closed	Closed Transition	Not Used
Switch in Emergency (ATS-G)	Open	Open Transition	Open

Normal Source Available	Closed	Test Mode	Open

1. System Description
   1.1. Summary: New Generator Medium Voltage switch communicate with existing Pad Mount Automatic Switch
      1.1.1. Pad Mount – indicate controls in pad mount automatic switch.
      1.1.2. Generator MV Switch – Indicates controls in medium voltage switch.
   1.2. All replacements shall be U.L. components and fit within existing enclosures.
   1.3. Provide all programming integration for relay settings, and sequence of operation.

2. Sequence of Operation
   2.1. Automatic Sequence of Operation – Utility loss of power.
      2.1.1. Pad Mount: Normal Source Available - Opens
      2.1.2. Pad Mount: Engine Start – Closes
      2.1.3. Generator MV Switch: PLC starts Generator.
      2.1.4. Generator MV Switch: Once Generator is stable and read to transfer.
         2.1.4.1. Generator MV Switch: Generator Close – 52-G1
         2.1.4.2. Generator MV Switch: Ready To Transfer Signal – Closes
      2.1.5. Pad Mount: ATS-G closes.
         2.1.5.1. Switch In Emergency - Closes
         2.1.5.2. Switch In Normal – Opens
   2.2. Automatic Sequence of Operation – Return To Normal power.
      2.2.1. Pad Mount: Normal Source Available - Closes
      2.2.2. Pad Mount: ATS-G - Open
         2.2.2.1. ATS-S - Close
         2.2.2.2. Switch In Emergency - Open
         2.2.2.3. Switch In Normal – Close
      2.2.3. Pad Mount: Engine Start – Opens
         2.2.3.1. Generator MV Switch: Generator Open – 52-G1
         2.2.3.2. Generator MV Switch: PLC starts Generator Shut down Process.

END OF SECTION 261326

SECTION 263213 - ENGINE GENERATORS

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 REFERENCES

A. ANSI/NEMA MG 1 - Motors and Generators

B. ANSI/NFPA 70 - National Electrical Code

1.3 SYSTEM DESCRIPTION

A. Engine generator system to provide source of emergency and standby power.

B. Existing Manufacture: Caterpillar

C. System Capacity: 1500 KW, 1675 KVA at an elevation of 1,000 feet above sea level, and ambient temperature between -20 degrees F and 110 degrees F; standby rating using engine-mounted radiator. 12,470 volts.

1.4 SUBMITTALS

A. General: Submit the following according to Conditions of Contract and Division 01 Specification Sections.

B. To be Submitted before Equipment Order:

1. Product data for products specified in this Section. Include data on features, components, ratings, and performance. Data shall include weights, fuel consumption rates, ventilation and combustion air requirements, exhaust flow data, cooling system data and engine and generator data. Include dimensioned outline plan and elevation drawings of engine generator set and other system components.

2. Dimensioned Outline Drawings of Equipment Unit: Identify center of gravity and locate and describe mounting and anchorage provisions.
3. Detailed description of equipment anchorage devices on which the certification is based and their installation requirements.

1.5 QUALITY ASSURANCE

A. Manufacturer Qualifications: Firms experienced in manufacturing equipment of the types and capacities indicated that have a record of successful in-service performance.

B. Manufacturer’s Service Personnel: Service personnel shall be factory trained and certified in the maintenance of the specified equipment.

C. Electrical Items and Components shall be listed (or recognized) by Underwriters Laboratories, Inc.

D. Non-Electrical Components shall be listed (or recognized) by Underwriters Laboratories, Inc. or other applicable Nationally Recognized Testing Laboratory.

E. Single-Source Responsibility: Unit shall be a representative product built from components that have proven compatibility and reliability and are coordinated to operate as a unit as evidenced by records of prototype testing.

F. Furnish fuel, load banks, testing instruments, and all other equipment necessary to perform field quality control, testing and demonstration of generator system per this specification and drawings.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Deliver engine generator system components to their final locations in protective wrappings, containers, and other protection that will exclude dirt and moisture and prevent damage from construction operations. Remove protection only after equipment is made safe from such hazards.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Engine Generator Set Manufacturers: Subject to compliance with requirements, provide completely assembled engine-generator units by one of the following engine generator set manufacturers:

1. Caterpillar, Inc.

2.2 BATTERY CHARGER

A. Battery Charger: Current-limiting, automatic-equalizing and float-charging type. Unit shall comply with UL 1236 and include the following features:

1. Operation: Equalizing-charging rate of 10 A 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.
2. Automatic Temperature Compensation: Adjust float and equalize voltages for variations in ambient temperature from minus 40 degrees C to plus 60 degrees C to prevent overcharging at high temperatures and undercharging at low temperatures.
3. Automatic Voltage Regulation: Maintain constant output voltage regardless of input voltage variations up to plus or minus 10 percent.
4. Ammeter and Voltmeter: Flush mounted in door. Meters shall indicate charging rates.
5. 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.

6. Enclosure and Mounting: NEMA 250, Type 1, wall-mounted cabinet.

2.3 CONTROL AND MONITORING

A. Generator Protector: Microprocessor-based unit shall continuously monitor current level in each phase of generator output, integrate generator heating effect over time, and predict when thermal damage of alternator will occur. When signaled by generator protector or other generator-set protective devices, a shunt-trip device in the generator circuit breaker shall open the circuit breaker to disconnect the generator from load circuits. Protector shall perform the following functions:

1. Initiates a generator 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 or three-phase fault conditions, regulates generator to 300 percent of rated full-load current for up to 10 seconds.
3. As overcurrent heating effect on the generator approaches the thermal damage point of the unit, protector switches the excitation system off, opens the generator circuit breaker, and shuts down the generator set.
4. Senses clearing of a fault by other overcurrent devices and controls recovery of rated voltage to avoid overshoot.

B. Ground-Fault Indication: Comply with NFPA 70, "Emergency System" signals for ground-fault. Integrate ground-fault alarm indication with other generator-set alarm indications.

C. Indicating Devices, Protective Devices, and Controls:

1. A.C. Voltmeter.
2. A.C. Ammeter.
3. A.C. Frequency Meter.
4. D.C. Voltmeter (Alternator Battery Charging).
5. Engine Coolant Temperature Gage.
6. Low Engine Coolant Temperature Indicator Lights.
7. Engine-Lubricating Oil Pressure Gage.
8. Running Time Meter.
9. 4 position Ammeter Phase Selector Switch.
10. Auxiliary Contacts: Separate terminal blocks factory wired to separate form C dry contacts. Contacts shall be for field connection and to start generator ventilation fans and motorized dampers. Contacts shall activate upon generator start signal. Provide two Form A and two Form B contacts, each rated no less than 10 amperes at 120 volts AC and no less than 5 amperes at 24 volts DC.
11. Generator Voltage-Adjusting Control.
12. Fuel tank derangement alarm.
13. Fuel tank high level shutdown of fuel supply alarm.
14. Generator overload.
15. Supporting Items: Include sensors, transducers, terminals, relays, and other devices, and wiring required to support specified items. Locate sensors and other supporting items in engine generator control panel unless otherwise indicated.
16. Temperature Relay: Provide temperature relay(s) as required at generator to monitor bearing and stator windings. Provide minimum of two contacts (form C) for each of alarm and shutdown. Factory wire shutdown output contacts to generator control panel.

Temperature relay may be omitted if the generator control panel can perform the same monitoring and output contact functions.

2.4 LOCAL AND REMOTE ALARMS AND SHUTDOWN

A. Conform to NFPA 110 requirements for Level 1 systems. Include necessary Form C contacts and terminals in control and monitoring panel.

B. Local Alarms: Provide generator set mounted alarms as follows with shutdown where noted:

1. Over-crank (with shutdown).
2. Over-speed (with shutdown).
3. Low lube oil pressure (with shutdown).
4. High engine temperature pre-alarm.
5. High engine temperature (with shutdown).
6. Low fuel main tank.
7. Generator supplying load.
8. Low water temperature.
9. Control switch not in auto.
10. High battery voltage.
11. Low battery voltage.
12. Battery charger A.C. failure.
13. Storage tank leak.
14. Low coolant level.
15. Low cranking voltage.

C. The above alarms shall be by individually identified visual indications plus a common audible alarm.

D. There shall be a lamp test switch to test all of the above lamps.

E. The remote emergency stop switch shall also shut the unit down.

F. Remote Alarms:

1. Provide a remote generator alarm annunciator for the generator powered from the generator battery, with an individually identified visual indication for any of the following conditions:

a. Over-crank (with shutdown).
b. Over-speed (with shutdown).
c. Low lube oil pressure (with shutdown).
d. High engine temperature pre-alarm.
e. High engine temperature (with shutdown).
f. Low fuel main tank.
g. Low water temperature.
h. Control switch not in auto.
i. High battery voltage.
j. Low battery voltage.
k. Battery charger A.C. failure.
l. Storage tank leak.

m. Low coolant level.
n. Low cranking voltage.

2. In addition, a common audible alarm shall sound at the remote annunciator when any of the conditions above is activated. The audible alarm shall be silenceable, but must have a resound feature which will require the restoration of the silence switch to its normal position when the alarm condition has been corrected.
3. The remote annunciator shall also include a lamp test switch.

G. Provide provisions for future Connection to Building Automation System: A separate terminal block, factory wired to Form C dry contacts, for each alarm and status indication. Provide individual terminal points for each of the annunciator alarms and pre-alarms. Provide an additional terminal point to combine all of the generator alarms under a single terminal point. Provide a permanent label for each terminal point. Each terminal will provide a binary output for the building automation system to read.

PART 3 - EXECUTION

3.1 FIELD QUALITY CONTROL

A. Project Specific Tests:

1. Supervised Adjusting and Pretesting: Under supervision of factory-authorized service representative, pretest all system functions, operations, and protective features. Provide all instruments and equipment required for tests. Adjust to ensure operation is according to Specifications. Load system using a variable resistive load bank simulating full load rating of unit.
2. Battery Tests: Measure charging voltage and voltages between available battery terminals for full-charging and float-charging conditions. Check electrolyte level and specific gravity under both conditions. Test for contact integrity of all connectors. Perform an integrity load test and a capacity load test for the battery. Verify measurements are within manufacturer's specifications.
3. Battery Charger Tests: Verify specified rates of charge for both equalizing and float-charging conditions.

3.2 CONNECTIONS

A. Conduit Connections: All power and control wiring connections to the generator control panel and electrical accessories shall be made with a minimum of 18-inch Liquidtight steel conduit.

END OF SECTION 263213

Engineered to order. Built to last.

APPENDIX A

INSTALLATION, OPERATION AND MAINTENANCE INSTRUCTIONS

TRIAD SERIES 2
SF6 SWITCHES

Padmount Style

GWI 527-49
Rev. 11
August, 2017
Supersedes Rev. 10
Dated February, 2013

Table of Contents

SECTION 1: Introduction
1.1 General....Page 2
1.2 Qualified Persons....Page 2
1.3 Shipment Inspection....Page 2
1.4 Storage....Page 3
1.5 Standards....Page 3

SECTION 2: Safety Information
2.1 Safety Alert Messages....Page 4
2.2 Following Safety Instructions....Page 4
2.3 Replacement Instructions....Page 4
2.4 Location of Safety Labels....Page 4
2.5 X-Radiation Limits....Page 6

SECTION 3: Components
3.1 General....Page 8

SECTION 4: Installation
4.1 Handling....Page 8
4.2 Mounting....Page 9
4.3 Grounding (earthing)....Page 9
4.4 Cable Connections....Page 9
4.5 Installation Testing....Page 10
4.6 Fault Indicators....Page 10
4.7 Interrupter Controls....Page 10
4.8 Voltage Sensors....Page 10
4.9 Actuators....Page 10
4.10 Enclosure....Page 10

SECTION 5: Operation
5.1 General....Page 10
5.2 Multi Position Operator....Page 10
5.3 Operation of Vacuum Interrupters....Page 15
5.4 Interrupter Controls....Page 18
5.5 Locking in a Position....Page 18
5.6 Operation by actuator....page 18
5.7 Automatic operation....page 18
5.8 Fuses....page 18

SECTION 6: Maintenance
6.1 General....Page 19
6.2 Pressure / Temperature Chart....Page 19
6.3 SF_6 Filling Procedure....Page 20
6.4 Handling of Switches....Page 21
6.5 SF_6 Gas Specification....Page 25
6.6 Finish of Switch....Page 25
6.7 Repair Parts....Page 25
6.8 Returning Equipment....Page 25

SECTION 7: Testing
7.1 Installation Testing....Page 26
7.2 Cable Testing....Page 27
7.3 Factory Production Tests....Page 27
7.4 Interrupter Testing....Page 28

SECTION 8: Troubleshooting
8.1 Leak Checking....Page 29
8.2 Controls....Page 29

SECTION 9 Attachments
9.1 Customer Drawing(s)....Page 30
9.2 Supplemental Instructions....Page 30
9.3 Material Safety Data Information....Page 30

SECTION 1 INTRODUCTION

1.1 General

This document is intended to provide the user with necessary information to properly receive, inspect, test, install, operate and maintain G&W SF_6 switches. If after reviewing the information contained herein, you should have any questions, please contact G&W Technical Support.

Read these Instructions	**Read and understand the contents of this document and follow all locally approved procedures and safety practices before installing, operating or maintaining this equipment. Be sure to read and understand the Safety Information.**	
Keep these Instructions	**This document is a permanent part of your G&W product. Keep it in a safe location where it can be readily available and referred to as necessary.**	
How to Contact G&W	**By Phone:**	**708-388-5010, Monday through Friday, 8:00 AM to 5:00 PM Central Time**
	By Fax:	**708-388-0755**
	E-mail:	**info@gwelec.com**
	For Technical Support:	**708-297-3835**
	Fax:	**708-389-0016**
	E-mail:	**Aftermarket.support@gwelec.com**
	Mail:	**305 W. Crossroads Parkway, Bolingbrook, Illinois 60440, USA**
	Internet:	**To find your local G&W Representative visit: www.gwelec.com**

1.2 Qualified Persons

⚠ WARNING

The equipment covered by this document is intended to be installed, operated and maintained by qualified persons who are trained in the installation, operation and maintenance of electric power distribution equipment along with the associated hazards. A qualified person has been trained and is competent:

- To de-energize, clear and tag circuits and equipment in accordance with established safety procedures.
- To distinguish between live parts from non-live parts of the equipment.
- In the proper use of insulated tools, wears protective equipment such as rubber gloves, hard hat, safety glasses, flash-clothes, etc. in accordance with established safety practices and is trained in the care of such equipment.
- As in certified in rendering first aid, especially in the technique of removing a person in contact with a live circuit and in applying cardiopulmonary respiration.

These instructions are intended only for qualified persons and are not intended as a substitute for adequate training and experience in safety procedures for this type of equipment.

1.3 Shipment Inspection

Examine the crated equipment carefully for any damage that may have occurred in transit. If damage is found, a claim must be filed at once with the transportation company. Uncrate and remove packing as soon as possible after receiving the equipment. Examine the equipment carefully for any hidden damage that may have occurred in transit and was previously undetected. If damage is found, a claim should be filed at once with the transportation company.

Check the pressure gauge and insure that the pressure corresponds to the values on the table located near the pressure gauge or in Table1, Section 6.2 of this instruction. If the pressure is below the recommended level, contact your G&W representative or contact G&W customer service before placing the equipment in service.

If switch is supplied with optional temperature compensated pressure gauge check the pressure gauge and insure that the pressure reads at the fill mark in the green zone of the gauge. If the pressure is below the

recommended level, contact your G&W representative or contact G&W customer service before placing the equipment in service.

1.4 Storage

Switches that will not be installed immediately should be suitable stored in a clean, dry location. Possible replacement of crating material should be investigated. Make certain switches are protected from potential damage**.**

1.5 Standards

Some or all of these standards are applicable to this switch:

Type of Switch						
	Each switch is characterized by a "Type" (i.e. Pole Top, a Pad Mount or a Subsurface [Vault] switch) and a "Duty" (i.e. Load Break, Fault Interrupting or both Load Break and Fault Interrupting.) To determine which standards apply to your particular switch select those indicated with a X.	**POLE TOP**	**PAD MOUNT**	**SUBSURFACE**	**LOAD BREAK**	**FAULT INT.**
Standards						
IEEE C57.12.28. Switchgear and Transformers, Padmounted Equipment, Enclosure Integrity.			X			
IEEE 4. Standard Techniques for High-Voltage Testing.					X	X
IEEE 386. Separable Insulated Connectors for Power Distribution Systems Above 600 V.		X	X	X	X	X
IEEE 1291. IEEE Guide for Partial Discharge Measurements in Power Switchgear.					X	
IEEE C37.60. Automatic Circuit Reclosers and Fault Interrupters for Alternating Current Systems.						X
IEEE C37.71. Three phase, Manually Operated Subsurface Load Interrupting Switches for Alternating Current Systems.				X		
IEEE C37.72. Manually Operated, Deadfront, Padmounted Switchgear with Load Interrupting Switches and Separable Connectors for Alternating Current Systems.			X			
IEEE C37.74. IEEE Standard Requirements for Subsurface, Vault, and Pamounted Load-Interrupter Switchgear and Fused Load-Interrupter Switchgear for Alternating Current Systems up to 38kV.			X	X	X	X
IEEE C37.85. Interrupters used in Power Switchgear, X-radiation Limits for AC High-Voltage Power Vacuum.						X
IEEE C37.100. Definitions for Power Switchgear		X	X	X	X	X
IEC 60265-1. International Standard for High-Voltage Switches		X	X	X	X	

SECTION 2. SAFETY INFORMATION & PRECAUTIONS

2.1 Safety Alert Messages

The following is important safety information. For safe installation and operation, be sure to read and understand all danger, warning and caution information. The various types of safety alert messages are described below:

⚠ DANGER

DANGER - Indicates an imminently hazardous situation which, if not avoided, will result in death or serious injury.

⚠ WARNING

WARNING - Indicates a potentially hazardous situation which, if not avoided, could result in death or serious injury.

⚠ CAUTION

CAUTION - Indicates a potentially hazardous situation which, if not avoided, may result in minor or moderate injury. May also be used to alert against unsafe practices.

2.2 Following Safety Instructions

Carefully read all safety messages in this manual and on your equipment. Keep safety signs in good condition. Replace missing or damaged safety signs.

Keep your equipment in proper working condition. Unauthorized modifications to the equipment may impair the function and/or safety and effect equipment life.

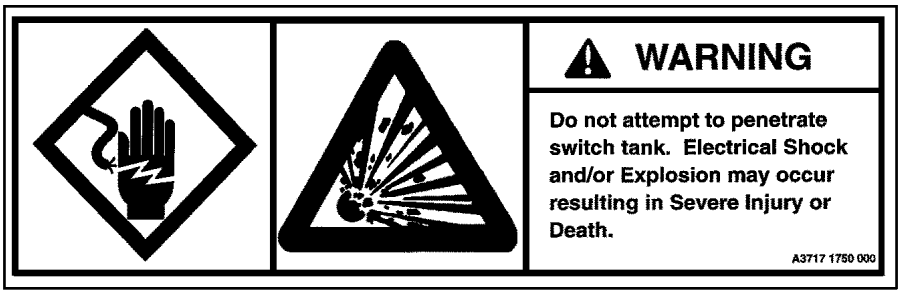
If you do not understand any part of these safety instructions and need assistance, contact your G&W representative or G&W Customer Service.

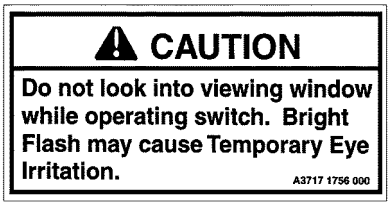
2.3 Replacement Instruction and Labels

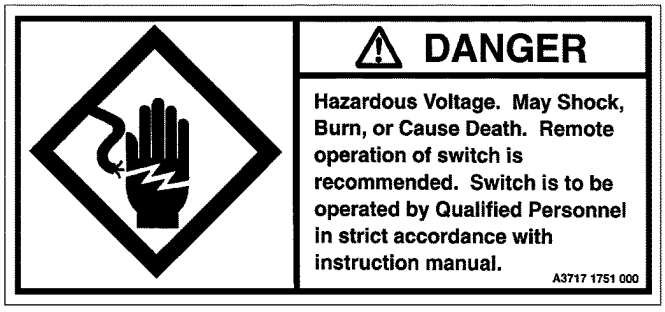
Replacement instructions and safety labels are available from G&W. To obtain them, please contact Customer Service**.**

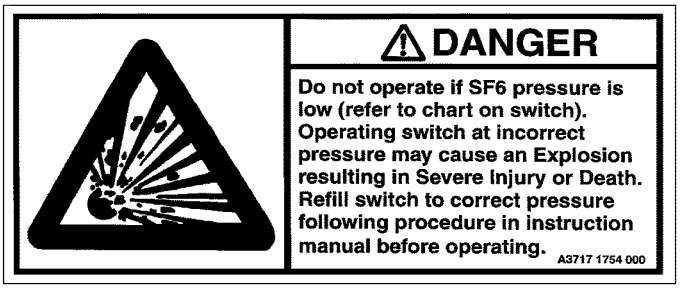
2.4 List and Location of Safety Labels

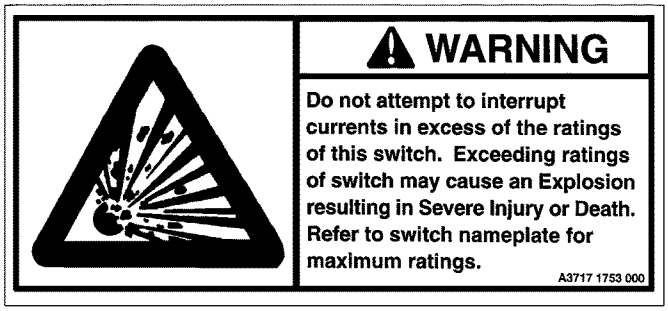
The following are typical safety labels which must be followed. Refer to customer drawing in Section 9 for approximate location of the labels on the switch. The drawings represent typical configurations and may vary.


WARNING
Do not attempt to penetrate switch tank. Electrical Shock and/or Explosion may occur resulting in Severe Injury or Death.
A3717 1750 000


CAUTION
Do not look into viewing window while operating switch. Bright Flash may cause Temporary Eye Irritation.
A3717 1756 000

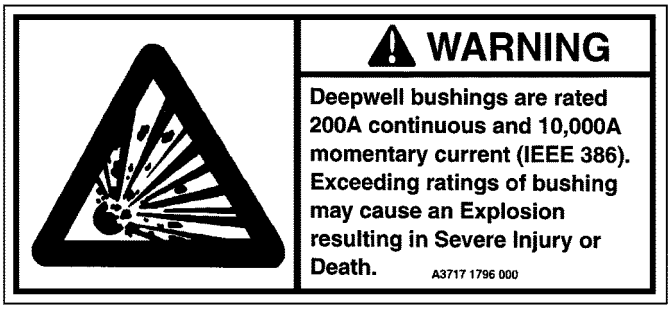

DANGER
Hazardous Voltage. May Shock, Burn, or Cause Death. Remote operation of switch is recommended. Switch is to be operated by Qualified Personnel in strict accordance with instruction manual.
A3717 1751 000


DANGER
Do not operate if SF6 pressure is low (refer to chart on switch). Operating switch at incorrect pressure may cause an Explosion resulting in Severe Injury or Death. Refill switch to correct pressure following procedure in instruction manual before operating.
A3717 1754 000

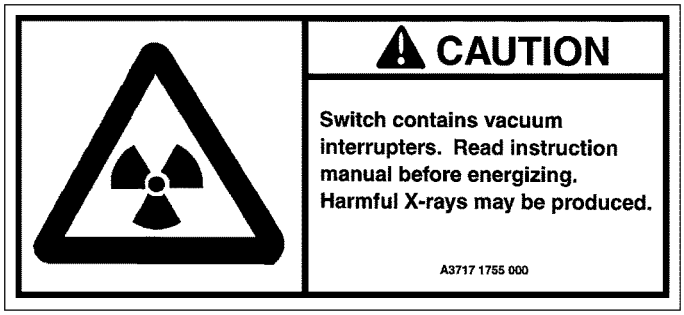

WARNING
Do not attempt to interrupt currents in excess of the ratings of this switch. Exceeding ratings of switch may cause an Explosion resulting in Severe Injury or Death. Refer to switch nameplate for maximum ratings.
A3717 1753 000


WARNING
Do not operate switch if a short circuit is suspected. Exceeding ratings of switch may cause an Explosion resulting in Severe Injury or Death. Refer to switch nameplate for maximum ratings.
A3717 1752 000


WARNING
SF6 Gas is heavier than air and may cause Suffocation. Do not exhaust SF6 into an Unventilated Area.
A3717 1757 000


WARNING
Deepwell bushings are rated 200A continuous and 10,000A momentary current (IEEE 386). Exceeding ratings of bushing may cause an Explosion resulting in Severe Injury or Death.
A3717 1796 000


WARNING
Hazardous voltage inside.
Can shock, burn, or cause death.
Keep out.
If open or unlocked, immediately call electric power and light company.


CAUTION
Switch contains vacuum interrupters. Read instruction manual before energizing. Harmful X-rays may be produced.
A3717 1755 000

2.5 X- Radiation Limits (if applicable)

G&W Vacuum Interrupters and Fault Interrupters are designed and tested in accordance with applicable sections of IEEE C37.60 and C37.85, which include the following information. Reference the above standards for more detailed information.

The known United States manufacturers of vacuum interrupters initiated a test program during July of 1968 (as a Task Force of the NEMA Switchgear Section) to determine the present levels of X-radiation, if any, being emitted from high-voltage power vacuum interrupters, and to suggest permissible levels of radiation from such interrupters on the basis of their recognized application.

Each manufacturer conducted a series of tests on new vacuum interrupters taken from stock and recorded the X-radiation levels, if any, under the following conditions:

1. Dielectric withstand test voltage applied to new interrupters
2. Fault current interruption (where applicable)
3. Load current interruption
4. Dielectric withstand test voltages after fault current interruption
5. Dielectric withstand test voltages after load current interruption

As a result of evaluating the results of the aforementioned tests, the manufacturers concluded that neither the general public nor users will be subjected to harmful X-radiation due to normal application and operation of 15.5kV rated vacuum interrupter devices when applied within their assigned ratings and when the voltage applied across the open contacts of the interrupters is 15.5kV or less.

Since the original 1972 adoption of this standard, manufactures have conducted tests on interrupters rated through 38kV, and data for these higher voltage interrupters was reflected in the 1989 edition of this standard. The testing and concurrent field experience has demonstrated that these higher voltage ratings meet the requirements of this standard.

The 2002 revision of this document also adds data for interrupters rated below 15.5kV, to coordinate with the ratings of available apparatus.

Precautions: If distances normally required for electrical safety are maintained, the exposure to test personnel will generally not exceed established dose limits (see IEEE N43.3). Nevertheless, adequate precautions such as shielding or distance should be used to protect test personnel against possible higher X-radiation occurrences due, for example, to incorrect contact spacing, or to the application of voltages in excess of those specified in Table 1, column 3.

Table 1 - X-Radiation test voltages for interrupters applied without additional external shielding (Note 1)

Rated Maximum Voltage (kV RMS) (note 1) (Col 1)	**X-radiation Test Voltages (Note2)**	
	Maximum Interrupter Operating Voltage (kV RMS) (Col 2)	**Power-Frequency Test Voltage (Col 3)**
4.76	4.76	14.25
8.25	8.25	27.0
15.0	15.0	27.0
15.5	15.5	37.5
25.8-27.0	27.0	45.0
38.0	38.0	52.5 (Note 3)
38.0	38.0	60.0 (Note 4)

Notes:
(1) Table 1 will be expanded in future revisions of this standard as additional ratings become available.
(2) Refer to Appendix B (IEEE C37.85) for derivation of the test voltages.
(3) For interrupters used in switchgear having a power-frequency withstand test voltage of 70kV rms.
(4) For interrupters used in switchgear having a power-frequency withstand test voltage of 80kV rms.

SECTION 3 SWITCH DESCRIPTION

3.1 General

G&W manufactures a complete line of SF6 switches for either load break, fault interrupting or a combination of load and fault interrupting switching. Padmount, vault and overhead configurations are available. Switches are connected to cable systems using industry standard bushings and connectors. Switches can be operated either manually using a variety of operating handles or remotely using a motor actuator. A variety of electronic controls are available for local or remote operation.

Refer to the outline drawing attached for identification and location of switch components for your particular switch style.

This switch has been shipped factory filled with the proper amount of SF_6. If the switch has not maintained the proper pressure (refer to the table on the switch, located near the pressure gauge or Table 1, Section 6.2 or, if supplied with a temperature compensated gauge, by ensuring indicator of pressure gauge is in green zone), do not install the switch. Follow the filling procedure in Section 6.3.

4.1 Handling

⚠ WARNING

Do not lift or handle switch by the bushings. Doing so may result in damage to the switch and possible injury or death to personnel.

⚠ WARNING

Use proper procedures meeting all applicable safety codes when lifting the switch. This may require the use of spreader bars, lifting beams, or other equipment to obtain a proper lift. Failure to use proper equipment and/or techniques to lift the switch may result in personal injury or death and potentially damaging the equipment.

The switch includes 4 lifting provisions. These provisions are shown on the switch drawing. The lifting provisions are designed to use overhead vertical lifting slings for handling and installation of the product in the field. The lifting provisions are suitable for lifting the product as received. Use all 4 lifting provisions and ensure the switch is properly balanced. Maximize the angle between the lifting slings and roof to minimize the lateral forces on the switch. Adequate sling length, spreader bars, or beams are necessary to maximize the angle between the lifting slings and roof.

1) Check all lifting provisions attachment bolts for proper tightness before beginning the lift.
2) Properly attach lifting sling as noted above and establish safety procedures.
3) Test Lift and observe the lifting slings. Lower and adjust the lifting slings as necessary.
4) In order to minimize stresses, avoid sudden start and stops during the lift
5) Keep all personnel clear of lifted product.

These lifting instructions should only be considered a supplement to proper training in lifting of heavy equipment as noted in the warning above.

See Drawing for specific switch detail.

4.2 Mounting

For vault and pad mount applications, provisions should be made for ample cable training space. All switches have provisions for mounting. See switch drawing in Section 9 for mounting details. Check that the switch, in its installed position, is secured and that mountings are adequate to support the weight of the switch. For applications that may be subject to flooding, the mountings must be capable of withstanding buoyant tendencies**.**

4.3 Grounding (earthing)

Ground bosses are located on the switch tank. To ensure a good ground connection, the top surface of each boss must be sanded to expose bare metal before making a ground connection. The switch tank must be attached to a suitable ground as required by local practice. Ensure that all cable terminations for shielded cable have been properly grounded to the switch tank during installation.

4.4 Cable Connections

Each entrance must be properly terminated. Entrances must be terminated following instructions supplied by the termination manufacturer.

⚠ WARNING

Switch entrances are designed to accept cable accessories constructed in accordance with IEEE 386 or a termination means specifically approved by G&W Electric Co. The use of any other cable termination means can present an electrical hazard or cause failure resulting in serious injury or death.

⚠ DANGER

End caps constructed in accordance with IEEE 386 or a termination means specifically approved by G&W Electric Co. must be used to cover any terminal connections that are not terminated to a cable. The shipping caps will not provide proper electrical insulation for an energized terminal. Energizing a non-terminated connection can present an electrical hazard or cause failure resulting in serious injury or death.

4.5 Installation Testing

High potential testing on switches and cable systems may be conducted. Refer to Section 7, Testing.

4.6 Fault Indicators (if applicable)

Refer to separate instructions.

4.7 Interrupter Controls (if applicable)

Refer to separate instructions.

4.8 Voltage sensors (if applicable)

Refer to separate instructions.

4.9 Actuators (if applicable)

Refer to separate instructions.

4.10 Enclosure (if applicable)

If supplied, pad mount enclosures provide tamper resistant construction. Penta-head bolts require a special wrench to open and are located on each access door. Door handles are supplied with a provision for padlocking. Wind stops are supplied for each door panel. Some enclosures are supplied with a flip-up top section that is locked in place behind the main access doors.

5.1 General

Switches are assigned ratings by the manufacturer and have been designed and tested using levels established by IEEE and/or IEC standards. Design and production tests are conducted to demonstrate that the equipment will perform within the ratings on the nameplate and customer drawing. See section 9.1 and Customer Drawing in Section 9

⚠ WARNING

Equipment in service will perform to established ratings only if properly installed, operated and maintained. Power switchgear is characterized by high voltage and high continuous and short circuit currents. It should be installed, operated and maintained by Qualified Personnel. Failure to properly install, operate or maintain the equipment may result in damage to the switch and possible injury or death.

For further information on operation and maintenance of equipment see IEEE C2 standards.

⚠ WARNING

Do not attempt to close into fault in excess of the switch ratings or to interrupt currents in excess of interrupting ratings. Either may result in damage to the switch and possible injury or death.

At least once per year and before each operation, check the SF_6 pressure by comparing the pressure gauge to the table on the switch or in Section 6.2 or, if supplied with a temperature compensated gauge, by ensuring indicator of pressure gauge is in green zone. Re-pressurize, if required, in accordance with Section 6.3.

⚠ WARNING

Do not operate an energized switch if the SF_6 gas pressure varies by more than 2 psig (14 kPa) from the Table 1, Section 6.2 or is in red zone of temperature compensated pressure gauge. Check gauge pressure before operating the switch. Improper SF_6 gas pressure may cause the switch not to operate as designed, resulting in damage to the switch and possible injury or death.

5.2 Use of the Multi-Position Operator and Locking System

The following steps are for switches utilizing a removable, breakaway style-operating handle (see Figure 1). Read all steps prior to operation.

⚠ CAUTION

Do not look into the viewing window while operating switch. The bright flash may cause temporary eye irritation.

5.2.1. The multi-position operator works with a removable handle, which fits over the hex nut of the operating shaft. A hook is provided on the switch for handle storage when not in use.

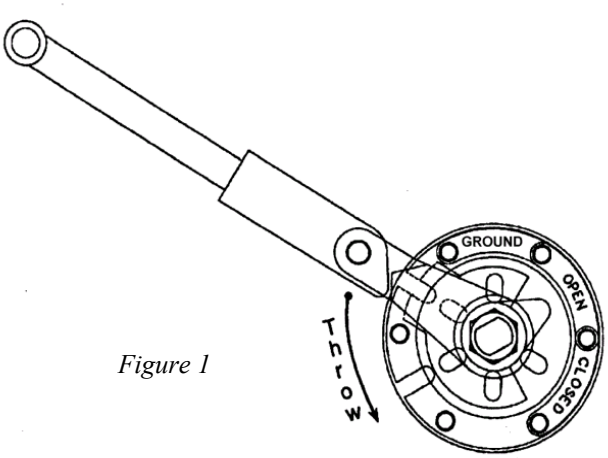
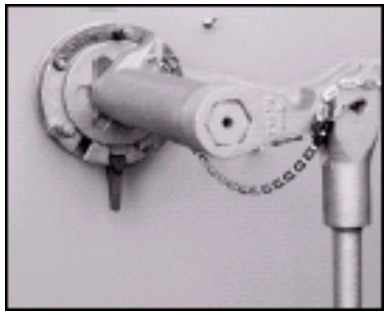


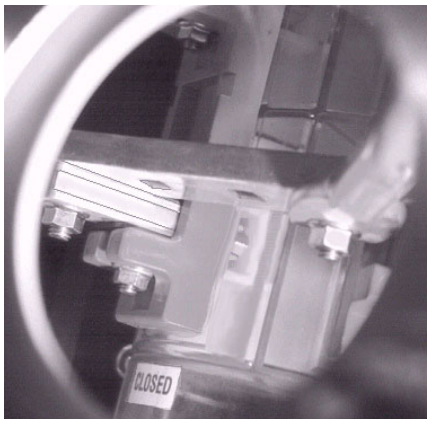
Figure 1



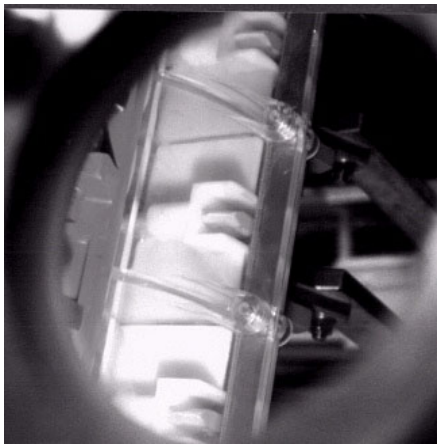
5.2.2. The handle may be positioned on the hex nut to give the best mechanical advantage for a particular switching sequence. To operate the switch, mount the handle on the hex nut so that the handle is rigid in the direction of operation. The handle will collapse and not operate the switch in the opposite direction. This breakaway action is a safety feature and prevents rapid reversal of the switch contacts. Because a load interrupting switch is not designed or rated to interrupt fault current, the breakaway handle eliminates the possibility of immediately reopening the contacts after closing into a fault. This provides time for line side circuit protective devices to operate. To return the switch to its original position, the handle must be removed, turned around, repositioned and reset. Verify contact position through the viewing windows supplied. (See photos).

NOTE: There are two viewing windows provided for each switched way. For best viewing of the contacts, position a flashlight through one window while looking through the other. Which window is used for viewing will depend on the contact position being verified. The stationary contact positions are identified by CLOSED and GROUND labels. Best viewing of the contacts in the CLOSED or GROUND position is obtained by viewing through the window opposite the contact position and illuminating the contact through the other viewing window with a flashlight.

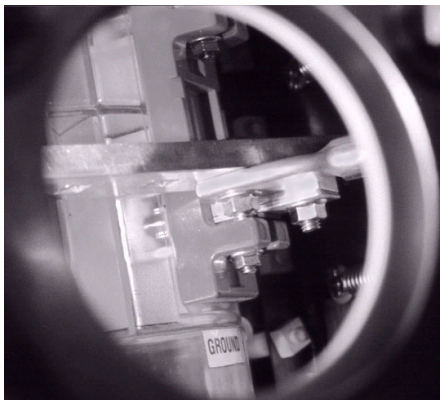
For safety reasons, the handle travel stops will prevent performance of successive, same-direction operations without first removing the handle extension and resetting it to its initial position



Closed contacts through viewing window.



Open contacts through viewing window.



Ground contacts through viewing

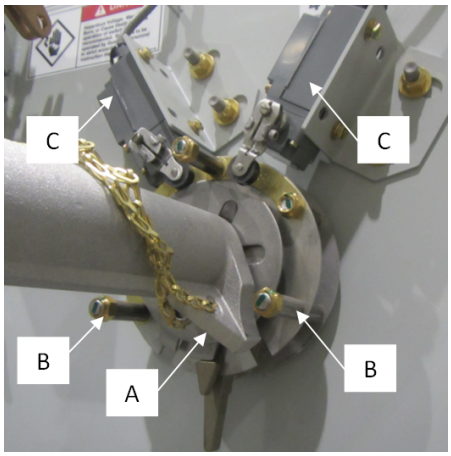
5.2.3. The operating handle is rotated in the same direction as the desired rotation of the switch contact system. When the spring operator is unarmed, the pointer indicates the relative contact position.

5.2.4. The position operator travels 60 degrees per operation. The operating handle must travel more than 60 degrees before the spring mechanism inside the switch tank is fully charged and unlatching will occur. At that point the switch contacts move rapidly from one position to the next. Whether the operating handle is moved fast or slow is unimportant. The switch contacts will remain latched until released by action of the spring mechanism. Contacts will latch in the new position when the switching action is completed. Avoid excessive force when manually operating.

For safety, the mechanism provides positive position indication. The operating handle and indicator will return to its original position, signifying an incomplete operation if the switch contacts fail to move.

5.2.5. For remote operation, either a hookstick or a rope may be used. A pully arrangement may be needed for rope operation to provide training to the desired location and to maintain proper mechanical advantage. To operate the switch remotely, position the handle on the operator hex nut and attach the rope or hookstick to the eye at the end of the handle. By operating the switch slowly, the transfer, occurring when the handle reaches the limit of its travel, will be felt, indicating a complete operation.

5.2.6. Handle stop tab (A) must be position between the bottom pins (B) when external limit switches(C) are present (See photo).



5.2.7. To OPEN from CLOSED, position the handle over the hex nut so that the handle is rigid for rotating counter-clockwise. Position the handle to permit a 60-degree rotation. Rotate the handle until the spring mechanism takes over to open the contacts.

Verify the OPEN contacts through the viewing window and by the indicating pointer on the external operator. The travel stop on the handle will prevent a successive operation without first repositioning the handle.

To padlock in the OPEN position, simply insert a padlock (#1) through the hole in the locking plate as shown in Figure 2.

To permit OPEN / CLOSE operation while preventing GROUND operation, position the ground stop up to the right (Figure 2) and insert a padlock (#2) around the mounting shaft as shown.

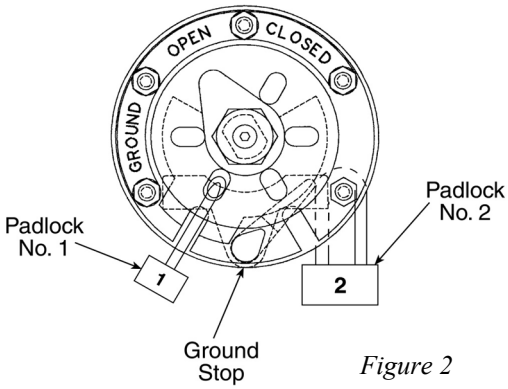


Figure 2

5.2.8. To CLOSE from OPEN, position the handle over the hex nut so that the handle is rigid for rotating clockwise. Position the handle to permit a 60 degree rotation. Rotate the handle until the spring mechanism takes over to close the contacts.

Verify the CLOSED contacts through the viewing window and by the indicating pointer on the external operator. The travel stop on the handle will prevent a successive operation without first repositioning the handle.

To padlock in the CLOSED position, simply insert a padlock (#1) through the hole in the locking plate as shown in Figure 3.

To permit OPEN / CLOSE operation while preventing GROUND operation, position the ground stop up to the right (Figure 3) and insert a padlock (#2) around the mounting shaft as shown.

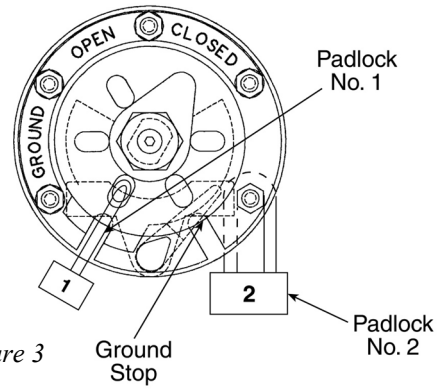


Figure 3

5.2.9. To GROUND from OPEN, position the handle over the hex nut so that the handle is rigid for rotating counter-clockwise. Position the handle to permit a 60-degree rotation. Rotate the handle until the spring mechanism takes over to ground the contacts.

Verify the GROUND contacts through the viewing window and by the indicating pointer on the external operator. The travel stop on the handle will prevent a successive operation without first repositioning the handle.

To padlock in the GROUND position, simply insert a padlock (#1) through the hole in the locking plate as shown in Figure 4.

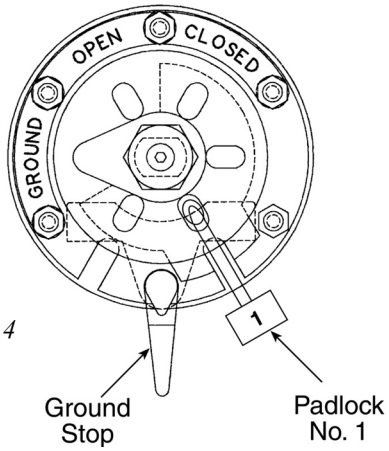


Figure 4

5.2.10. Manual operation of switches equipped with Two Position Motor Actuators and Quick Disconnect mounting (optional).

With motor actuator disengaged from lock assembly, position the special removable handle with notched head over the hex nut of the operating shaft. The handle must be positioned below the hex nut (see Figure 4A).

Figure 4A: Manual operation for motor actuator with quick disconnect coupling. Photo does not show motor actuator.

5.3 Operation of the THREE-PHASE fault Interrupter (if applicable)

To GROUND or Verify Contact Position
Refer to and follow the operating procedures for the three position rotary operator.

To Operate Fault Interrupters
The following steps are for three-phase FI fault interrupters utilizing an insulated removable style operating handle (Figure 5).

NOTE: The position of the three-phase vacuum interrupter handle (indicator) does not indicate switch contact position. Contact position is only verified by the OPEN-CLOSED indicator visible through the viewing window located below each interrupter operating handle coupling.

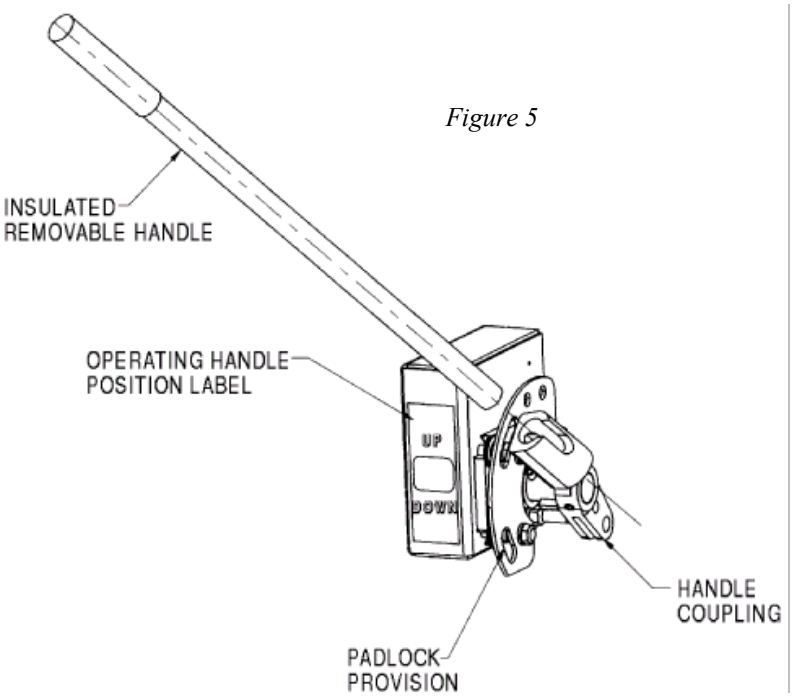


Figure 5

5.3.1. The insulated removable style handle is designed for direct hand operation.

5.3.2. Verify the proper SF_6 gas pressure of the switch by viewing the pressure gauge on the tank and cross-referencing the gas pressure/temperature Table 1, Section 6.2 of this instruction. The pressure/temperature chart is also located on the switch tank.

5.3.3. Verify interrupter contact position (OPEN or CLOSED) by looking through the viewing window adjacent to the operating handle.

5.3.4. If contact indicator reads CLOSED the operating handle will be in the up position. **To OPEN**, depress the handle down using a steady motion (approximately 15 degrees from its original position). Verify "OPEN" contacts by looking at the contact indicator through the viewing window (Figures 6 and 7).

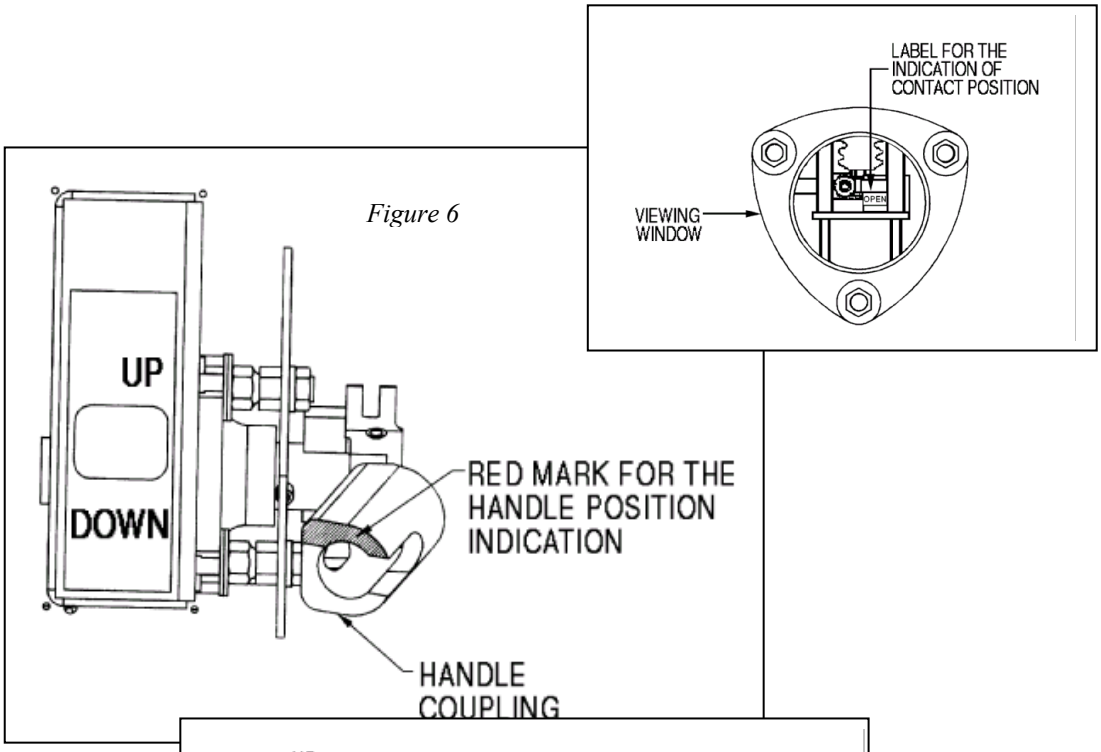


Figure 6

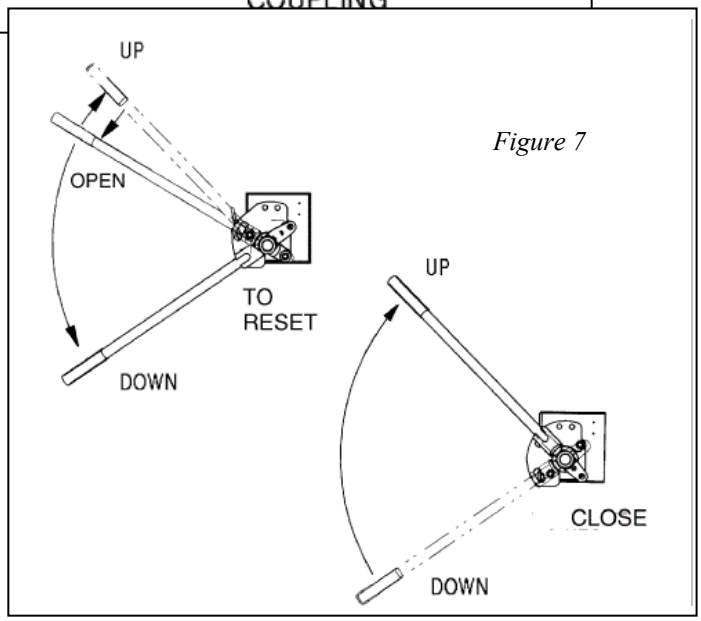


Figure 7

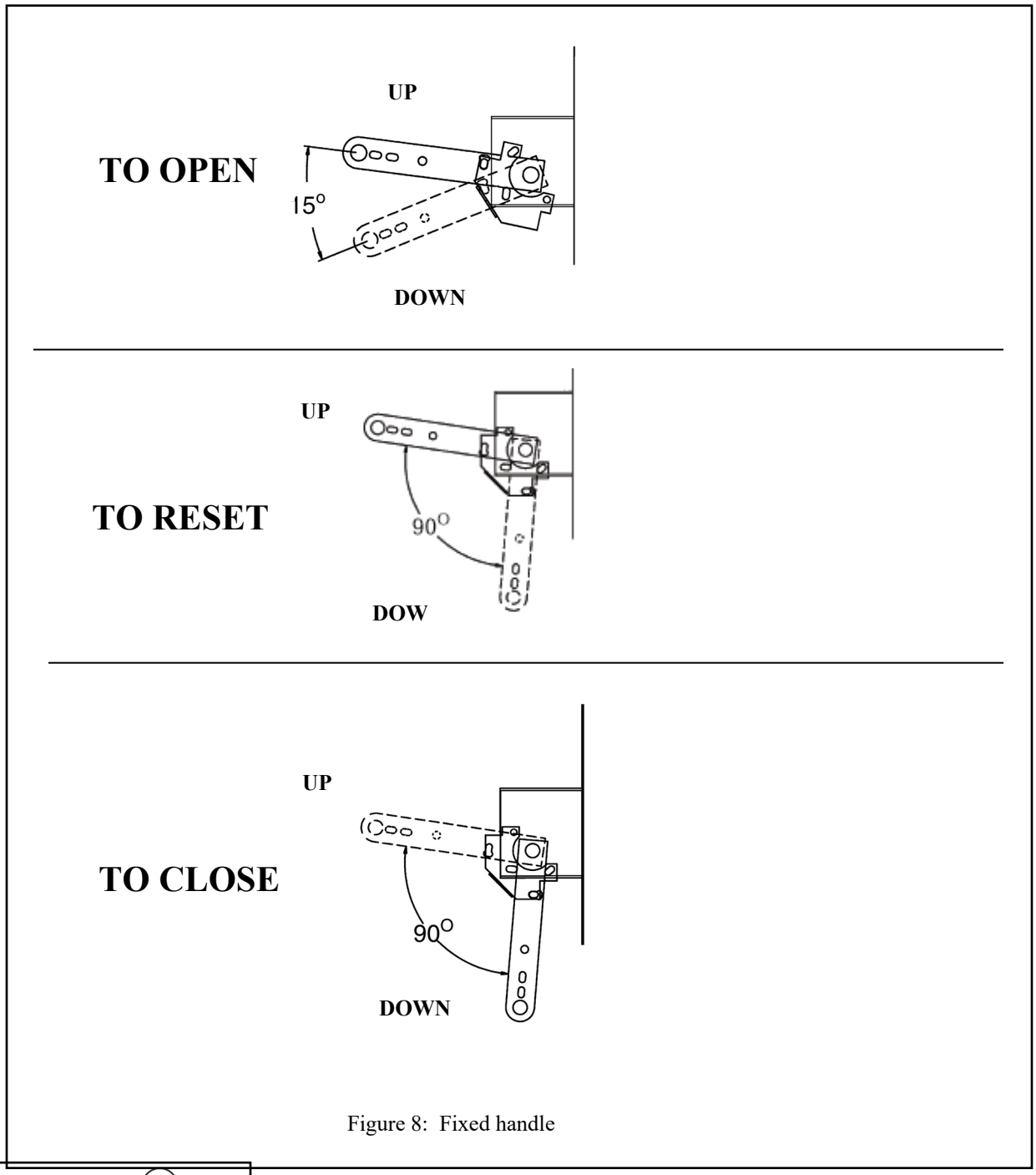
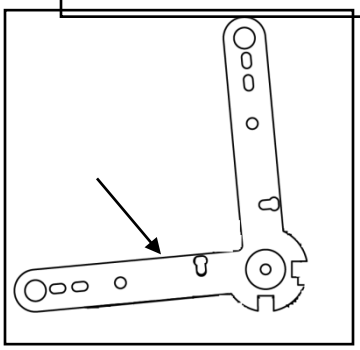


Figure 8: Fixed handle



For "L" shape fixed handles, the handle orientation mentioned in procedures refer to the bottom leg of the L handle.

5.3.5. If the contact indicator reads OPEN the operating handle may be in either the up or down position.

If the handle is up it means that the vacuum interrupter has been tripped due to an overcurrent condition,

remote or local electrical trip through the electronic control or manual open by depressing the handle approximately 15 degrees.

To RESET a tripped phase, first verify that the cause of the fault or overload is corrected. Next, depress the handle down using a steady motion until the handle movement stops (approximately 90 degrees from its original position). Return the operating handle to the up position until the handle movement stops.

This action recharges the springs inside the interrupter operating mechanism and closes the switch contacts. Verify "CLOSED" contacts by looking at the contact indicator through the viewing window. If the handle is down, it means that the vacuum interrupter has been manually opened.

To CLOSE, if handle is in the full down position, raise the handle up using a steady motion until the handle stops (approximately 90 degrees from its original position). Verify "CLOSED" contacts by looking at the contact indicator through the viewing window.

5.4 Operation of the Interrupter Controls

The electronic control monitors the current and activates a trip solenoid, which opens the vacuum interrupter to interrupt overcurrents. The control is housed within a NEMA enclosure and are powered by current transformers mounted inside the switch tank. The controls are factory set for the current response curves if specified by the customer.

Reference switch outline drawing and separate instructions on Vacuum Interrupter Controls for location and style of the controls supplied. Review the instructions for more detailed information.

5.5 Locking in a position

Padlock provisions are provided.

5.6 Operation by actuator (if applicable)

See supplemental instructions provided.

5.7 Automatic operation (if applicable)

See supplemental instructions provided.

5.8 Fuses (if applicable)

Some switches are equipped with dry well fuse holders for use with NX, ELX, CX or GP type current limiting fuses. Fuses are installed at the factory when they are ordered with the switch. The fuse holders are hook stick operable and can be mechanically interlocked with the switch to prevent access to the fuses when the switch is in the closed position.

⚠ DANGER

Fuse holders are not rated for load break or load make operation. Do not attempt to override the mechanical interlock to remove or replace fuses with the switch in the closed position. Always replace the fuse draw out rod and return the interlock to its closed and locked position prior to closing the switch. Fuse holders can contain energized parts even with the switch in the open position. Do not attempt to clean or probe inside of the fuse holders without completely de-energizing, grounding and isolating the switch in accordance with prescribed practices. Failure to follow these prescribed procedures can result in serious personal injury or death.

6.1 General

No internal maintenance is required. However, if the switch must be opened, personnel should be instructed to take certain precautions. During any internal maintenance, the switch must be de-energized. The SF_6 should be pumped from the switch through filters into a storage tank for reuse.

⚠ CAUTION

SF_6 removed from a switch should be pumped through a filter into a storage tank for reuse. SF_6 is heavier than air and will displace air (oxygen) in confined or low-lying areas. Make sure adequate ventilation is provided for enclosed or low-lying environments to prevent oxygen displacement and possible injury or death by asphyxiation.

SF_6 has been identified as a greenhouse gas and should not be released into the atmosphere. Emissions of SF_6 may contribute to global warming.

Occasional visual inspection of the switch is recommended and if possible, the switch (es) should be exercised periodically.

At least once per year and before each operation, check the SF_6 pressure by comparing the pressure gauge to the table on the switch located near the pressure gauge or in Section 6.2 or if supplied with a temperature compensated pressure gauge, by ensuring indicator of pressure gauge is in green zone. Re-pressurize if required in accordance with Section 6.3. A fitting is provided on the tank for the addition of SF_6. If leak detection becomes necessary, detectors are readily available which are sensitive to SF_6.

6.2 Table 1, SF_6 Pressure/Temperature Chart (for non-temperature compensated pressure gauge)

Ambient Temperature (1)	Filling Pressure	Ambient Temperature (1)	Filling Pressure
°C	kPa	°F	psig
-30	31	-20	4.7
-20	37	0	5.6
-10	43	20	6.5
0	49	40	7.5
10	55	60	8.4
20	61	80	9.3
30	66	100	10.2
40	72	120	11.2
50	78		

(1) For ambient temperatures less than -20°F *(-30°C)* or in excess of 120°F *(50°C)* consult factory.

⚠ WARNING

Do not operate an energized switch if the SF_6 gas pressure varies by more than 2 psig (14 kPa) from the Table 1, Section 6.2 or is in red zone of temperature compensated pressure gauge. Check gauge pressure before operating the switch. Improper SF_6 gas pressure may cause the switch not to operate as designed, resulting in damage to the switch and possible injury or death.

⚠ CAUTION

Fresh SF_6 gas is nonflammable and non-toxic but is heavier than air. Oxygen may be displaced in low-lying or enclosed environments. Make sure adequate ventilation is provided to prevent oxygen displacement and possible asphyxiation.

6.3 SF_6 Filling Procedure

If it is suspected that the switch has lost some or all of its gas, follow this procedure to verify loss and properly refill the switch. Verify the switch pressure with a known gauge. This can be accomplished by connecting the known gauge to one end of a flexible hose suitable for pressure up to 15 psig or 103 kPa and connecting the other end to the switch fill valve.

Two different types of fill valves have been used on G&W switches. One has a 1/4" NPT male connection and the other has a 1/4" SAE male flare connection. The fill valve with the 1/4" NPT male fitting is distinguished by its separate shutoff handle. Valves with the 1/4" SAE male flare connection have internal shut-offs which are activated by the hose connection fitting. Be sure to use the proper fittings for connecting to the fill valve.

⚠ CAUTION

Use of improper fittings can cause gas leakage leading to a complete loss of gas pressure. Complete loss of gas pressure can lead to a switch explosion resulting in serious injury and/or death.

6.3.1 If the switch has lost some gas but has maintained a positive pressure, it need not be de-energized or vacuumed before re-pressurizing with SF_6. Proceed to 6.3.5

6.3.2 If the switch has not maintained a positive pressure de-energize immediately and follow the entire filling procedure beginning with 6.3.3, below.

6.3.3 If the switch tank has not maintained a positive pressure of at least 2 psig (14 kPa) or has otherwise been opened to ambient air, the switch tank should be purged**.**

⚠ CAUTION

Do not purge the switch while energized. Complete loss of SF_6 gas can lead to a switch explosion resulting in serious injury and/or death.

The molecular sieve is located inside the switch tank in a plastic mesh. The switch tank may have to be cut open to replace the molecular sieve. Plastic gloves should be worn to prevent white power by-products from coming in contact with skin as it may cause irritation. One end of the plastic mesh may be unfastened to allow removal of the bags.

It is important to minimize exposure of the molecular sieve to moist atmospheric conditions. The molecular sieve is not listed in the U.S. EPA's Resource Conservation and Recover Act (RCRA) Hazardous Waste Management Regulations and does not possess any of the four identifying characteristics of hazardous waste. Dispose of the sieve and container in an environmentally acceptable manner, in full compliance with all applicable government regulations.

6.3.4 Remove the cap covering the valve, connect the vacuum pump, open the tank valve and evacuate the switch to between 29 and 30 inches of mercury at 60°F (98-101 kPa at 15.6°C). Disconnect vacuum pump.

Fill switch to 10 psig (79 kPa) with dry nitrogen having a dew point of less than -45°C (-49°F).

⚠ CAUTION

Do not pressurize the switch beyond 103 kPa or 15 psig. The tank has a maximum operating pressure of 103 kPa or 15 psig. Exceeding 15 psig or 103 kPa can lead to a switch explosion resulting in serious injury and/or death.

After completing the fill, vent and re-vacuum to between 29 and 30 inches of mercury at 60°F (98-101 kPa at 15.6°C). Disconnect vacuum pump. The switch is now purged.

6.3.5 Adjust the gas regulator to 20 psig (140 kPa) and allow a small volume of SF_6 to flow, purging air from the supply line prior to connecting the supply line to the switch.

⚠ CAUTION

Do not pressurize the switch beyond 103kPa or 15 psig. The tank has a maximum operating pressure of 103 kPa or 15 psig. Exceeding 15 psig or 103 kPa can lead to a switch explosion resulting in serious injury and/or death.

6.3.6 Remove the valve cap and make the connection to the switch. Re-pressurize the switch according to Table 1, Section 6.2.

⚠ CAUTION

Do not pressurize the switch beyond 103kPa or 15 psig. The tank has a maximum operating pressure of 103 kPa or 15 psig. Exceeding 15 psig or 103 kPa can lead to a switch explosion resulting in serious injury and/or death.

6.3.7 Once the switch is filled, stop the flow of SF_6, remove the filling line and replace the cap.

6.4 Handling of G&W SF_6 Switches

6.4.1 Overview

The following information is for reference as a general guideline when operating, performing maintenance or disposing of G&W Electric Sulfur Hexaflouride (SF_6) gas insulated switchgear. This information is compiled in accordance with existing industry papers on the subject *(see reference section)*. It is difficult to anticipate all possible situations that may occur. Any questions on how to handle a specific situation should be forwarded to the local G&W Electric representative. State and local regulations should always be considered.

⚠ CAUTION

SF_6 gas venting from a switch should be pumped through a filter into a storage tank for reuse. SF_6 heavier than air and will displace air in confined or low-lying areas. Make sure adequate ventilation is provided for low-lying or enclosed environments to prevent oxygen displacement and possible asphyxiation.

6.4.2 General Information

SF_6 gas has been used for many years in transmission cable systems and circuit breakers. The application versatility of the gas soon led to its use in distribution voltage (15.5-38kV) equipment. Although it is used as an insulating medium in both applications, there are some very important differences to consider. Primary considerations are the amount of SF_6 gas used in the equipment, typical operating pressures and the fault or load break energy associated with interruption.

6.4.2.1 Amount of Gas

High voltage circuit breakers use large amount of gas, up to 2000 lbs. (800 kg) in some applications. G&W SF_6 switches use between 8-20 lbs. of gas**.**

6.4.2.2 Operating Pressure

The pressure of SF_6 gas in any contained vessel will vary with temperature. G&W SF_6 switches require an operating pressure of approximately 8.5 psig at 60^{o}F (55 kPa at 10 ^{o}C).

6.4.2.3 Fault or Load Break Energy

High voltage circuit breakers re designed to interrupt typically high energy fault current within the SF_6 environment. G&W SF_6 load break switches are designed for typically 630 Amp load break operation. In accordance with industry standards, the switches also have a momentary and fault close rating typically in the 20-40 kA asym. (32-64 kA peak) range. Arc interruption in SF_6 is therefore only a load break or low energy function, as opposed to a fault interrupting or high energy function. G&W switches designed for fault interrupting duty incorporate vacuum bottles or air insulated canister style fuses for these applications. All fault interruption is performed without the aid of SF_6 gas.

Sulfur hexaflouride gas, in its virgin state, is a non-toxic, nonflammable, odorless and colorless gas. It combines excellent electrical, chemical and thermal properties making it an ideal dielectric. Included in these properties are high dielectric strength, excellent arc quenching capability, excellent chemical stability and good thermal conductivity. Although the gas has many advantages, there are certain precautions which should be considered when dealing with this dielectric.

6.4.3 Safety Precautions & By-products

Sulfur hexaflouride has been described as a "physiologically inert gas". Laboratory rats have been exposed to a mixture of 80% SF_6 and 20% oxygen (the maximum concentration of gas possible without lowering the oxygen supply to an unsafe level) for periods of 16-24 hours. The rats showed no signs of intoxication or irritation either during exposure or afterward. SF_6 is heavier than air and will accumulate in low lying areas. Because the gas is odorless, colorless and non-poisonous, it cannot easily be detected without the use of proper equipment. The possibility of asphyxiation due to oxygen displacement needs to be considered. Proper gas detection instruments should be used.

At very high temperatures or in the presence of an electric arc, SF_6 can be slowly decomposed. Decomposition products include lower fluorides of sulfur, which are hydrolyzable, yielding SO_2 and HF. Arced SF_6 in the presence of moisture may form potentially toxic by-products which can exist in both the gaseous and solid states.

G&W uses the driest, highest grade SF_6 gas commercially available. G&W SF_6 switches have short arcing times, small volumes of dry SF_6 and contain a molecular sieve to absorb possible moisture and arc by-products thus minimizing the amount of by-products released. However, all SF_6 by-products should be considered potentially dangerous**.**

6.4.4 Solid By-products

Tests have shown that arcing in SF_6 gas will produce solid by-products in the form of a fine dust or powder which consists of metal fluorides. These fluorides can be irritating and dangerous when in contact with skin or eyes. Contact with the powder should be avoided. Also, precautions should be taken to avoid inhaling the powder. The powder particles are small and light enough to be suspended in air for substantial periods of time. This dictates the use of respirators or other protection to prevent inhaling the suspended particles when internal maintenance of the switch is required.

6.4.5 Gaseous By-products

G&W has sampled the gas from a test switch to analyze the by-products. The switch was initially filled with approximately 13 pounds of SF_6 gas. The switch was operated 104 times under full load conditions (nominally 26 to 31 kV, 585 to 735 amps) and 30 times under loop circuit conditions (nominally, 5kV, 400 amps). The arc by-products and their concentrations resulting from these tests are in general agreement with those reported in other industry published papers and include SOF_2, CO_2, CF_4, and SO_2F. SOF_2, thionyl fluoride, is the most highly concentrated arc by-product produced. SOF and SO_2F are irritants to the respiratory tract and eyes. Fortunately, these gases are characterized by a pungent odor (rotten egg) noticeable in concentrations from 1 to 5 ppm. Industry reports indicate the lethal concentration for sixty minutes of exposure to SOF_2 is 100 ppm for rats and mice, and 500 ppm for rabbits. Carbon dioxide, CO_2, and carbon tetraflouride, CF_4 are considered nontoxic.

6.4.6 Recommended Precautions

Vault or Enclosed Area Applications. In the unlikely event of a catastrophic switch failure which may cause the gas to be released to the environment, special precautions are necessary for vault or enclosed area applications. In this situation, toxic gases may accumulate and be present at dangerous levels. The gases that are produced will have a characteristic "rotten egg" odor. However, smell should not be used a s a test for the presence of by-products. The vault should be completely ventilated of all contaminated gases. If a vault has been purged, use a halogen type detector to test the air in the vault to determine if all SF_6 gas has been vented and sufficient oxygen is present. If all SF_6 has been vented, then the other gaseous by-products should have been removed at the same time. In any case, it is recommended that personnel entering the enclosed area be provided with air masks or rescue breathing apparatus. Self-contained oxygen masks should be used for maximum safety.[(1)]

Above Ground Outdoor Applications. In the unlikely event of a catastrophic switch failure in above ground, applications, typically the gases would be dispersed into the atmosphere. Allow adequate time, approximately thirty minutes, depending on conditions, for this to occur before investigating the equipment.

6.4.7 Opening an SF_6 Switch for Disposal

In order to dispose of a G&W SF_6 gas insulated switch, the switch must be opened. If the tank is still under pressure, the SF_6 must first be removed from the switch. This should be accomplished using suitable gas recovery equipment if at all possible. Alternately, the gas may be released to a well ventilated area where personnel will not be subject to possible arc by-products. One method might be to vent the gas through an absorber to neutralize any acid present. This can be accomplished using a hose on the fill valve of the tank. Air masks, breathing apparatus or, for maximum safety, self-contained oxygen masks should be provided for personnel if proper ventilation is not possible. Do not allow personnel to continually breathe gas that has an odor. Store the gas in suitable containers.

⚠ WARNING

Do not open any SF_6 filled equipment that has experienced arcing, corona or very high temperatures without taking adequate safety precautions to protect personnel from potentially hazardous solid and gaseous products.

Since G&W SF_6 tanks are welded, it is necessary to grind or otherwise remove the weld off of the lid. This can be accomplished by grinding the weld filet flush and then chisel the remaining weld. This will minimize the possible spread of the solid by-products. Once the lid is removed, the exposed interior of the switch should be allowed to stand in a well ventilated area for at least thirty minutes in order for any retained gaseous by-products to dissipate. The use of gas detection equipment and proper protective clothing is recommended.

6.4.8 Internal Cleanup

Although the amount of by-products should be minimal, personnel required to handle or remove the SF_6 solid by-products should wear skin protection equipment including disposable coveralls and gloves. Respiratory protection as previously described should also be worn. Any powder should be vacuumed (2) up or if possible wiped up with rags. The powder should be stored in an air tight metal container. The switch may have a light coating of white powder on the walls and components. These should be wiped down with a solution of sodium bicarbonate (baking soda).(3) The excess solution and rags should be disposed of with any powder previously collected. Parts with powder on them that cannot be reached should be disassembled and wiped down.

6.4.9 Disposal of Materials

The tank and components that have been cleaned in the prescribed manner may be disposed of safely. The collected powder, solution and cleanup materials should be placed together in double plastic bags inside a metal container and have water added to cover them The pH of the solution should be checked. Solutions with a pH between 6 and 9 are generally suitable for normal disposal. If desired, soda carbonate (soda lime)(4) can be placed on top of the materials to neutralize the acidity.

Emission of SF_6, or disposal of contaminated absorbents may be subject to environmental regulations. Users should review their operations in terms of applicable federal, state and local laws and regulations.

6.4.10 SF_6 General Guideline References

1. Study of Arc By-products in Gas Insulated Equipment. EPRI Report EL1646, Project 1204-1.

2. SF_6 Gas Analysis Service. M J. Mastroianni & R. B. Jackson, Allied Chemical Corp. (Allied Signal)

3. Handling of SF_6 and Its Decomposition Products in Gas Insulated Switchgear (GIS). CIGRE Working Group 23.03, Electra No. 136 Part 1 dated June 1991 and Electra No. 137 Part 2 dated August 1991.

6.4.11 Footnotes

(1) Can be supplied from safety equipment manufacturers, e.g., Scott Aviation, a division of Figgie International Inc., 2225 Erie St., Lancaster, New York, 14086, USA Telephone 716-683-5100.

(2) Can be supplied from safety equipment manufacturers, e.g. Nilfisk of America, Inc., 300 Technology Drive, Malvern, Pennsylvania, 19355, USA or equivalent. Telephone 800 - *NIL - FISK*.
(3) Rule of thumb is dissolving 4 oz. (114 grams) of baking soda in one gallon (3.785 liters) of water.
(4) Rule of thumb is dissolving approximately 2.5 lbs. (*1.1325* kilograms) of sodium carbonate (soda lime) to 55 gallons (*211.538* liters) of water.

6.5 SF_6 Gas Specification

SF_6 is made from two materials, sulfur and fluorine, which are in abundant supply. SF_6 is readily available from any of several suppliers.

The use of commercial grade SF_6, per ASTM D2472, is recommended and may be obtained in cylinder sizes ranging from 6 to 115 pounds (2.714 to 52.036 kilograms).

Because high moisture content will affect the interrupting and dielectric properties of SF_6, cylinders should be sampled, testing dew point per ASTM D2029, before using. Simplified equipment for making this check is readily available. Cylinders whose dew point occurs above -45°C (-49°F) should be rejected.

6.6 Finish of Switch

The switch paint finish is comprised of a two part epoxy, gray coating (Munsell No. 5BG7/0.4). Clean using soap and water. Touch up paint is available.

6.7 Repair Parts List

Items such as operating handles, motor actuators, pressure gages, fill valves, shaft seals, bushings, gaskets, viewing windows, etc. are available from the factory if required. To inquire about spare or repair parts, contact G&W Representative or customer service with the switch serial number.

6.8 Returning Equipment to Service

6.8.1 Make sure that the load interrupting and fault interrupting switches grounding means are removed.

6.8.2 Make certain the load interrupting and fault interrupting switches are in the correct position. If the switch operators are to be padlocked, do so at this time.

6.8.3 For padmounted switches, padlock the enclosure before leaving the area even momentarily. This should be done even if the switch is accessible only to qualified persons.

SECTION 7 TESTING

7.1 Installation Testing

⚠ WARNING

Follow these precautions when performing electrical tests:
1. Completely de-energize the switch and disconnect it from all power sources.
2. Terminate all bushings with an insulated cap or other suitable cable termination capable of withstanding the test voltage.
3. Verify the SF_6 gas pressure is in accordance with Table X, Section 6.2.
Failure to observe these precautions can result in flash over, injury and equipment damage.

⚠ WARNING

The DC withstand capability of switches may be reduced due to damage, gas leakage, or electrical or mechanical wear. The DC test voltage must not exceed the withstand limits of the switch. Application of DC voltages greater than the withstand capability of the switch can result in flash over, injury and equipment damage.

⚠ CAUTION

Do not pressurize the switch beyond 103kPa or 15 psig. The tank has a maximum operating pressure of 103 kPa or 15 psig. Exceeding 15 psig or 103 kPa can lead to a switch explosion resulting in serious injury and/or death.

⚠ WARNING

When it is necessary to test the cables connected to an energized switch, proper insulation between the power-frequency source and the DC test equipment must be maintained. Follow the recommendations of the manufacturer of the test or fault location equipment.

⚠ DANGER

Do not exceed the Maximum Dielectric Test Levels as shown in Section 7.1.2. Exceeding the test levels can cause flash over. This can lead to a fault in the switch or test equipment and cause serious personal injury or death.

7.1.1 General

After switches are completely installed in accordance with local practices, high voltage testing may be performed before the switch is energized. Test levels will generally be established by the cable or termination manufacturer but should not exceed the values listed in the tables below. Insure the test equipment is used in accordance with the manufacturer's instructions.

7.1.2 Maximum Dielectric Test Levels:

Switchgear Rating			Withstand Test Voltage	
50 Hz	**60 Hz**	**Impulse (BIL)**	**Power Frequency***	**DC*ǂ**
12kV	15.5kV	95kV	27kV	42kV
24kV	27kV	125kV	40kV	62kV
36kV	38kV	150kV	50kV	82kV

*Power Frequency withstand and DC withstand test voltages listed in the table are approximately 80% of the design values for the equipment.

ǂAlthough AC withstand test is the preferred method of testing the integrity of a vacuum interrupter, DC withstand tests are often used as a substitute when an AC tester is not available.

7.2 Cable Testing

DC testing is primarily used to test the integrity of installed cable systems and terminations. DC testing should be performed in accordance with appropriate cable test standards, and must not exceed the rating of the switch.

⚠ WARNING

DC testing cables installed on switches must only be performed when all ways of the switch and cables are isolated from all system voltages. Applying a DC test voltage to a switch with energized ways may lead to electrical failure of the switch resulting in personnel injury or death.

⚠ WARNING

Testing of switches with internal potential transformers must not exceed the rating of the transformer. Applying a test voltage in excess of the transformer rating may damage the transformer leading to electrical failure of the switch which could result in personnel injury or death.

7.2.1 Maximum Cable Testing Levels:

Switchgear Rating			Cable Testing	Cable Thumping
50 Hz	**60 Hz**	**Impulse (BIL)**	**Power Frequency**	**DC**
12kV	15.5kV	95kV	30kV	15kV
24kV	27kV	125kV	40kV	20kV
36kV	38kV	150kV	40kV	20kV

7.3 Factory Production Tests

Routine (production) tests are conducted in accordance with applicable standards. The following are typical production tests performed.

Loadbreak Switches:

- Circuit Resistance Test
- Dielectric Test (60hz Withstand Test)
- Tightness Test (Leak Test)
- Design and Visual Checks (Operating Assurance Test)

Fault Interrupters:

- Circuit Resistance Test
- Dielectric Test (60hz Withstand Test)
- Tightness Test (Leak Test)
- Design and Visual Checks (Operating Assurance Test)
- Calibration of Minimum Power Up Level and Time Current Tests
- Control and Secondary Wiring Tests

7.4 Interrupter Testing

G&W can supply an optional tester to verify the proper operation of the fault interrupter electronics. Contact your G&W representative for further information**.**

SECTION 8 TROUBLESHOOTING

8.1 Leak Checking

SF6 switchgear is designed and built to be sealed for life. Should the pressure of the switch fall outside the range specified on the pressure/temperature chart, the switch should be checked for possible leaks. Hand held halogen leak detectors are generally suitable for detection of leaks which have caused a drop in pressure greater than allowed. These hand held detectors are commonly used for refrigeration equipment servicing and are readily available.

If a leak does occur, it is generally found to be at on of the points of penetration into the tank. These points of penetration typically consist of:

- Pressure Gauge
- Fill Valve
- Shaft Seals
- Bushings
- Viewing Windows
- Electrical Feedthroughs

Leak checking should be done in an area free of other substances that can be detected by the leak detector. The presence of solvents on the device being tested can give false leak detection readings.

Leak detection should follow the recommendations of the manufacture of the detection equipment being used. For hand held leak detectors of the "sniffer" type, generally the detection wand is moved slowly (1 cm/sec) over the area being tested. The presence of a leak is typically indicated by a change in audible tone or other visual indication.

⚠ WARNING

Repair of leaks on switches must only be attempted on de-energized equipment. Attempting repair on an energized switch can result in complete loss of pressure leading to failure of the switch which could cause severe personal injury or death.

Once the source of the leak has been detected, repair generally falls into one of three categories. If the leak is occurring from a threaded connection (pipe thread entrance) the fitting can be removed, sealant applied to the threads and the fitting reinstalled. If the leak is from a gasketed surface, the gasket may be replaced. When replacing a gasket it is important to clean the mating surfaces and apply a thin film of lubricant to the gasket for proper seating during assembly. Lubricant for gaskets should be a flourosilicone based oil for best results. If the leak is occurring from a component such as a pressure gauge or fill valve, then the component must be replaced.

Proper replacement components should be obtained from G&W Electric Co.

8.2 Controls

See separate control instructions.

SECTION 9 ATTACHMENTS

9.1 Customer Drawing(s)

9.2 Supplemental Instructions, if applicable. May include:

1) **Motor Actuators**
2) **Controls**
3) **Fuses**
4) **Fault Indicators**
5) **Voltage Sensors**
6) **Interrupter Controls**
7) **Low Pressure Warning Devices**

9.3 Material Safety Data Information

See G&W website at www.gwelec.com for MSDS information.

EPG PM1 Inspection

PM

● 8 ● 5 ● 37 ● 3

Inspection Number	16079544	Customer No	3039150
Serial Number	6WN00692	Customer Name	INTROBA INC
Make	CATERPILLAR	Work Order	0823894
Model	3512B	Completed On	2/15/2024 10:30:51 AM
Equipment Family	ENGINE - GENERATOR SET	Inspector	Ian Smith
Asset ID	POWRPLANT	PDF Generated On	2/15/2024
SMU	813 Hours	Location	300 EAST PEDRO SIMMONS DRIVE
Coordinates	0, 0, 0		

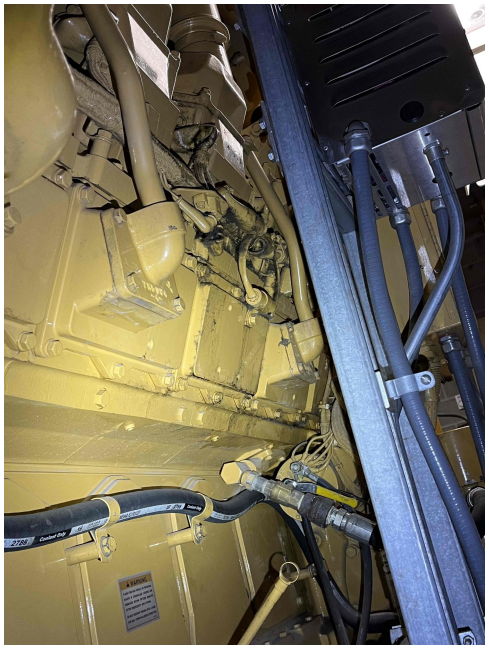
General Info & Comments

General info/Comments

ACTION

Comments: Recommend installing a closed crankcase ventilation system before damage is caused to the generator.
Right now the breathers are just venting directly onto the valve covers, covering them in oil. The oil from the breathers is getting into the generator end and causing excessive debris accumulation.

See inspection for other recommendations.



Red - Electrical System

2.4 Battery Part Number/Size, Replacement Date & Qty *NOT OK*

Comments: Installed 9/2020, customer would like them replaced asap. He said they could install them.

2.4.1 Results 153-5710 each

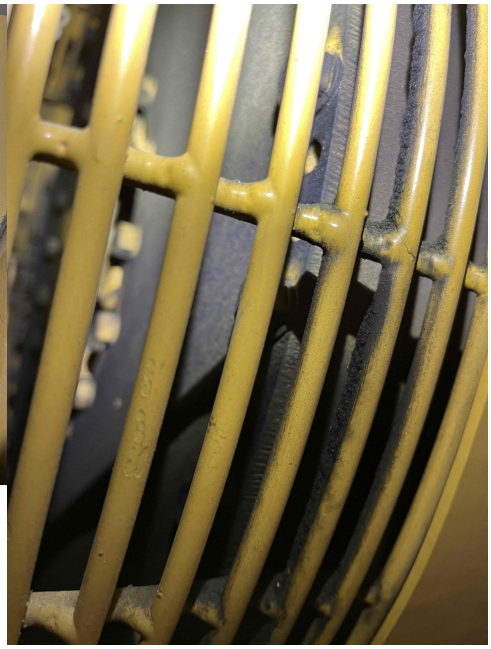
Red - Lubrication System

3.2 Check Engine for Oil Leaks *ACTION*

Comments: Fluid filled damper is leaking and covered with oil, front main seal is also leaking. Recommend replacing damper with reman and while the damper is off the front main seal should be replaced ASAP.

Due to the damper no longer being filled with fluid it can cause excessive crankshaft vibration leading to catastrophic damage and or failure of the crankshaft.

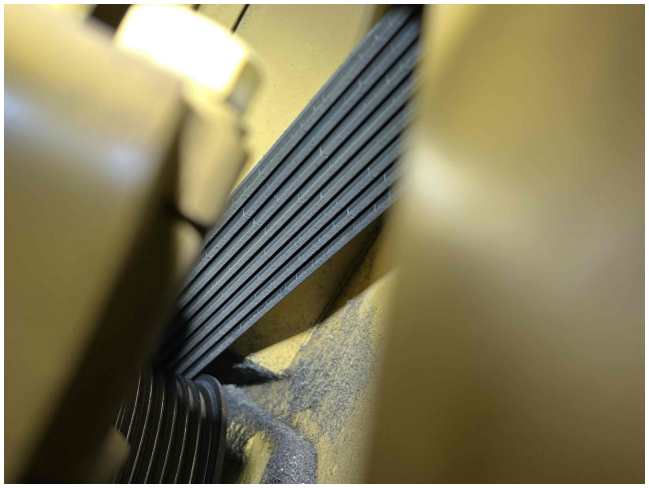
Found oil actively leaking where the oil pump is mounted to the front housing. Oil is also leaking at the alternator drive adapter. I showed these leaks to the customer so they can monitor them. Recommend resealing if leak worsens.



Red - Cooling System

4.7 Check Condition of Belts / Record Part Number if Replacement needed *ACTION*

Comments: Alternator belt is original to the unit and should be replaced.



4.9 Test Radiator Cap / Record Size if Replacement needed *ACTION*

Comments: Seals are getting brittle, recommend replacing.

Red - Generator

7.1 Remove Covers & Inspect Generator Components *ACTION*

Comments: Generator end is very dirty due to the engine breathers venting in properly.
Recommend installing a closed crankcase ventilation system or installing and routing hoses out of generator room.

7.2 Check Generator Condensation Heater (if applicable) *ACTION*

Comments: Strip heater does not have supply power ran or connected to it.

Red - Engine / Generator Mounting

9.1 Inspect for Proper Installation & Loose Fasteners *ACTION*

Comments: Mounts on emergency stop box are disenigrated. Recommend replacing mounts.

Yellow - Cooling System

4.2 Check for Coolant Leaks

MONITOR

Comments: Elbow coming out of the thermostat housing is starting to leak at the weld joint.

Front oil cooler water bonnet is starting to have a pin hole leak.

Showed customer these spots so the can monitor them.

4.5 Check Coolant Conditioner Level

MONITOR

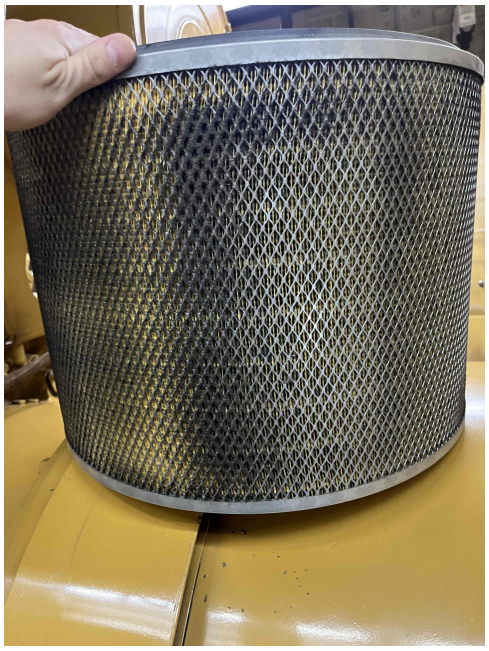
Comments: 1200 PPM

Yellow - Air Induction & Exaust System

6.1 Check Air Filter Element / record Part Number if Replacement is Needed

MONITOR

Comments: Covered with oil due to improper breather venting.



6.1.1 Part Number

6.3 Insect Operation of Air Intake Louvers/Fans

MONITOR

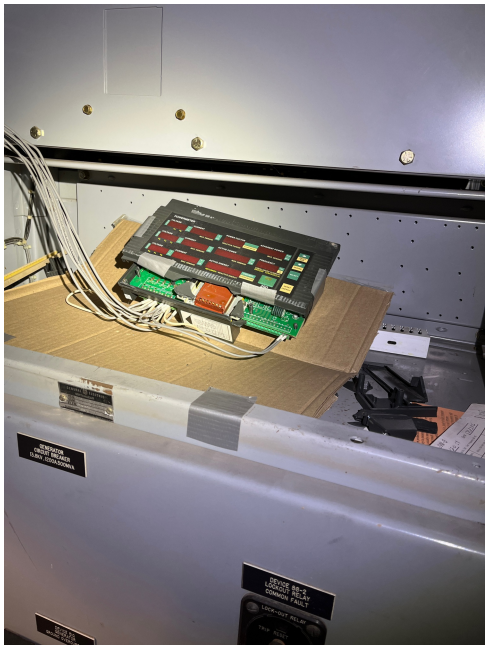
Comments: Louvers and fans are not automatic when unit starts.

Yellow - Generator

7.4 Inspect Contactors, Relays, & Timers

MONITOR

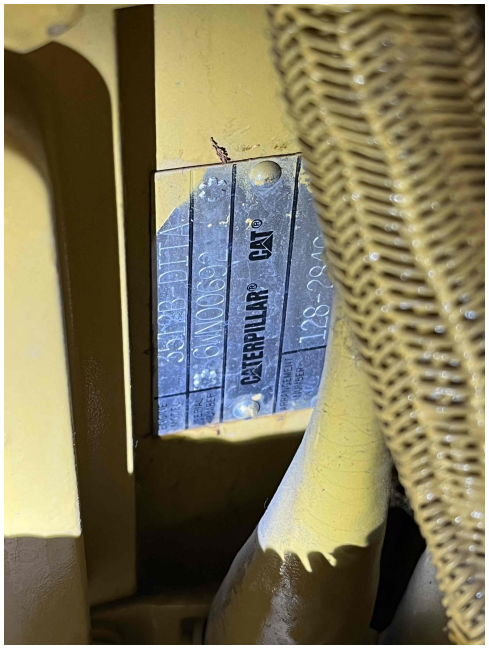
Comments: Controller laying loose in switchgear cabinet.




Green - Site / Unit Information

1.1 Obtain Pictures of Unit / Site — *YES*


1.2 Obtain Pictures of Data Tags — *YES*



Green - Electrical System

●	**2.2 Check & Record Battery Voltage Reading**	*NORMAL*
	2.2.1 Result	26.5 VDC
●	**2.3 Clean Battery Posts, Cables & Exterior**	*OK*
●	**2.5 Check Battery Charger Operation / Record Charge rate**	*NORMAL*
	2.5.1 Reading	2 Amps

Green - Lubrication System

●	**3.1 Check Engine Oil Level**	*WITHIN OPERATING RANGE*

Green - Cooling System

●	**4.1 Check Coolant Level & Condition**	*FULL*
●	**4.3 Check Coolant Hose Condition**	*NORMAL*
●	**4.6 Check Coolant Freeze Protection Level**	*NORMAL*
	4.6.1 Result	-38 Degrees
●	**4.8 Check Block Heater Operation**	*NORMAL*

4.10 Block Heater Shut Off Valves Installed	*YES*
Green - Fuel System	
5.2 Check Fuel Day Tank Operation (if applicable)	*NORMAL*
5.3 Check Fuel Prime / Starts Quickly	*NORMAL*
5.4 Check for Fuel Leaks	*NORMAL*
Green - Air Induction & Exaust System	
6.2 Inspect Air Intake Piping & Connections	*NORMAL*
6.4 Inspect Turbocharger(s)	*NORMAL*
6.5 Check Exhaust System for Leaks	*NORMAL*
6.6 Inspect Rain Cap / Record Size if Replacement is needed	*NORMAL*
6.6.1 Size	
Green - Generator	
7.3 Inspect / Tighten all Terminal Strip Connections	*NORMAL*
7.5 Inspect all Connections / Components with Infrared Camera	*NORMAL*
Green - Engine / Generator Protection Systems	
8.1 Check Engine Over Crank Alarm	*PASS*
8.2 Check Engine Over Speed Shutdown	*PASS*
8.3 Check Engine Low oil Pressure Shutdown	*PASS*
8.4 Check Engine High Coolant Temperature Shutdown	*PASS*

8.5 Check Control Panel Gauges & Warning Lights		*NORMAL*

Green - Engine / Generator Mounting

9.2 Inspect Vibration Isolators for Proper Adjustment		*NORMAL*

Green - Running Operational Checks

10.1 Visual Inspection with Infrared Camera		*NORMAL*
10.2 Record Alternator Output (if applicable)		*OK*
10.2.1 Reading	27.1 VDC	
10.3 Record Oil Pressure		*OK*
10.3.1 Reading	65 PSI	
10.4 Record Coolant Temperature		*OK*
10.4.1 Reading	188 Degrees	
10.5 Record Generator Frequency		*OK*
10.5.1 Reading	60 Htz	
10.6 Record Generator Voltage		*NORMAL*
10.6.1 A Phase	12500 VAC	
10.6.2 B Phase	12500 VAC	
10.6.3 C Phase	12500 VAC	

Green - Post Run Checks

11.1 Check Oil Level		*FULL*
11.2 Cooling System Fluid level		*FULL*
11.3 Return Control Switch to Auto Position		*YES*
11.4 Verify Block Heater & Battery Charger Energized		*YES*

11.5 Return Area Around Unit to Condition it was in upon our arrival	*YES*

Grey - Electrical System

2.1 Check Battery Electrolyte Level & Condition	*N/A - NOT APPLICABLE*

Grey - Cooling System

4.4 Type of Coolant	*ELC*

Grey - Running Operational Checks

10.7 Transfer Load To Generator (W/ Customer Approval)	*N/A*
10.7.1 Amps A Phase	
10.7.2 Amps B Phase	
10.7.3 Amps C Phase	

Unselected - Fuel System

5.1 Check / Record Fuel Level	
5.1.1 Level	