



**INVITATION FOR BIDS**  
**OFFICE OF PROCUREMENT & CONTRACTS**

**1. INSTRUCTIONS FOR BIDDERS**

- a. Sealed bids will be received in the Office of Procurement & Contracts, Mississippi State University, for the purchase of the items listed herein.
- b. All bids must be received in the Office of Procurement & Contracts on or before the bid opening time and date listed herein. Delivery of bids must be during normal working hours, 8:00 a.m. to 5:00 p.m. CST, except on weekends and holidays when no delivery is possible.
- c. Bidders shall submit their bids either electronically or in a sealed envelope.
  - i. Sealed bids should include the bid number on the face of the envelope as well as the bidders' name and address. Bids should be mailed to: 245 Barr Avenue, 610 McArthur Hall, Mississippi State, MS 39762.
  - ii. At this time we only accept non-ITS bids electronically. For electronic submission of bids, go to: <https://portal.magic.ms.gov> and use the RFX number on the next page as your reference number.
- d. All questions regarding this bid should be directed to the Office of Procurement & Contracts at 662-325-2550.

**2. TERMS AND CONDITIONS**

- a. All bids should be bid "FOB Destination"
- b. Bidders must comply with all rules, regulations, and statutes relating to purchasing in the State of Mississippi, in addition to the requirements on this form. General Bid Terms and Conditions can be found here:  
[https://www.procurement.msstate.edu/procurement/bids/Bid\\_General\\_Terms\\_May\\_2019\\_V2.pdf](https://www.procurement.msstate.edu/procurement/bids/Bid_General_Terms_May_2019_V2.pdf)
- c. Any contract resulting from this Invitation for Bid shall be in substantial compliance with Mississippi State University's Standard Contract Addendum:  
<https://www.procurement.msstate.edu/contracts/standardaddendum.pdf>

**Bid Number/RFX Number: 24-34/RFX#3160006508**

**Opening Date: April 23, 2024 at 2:00 p.m.**

**Description: Switchboard and Generator for Dorman Hall Renovation  
(Materials Only)**

Vendor Name: \_\_\_\_\_

Vendor Address: \_\_\_\_\_

Telephone Number: \_\_\_\_\_

Days the Offer is Firm: \_\_\_\_\_

Authorized Signature: \_\_\_\_\_

Name: \_\_\_\_\_

Title: \_\_\_\_\_

See following pages for specifications and bid pricing form.

**Specifications & Materialman's Proposal  
For  
Switchboard and Generator for  
Dorman Hall Renovation  
(Material Only)**



**26 March 2023**

**Prepared for:**  
Mississippi State University  
610 McArthur Hall  
Mississippi State, Mississippi 39762

**Prepared by:**  
Corbett Legge & Associates, PLLC  
431 West Main Street, Suite 101  
Tupelo, MS 38804



**WR# 433130  
CLA# 20080**

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DORMAN HALL RENOVATION (MATERIAL ONLY)  
MISSISSIPPI STATE UNIVERSITY  
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## INSTRUCTIONS TO BIDDERS

SWITCHBOARD AND GENERATOR FOR  
DORMAN HALL RENOVATION (MATERIAL ONLY)  
MISSISSIPPI STATE UNIVERSITY  
MISSISSIPPI STATE, MISSISSIPPI

Refer to Bid Advertisement for bid opening time and date.

SUBMITTAL OF SEALED PROPOSALS: Bids that are sent by mail shall be clearly marked "Bid Enclosed" or "Bid Envelope Enclosed" as appropriate. The sealed envelope containing the bid shall have the following information shown on the envelope:

BID ENCLOSED

ITEM: SWITCHBOARD AND GENERATOR FOR  
DORMAN HALL RENOVATION (MATERIAL ONLY)  
OWNER: MISSISSIPPI STATE UNIVERSITY  
MISSISSIPPI STATE, MISSISSIPPI  
BIDDER: BIDDER'S ADDRESS  
BID DUE: REFER TO ADVERTISEMENT FOR BIDS

Bids that are sent by parcel delivery service should be addressed to:

Mr. Don Buffum, Director  
Office of Procurements & Contracts  
Mississippi State University  
245 Barr Avenue, 610 McArthur Hall  
Mississippi State, Mississippi 39762

Bids that are sent by mail should be addressed to:

Mr. Don Buffum, Director  
Office of Procurements & Contracts  
Mississippi State University  
P.O. Box 5307  
Mississippi State, Mississippi 39762

SUBMITTAL OF ELECTRONIC BIDS: Each electronically submitted bid must be submitted in "pdf" format and shall contain the same information and forms as required for the paper bids. In the event that an electronically submitted bid has a corrupted attachment, the bid will be considered null and void.

The Engineer for this project is:

Corbett Legge & Associates, PLLC  
431 West Main Street, Suite 101  
Tupelo, MS 38804  
Telephone 662.844.7114

The Engineer will represent the Owner in all matters pertaining to this project, including but not limited to, answering technical questions of prospective bidders and recommendations of lowest and best bid, acceptance of shop drawings and similar documents, and approval of invoices prior to payment by the Owner.

Questions and Clarifications:

Submit all questions about the specifications to the Engineer, in writing. Replies will be issued to all prospective Bidders of Record. The Owner will be responsible for oral clarifications. Reference the bid number in all correspondence.

Bid Preparation Instructions:

Bidders shall complete all blank spaces on the Materialman's Proposal Form for each item of equipment being bid in accordance with these specifications and terms and conditions.

Bidder shall insert the delivery time in weeks after receipt of an order for each item of equipment bid in the blank provided. Bidder shall also indicate equipment being bid by the manufacturer's name and catalog number in the blanks provided on the Materialman's Proposal Form.

Bidder shall complete both copies of the Materialman's Proposal Forms bound in these Specifications and shall submit both copies to the OWNER at the time that the bids are due. Bidders taking exceptions to any part of the specifications, conditions, or payment terms specified herein shall show such exception on the Materialman's Proposal Form in the space provided. If exceptions are not shown on the Proposal Form, Bidder must supply equipment specified herein under the terms and conditions specified herein. Proposals that are modified, excepted, or in any way changed from the proposal that the OWNER is requesting in this request for proposals may be rejected by the OWNER.

**NOTE: The OWNER will evaluate each Bid Item and intends to make its determination to award based on each individual bid item and not on the proposal as a whole.**

# PROPOSAL FORM

SWITCHBOARD AND GENERATOR FOR  
DORMAN HALL RENOVATION (MATERIAL ONLY)  
MISSISSIPPI STATE UNIVERSITY  
MISSISSIPPI STATE, MISSISSIPPI

To: Mr. Don Buffum, Director  
Office of Procurements & Contracts  
Mississippi State University  
Barr Avenue, 610 McArthur Hall  
Mississippi State, Mississippi 39762

The undersigned (hereinafter called the MATERIALMAN) acknowledges by his signature that he has received and examined the documents entitled "Specifications and Materialman's Proposal for "SWITCHBOARD AND GENERATOR FOR DORMAN HALL RENOVATION (MATERIAL ONLY)" for Mississippi State University, dated February 3, 2023, and has included the provisions of the Specifications in his Proposal. The MATERIALMAN further acknowledges that he has received the following addenda:

Addendum No. \_\_\_\_\_ Dated \_\_\_\_\_

Addendum No. \_\_\_\_\_ Dated \_\_\_\_\_

Addendum No. \_\_\_\_\_ Dated \_\_\_\_\_

The Materialman hereby proposes to sell and deliver to Mississippi State University, Mississippi State, Mississippi (hereinafter called OWNER), upon the terms and conditions herein stated, the equipment specified in the attached specification for the following sums:

<u>BID ITEM NUMBER</u>	<u>DESCRIPTION</u>	<u>NO. REQUIRED</u>	<u>UNIT</u>	<u>TOTAL PRICE</u>
1	Switchboard and SPD	1	LS	_____
2	Generator and Transfer Switches	1	LS	_____

- A. The prices set forth above shall include delivery to the Mississippi State University Oktibbeha County; Starkville, Mississippi. The exact location on campus will be determined at a later date and will be provided by the Engineer. The equipment will be received and unloaded by a contractor on campus.
- B. Mississippi State University is tax exempt. The prices set forth herein do not include any sums which are or which may be payable by the Materialman on account of taxes imposed by any taxing authority upon the sale, purchase, or use of the equipment.

- C. The prices set forth above shall be firm if accepted within thirty (30) days of the bid due date and time.
- D. The MATERIALMAN shall include engineering data with his proposal as specified and as required to evaluate bid.
- E. The times of delivery shall be as follows:

BID ITEM NO. 1 \_\_\_\_\_

BID ITEM NO. 2 \_\_\_\_\_

- F. The items included in each of the above bid prices are as follows:

BID ITEM NO. 1

MANUFACTURER \_\_\_\_\_

CATALOG NO. \_\_\_\_\_

BID ITEM NO. 2

MANUFACTURER \_\_\_\_\_

CATALOG NO. \_\_\_\_\_

- G. Title of the equipment shall pass to the Owner upon:

1. Delivery to location specified.
2. Satisfactory inspection for in-transit damage.
3. Acceptance by the Owner.

- H. Bidder hereby certifies that he is:

(    ) Manufacturer

(    ) Manufacturer's Authorized Mississippi Representative

(    ) Manufacturer's Authorized Mississippi Distributor

- I. Exceptions: \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_



- J. It is understood by the undersigned that the OWNER retains the privilege of accepting or rejecting all or any part of this proposal and to waive any informalities or technicalities therein. Counter-proposals or qualified bids shall be subject to rejection at the discretion of the OWNER.

The OWNER will evaluate each Bid Item and intends to make its determination to award based on each individual bid item and not on the proposal as a whole.

It is also understood by the undersigned that the OWNER reserves the right to conduct investigations to evaluate the proposals received and to award the bid for this equipment to the lowest Bidder, who in the OWNER's evaluation will provide the equipment which will be in the best interest of the OWNER.

**MATERIALMAN**

BY: \_\_\_\_\_

TITLE: \_\_\_\_\_

ADDRESS: \_\_\_\_\_

\_\_\_\_\_

TELEPHONE NO.: \_\_\_\_\_

DATE SIGNED: \_\_\_\_\_

**SECTION 26 2413**

**SWITCHBOARDS**

**PART 1 - GENERAL**

**1.1 RELATED DOCUMENTS**

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions apply to this Section.

**1.2 SUMMARY**

- A. Section Includes:
  - 1. Service switchboard rated 600 V and less.
  - 2. Transient voltage suppression devices.
  - 3. Disconnecting and overcurrent protective devices.
  - 4. Instrumentation.
  - 5. Control power.
  - 6. Accessory components and features.
  - 7. Identification.
  - 8. Mimic bus.

**1.3 SUBMITTALS**

- A. Product Data: For each type of switchboard, overcurrent protective device, transient voltage suppression device, ground-fault protector, accessory, and component indicated. Include dimensions and manufacturers' technical data on features, performance, electrical characteristics, ratings, accessories, and finishes.
- B. Shop Drawings: For each switchboard and related equipment.
  - 1. Include dimensioned plans, elevations, sections, and details, including required clearances and service space around equipment. Show tabulations of installed devices, equipment features, and ratings.
  - 2. Detail enclosure types for types other than NEMA 250, Type 1.
  - 3. Detail bus configuration, current, and voltage ratings.
  - 4. Detail short-circuit current rating of switchboards and overcurrent protective devices.
  - 5. Include descriptive documentation of optional barriers specified for electrical insulation and isolation.
  - 6. Detail utility company's metering provisions with indication of approval by utility company.
  - 7. Include evidence of NRTL listing for series rating of installed devices.
  - 8. Detail features, characteristics, ratings, and factory settings of individual overcurrent protective devices and auxiliary components.
  - 9. Include time-current coordination curves for each type and rating of overcurrent protective device included in switchboards. Submit on translucent log-log graft paper; include selectable ranges for each type of overcurrent protective device.
  - 10. Include diagram and details of proposed mimic bus.
- C. Field Quality-Control Reports:
  - 1. Test procedures used.
  - 2. Test results that comply with requirements.
  - 3. Results of failed tests and corrective action taken to achieve test results that comply with requirements.

- D. Operation and Maintenance Data: For switchboards and components to include in operation, and maintenance manuals. In addition to items specified in Section on "Operation and Maintenance Data," include the following:
  - 1. Routine maintenance requirements for switchboards and all installed components.
  - 2. Manufacturer's written instructions for testing and adjusting overcurrent protective devices.
  - 3. Time-current coordination curves for each type and rating of overcurrent protective device included in switchboards. Submit on translucent log-log graph paper; include selectable ranges for each type of overcurrent protective device.

#### **1.4 QUALITY ASSURANCE**

- A. Source Limitations: Obtain switchboards, overcurrent protective devices, components, and accessories from single source from single manufacturer.
- B. Product Selection for Restricted Space: Drawings indicate maximum dimensions for switchboards including clearances between switchboards and adjacent surfaces and other items. Comply with indicated maximum dimensions.
- C. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- D. Comply with NEMA PB 2.
- E. Comply with NFPA 70.
- F. Comply with UL 891.

#### **1.5 DELIVERY, STORAGE, AND HANDLING**

- A. Deliver switchboards in sections or lengths that can be moved past obstructions in delivery path.
- B. Remove loose packing and flammable materials from inside switchboards and install temporary electric heating (250 W per section) to prevent condensation.
- C. Handle and prepare switchboards for installation according to NECA 400 and NEMA PB 2.1.

#### **1.6 PROJECT CONDITIONS**

- A. Installation Pathway: Remove and replace access fencing, doors, lift-out panels, and structures to provide pathway for moving switchboards into place.
- B. Environmental Limitations:
  - 1. Do not deliver or install switchboards until spaces are enclosed and weathertight, wet work in spaces is complete and dry, work above switchboards is complete, and temporary HVAC system is operating and maintaining ambient temperature and humidity conditions at occupancy levels during the remainder of the construction period.
  - 2. Rate equipment for continuous operation under the following conditions unless otherwise indicated:
    - a. Ambient Temperature: Not exceeding 104 deg F (40 deg C).
    - b. Altitude: Not exceeding 5000 feet.
- C. Service Conditions: NEMA PB 2, usual service conditions, as follows:
  - 1. Ambient temperatures within limits specified.
  - 2. Altitude not exceeding 5000 feet.

**1.7 EXTRA MATERIALS**

- A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
  - 1. Indicating Lights: Equal to 10 percent of quantity installed for each size and type, but no fewer than one of each size and type.

**1.8 WARRANTY**

- A. Manufacturer's Warranty: Manufacturer agrees to repair or replace switchboard enclosures, buswork, overcurrent protective devices, accessories, and factory installed interconnection wiring that fail in materials or workmanship within specified warranty period.
  - 1. Warranty Period: Three years from date of Substantial Completion.
- B. Manufacturer's Warranty: Manufacturer agrees to repair or replace surge protection devices that fail in materials or workmanship within specified warranty period as referenced in Section 264313 Surge Protection Device.

**PART 2 - PRODUCTS**

**2.1 MANUFACTURED UNITS**

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - 1. Square D; a brand of Schneider Electric.
  - 2. Siemens Energy & Automation, Inc.
  - 3. General Electric Company; GE Consumer & Industrial - Electrical Distribution.
- B. Front-Connected, Front-Accessible Switchboards:
  - 1. Refer to switchboard schedule at the end of this section for additional switchboard requirements.
  - 2. Main Devices: Fixed, individually mounted.
  - 3. Branch Devices: Panel mounted.
  - 4. Sections front and rear aligned.
- C. Nominal System Voltage: **480Y/277 V, 3 phase, 4 wire.**
- D. Main-Bus Continuous.
- E. Indoor Enclosures: Steel, NEMA 250, Type 1.
- F. Enclosure Finish for Indoor Units: Factory-applied finish in manufacturer's standard gray finish over a rust-inhibiting primer on treated metal surface.
- G. Barriers: Between adjacent switchboard sections.
- H. Insulation and isolation for main bus of main section and main and vertical buses of feeder sections.
- I. Customer Metering Compartment: Provide digital metering for switchboard.
- J. Bus Transition and Incoming Pull Sections: Matched and aligned with basic switchboard.
- K. Removable, Hinged Rear Doors and Compartment Covers: Secured by standard bolts, for access to rear interior of switchboard.
- L. Hinged Front Panels: Allow access to circuit breaker, metering, accessory, and blank compartments.
- M. Buses and Connections: Three phase, four wire unless otherwise indicated.

SWITCHBOARD AND GENERATOR FOR  
DORMAN HALL RENOVATION

1. Phase- and Neutral-Bus Material: Hard-drawn copper of 98 percent conductivity, silver-plated, copper feeder circuit-breaker line connections.
  2. Load Terminals: Insulated, rigidly braced, runback bus extensions, of same material as through buses, equipped with mechanical connectors for outgoing circuit conductors. Provide load terminals for future circuit-breaker positions at full-ampere rating of circuit-breaker position.
  3. Ground Bus: Minimum-size required by UL 891, hard-drawn copper of 98 percent conductivity, equipped with mechanical connectors for feeder and branch-circuit ground conductors. For busway feeders, extend insulated equipment grounding cable to busway ground connection and support cable at intervals in vertical run.
  4. Main Phase Buses and Equipment Ground Buses: Uniform capacity for entire length of switchboard's main and distribution sections. Provide for future extensions from both ends.
  5. Neutral Buses: 100 percent of the ampacity of phase buses unless otherwise indicated, equipped with mechanical connectors for outgoing circuit neutral cables. Brace bus extensions for busway feeder neutral bus.
  6. Isolation Barrier Access Provisions: Permit checking of bus-bolt tightness.
- N. Future Devices: Equip compartments with mounting brackets, supports, bus connections, and appurtenances at full rating of circuit-breaker compartment.

**2.2 DISCONNECTING AND OVERCURRENT PROTECTIVE DEVICES**

- A. Molded-Case Circuit Breaker (MCCB): Comply with UL 489, with interrupting capacity to meet available fault currents.
1. Adjustable Instantaneous-Trip Circuit Breakers: Magnetic trip element with front-mounted, field-adjustable trip setting.
  2. Electronic trip circuit breakers with rms sensing; field-replaceable rating plug or field-replicable electronic trip; and the following field-adjustable settings:
    - a. Instantaneous trip.
    - b. Long- and short-time pickup levels.
    - c. Long- and short-time time adjustments.
    - d. Ground-Fault and ground-fault delay adjustable settings.
  3. Molded-Case Circuit-Breaker (MCCB) Features and Accessories:
    - a. Standard frame sizes, trip ratings, and number of poles.
    - b. Lugs: Mechanical style, suitable for number, size, trip ratings, and conductor material.
    - c. Application Listing: Appropriate for application;
    - d. Shunt Trip: 120-V trip coil energized from separate circuit, set to trip at 55 percent of rated voltage.
- B. All breakers shall have frame sizes as indicated in the "frame" column and trip plugs as indicated in the "trip" column of the switchboard schedule.
- C. Breaker lugs shall accommodate conductor sizes as indicated in the "remarks" column of the switchboard schedule.
- D. The main circuit breaker shall be 100% rated.

**2.3 SWITCHBOARD SECTIONS**

- A. Multifunction switchboard shall have three sections setup left to right as described below:

1. The main circuit breaker (MCB) shall be installed in incoming section with top feed provisions, metering, and SPD. This section will require a top hat to receive an incoming feed from a vault.
2. It is the intent that all specified breakers and breakers or equipment shall be group mounted in the second and thirds sections.
3. All spare breakers or designated spaces shall be installed in the top of the third section.

## **2.4 INSTRUMENTATION**

- A. Multifunction Digital-Metering Monitor: Microprocessor-based unit suitable for three- or four-wire systems and with the following features:
  1. Switch-selectable digital display of the following values with maximum accuracy tolerances as indicated:
    - 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. Megawatts: Plus or minus 2 percent.
    - e. Megavars: Plus or minus 2 percent.
    - f. Power Factor: Plus or minus 2 percent.
    - g. Frequency: Plus or minus 0.5 percent.
    - h. Accumulated Energy, Megawatt Hours: Plus or minus 2 percent; accumulated values unaffected by power outages up to 72 hours.
    - i. Megawatt Demand: Plus or minus 2 percent; demand interval programmable from five to 60 minutes.
    - j. Contact devices to operate remote impulse-totalizing demand meter.
  2. Mounting: Display and control unit flush or semi-flush mounted in instrument compartment door.

## **2.5 IDENTIFICATION**

1. Surge Protection Device shall be installed integral to the switchboard with integral disconnect/circuit breaker such that the unit can be disconnected and removed from the switchboard without requiring de-energization. Refer to Section 264313.

## **2.6 IDENTIFICATION**

- A. Mimic Bus: Continuously integrated mimic bus factory applied to front of switchboard. Arrange in single-line diagram format, using symbols and letter designations consistent with final mimic-bus diagram.
- B. Coordinate mimic-bus segments with devices in switchboard sections to which they are applied. Produce a concise visual presentation of principal switchboard components and connections.
- C. Service Equipment Label: NRTL labeled for use as service equipment for switchboards with one or more service disconnecting and overcurrent protective devices.

WR# 433130  
CLA# 20080

## SWITCHBOARD AND GENERATOR FOR DORMAN HALL RENOVATION

### 2.7 SWITCHBOARD SCHEDULE

Switchboard: MDP								
Location: MECH 011 Supply From: BLD'G TRANSFORMER Mounting: FLOOR Enclosure: NEMA 1			Distribution System: 480/277 Wye Phases: 3 Wires: 4			A.I.C. Rating: 65k Mains Rating: 2000 A MCB Rating: 2000 A		
CKT	Circuit Description	# of Poles	Frame Size	Trip Rating	A	B	C	Remarks
1	BH1	3	400A	400 A	64678 VA	64078 VA	65658 VA	4-#600 KCMIL, 1-#2G
2	ATS-700	3	400A	400 A	7350 VA	3691 VA	5035 VA	4-#600 KCMIL, 1-#2G
3	HH	3	400A	200 A	2030 VA	280 VA	210 VA	4-#30, 1-#6G
4	TRANSFORMER FOR RM 205D	3	100A	70 A	0 VA	0 VA	0 VA	3-#4, 1-#8
5	T-DPBL1	3	400A	350 A	61745 VA	60745 VA	61955 VA	3-#350 KCMIL, 1-#2G
6	T-DPBL2	3	400A	350 A	71471 VA	70151 VA	67351 VA	3-#350 KCMIL, 1-#2G
7	T-DPBL3	3	400A	350 A	61455 VA	63055 VA	61145 VA	3-#350 KCMIL, 1-#2G
8	BH2	3	600A	600 A	108743 VA	108743 VA	108743 VA	(2 SETS) 4-#350 KCMIL, 1-#1G
9	ELEVATOR B (SHUNT TRIP)	3	100A	40 A	7205 VA	7205 VA	7205 VA	3#8, 1#10G
8	PH1	3	400A	225 A	39951 VA	39951 VA	39531 VA	4-#4/0, 1-#4G
9	T-BL3	3	400A	125 A	0 VA	0 VA	0 VA	3#1, 1#6G
10	T-BL4	3	400A	125 A	0 VA	0 VA	0 VA	3#1, 1#6G
11	SPD	3	100A	100 A	0 VA	0 VA	0 VA	5-#2
12	SPARE	3	400A	400 A	0 VA	0 VA	0 VA	4-#600 KCMIL, 1-#2G
13	SPACE	3	400A	400 A	0 VA	0 VA	0 VA	
14	SPACE	3	400A	400 A	0 VA	0 VA	0 VA	
15								
16								
17								
					431834 VA	425105 VA	424039 VA	
Notes: 1. 2000A MCB CIRCUIT BREAKER SWITCHBOARD. COPPER BUS, SERVICE ENTRANCE RATED. 2. MCB TO HAVE LT, LTD, ST, STD, GF, GFD, AND INSTANTANEOUS ADJUSTABLE TRIP SETTINGS. 3. ALL FEEDER BREAKERS TO HAVE LT, LTD, ST, STD AND INSTANTANEOUS ADJUSTABLE TRIP SETTINGS.								

PART 3 - EXECUTION – Not Applicable

END OF SECTION

**SECTION 26 3213**  
**PACKAGED ENGINE GENERATOR**

**PART 1 - GENERAL**

**1.1 RELATED DOCUMENTS**

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions, apply to this Section.

**1.2 SUMMARY**

- A. Section Includes:
  - 1. Engine.
  - 2. Natural Gas fuel system.
  - 3. Control and monitoring.
  - 4. Generator overcurrent and fault protection.
  - 5. Generator, exciter, and voltage regulator.
  - 6. Outdoor generator-set enclosure.
  - 7. Vibration isolation devices.
- B. Related Requirements:
  - 1. Section 263600 "Transfer Switches" for transfer switches including sensors and relays to initiate automatic-starting and -stopping signals for engine generators.

**1.3 DEFINITIONS**

- A. NG: Natural Gas
- B. Operational Bandwidth: The total variation from the lowest to highest value of a parameter over the range of conditions indicated, expressed as a percentage of the nominal value of the parameter.

**1.4 ACTION SUBMITTALS**

- A. Product Data: For each type of product.
  - 1. Include rated capacities, operating characteristics, electrical characteristics, and furnished specialties and accessories.
  - 2. Include thermal damage curve for generator.
  - 3. Include time-current characteristic curves for generator protective device.
  - 4. Include fuel consumption in cubic feet per hour at 0.8 power factor at 1.0 times generator capacity.
  - 5. Include generator efficiency at 0.8 power factor at 0.5, 0.75, and 1.0 times generator capacity.
  - 6. Include air flow requirements for cooling and combustion air in cfm at 0.8 power factor, with air supply temperature of 95 deg F (35 deg C), 80 deg F (27 deg C), 70 deg F (21 deg C), and 50 deg F (10 deg C). Provide drawings showing requirements and limitations for location of air intake and exhausts.
  - 7. Include generator characteristics, including, but not limited to, kilowatt rating, efficiency, reactances, and short-circuit current capability.
- B. Shop Drawings:
  - 1. Include plans and elevations for engine generator and other components specified.
  - 2. Include details of equipment assemblies. Indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
  - 3. Identify fluid drain ports and clearance requirements for proper fluid drain.



4. Design calculations for selecting vibration isolators and seismic restraints and for designing vibration isolation bases.
5. Vibration Isolation Base Details: Detail fabrication including anchorages and attachments to structure and to supported equipment. Include base weights.
6. Include diagrams for power, signal, and control wiring. Complete schematic, wiring, and interconnection diagrams showing terminal markings for EPS equipment and functional relationship between all electrical components.
- C. Source Quality-Control Reports: Including, but not limited to, the following:
  1. Certified summary of prototype-unit test report.
  2. Certified Test Reports: For components and accessories that are equivalent, but not identical, to those tested on prototype unit.
  3. Certified Summary of Performance Tests: Certify compliance with specified requirement to meet performance criteria for sensitive loads.
  4. Report of factory test on units to be shipped for this Project, showing evidence of compliance with specified requirements.
  5. Report of sound generation.
  6. Report of exhaust emissions showing compliance with applicable regulations.
- D. Warranty: Special warranty specified in this Section.

#### **1.5 CLOSEOUT SUBMITTALS**

- A. Operation and Maintenance Data: For engine generators to include in emergency, operation, and maintenance manuals.
  1. In addition to items specified in Section 017823 "Operation and Maintenance Data," include the following:
    - a. List of tools and replacement items recommended to be stored at Project for ready access. Include part and drawing numbers, current unit prices, and source of supply.
    - b. Operating instructions laminated and mounted adjacent to generator location.

#### **1.6 EXTRA MATERIALS**

- A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
  1. Fuses: One for every 10 of each type and rating, but no fewer than one of each.
  2. Filters: One set each of lubricating oil, fuel, and combustion-air filters.
  3. Tools: Each tool listed by part number in operations and maintenance manual.

#### **1.7 QUALITY ASSURANCE**

- A. Qualifications: Manufacturer's authorized representative who is trained and approved for installation and service of units required for this Project.
  1. Maintenance Proximity: Not more than two hours normal travel time from Installer's place of business to Project site.
  2. Engineering Responsibility: Preparation of data for vibration isolators including Shop Drawings, based on testing and engineering analysis of manufacturer's standard units in assemblies similar to those indicated for this Project.
- B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.
- C. Comply with ASME B15.1.
- D. Comply with NFPA 37.
- E. Comply with NFPA 70.

- F. Comply with NFPA 110 requirements for Level 1 emergency power supply system.
- G. Comply with UL 2200.
- H. Engine Exhaust Emissions: Comply with applicable state and local government requirements.

**1.8 PROJECT CONDITIONS**

- A. Environmental Conditions: Engine-generator system shall withstand the following environmental conditions without mechanical or electrical damage or degradation of performance capability:
  - 1. Ambient Temperature: Minus 15 to plus 100 deg F.

**1.9 WARRANTY**

- A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of packaged engine generators and associated auxiliary components that fail in materials or workmanship within specified warranty period.
  - 1. **Warranty Period: 5 years from date of Startup or 2500 hours (whichever comes first)**

**PART 2 - PRODUCTS**

**2.1 MANUFACTURERS**

- 1. Caterpillar; Engine Div.
  - 2. Generac Power Systems, Inc.
  - 3. Onan/Cummins Power Generation; Industrial Business Group.
- B. Source Limitations: Obtain packaged engine generators and auxiliary components through one source from a single manufacturer.

**2.2 PERFORMANCE REQUIREMENTS**

- A. B11 Compliance: Comply with B11.19.
- B. NFPA Compliance:
  - 1. Comply with NFPA 37.
  - 2. Comply with NFPA 70.
  - 3. Comply with NFPA 110 requirements for Level 1 EPSS.
- C. UL Compliance: Comply with UL 2200.
- D. Environmental Conditions: Engine generator system shall withstand the following environmental conditions without mechanical or electrical damage or degradation of performance capability:
  - 1. Ambient Temperature: Minus 15 to plus 100 deg F.

**2.3 ENGINE GENERATOR ASSEMBLY DESCRIPTION**

- A. Factory-assembled and -tested, water-cooled engine, with brushless generator and accessories.
- B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a testing agency acceptable to authorities having jurisdiction, and marked for intended location and use.
- C. Power Rating: Standby
- D. EPSS Class: Engine generator shall be classified as Class 96 according to NFPA 110.
- E. Service Load: 200kW / 250kVA
- F. Power Factor: 0.8, lagging.
- G. Frequency: 60 Hz.
- H. Voltage: 480V AC.
- I. Phase: Three-phase, four-wire, wye.
- J. Governor: Adjustable isochronous, with speed sensing.

- K. Mounting Frame: Structural steel framework to maintain alignment of mounted components without depending on concrete foundation. Provide lifting attachments sized and spaced to prevent deflection of base during lifting and moving.
- L. Capacities and Characteristics:
  - 1. Power Output Ratings: Nominal ratings as indicated at 0.8 power factor excluding power required for the continued and repeated operation of the unit and auxiliaries.
  - 2. Nameplates: For each major system component to identify manufacturer's name and address, and model and serial number of component.
- M. Engine Generator Performance:
  - 1. Oversizing generator compared with the rated power output of the engine is permissible to meet specified performance.
  - 2. Steady-State Voltage Operational Bandwidth: 3 percent of rated output voltage from no load to full load.
  - 3. Transient Voltage Performance: Not more than 20 percent variation for 50 percent step-load increase or decrease. Voltage shall recover and remain within the steady-state operating band within three seconds.
  - 4. Steady-State Frequency Operational Bandwidth: 0.5 percent of rated frequency from no load to full load.
  - 5. Steady-State Frequency Stability: When system is operating at any constant load within the rated load, there shall be no random speed variations outside the steady-state operational band and no hunting or surging of speed.
  - 6. Transient Frequency Performance: Less than 5 percent variation for 50 percent step-load increase or decrease. Frequency shall recover and remain within the steady-state operating band within five seconds.
  - 7. Output Waveform: At no load, harmonic content measured line to line or line to neutral shall not exceed 5 percent total and 3 percent for single harmonics. Telephone influence factor, determined according to NEMA MG 1, shall not exceed 50 percent.
  - 8. Sustained Short-Circuit Current: For a three-phase, bolted short circuit at system output terminals, system shall supply a minimum of 250 percent of rated full-load current for not less than 10 seconds and then clear the fault automatically, without damage to generator system components.
  - 9. Start Time:
    - a. Comply with NFPA 110, Type 10 system requirements.

## **2.4 GAS ENGINE**

- A. Fuel: Natural gas.
- B. Rated Engine Speed: 1800 rpm.
- C. Lubrication System: Engine or skid-mounted.
  - 1. Filter and Strainer: Rated to remove 90 percent of particles 5 micrometers and smaller while passing full flow.
  - 2. Thermostatic Control Valve: Control flow in system to maintain optimum oil temperature. Unit shall be capable of full flow and is designed to be fail-safe.
  - 3. Crankcase Drain: Arranged for complete gravity drainage to an easily removable container with no disassembly and without use of pumps, siphons, special tools, or appliances.
- D. Jacket Coolant Heater: Electric-immersion type, factory installed in coolant jacket system. Comply with UL 499 and with NFPA 110 requirements for Level 1 equipment for heater capacity.

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- E. Integral Cooling System: Closed loop, liquid cooled, with radiator factory mounted on engine generator mounting frame and integral engine-driven coolant pump.
  - 1. Coolant: Solution of 50 percent ethylene-glycol-based antifreeze and 50 percent water, with anticorrosion additives as recommended by engine manufacturer.
  - 2. Size of Radiator: Adequate to contain expansion of total system coolant from cold start to 110 percent load condition.
  - 3. Expansion Tank: Constructed of welded steel plate and rated to withstand maximum closed-loop coolant system pressure for engine used. Equip with gage glass and petcock.
  - 4. Temperature Control: Self-contained, thermostatic-control valve modulates coolant flow automatically to maintain optimum constant coolant temperature as recommended by engine manufacturer.
  - 5. Coolant Hose: Flexible assembly with inside surface of nonporous rubber and outer covering of aging-, ultraviolet-, and abrasion-resistant fabric.
    - a. Rating: 50-psig (345-kPa) maximum working pressure with coolant at 180 deg F (82 deg C), and non-collapsible under vacuum.
    - b. End Fittings: Flanges or steel pipe nipples with clamps to suit piping and equipment connections.
- F. Muffler/Silencer:
  - 1. Critical type, sized as recommended by engine manufacturer and selected with exhaust piping system to not exceed engine manufacturer's engine backpressure requirements.
    - a. Minimum sound attenuation of 25 dB at 500 Hz.
    - b. Sound level measured at a distance of 23 feet from exhaust discharge after installation is complete shall be 76 dBA or less.
- G. Air-Intake Filter: Heavy-duty, engine-mounted air cleaner with replaceable dry-filter element and "blocked filter" indicator.
- H. Starting System: 12-V electric, with negative ground.
  - 1. Components: Sized so they are not damaged during a full engine-cranking cycle with ambient temperature at maximum specified in "Performance Requirements" Article.
  - 2. Cranking Motor: Heavy-duty unit that automatically engages and releases from engine flywheel without binding.
    - 1. Cranking Cycle: As required by NFPA 110 for system level specified.
  - 2. Battery: Adequate with capacity within ambient temperature range specified in "Performance Requirements" Article to provide specified cranking cycle at least three times without recharging.
  - 3. Battery Cable: Size as recommended by engine manufacturer for cable length indicated. Include required interconnecting conductors and connection accessories.
  - 4. Battery Compartment: Factory fabricated of metal with acid-resistant finish and thermal insulation. Thermostatically controlled heater shall be arranged to maintain battery above 50 deg F (10 deg C) regardless of external ambient temperature within range specified in "Performance Requirements" Article. Include accessories required to support and fasten batteries in place. Provide ventilation to exhaust battery gases.
  - 5. Battery-Charging Alternator: Factory mounted on engine with solid-state voltage regulation and 35 A minimum continuous rating.
  - 6. Battery Charger: Current-limiting, automatic-equalizing and float-charging type. Unit shall comply with UL 1236 and include the following features:

- a. 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.
- b. Automatic Temperature Compensation: Adjust float and equalize voltages for variations in ambient temperature from minus 40 deg F (minus 40 deg C) to 140 deg F (plus 60 deg C) to prevent overcharging at high temperatures and undercharging at low temperatures.
- c. Automatic Voltage Regulation: Maintain constant output voltage regardless of input voltage variations up to plus or minus 10 percent.
- d. Ammeter and Voltmeter: Flush mounted in door. Meters shall indicate charging rates.
- e. 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.
- f. Enclosure and Mounting: NEMA 250, Type 1, wall-mounted cabinet.

## **2.5 GAS FUEL SYSTEM**

- A. Natural Gas Piping: Comply with requirements in Section 231123 "Facility Natural Gas Piping."
- B. Gas Train: Comply with NFPA 37.
- C. Engine Fuel System:
- D. Natural Gas, Vapor-Withdrawal System:
  - 1. Carburetor.
  - 2. Secondary Gas Regulators.
  - 3. Fuel-Shutoff Solenoid Valves: NRTL-listed, normally closed, safety shutoff valves.
  - 4. Fuel Filters.
  - 5. Manual Fuel Shutoff Valves.
  - 6. Flexible Fuel Connectors.

## **2.6 CONTROL AND MONITORING**

- A. Automatic Starting System Sequence of Operation: When mode-selector switch on the control and monitoring panel is in the automatic position, remote-control contacts in one or more separate automatic transfer switches initiate starting and stopping of engine generator. When mode-selector switch is switched to the on position, engine generator starts. The off position of same switch initiates generator-set shutdown. When engine generator is running, specified system or equipment failures or derangements automatically shut down engine generator and initiate alarms.
- B. Comply with UL 508A.
- C. Configuration:
  - 1. Operating and safety indications, protective devices, basic system controls, and engine gages shall be grouped in a common control and monitoring panel mounted on the engine generator. Mounting method shall isolate the control panel from generator-set vibration. Panel shall be powered from the engine generator battery.
- D. Control and Monitoring Panel:

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1. Digital controller with integrated LCD, controls, and microprocessor, capable of local and remote control, monitoring, and programming, with battery backup.
2. Instruments: Located on the control and monitoring panel and viewable during operation.
  - a. Engine lubricating-oil pressure gage.
  - b. Engine-coolant temperature gage.
  - c. DC voltmeter (alternator battery charging).
  - d. Running-time meter.
  - e. AC voltmeter.
  - f. AC ammeter.
  - g. AC frequency meter.
  - h. Generator-voltage adjusting rheostat.
3. Controls and Protective Devices: Controls, shutdown devices, and common visual alarm indication, including the following:
  - a. Cranking control equipment.
  - b. Run-Off-Auto switch.
  - c. Overcrank alarm.
  - d. Overcrank shutdown device.
  - e. Low water temperature alarm.
  - f. High engine temperature prealarm.
  - g. High engine temperature.
  - h. High engine temperature shutdown device.
  - i. Overspeed alarm.
  - j. Overspeed shutdown device.
  - k. Coolant low-level alarm.
  - l. Coolant low-level shutdown device.
  - m. Battery high-voltage alarm.
  - n. Low cranking voltage alarm.
  - o. Battery-charger malfunction alarm.
  - p. Battery low-voltage alarm.
- E. Connection to Datalink:
  1. A separate terminal block, factory wired to Form C dry contacts, for each alarm and status indication.
  2. Provide connections for datalink transmission of indications to remote data terminals via Ethernet.
- F. Common Remote Panel with Common Audible Alarm: Include necessary contacts and terminals in control and monitoring panel. Remote panel shall be powered from the engine generator battery.
- G. Remote Alarm Annunciator: An LED indicator light labeled with proper alarm conditions shall identify each alarm event, and a common audible signal shall sound for each alarm condition. Silencing switch in face of panel shall silence signal without altering visual indication. Connect so that after an alarm is silenced, clearing of initiating condition will reactivate alarm until silencing switch is reset. Cabinet and faceplate are surface- or flush-mounting type to suit mounting conditions indicated.
  1. Overcrank alarm.
  2. Coolant low-temperature alarm.
  3. High engine temperature pre-alarm.
  4. High engine temperature alarm.
  5. Low lube oil pressure alarm.
  6. Overspeed alarm.

7. Low coolant level alarm.
8. Low cranking voltage alarm.
9. Contacts for local and remote common alarm.
10. Audible-alarm silencing switch.
11. Air shutdown damper when used.
12. Run-Off-Auto switch.
13. Low cranking voltage alarm.
- H. Remote Emergency-Stop Switch: Flush; wall mounted, unless otherwise indicated; and labeled. Push button shall be protected from accidental operation. Verify location of switch with Engineer.
- I. Supporting Items: Include sensors, transducers, terminals, relays, and other devices and include wiring required to support specified items. Locate sensors and other supporting items on engine or generator, unless otherwise indicated.

## **2.7 GENERATOR OVERCURRENT AND FAULT PROTECTION**

- A. Overcurrent protective devices shall be coordinated to optimize selective tripping when a short circuit occurs.
  1. Overcurrent protective devices for the entire EPSS shall be coordinated to optimize selective tripping when a short circuit occurs. Coordination of protective devices shall consider both utility and EPSS as the voltage source.
  2. Overcurrent protective devices for the EPSS shall be accessible only to authorized personnel.
- B. Generator Overcurrent Protective Device:
  1. Molded-case circuit breaker, electronic-trip type; 100 percent rated; complying with UL 489:
    - a. Tripping Characteristics: As described herein.
    - b. Trip Settings: Selected to coordinate with generator thermal damage curve.
    - c. Shunt Trip: Connected to trip breaker when engine generator is shut down by other protective devices.
    - d. Mounting: Adjacent to or integrated with control and monitoring panel.
  2. 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. Contacts shall be available for load shed functions.
  3. Under single or three-phase fault conditions, regulates generator to 300 percent of rated full-load current for up to 10 seconds.
  4. As overcurrent heating effect on the generator approaches the thermal damage point of the unit, protector switches the excitation system off, opens the generator disconnect device, and shuts down the engine generator.
  5. Senses clearing of a fault by other overcurrent devices and controls recovery of rated voltage to avoid overshoot.
- C. Provide the following breakers to support the loads as noted:
  1. Provide (1) 400A/3P breaker for the building Emergency Loads. Verify with Drawings. Breaker shall have lugs to accommodate one set of 600kCMIL conductors.
  2. All breakers shall have ST, STD, LT, LTD, and Instantaneous Adjustable Trip Settings and Ground Fault Sensing Only (no tripping).

## **2.8 GENERATOR, EXCITER, AND VOLTAGE REGULATOR**

- A. Comply with NEMA MG 1.

- B. Drive: Generator shaft shall be directly connected to engine shaft. Exciter shall be rotated integrally with generator rotor.
- C. Range: Provide broad range of output voltage by adjusting the excitation level.
- D. Construction shall prevent mechanical, electrical, and thermal damage due to vibration, overspeed up to 125 percent of rating, and heat during operation at 110 percent of rated capacity.
- E. Enclosure: Drip proof.
- F. Instrument Transformers: Mounted within generator enclosure.
- G. Voltage Regulator: Solid-state type, separate from exciter, providing performance as specified and as required by NFPA 110.
  - 1. Adjusting Digital Rheostat on Control and Monitoring Panel: Provide plus or minus 5 percent adjustment of output-voltage operating band.
  - 2. Maintain voltage within 20 percent on one step, full load.
  - 3. Provide anti-hunt provision to stabilize voltage.
  - 4. Maintain frequency within 15 percent and stabilize at rated frequency within 5 seconds.
- H. Strip Heater: Thermostatically controlled unit arranged to maintain stator windings above dew point.

## **2.9 OUTDOOR GENERATOR-SET ENCLOSURE**

- A. Description:
  - 1. Vandal-resistant, weatherproof steel housing, wind resistant up to 100 mph (160 km/h). Multiple panels shall be lockable and provide adequate access to components requiring maintenance. Panels shall be removable by one person without tools. Instruments and control shall be mounted within enclosure.
- B. Hinged Doors: With padlocking provisions.
- C. Thermal Insulation: Manufacturer's standard materials and thickness selected in coordination with space heater to maintain winter interior temperature within operating limits required by engine generator components.
- D. Muffler Location: Within enclosure.
- E. Exhaust to be vertical.
- F. Engine Cooling Airflow through Enclosure: Maintain temperature rise of system components within required limits when unit operates at 110 percent of rated load for 2 hours with ambient temperature at top of range specified in system service conditions.
  - 1. Louvers: Fixed-engine, cooling-air inlet and discharge. Storm-proof and drainable louvers prevent entry of rain and snow.
  - 2. Automatic Dampers: At engine cooling-air inlet and discharge. Dampers shall be closed to reduce enclosure heat loss in cold weather when unit is not operating.
- G. Convenience Outlets: Factory wired, GFCI. Arrange for external electrical connection.

## **2.10 VIBRATION ISOLATION DEVICES**

- A. Restrained Spring Isolators: Freestanding, steel, open-spring isolators with seismic restraint.
  - 1. Housing: Steel with resilient vertical-limit stops to prevent spring extension due to wind loads or if weight is removed; factory-drilled baseplate bonded to 1/4-inch-(6-mm-) thick, elastomeric isolator pad attached to baseplate underside; and adjustable equipment mounting and leveling bolt that acts as blocking during installation.
  - 2. Outside Spring Diameter: Not less than 80 percent of compressed height of the spring at rated load.



3. Minimum Additional Travel: 50 percent of required deflection at rated load.
  4. Lateral Stiffness: More than 80 percent of rated vertical stiffness.
  5. Overload Capacity: Support 200 percent of rated load, fully compressed, without deformation or failure.
- B. Vibration isolation devices shall not be used to accommodate misalignments or to make bends.

## **2.11 FINISHES**

- A. Indoor and Outdoor Enclosures and Components: Manufacturer shall provide cost in their bid for the following finishes that will be selected by the ARCHITECT. Provide a color chart with your submittals so he can select. Finish shall be applied over corrosion-resistant pretreatment and compatible primer. Coordinate exact finish with Architect.
- B. FINISHES THAT MUST BE AVAILABLE:
1. Yellow
  2. Green
  3. Beige
  4. Grey
  5. White
  6. **DO NOT BID THIS PROJECT IF YOU CAN'T PROVIDE THESE COLORS AS PART OF YOUR BID. NO CHANGE ORDER WILL BE ISSUED FOR THESE COLORS.**

## **2.12 SOURCE QUALITY CONTROL**

- A. Prototype Testing: Factory test engine generator using same engine model, constructed of identical or equivalent components and equipped with identical or equivalent accessories.
1. Tests: Comply with IEEE 115 and with NFPA 110, Level 1 Energy Converters.
- B. Project-Specific Equipment Tests: Before shipment, factory test engine generator and other system components and accessories manufactured specifically for this Project. Perform tests at rated load and power factor. Include the following tests:
1. Test components and accessories furnished with installed unit that are not identical to those on tested prototype to demonstrate compatibility and reliability.
  2. Test generator, exciter, and voltage regulator as a unit.
  3. Full load run.
  4. Maximum power.
  5. Voltage regulation.
  6. Transient and steady-state governing.
  7. Single-step load pickup.
  8. Safety shutdown.
  9. Provide 14 days' advance notice of tests and opportunity for observation of tests by Owner's representative.
  10. Report factory test results within 10 days of completion of test.

## **PART 3 - EXECUTION – Not Applicable**

**END OF SECTION**

**SECTION 26 3600**  
**TRANSFER SWITCHES**

**PART 1 - GENERAL**

**1.1 RELATED DOCUMENTS**

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

**1.2 SUMMARY**

- A. This Section includes transfer switches rated 600 V and less, including the following:
  - 1. Provide (1) 400A/3P four-pole Automatic Transfer Switch with 50kAIC withstand rating for Emergency.
  - 2. Provide (1) 400A/3P four-pole Manual (Nonautomatic) Transfer Switch with 50kAIC withstand rating for Emergency.

**1.3 SUBMITTALS**

- A. Product Data: For each type of product indicated. Include rated capacities, weights, operating characteristics, furnished specialties, and accessories.
- B. Shop Drawings: Dimensioned plans, elevations, sections, and details showing minimum clearances, conductor entry provisions, gutter space, installed features and devices, and material lists for each switch specified.
  - 1. Single-Line Diagram: Show connections between transfer switch, bypass/isolation switch, power sources, and load; and show interlocking provisions for each combined transfer switch and bypass/isolation switch.
- C. Operation and Maintenance Data: For each type of product to include in emergency, operation, and maintenance manuals. In addition to items specified in Division 1 Section "Operation and Maintenance Data," include the following:
  - 1. Features and operating sequences, both automatic and manual.
  - 2. List of all factory settings of relays; provide relay-setting and calibration instructions, including software, where applicable.

**1.4 QUALITY ASSURANCE**

- A. Manufacturer Qualifications: Maintain a service center capable of providing training, parts, and emergency maintenance repairs within a response period of less than eight hours from time of notification.
- B. Source Limitations: Obtain automatic transfer switches, bypass/isolation switches, non-automatic transfer switches and remote annunciators through one source from a single manufacturer.
- C. 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.
- D. Comply with NEMA ICS 1.
- E. Comply with NFPA 70.
- F. Comply with NFPA 110.
- G. Comply with UL 1008 unless requirements of these Specifications are stricter.

### 1.5 WARRANTY

- A. Manufacturer's Warranty: Manufacturer agrees to repair or replace components of transfer switch or transfer switch components that fail in materials or workmanship within specified warranty period.

1. Warranty Period: Two year from date of startup.

## PART 2 - PRODUCTS

### 2.1 MANUFACTURERS

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

1. Contactor Transfer Switches:
  - a. Eaton ATC3 series switch or approved equal.
  - b. Caterpillar; Engine Div.
  - c. Emerson; ASCO Power Technologies, LP.
  - d. Kohler Power Systems; Generator Division.
  - e. Onan/Cummins Power Generation; Industrial Business Group.
  - f. Or Equal.
2. Transfer Switches Using Molded-Case Switches or Circuit Breakers are NOT allowed.

### 2.2 GENERAL TRANSFER-SWITCH PRODUCT REQUIREMENTS

- A. Indicated Current Ratings: Apply as defined in UL 1008 for continuous loading and total system transfer, including tungsten filament lamp loads not exceeding 30 percent of switch ampere rating, unless otherwise indicated.
- B. Tested Fault-Current Closing and Withstand Ratings: Adequate for duty imposed by protective devices at installation locations in Project under the fault conditions indicated, based on testing according to UL 1008.
1. Where transfer switch includes internal fault-current protection, rating of switch and trip unit combination shall exceed indicated fault-current value at installation location.
- C. Solid-State Controls: Repetitive accuracy of all settings shall be plus or minus 2 percent or better over an operating temperature range of minus 20 to plus 70 deg C.
- D. Resistance to Damage by Voltage Transients: Components shall meet or exceed voltage-surge withstand capability requirements when tested according to IEEE C62.41. Components shall meet or exceed voltage-impulse withstand test of NEMA ICS 1.
- E. Electrical Operation: Accomplish by a non-fused, momentarily energized solenoid or electric-motor-operated mechanism, mechanically and electrically interlocked in both directions.
- F. Switch Characteristics: Designed for continuous-duty repetitive transfer of full-rated current between active power sources.
1. Limitation: Switches using molded-case switches or circuit breakers or insulated-case circuit-breaker components are not acceptable.
  2. Switch Action: Double throw; mechanically held in both directions.
  3. Contacts: Silver composition or silver alloy for load-current switching. Conventional automatic transfer-switch units, rated 225 A and higher, shall have separate arcing contacts.

- G. Factory Wiring: Train and bundle factory wiring and label, consistent with Shop Drawings, either by color-code or by numbered or lettered wire and cable tape markers at terminations. Color-coding and wire and cable tape markers are specified in Division 26 Section "Basic Electrical Materials and Methods."
  - 1. Designated Terminals: Pressure type, suitable for types and sizes of field wiring indicated.
  - 2. Power-Terminal Arrangement and Field-Wiring Space: Suitable for top, side, or bottom entrance of feeder conductors as indicated.
  - 3. Control Wiring: Equipped with lugs suitable for connection to terminal strips.
- H. Enclosures: General-purpose NEMA 250, Type 1 or 3R, complying with NEMA ICS 6 and UL 508, unless otherwise indicated.

### **2.3 AUTOMATIC TRANSFER SWITCHES**

- A. Comply with Level 1 equipment according to NFPA 110.
- B. Switching Arrangement: Double-throw type, incapable of pauses or intermediate position stops during normal functioning, unless otherwise indicated.
- C. Manual Switch Operation: Under load, with door closed and with either or both sources energized. Transfer time is same as for electrical operation. Control circuit automatically disconnects from electrical operator during manual operation.
- D. Manual Switch Operation: Unloaded. Control circuit automatically disconnects from electrical operator during manual operation.
- E. Signal-Before-Transfer Contacts: A set of normally open/normally closed dry contacts operates in advance of retransfer to normal source. Interval is adjustable from 1 to 30 seconds.
- F. Digital Communication Interface: Matched to capability of remote annunciator or annunciator and control panel.
- G. Transfer Switches Based on Molded-Case-Switch Components: Comply with NEMA AB 1, UL 489, and UL 869A.
- H. Automatic Open-Transition Transfer Switches: Include the following functions and characteristics:
  - 1. Fully automatic make-before-break operation.
  - 2. Load transfer without interruption, through momentary interconnection of both power sources not exceeding 100 ms.
  - 3. Initiation of No-Interruption Transfer: Controlled by in-phase monitor and sensors confirming both sources are present and acceptable.
    - a. Initiation occurs without active control of generator.
    - b. Controls ensure that closed-transition load transfer closure occurs only when the 2 sources are within plus or minus 5 electrical degrees maximum, and plus or minus 5 percent maximum voltage difference.
  - 4. Failure of power source serving load initiates automatic break-before-make transfer.
- I. Automatic Transfer-Switch Features:
  - 1. Undervoltage Sensing for Each Phase of Normal Source: Sense low phase-to-ground voltage on each phase. Pickup voltage shall be adjustable from 85 to 100 percent of nominal, and dropout voltage is adjustable from 75 to 98 percent of pickup value. Factory set for pickup at 90 percent and dropout at 85 percent.

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2. Adjustable Time Delay: For override of normal-source voltage sensing to delay transfer and engine start signals. Adjustable from zero to six seconds, and factory set for one second.
3. Voltage/Frequency Lockout Relay: Prevent premature transfer to generator. Pickup voltage shall be adjustable from 85 to 100 percent of nominal. Factory set for pickup at 90 percent. Pickup frequency shall be adjustable from 90 to 100 percent of nominal. Factory set for pickup at 95 percent.
4. Time Delay for Retransfer to Normal Source: Adjustable from 0 to 30 minutes, and factory set for 10 minutes to automatically defeat delay on loss of voltage or sustained undervoltage of emergency source, provided normal supply has been restored.
5. Test Switch: Simulate normal-source failure.
6. Switch-Position Pilot Lights: Indicate source to which load is connected.
7. Source-Available Indicating Lights: Supervise sources via transfer-switch normal- and emergency-source sensing circuits.
  - a. Normal Power Supervision: Green light with nameplate engraved "Normal Source Available."
  - b. Emergency Power Supervision: Red light with nameplate engraved "Emergency Source Available."
8. Unassigned Auxiliary Contacts: Two normally open, single-pole, double-throw contacts for each switch position, rated 10 A at 240-V ac.
9. Engine Starting Contacts: One isolated and normally closed, and one isolated and normally open; rated 10 A at 32-V dc minimum.
10. Engine Shutdown Contacts: Time delay adjustable from zero to five minutes, and factory set for five minutes. Contacts shall initiate shutdown at remote engine-generator controls after retransfer of load to normal source.
11. Engine-Generator Exerciser: Solid-state, programmable-time switch starts engine generator and transfers load to it from normal source for a preset time, then retransfers and shuts down engine after a preset cool-down period. Initiates exercise cycle at preset intervals adjustable from 7 to 30 days. Running periods are adjustable from 10 to 30 minutes. Factory settings are for 7-day exercise cycle, 20-minute running period, and 5-minute cool-down period. Exerciser features include the following:
  - a. Exerciser Transfer Selector Switch: Permits selection of exercise with and without load transfer.
  - b. Push-button programming control with digital display of settings.
  - c. Integral battery operation of time switch when normal control power is not available.

**2.4 NONAUTOMATIC TRANSFER SWITCHES**

- A. Operation: Electrically actuated by push buttons designated "Normal Source" and "Alternate Source." Switch shall be capable of transferring load in either direction with either or both sources energized.
- B. Operation: Electrically actuated by push buttons designated "Normal Source" and "Alternate Source." In addition, removable manual handle provides quick-make, quick-break manual-switching action. Switch shall be capable of electrically or manually transferring load in either direction with either or both sources energized. Control circuit disconnects from electrical operator during manual operation.
- C. Double-Throw Switching Arrangement: Incapable of pauses or intermediate position stops during switching sequence.

- D. Source 1 is to be a lugged (600kCMIL) connection for permanent connection. Source 2 is to be a cam-loc connection for temporary connection during generator servicing or outage conditions.
- E. Nonautomatic Transfer-Switch Accessories:
  - 1. Pilot Lights: Indicate source to which load is connected.
  - 2. Source-Available Indicating Lights: Supervise sources via transfer-switch normal- and alternate-source sensing circuits.
    - a. Normal Power Supervision: Green light with nameplate engraved "Normal Source Available."
    - b. Emergency Power Supervision: Red light with nameplate engraved "Alternate Source Available."
  - 3. Unassigned Auxiliary Contacts: One set of normally closed contacts for each switch position, rated 10 A at 240-V ac.

## **2.5 SOURCE QUALITY CONTROL**

- A. Factory test and inspect components, assembled switches, and associated equipment. Ensure proper operation. Check transfer time and voltage, frequency, and time-delay settings for compliance with specified requirements. Perform dielectric strength test complying with NEMA ICS 1.

## **PART 3 - EXECUTION – Not Applicable**

**END OF SECTION**

**SECTION 26 4313**

**SURGE PROTECTION DEVICE (SPD)**

**PART 1 - GENERAL**

**1.1 SECTION INCLUDES**

- A. SPD for electrical power service at the Main Switchboard.

**1.2 SUBMITTALS**

- A. Provide submittals for this item.
- B. Submit shop drawings of catalog data with complete description of materials and performance data.
- C. Submit a single impulse surge current test report issued by a nationally recognized testing facility & an ANSI/IEEE Category C3 (20KV, 10KA) life cycle test report. The test reports should demonstrate that each SPD unit could withstand, in its installed configuration, the specified values (up to 200K transient amps per mode) without failure of any internal component (MOVs, wiring, printed circuit board, fusing and disconnect).

**1.3 COMPLIANCE REQUIREMENTS**

- A. Listed to UL 1449, Third Edition – Type 1 SPD
- B. Listed to UL 1283 listing for EMI/RFI filters

**1.4 ACCEPTABLE VENDORS**

- A. Current Technology
- B. Liebert
- C. Approved Switchboard Manufacturer with Engineer approval

**PART 2 PRODUCTS**

**2.1 MATERIALS AND EQUIPMENT**

- A. Raceway and Fittings: Rigid steel conduit as specified in other sections.
- B. Wire & Cable: Single conductor Type THHN, stranded copper, as specified in other sections.
- C. SPD for Main Switchboard: SPD shall protect in all seven modes for a wye configuration (L-N, L-G, all phases & N-G). Tested surge current capacity of 150,000 amps per protection mode. SPD shall be equal to Current Technology Model CGP3150.
- D. SPD to be mounted integral to the switchboard with integral disconnect such that the unit can be disconnected and removed from the switchboard without requiring de-energization.
- E. Each SPD unit shall be capable of surviving at least the following Category C3 (20KV, 10KA) impulses without failing or degrading the UL 1449, Third Edition VPR more than 10%:

Main Switchboard	7,000 impulses
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- F. Electrical Noise Filter- each unit shall include a high-performance EMI/RFI noise rejection filter. Noise attenuation for electric noise shall be as follows using the MIL-STD-220A insertion loss test method - Up to 33 dB from 10 KHz to 100 MHz.
- G. Diagnostic Monitoring System: The SPDs shall include the Current Technology Diagnostic Monitoring System. It includes an audible alarm system, Form C

Contacts, phase indicator smart lights, which change color based upon percentage of protection remaining., and the ability to field test for the condition of protection.

## **2.2 WARRANTY**

- A. The SPD system shall have a TEN YEAR limited product warranty from date of shipment against transient failure, when installed in compliance with applicable national/local electrical codes and manufacturer's installation manual.

## **PART 3. EXECUTION – Not Applicable**

**END OF SECTION**