

SECTION 26 13 00 – MEDIUM VOLTAGE SWITCHGEAR

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 metal-enclosed interrupter switchgear assembly consisting of outdoor self-supporting multi-bay assembly containing interrupter switches and fuses all completely factory assembled and operationally checked with the following optional components, features, and accessories:
 - 1. Copper, silver-plated main bus at connection points.
 - 2. Communication modules.
 - 3. Instrumentation.
 - 4. Protective Relays and current transformers.
 - 5. Surge arresters.
 - 6. Provisions for future devices.
 - 7. **Control battery system.**
 - 8. Power Operators.
- B. Related Requirements:
 - 1. Section 26 09 13 "Electrical Power Monitoring and Control" for interfacing communication and metering.
 - 2. Section 26 11 16 "Secondary Unit Substations" for medium voltage fused interrupter switchgear used as incoming primary equipment.
 - 3. Section 26 13 01 "Medium Voltage Pad Mounted Switchgear" for medium voltage fused switchgear used as power distribution to buildings.
 - 4. Section 26 05 72 "Overcurrent Protective Device Short-Circuit Study".
 - 5. Section 26 05 73 "Overcurrent Protective Device Coordination Study".
 - 6. Section 26 05 74 "Overcurrent Protective Device Arc-Flash Study" for short-circuit rating of devices and for setting of overcurrent protective devices and protective relays.
 - 7. Electrical drawings, particularly sheet S-E102 – Single Line Diagram.
 - 8. Section 01 91 13 "General Commissioning Requirements" for commissioning requirements.

1.3 DEFINITIONS

- A. ATS: Acceptance Testing Specifications.
- B. GFCI: Ground-Fault Circuit Interrupter.

1.4 PERFORMANCE REQUIREMENTS

- A. Seismic Performance: Switchboards shall withstand the effects of earthquake motions determined according to SEI/ASCE 7.
 - 1. The term "withstand" means "the unit will remain in place without separation of any parts from the device when subjected to the seismic forces specified and the unit will be fully

operational after the seismic event."

1.5 ACTION SUBMITTALS

- A. Product Data: For each type of switchgear and related equipment, include the following:
 - 1. Rated capacities, operating characteristics, furnished specialties, and accessories for individual interrupter switches and overcurrent protective devices.
 - 2. Time-current characteristic curves for overcurrent protective devices.
- B. Shop Drawings: For each type of switchgear and related equipment, include the following:
 - 1. Dimensioned plans, elevations, sections, and details, including required clearances and service space around equipment. Show method of field assembly and location and size of each field connection. Include the following:
 - a. Tabulation of installed devices with features and ratings.
 - b. Outline and general arrangement drawing showing dimensions, shipping sections, and weights of each assembled section.
 - c. Drawing of cable termination compartments showing preferred locations for conduits and indicating space available for cable terminations.
 - d. Floor plan drawing showing locations for anchor bolts.
 - e. Current ratings of buses.
 - f. Short-time and short-circuit ratings of switchgear assembly.
 - g. Nameplate legends.
 - h. Mimic-bus diagram.
 - i. Utility company's metering provisions with indication of approval by utility company.
 - 2. Wiring Diagrams: For each type of switchgear and related equipment, 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.
 - e. Schematic diagrams showing connections to remote devices including power monitoring and control devices.
- C. Coordination Drawings: Floor plans showing dimensioned layout, required working clearances, and required area above and around switchgear where piping and ducts are prohibited. Show switchgear layout and relationships between components and adjacent structural and mechanical elements. Show support locations, type of support, and weight on each support. Identify field measurements.
- D. Source quality-control test reports.
- E. Field quality-control test reports.
- F. Operation and Maintenance Data: For switchgear and switchgear components to include in emergency, operation, and maintenance manuals. In addition, include the following:
 - 1. Manufacturer's written instructions for testing and adjusting overcurrent protective devices.
 - 2. Time-current curves, including selectable ranges for each type of overcurrent protective device.

1.6 QUALITY ASSURANCE

- A. Source Limitations: Obtain each type of switchgear and associated components through one source from a single manufacturer.
- B. Product Options: Drawings indicate size, profiles, and dimensional requirements of switchgear and are based on the specific system indicated.
- C. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by UL and marked for intended use.
- D. Comply with IEEE C2.
- E. Comply with Using Agency Design Standards.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Deliver in sections of lengths that can be moved past obstructions in delivery path as indicated.
- B. Store switchgear indoors in clean dry space with uniform temperature to prevent condensation. Protect switchgear from exposure to dirt, fumes, water, corrosive substances, and physical damage.
- C. If stored in areas subjected to weather, cover switchgear to provide protection from weather, dirt, dust, corrosive substances, and physical damage. Remove loose packing and flammable materials from inside switchgear; install electric heating (250 W per section) to prevent condensation.

1.8 PROJECT CONDITIONS

- A. Environmental Limitations: Rate equipment for continuous operation at indicated ampere ratings for the following conditions:
 - 1. Ambient temperature not exceeding 122 deg F (50 deg C).
 - 2. Altitude: Sea level to 1000 feet (300 m).
 - 3. Wind resistant up to 150 MPH.
- B. Installation Pathway: Remove and replace building components and structures to provide pathway for moving switchgear into place.
- C. Product Selection for Restricted Space: Drawings indicate maximum dimensions for switchgear, including clearances between switchgear and adjacent surfaces and other items. Comply with indicated maximum dimensions.
- D. Interruption of Existing Electrical Service: Do not interrupt electrical service to facilities occupied by Using Agency or others unless permitted under the following conditions and then only after arranging to provide temporary electrical service according to requirements indicated:
 - 1. Notify Using Agency no fewer than seven days in advance of proposed interruption of electrical service.
 - 2. Do not proceed with interruption of electrical service without Using Agency's written permission.
 - 3. Using Agency Lock-out/Tag-out procedures shall be used with Contractor controlled locks and tags.
 - 4. Comply with NFPA 70E.

1.9 COORDINATION

- A. Coordinate sensor-communication module package with data network and with monitoring equipment specified in Section 26 09 13 "Electrical Power Monitoring and Control" for successful transmission and remote readout of remote monitoring data specified in this Section.
- B. Coordinate layout and installation of switchgear and components with other construction including conduit, piping, equipment, and adjacent surfaces. Maintain required clearances for workspace and equipment access doors and panels.
- C. Coordinate size and location of concrete bases. Concrete, reinforcement, and formwork requirements are specified in Division 03.

1.10 EXTRA MATERIALS

- A. Furnish extra materials described below that match products installed and that are packaged with protective covering in a spare fuse rack for storage and identified with labels describing contents.
 - 1. Fuses: Six of each type and rating used. Include spares for future transformers, control power circuits, and fusible devices.
- B. Maintenance Tools: Furnish tools and miscellaneous items required for switchgear test, inspection, maintenance, and operation. Include the following:
 - 1. Fuse-handling tool.
 - 2. Extension rails, lifting device, transport dolly or mobile lift, and all other items necessary to remove overcurrent protective device from housing and transport to remote location.
 - 3. Racking handle to move overcurrent protective device manually between connected and disconnected positions, and a secondary test coupler to permit testing of overcurrent protective device without removal from switchgear.
 - 4. Remote operated, motor driven, racking device.
 - 5. Provide owner with labeled keys for all switchgear.

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. All products supplied for this project must comply with the Illinois Procurement of Domestic Products Act (30 ILCS 517).
- B. Available Manufacturers:
 - 1. S & C Custom Metal Enclosed Switchgear
 - 2. Eaton Corp. Electrical Group "MVS, or equal.
 - 3. Square D; a brand of Schneider Electric.
 - 4. General Electric Company; GE Consumer & Industrial - Electrical Distribution.

2.2 MANUFACTURED UNITS

- A. Description: Factory assembled and tested.

- B. Ratings: Suitable for application in 3-phase, 60-Hz, solidly grounded-neutral system.
 - 1. Rated 13.8 kV Nominal, 95 kV BIL.
- C. System Voltage: 12.47 kV nominal; 15 kV maximum.
- D. Main-Bus Rating: 600A, continuous; 600MVA Short Circuit.

2.3 METAL-ENCLOSED SWITCHGEAR

- A. Meet or exceed the applicable requirements of ANS/IEEE C37.20.3 for Metal-Enclosed Interrupter Switchgear.
- B. Design Level of Available-Source Fault Current: Integrated short-circuit rating consistent with value of fault current indicated by the power utility.
- C. Interrupter Switches: Stationary, 3-pole, gang-operated, and suitable for application at maximum short-circuit rating of integrated switchgear assembly.
 - 1. Rating: The momentary and duty-cycle fault-closing ratings of switches, momentary rating of bus, and interrupting ratings of fuses shall equal or exceed the short-circuit ratings of the metal-enclosed switchgear.
 - 2. Extra auxiliary switch, coupled to switch operator.
 - 3. Copper terminals and adapters on switches.
 - 4. Duty-Cycle, Fault Closing: 40,000 asymmetrical A.
 - 5. Switch Action: No external arc or significant ionized gas released into the enclosure.
 - 6. Switch Construction: Supported entirely by interior framework of structure, with copper switchblades and stored-energy operating mechanism.
 - 7. The speed of opening and closing the switch shall be independent of the operator, and it shall be impossible to "tease" the switch into any intermediate position under normal operation.
 - 8. A maintenance provision for slow closing the switch to check switch blade engagement and slow opening the switch to check operation of the arc interrupting contacts.
 - 9.8. Phase Barriers: Full length of switchblades and fuses for each pole; designed for easy removal; allow visual inspection of switch components if barrier is in place.
 - 10. Protective Shields: Cover live components and terminals.
 - 11.9. Fuses: De-energized if switch is open.
 - 12.10. Distribution Class Surge Arrestors on load side of fuse.
 - 13.11. Ground Ball Studs shall be provided on all phase, neutral and ground bus to allow for apparatus grounding clamps during maintenance.
- D. Mechanical Interlock Power Operators: Prevent opening switch compartment door unless switchblades are open, and prevent closing switch if door is open to function in conjunction with fused switches in bays as indicated in the Components Part of this specification section.
 - 1. Green-OPEN, Red-CLOSED switch position indicators (FLAGS) with the words "Open" and "Closed" in French, Spanish and English.
 - 2. Keyed interlock, locks switch operator open, prevents electrical paralleling.
- E. Network Communications Equipment: Microprocessor-based unit suitable for three- or four- wire systems with the following features:
 - 1. The communication system network shall be as described in Section 260913.
 - 2. Each load interrupter switch position (open and closed), where shown, shall communicate via an addressable relay. This relayauxiliary switches. The switches shall communicate over the network. The relayswitches shall monitor an auxiliary switch contact that monitors the primary

- switch position and shall be rated for the application. Each relay shall have a unique address so that it is possible to “call up” and “read” each load interrupter switch’s position from a host computer.
3. A blown high voltage fuse condition on each set of three (3) fuses shall be monitored by an addressable relay. Any blown fuse operation shall be communicated immediately over the network via the monitoring addressable relay. Each relay shall have a unique address so that it is possible to “call up” and “read” a fuse blown operation for a set of fuses with the communication system.
- F. Window: Minimum 8-inch x 16-inch high-impact viewing window that permits full view of the position of all three switch blades through the closed door. The window shall not be more than 58-inches above the switch pad level to allow ease of inspection.
- G. Key Interlocks: Arranged for interlocking schemes indicated.
- H. Padlocking Provisions: For installing at least three padlocks on each switch to secure its enclosure and prevent movement of drawout mechanism. Provisions shall be included for padlocking in the open or closed position.
- I. Power Fuses: Comply with the following and with applicable requirements in NEMA SG 2:
1. Indicator: Integral with each fuse to indicate when it has blown.
 2. Mounting: Positively held in position with provision for easy removal and replacement from front without special tools.
 3. Current-Limiting, E-rated Fuses: Full-range, fast-replaceable, current-limiting type rated for not less than 50-kA RMS symmetrical current-interrupting capacity that will operate without explosive noise or expulsion of gas, vapor, or foreign matter from tube.
 4. Spares: Include three fuses in use and three spare fuses in storage clips in each switch

2.4 FABRICATION

- A. Enclosure: NEMA Type 3R, galvanized steel, listed for installation outdoors.
1. Each compartment shall have the following features:
 - a. Structural design and anchorage adequate to resist loads imposed by 150-mph wind.
 - b. Space heater operating at one-half or less of rated voltage, sized to prevent condensation.
 - c. Aisle-less construction, full height doors in front of basic weatherproof equipment, rear hinged doors for each section, all with provisions for padlocking. Downward, rearward sloping roof. Integral structural steel base frame with factory-applied undercoating.
 - d. Interior light with switch.
 - e. Weatherproof GFCI duplex receptacle.
 - f. Power for heaters, lights, automatic power operators and receptacles to be provided by control power transformer.
 - g. Ventilation louvers equipped with insect and rodent screen and filter, and arranged to permit air circulation while excluding rodents and exterior dust.
- B. Finish: Manufacturer's standard gray finish over rust-inhibiting primer on phosphatizing-treated metal surfaces.
- C. Bus Transition Unit: Arranged to suit bus and adjacent units.
- D. Incoming-Line Unit: Arranged to suit incoming line.

- E. Outgoing Feeder Units: Arranged to suit distribution feeders.
- F. Auxiliary Compartments: Arranged to house customer metering, relays, controls, and auxiliary equipment; isolated from medium-voltage components.
- G. Inspection windows, 4" diameter, in front/rear panels of each cubicle, to permit thermal imaging of terminations, with sliding cover.

2.5 COMPONENTS

- A. Main Bus: Copper, silver plated at connection points; full length of switchgear.
- B. Ground Bus: Copper, silver plated or copper, tin plated; minimum size 1/4 by 2 inches (6 by 50 mm); full length of switchgear.
- C. Bus Insulation Covering: Covered with flame-retardant insulation.
- D. Enclosure design:

Bay 1 Entrance Module Switch-Fuse - Power OpCable Tap - Thru Bus with the Switch Type:
None following optional features:

Switch Type: Mini-Rupter

Fuse Type: SM-5SNone

OUTDOOR CONSTRUCTION - LIGHT GRAY FINISH
DUSTPROOF CONSTRUCTION FOR OUTDOOR BAY
600 A COVERED COPPER BUS WITH SILVER-PLATED BUS JOINTS
LONG-LIFE HEATERS – 250W TOTAL OUTPUT
IR SIGHT GLASSES FOR TERMINATIONS
INTERNAL LIGHT
TOGGLE SWITCH OPERATOR TYPE MS-2, 115 VAC CONTROL VOLTAGEFOR

LIGHT

EXTRA AUXILIARY SWITCH, COUPLED TO SWITCH OPERATOR
COPPER TERMINALS AND ADAPTERS ON MINI-RUPTER SWITCHES
DISTRIBUTION CLASS SURGE ARRESTERS, 9 KV
~~MICRO-AT SOURCE TRANSFER CONTROL~~
~~REMOTE INDICATION FOR MICRO-AT~~
~~COMMUNICATIONS CARD FOR MICRO-AT~~
~~SUPERVISORY CONTROL FOR COMMON BUS MICRO-AT~~
~~OVERCURRENT LOCKOUT FOR MICRO-AT~~
GFCI RECEPTACLE
~~3 FUSED VT'S CONNECTED PHASE TO GROUND~~
KEY INTERLOCKS, LOCK SWITCH OPEN, PREVENTS MANUAL
PARALLELING

DIVISION 26 - ELECTRICAL

Section 26 13 00 - Medium Voltage Switchgear

Bay 2	Tie-Metering Module Through Bus From Left with the following optional features:	Switch Type: None Fuse Type: None
GRD	OUTDOOR CONSTRUCTION - LIGHT GRAY FINISH DUSTPROOF CONSTRUCTION FOR OUTDOOR BAY 600 A COVERED COPPER BUS WITH SILVER-PLATED BUS JOINTS LONG-LIFE HEATERS – 250W TOTAL OUTPUT VT ROLLOUT CARRIAGE WITH 3 CUSTOMER-SUPPLIED VT'S CONNECTED PH- COMPLETE PROVISIONS -- 3 CUSTOMER-SUPPLIED WOUND CT'SCT'S	

Bay 3 Bus Transition Bay with the following optional features:

OUTDOOR CONSTRUCTION - LIGHT GRAY FINISH
DUSTPROOF CONSTRUCTION FOR OUTDOOR BAY
600 A COVERED COPPER BUS WITH SILVER-PLATED BUS JOINTS
LONG-LIFE HEATERS – 250W TOTAL OUTPUT
INTERNAL LIGHT
TOGGLE SWITCH FOR LIGHT

Bay 4 Entrance Module Switch-Fuse - Power Op with the following Switch Type: Mini-Rupter
following optional features: Fuse Type: SM-5S

~~OUTDOOR CONSTRUCTION LIGHT GRAY FINISH~~

OUTDOOR CONSTRUCTION - LIGHT GRAY FINISH
DUSTPROOF CONSTRUCTION FOR OUTDOOR BAY
600 A COVERED COPPER BUS WITH SILVER-PLATED BUS JOINTS
LONG-LIFE HEATERS – 250W TOTAL OUTPUT
SWITCH OPERATOR TYPE MS-2, 115 VAC CONTROL VOLTAGE
EXTRA AUXILIARY SWITCH, COUPLED TO SWITCH OPERATOR
COPPER TERMINALS AND ADAPTERS ON MINI-RUPTER SWITCHES

MICRO-AT SOURCE-TRANSFER CONTROL

REMOTE INDICATION FOR MICRO-AT

TEST PANEL FOR MICRO-AT

COMMUNICATIONS CARD FOR MICRO-AT

SUPERVISORY CONTROL FOR COMMON-BUS MICRO-AT

OVERCURRENT LOCKOUT FOR MICRO-AT

INTERNAL LIGHT

TOGGLE SWITCH FOR LIGHT

GFCI RECEPTACLE

3 FUSED VT'S CONNECTED PHASE-TO-GROUND

3 VOLTAGE SENSORS FOR OVERCURRENT LOCKOUT FEATURE

KEY INTERLOCKS, LOCK SWITCH OPEN, PREVENTS MANUAL PARALLELING

Bay 5	Entrance Module Switch-Fuse - Power Op with the following optional features:	Switch Type: Mini-Rupter Fuse Type: SM-5S
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OUTDOOR CONSTRUCTION - LIGHT GRAY FINISH

DUSTPROOF CONSTRUCTION FOR OUTDOOR BAY
600 A COVERED COPPER BUS WITH SILVER-PLATED BUS JOINTS
LONG-LIFE HEATERS – 250W TOTAL OUTPUT
SWITCH OPERATOR TYPE MS-2, 115 VAC CONTROL VOLTAGE
EXTRA AUXILIARY SWITCH, COUPLED TO SWITCH OPERATOR
IR SIGHT GLASSES FOR TERMINATIONS
COPPER TERMINALS AND ADAPTERS ON MINI-RUPTER SWITCHES
DISTRIBUTION CLASS SURGE ARRESTERS, 9 KV
INTERNAL LIGHT
TOGGLE SWITCH FOR LIGHT
GFCI RECEPTACLE
3 FUSED VT'S CONNECTED PHASE-TO-GROUND
KEY INTERLOCKS, LOCK SWITCH OPEN, PREVENTS MANUAL, PAR

Bay 46 Feeder Module Switch-Fuse - Power Op with the following Switch Type: Mini-Rupter
optional features: Fuse Type: SM-5S

OUTDOOR CONSTRUCTION - LIGHT GRAY FINISH
DUSTPROOF CONSTRUCTION FOR OUTDOOR BAY
600 A COVERED COPPER BUS WITH SILVER-PLATED BUS JOINTS
LONG-LIFE HEATERS – 250W TOTAL OUTPUT
SWITCH OPERATOR TYPE MS-10, 115 VAC CONTROL VOLTAGE
~~DIGITAL MULTI-METER LOCATED IN SAGINAW BOX - TBD~~
~~PROVISIONS FOR DIGITAL MULTI-METER~~
~~THREE WINDOW CT'S RATED 400:5~~
COPPER TERMINALS AND ADAPTERS ON MINI-RUPTER SWITCHES
SPD OPEN-PHASE DETECTOR FOR USE WITH 3 VOLTAGE SENSORS
(INCLUDED)

Bay 5 Feeder Module Switch-Fuse - Power Op with the following Switch Type: Mini-Rupter
optional features: Fuse Type: SM-5S

~~OUTDOOR CONSTRUCTION - LIGHT GRAY FINISH~~
600 A COPPER BUS WITH SILVER-PLATED BUS JOINTS
EXTRA AUXILIARY SWITCH COUPLED TO SWITCH OPERATOR TYPE MS-10,
115 VAC CONTROL VOLTAGE
DIGITAL MULTI-METER LOCATED IN SAGINAW BOX - TBD
PROVISIONS FOR DIGITAL MULTI-METER
THREE WINDOW CT'S RATED 400:5
~~COPPER TERMINALS AND ADAPTERS ON MINI-RUPTER SWITCHES~~
IR SIGHT GLASSES FOR TERMINATIONS
COPPER TERMINALS AND ADAPTERS ON MINI-RUPTER SWITCHES
DISTRIBUTION CLASS SURGE ARRESTERS, 9 KV
SPD OPEN-PHASE DETECTOR FOR USE WITH 3 VOLTAGE SENSORS
(INCLUDED)
INTERNAL LIGHT
TOGGLE SWITCH FOR LIGHT
GFCI RECEPTACLE

Bay 67 Feeder Module Switch-Fuse - Power Op with the following Switch Type: Mini-Rupter
optional features: Fuse Type: SM-5S

OUTDOOR CONSTRUCTION - LIGHT GRAY FINISH

~~OUTDOOR CONSTRUCTION - LIGHT GRAY FINISH~~
DUSTPROOF CONSTRUCTION FOR OUTDOOR BAY
600 A COVERED COPPER BUS WITH SILVER-PLATED BUS JOINTS
LONG-LIFE HEATERS – 250W TOTAL OUTPUT
SWITCH OPERATOR TYPE MS-10, 115 VAC CONTROL VOLTAGE
EXTRA AUXILIARY SWITCH COUPLED TO SWITCH OPERATOR
DIGITAL MULTI-METER LOCATED IN SAGINAW BOX - TBD
PROVISIONS FOR DIGITAL MULTI-METER

THREE WINDOW CT'S RATED 400:5

IR SIGHT GLASSES FOR TERMINATIONS

COPPER TERMINALS AND ADAPTERS ON MINI-RUPTER SWITCHES

DISTRIBUTION CLASS SURGE ARRESTERS, 9 KV

SPD OPEN-PHASE DETECTOR FOR USE WITH 3 VOLTAGE SENSORS (INCLUDED)

INTERNAL LIGHT

TOGGLE SWITCH FOR LIGHT

GFCI RECEPTACLE

Bay 8 Feeder Module Switch-Fuse - Power Op with the following Switch Type: Mini-Rupter
optional features: Fuse Type: SM-5S

OUTDOOR CONSTRUCTION - LIGHT GRAY FINISH

DUSTPROOF CONSTRUCTION FOR OUTDOOR BAY
600 A COVERED COPPER BUS WITH SILVER-PLATED BUS JOINTS
LONG-LIFE HEATERS – 250W TOTAL OUTPUT
SWITCH OPERATOR TYPE MS-10, 115 VAC CONTROL VOLTAGE
EXTRA AUXILIARY SWITCH COUPLED TO SWITCH OPERATOR
DIGITAL MULTI-METER LOCATED IN SAGINAW BOX - TBD

PROVISIONS FOR DIGITAL MULTI-METER

THREE WINDOW CT'S RATED 400:5

IR SIGHT GLASSES FOR TERMINATIONS
COPPER TERMINALS AND ADAPTERS ON MINI-RUPTER SWITCHES
DISTRIBUTION CLASS SURGE ARRESTERS, 9 KV
SPD OPEN-PHASE DETECTOR FOR USE WITH 3 VOLTAGE SENSORS
(INCLUDED)
INTERNAL LIGHT
TOGGLE SWITCH FOR LIGHT
GFCI RECEPTACLE

Bay 79 Feeder Module Switch-Fuse - Power Op with the following Switch Type: Mini-Rupter
optional features: Fuse Type: SM-5S

OUTDOOR CONSTRUCTION - LIGHT GRAY FINISH
DUSTPROOF CONSTRUCTION FOR OUTDOOR BAY
600 A COVERED COPPER BUS WITH SILVER-PLATED BUS JOINTS
LONG-LIFE HEATERS – 250W TOTAL OUTPUT
SWITCH OPERATOR TYPE MS-10, 115 VAC CONTROL VOLTAGE
EXTRA AUXILIARY SWITCH COUPLED TO SWITCH OPERATOR
DIGITAL MULTI-METER LOCATED IN SAGINAW BOX - TBD
PROVISIONS FOR DIGITAL MULTI-METER
THREE WINDOW CT'S RATED 400:5
IR SIGHT GLASSES FOR TERMINATIONS
COPPER TERMINALS AND ADAPTERS ON MINI-RUPTER SWITCHES
DISTRIBUTION CLASS SURGE ARRESTERS, 9 KV
SPD OPEN-PHASE DETECTOR FOR USE WITH 3 VOLTAGE SENSORS
(INCLUDED)
This quotation includes INTERNAL LIGHT
TOGGLE SWITCH FOR LIGHT
GFCI RECEPTACLE

Include the following accessories and fuses for this S&C Metal-Enclosed Switchgear assembly:

(36) SM-5 Fuse Refill Units

E. Provide insulating boots on all cable terminations.

- F. Instrument Transformers: Comply with IEEE C57.13.
 - 1. Potential Transformers: Secondary voltage rating of 120 V and NEMA 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.
- G. Multifunction Digital-Metering Monitor: Microprocessor-based unit suitable for three- or four-wire systems, listed and labeled by an NRTL, and with the following features:
 - 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.
 - i. Accumulated energy, in megawatt hours (joules), plus or minus 2 percent; stored values unaffected by power outages for up to 72 hours.
 - 3. Mounting: Display and control unit that is flush or semi-flush mounted in instrument compartment door.
- G. Network Communications: Coordinate remote monitoring communication module package with power monitoring equipment specified in Division 26 Section "Electrical Power Monitoring and Control" for successful transmission and remote readout of monitoring data.
 - 1. Connect remote monitoring communication module to Using Agency's data network through appropriate network interface unit.
 - 2. The manufacturer shall wire between all communications capable devices within the switchgear, including electronic meters with the same protocol and wire to a set of easily accessible terminal blocks suitable for remote monitoring of meter quantities and functions.
 - a. Control power shall be 120 volts, 60 Hz available from a fused control transformer.
- H. Protective Relays: Comply with IEEE C37.90, integrated digital type; with test blocks and plugs.
- I. Surge Arresters: Distribution class B, 3KV, metal-oxide-varistor type. Comply with ANSI C37.90.1 and NEMA LA 1.
 - 1. Install in cable termination compartments in each phase of circuit.
 - 2. Coordinate rating with circuit voltage.
- J. Control Power Supply: Control power transformer supplies 120-V control circuits through secondary disconnect devices. Include the following features:
 - 1. Dry-type transformers, in separate compartments for units larger than 3 kVA, including primary and secondary fuses.
 - 2. Two control power transformers in separate compartments with necessary interlocking relays; each transformer connected to line side of associated main switch for M-T-M arrangements.
 - a. Secondary windings connected through relay(s) to control bus to affect an automatic

- transfer scheme.
- b. Secondary windings connected through an internal automatic transfer switch to switchgear control power bus.
- 3. Control Power Fuses: Primary and secondary fuses provide current-limiting and overload protection.
- K. Control Wiring: Factory installed, complete with bundling, lacing, and protection; and complying with the following:
 - 1. Flexible conductors for No. 8 AWG and smaller, for conductors across hinges, and for conductors for interconnections between shipping units.
 - 2. Conductors sized according to NFPA 70 for duty required.

2.6 CONTROL BATTERY SYSTEM (remove??)

- A. System Requirements: Battery shall have number of cells and ampere-hour capacity based on an initial specific gravity of 1.210 at 25 deg C with electrolyte at normal level and minimum ambient temperature of 13 deg C. Cycle battery before shipment to guarantee rated capacity on installation. Arrange battery to operate ungrounded.
- B. Battery: Lead-calcium, maintenance-free type in sealed, clear plastic or glass containers, complete with electrolyte, fully charged and arranged for shipment with electrolyte in cells. Limit weight of each container to not more than 70 lb (32 kg) and cells per container to not more than 3. System batteries shall be suitable for service at an ambient temperature ranging from minus 18 to 25 deg C. Limit variation of current output to 0.8 percent for each degree below 25 deg C down to minus 8 deg C. For outdoor installations: Thermostatically controlled heater shall be arranged to maintain battery above 10 deg C regardless of external ambient temperature within range specified in Part 1 "Project Conditions" Article.
- C. Rack: Two-step rack with electrical connections between battery cells and between rows of cells; include two flexible connectors with bolted-type terminals for output leads.
- D. Accessories:
 - 1. Thermometers with specific-gravity correction scales.
 - 2. Hydrometer syringes.
 - 3. Set of socket wrenches and other tools required for battery maintenance.
 - 4. Wall-mounting, nonmetallic storage rack fitted to store above items.
 - 5. Set of cell numerals.
- E. Charger: Provide products by La Marche. Static-type silicon rectifier equipped with automatic regulation and provision for manual and automatic adjustment of charging rate. Unit shall 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. Other features of charger include the following:
 - 1. DC ammeter.
 - 2. DC Voltmeter: Maximum error of 5 percent at full-charge voltage; operates with toggle switch to select between battery and charger voltages.
 - 3. 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 normally open push-button contact.
 - 4. 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.

5. Charging-Rate Switch: Manually operated switch provides for transferring to higher charging rate. Charger operates automatically after switch operation until manually reset.
6. AC power supply is 120 V, 60 Hz, subject to plus or minus 10 percent variation in voltage and plus or minus 3-Hz variation in frequency. After loss of ac power supply for any interval, charger automatically resumes charging battery. Charger regulates rate of charge to prevent damage due to overload and to prevent fuses or circuit breakers from opening.
7. Protective Feature: Current-limiting device or circuit, which limits output current to rating of charger but does not disconnect charger from either battery or ac supply; to protect charger from damage due to overload, including short circuit on output terminals.
8. Electrical Filtering: Reduces charger's audible noise to less than 26 dB.

2.7 UTILITY COMPANY EQUIPMENT

- A. Provide separate cubicles for utility metering equipment. Utility metering vertical section shall contain provisions for minimum (3) wound current transformers and voltage transformers connected phase to ground as required by the Utility. The construction shall conform to the Utility Company's metering standards. It shall also conform to the general electrical and construction design of the switchgear specified above.
- B. Provide suitable arrangements within the utility primary metering cubicles for mounting metering equipment, including drilling or tapping the bus. Obtain the Utility's approval of the cubicle arrangements prior to fabrication of the switchgear.
- C. This Contractor shall be responsible for coordinating the installation of utility metering equipment by utility personnel.

2.8 SPACE FOR FUTURE DEVICES

- A. Where indicated on the Drawings, "space" shall mean fully provisioned space ready for inserting a circuit breaker at a future date without any future modifications. Provide current transformers sized according to the breaker frame size. A blank door shall close off the front of the compartment.

2.9 IDENTIFICATION

- A. Materials: Refer to Section 26 05 53 "Identification for Electrical Systems." Identify units, devices, controls, and wiring.
- B. Mimic Bus: Continuous mimic bus applied to front of switchgear, arranged in single-line diagram format, using symbols and lettered designations consistent with approved final mimic-bus diagram.
 1. Mimic-bus segments coordinated with devices in switchgear sections to which applied, to produce a concise visual presentation of principal switchgear components and connections.
 2. Medium: Painted graphics, contrasting color to factory-finish as approved.

2.10 SOURCE QUALITY CONTROL

- A. Before shipment of equipment, perform the following tests and prepare test reports:
 1. Production tests on circuit breakers according to ANSI C37.09.
 2. Production tests on completed switchgear assembly according to IEEE C37.20.2.

- B. Assemble switchgear and equipment in manufacturer's plant and perform the following:
 - 1. Functional tests of all relays, instruments, meters, and control devices by application of secondary three-phase voltage to voltage circuits and injection of current in current transformer secondary circuits.
 - 2. Functional test of all control and trip circuits. Connect test devices into circuits to simulate operation of controlled remote equipment such as circuit-breaker trip coils, close coils, and auxiliary contacts. Test proper operation of relay targets.
- C. Prepare equipment for shipment.
 - 1. Provide suitable crating, blocking, and supports so equipment will withstand expected domestic shipping and handling shocks and vibration.
 - 2. Weatherproof equipment for shipment. Close connection openings to prevent entrance of foreign material during shipment and storage.

2.11 FACTORY FINISHES

- A. Finish: Manufacturer's standard olive green finish applied to equipment before shipping.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Examine elements and surfaces to receive switchgear for compliance with requirements for installation tolerances, required clearances, and other conditions affecting performance.
 - 1. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Anchor switchgear assembly to concrete base and attach by bolting.
 - 1. Interior location: Concrete base 4 inches high, reinforced, with chamfered edges. Extend base no less than 3 inches in all directions beyond the maximum dimensions of switchgear, unless otherwise indicated. Construct concrete bases according to Division 26 Section "Hangers and Supports for Electrical Systems."
 - 2. Exterior location: Mount switchgear on concrete slabs. Unless otherwise indicated, the slab shall be at least 8 inches thick, reinforced with a 6 by 6 inch No. 6 mesh placed uniformly 4 inches from the top of the slab. Slab shall be placed on a 6 inch thick, well-compacted gravel base. The top of the concrete slab shall be approximately 4 inches above the finished grade. Edges shall be chamfered. The slab shall be of adequate size to project at least 8 inches beyond the equipment.
 - a. Use 3000-psi 28-day compressive-strength concrete and reinforcement as specified in Division 03 Sections.
- B. Temporary Lifting Provisions: Remove temporary lifting eyes, channels, and brackets and temporary blocking of moving parts from switchgear units and components.

3.3 DOCUMENTATION

- A. Identify field-installed conductors, interconnecting wiring, and components; provide warning signs as specified in Division 26 Section "Identification for Electrical Systems."

- B. Diagram and Instructions:
 - 1. Provide to owner with maintenance manual:
 - a. Operating Instructions: Printed basic instructions for switchgear, including control and key-interlock sequences and emergency procedures.
 - b. System Power Riser Diagrams: Depict power sources, feeders, distribution components, and major loads.
 - 2. Storage for Maintenance: Include a rack or holder, with the maintenance manual.

3.4 CONNECTIONS

- A. Cable terminations at switchgear are specified in Division 26 Section "Medium-Voltage Cables."
- B. Tighten bus joints, electrical connectors, and terminals according to manufacturer's published torque-tightening values using a calibrated torque wrench. Provide a list of all torqued connections and values.
- C. Ground equipment according to Division 26 Section "Grounding and Bonding for Electrical Systems."
- D. Connect wiring according to Division 26 Sections "Low-Voltage Electrical Power Conductors and Cables" and "Medium-Voltage Cables."
- E. Provide all communications wiring between remote monitoring communication modules and the Using Agency's data network. Verify that each circuit breaker's address for microprocessor-communication packages corresponds to Division 26 Section "Electrical Power Monitoring and Control Systems" requirements.

3.5 FIELD QUALITY CONTROL

- A. Prepare for acceptance tests as follows:
 - 1. Test insulation resistance for each switchgear bus, component, connecting supply, feeder, and control circuit.
 - 2. Test continuity of each circuit.
- B. Manufacturer's Field Service: Engage a factory-authorized service representative to perform the following:
 - 1. Inspect switchgear, wiring, components, connections, and equipment installation. Test and adjust components and equipment.
 - 2. Assist in field testing of equipment.
 - 3. Report results in writing.
- C. Perform the following field tests and inspections and prepare test reports:
 - 1. Perform each electrical test and visual and mechanical inspection stated in NETA ATS. Certify compliance with test parameters. Perform NETA tests and inspections for each of the following NETA categories:
 - a. Switchgear.
 - b. Circuit breakers.
 - c. Protective relays.
 - d. Instrument transformers.
 - e. Metering and instrumentation.
 - f. Ground-fault systems.

- g. Battery systems.
 - h. Surge arresters.
- D. Remove and replace malfunctioning units and retest as specified above.
- E. Infrared Scanning: After Substantial Completion, but not more than 60 days after Final Acceptance, perform infrared scan of each switchgear lineup. Remove front and rear panels so joints and connections are accessible to portable scanner.
 - 1. Instrument: Use an infrared-scanning device designed to measure temperature or to detect significant deviations from normal values. Provide calibration record for device.
 - 2. Record of Infrared Scanning: Prepare a certified report that identifies switchgear checked and that describes infrared-scanning results. Include notation of deficiencies detected, remedial actions taken, and observations after remedial action.

3.6 ADJUSTING

- A. Set field-adjustable, protective-relay trip characteristics according to results in Division 26 Section "Overcurrent Protective Device Coordination Study." Post a durable copy of the "as-left" relay settings and fuse ratings in a convenient location within the switchgear.

3.7 CLEANING

- A. On completion of installation, inspect interior and exterior of switchgear. Vacuum dirt and debris; do not use compressed air to assist in cleaning. Repair damaged finishes.

3.8 PROTECTION

- A. Temporary Heating: Apply temporary heat to switchgear, according to manufacturer's written instructions, throughout periods when switchgear environment is not controlled for temperature and humidity within manufacturers' stipulated service conditions.

3.9 DEMONSTRATION

- A. Engage a factory-authorized service representative to train Using Agency's maintenance personnel to adjust, operate, and maintain switchgear.

PART 4 CONTRACTOR'S QUALITY CONTROL REQUIREMENTS

4.1 GENERAL

- A. Comply with applicable provisions of division 01 Section "Quality Requirements" for requirements for Contractor's Quality Control Program.

END OF SECTION 26 13 00

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