SECTION 26 23 00 – low voltage switchgear

1. GENERAL
   * + 1. RELATED DOCUMENTS
          1. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.
          2. Specifications throughout all Divisions of the Project Manual are directly applicable to this Section, and this Section is directly applicable to them.
       2. SUMMARY
          1. This Section specifies the furnishing and installation of low-voltage switchgear consisting of stored energy iron frame power circuit breakers instrumentation and auxiliary devices.
       3. REFERENCE STANDARDS
          1. The latest published edition of a reference shall be applicable to this Project unless identified by a specific edition date.
          2. All reference amendments adopted prior to the effective date of this Contract shall be applicable to this Project.
          3. All materials, installation and workmanship shall comply with the applicable requirements and standards addressed within the following references:

NEMA SG3 - Low-Voltage Power Circuit Breakers

NEMA SG5 - Power Switchgear Assemblies

ANSI/IEEE C37.13 - Standard for Low-Voltage AC Power Circuit Breakers Used in Enclosures

ANSI/IEEE C37.16 - Preferred Rating for Low-Voltage Power Circuit Breakers.

ANSI/IEEE C37.20.1 - Standard for Metal-Enclosed Low-Voltage Power Circuit Breaker Switchgear

ANSI C37.50 - Test Procedures for Low-Voltage AC Power Circuit Breakers Used in Enclosures

ANSI C37.51 - Standard for Conformance Testing of Metal-Enclosed Low-Voltage AC Power Circuit Breaker Switchgear Assemblies

NEMA PB 2.2 - Application Guide for Ground-Fault Protective Devices for Equipment

UL 1449 – Standard for Safety for Surge Protective Devices, 3rd Edition

* + - 1. SUBMITTALS
         1. Product Data and Record Documents:

Provide the following minimum information:

Manufacturer.

One line diagram.

Outline dimensions with trolley.

Total weight of unit.

Installation procedures.

Operation and maintenance manuals.

Instrument transformer data.

Coordination study for each type and rating of circuit breaker.

A five line diagram (phases, neutral, ground) for each switchgear assembly which shows all connections plus control wiring for zone selective interlocking and PSMS equipment.

Torque Specifications for all bus and lug connections.

* + - 1. DELIVERY, STORAGE and HANDLING
         1. Deliver units in factory-fabricated, water-resistant wrapping, mounted on shipping skids.
         2. Store in a clean, dry space. Maintain factory wrapping or provide an additional heavy canvas or heavy plastic cover to protect units from dirt, water, construction debris, and traffic.
         3. Handle units carefully to avoid damage to material components, enclosure, and finish. Provide units with adequate lifting means

1. PRODUCTS
   * + 1. GENERAL
          1. All materials shall meet or exceed all applicable referenced standards, federal, state and local requirements, and conform to codes and ordinances of authorities having jurisdiction.
          2. Provide completely factory assembled freestanding metal-enclosed drawout switchgear assembly from incoming line lugs to load terminals of all protective devices. Include all necessary buses, supports, devices and provision for future connections as shown on the Drawings.
          3. The physical size and configuration of the switchgear may be varied to suit the manufacturer’s standard design, provided all requirements of this Specification are met. Circuit breaker physical arrangement shall be as shown on the Drawings.
       2. MANUFACTURERS AND CIRCUIT BREAKER TYPE
          1. Square D Company
          2. Eaton
       3. RATINGS
          1. Voltage Characteristics: 480Y/277V, three phase, four wire, 60 hertz, unless indicated otherwise on Drawings.
          2. Main Bus: Braced to withstand calculated short circuit currents. Ampacity of phase bus is indicated on the Drawings. Neutral bus where required, is the same size as the phase bus.
          3. Available Short Circuit Current: Calculated as indicated on the Drawings.
          4. Circuit Breaker Interrupting Rating: Calculated as indicated on the Drawings.
       4. ENCLOSURE
          1. Construction:

Fabricate the switchgear enclosure with the required number of vertical sections nominally 90 inches high and with width and depth as shown on Drawings.

Bolt vertical sections together to provide a rigid, freestanding, metal-enclosed unit which must withstand all shipping, handling and installation procedures without damage or deformation.

Completely enclose the frame with removable, bolted, code-gage sheet steel covered panels and hinged doors.

Form all cover plates and doors to eliminate sharp edges.

* + - * 1. Access:

In general, the switchgear shall be composed of three (3) compartments front to back: the front compartment being the instrument or circuit breaker compartment, the middle compartment being the bus compartment, and the back compartment being the cable compartment. Front and rear access is required.

Provide adequate wiring gutter space at the top, bottom and sides for easy access to all wiring terminations.

Provide isolation barriers to separate the incoming conductors from other switchgear cabling.

* + - * 1. Device Mounting:

Provide switchgear with individually mounted protective devices.

Assembly must permit interchanging devices of the same type, rating and method of operation.

* + - * 1. Lifting Provisions:

Provide permanent lifting means on top of shipping sections.

Include an integral roll-along lifting device for switchgear equipped with drawout devices.

Mount lifting device on top of switchgear.

Provide all necessary equipment for removal of the circuit breakers.

* + - * 1. Finish:

Grind all steel surfaces smooth, with all burrs, sharp edges, welding splatters, loose rust, scale and the like totally removed after fabrication.

Following this, chemically clean and treat steelwork to allow a good bond between the steel surfaces and apply a rust-preventive primer paint.

After priming, thoroughly paint the inside and outside with ANSI 49 or ANSI 61 gray paint.

Supply one (1) pint of finish paint for each switchgear unit for touch-up after installation.

* + - 1. BUSES
         1. Main, Section and Branch Bus:

Material:

Fabricate all buses of 98 percent IACS conductivity, tin-plated copper with rounded edges.

Make all connections using a minimum of two (2) bolts with conical washers.

Design:

Size main bus for ampacity shown on Drawings.

Determine current rating for section bus and branch bus on the basis of service to all devices including spares and spaces for future addition.

Size all buses to limit their temperature rise within the switchgear to 65 degrees C based on a 40 degrees C outside ambient temperature.

Size all buses so that current density will not exceed 1000 amperes per square inch.

Insulate each individual phase bus bar to withstand 2000 volts AC for one minute.

Bus clearances must be rated for 600 VAC.

* + - * 1. Neutral Bus:

In each 4-wire switchgear section, include an uninsulated, tin-plated neutral bus on insulated bus supports secured to the section frame and bolt to neutral bus bars in adjacent sections, to provide a continuous neutral bus.

Rate bus for minimum 100 percent of phase current. Refer to Drawings.

* + - * 1. Ground Bus:

In each switchgear section, include an uninsulated tin-plated copper ground bus for the equipment.

Secure the bus to the unit frame and bolt to the ground bus in adjacent sections, to provide a continuous equipment ground bus.

Arrange the equipment ground bus to ground the switchgear parts that do not carry current.

Include terminations at the bus for feeder and branch circuit grounding conductors.

The terminations must be exothermically welded on or be of an approved pressure connector type. Make area of ground bus not less than 1.00 square inches.

* + - * 1. Length:

Extend all buses the entire length of the switchgear.

Buses must have the required capacity for their total length.

Make provisions for extensions from either end of buses if not a double ended unit substation.

* + - * 1. Insulators:

Support main, section and branch bus systems with insulators to provide short circuit bracings.

Use noncarbonizing, nontracking insulators.

* + - 1. DEVICE AND BUS ISOLATION
         1. Isolate vertical buses from each other using insulating barriers.
         2. Provide insulating barriers between vertical and main bus and between main bus and load terminal.
         3. Include barriers at rear and sides of individually mounted devices.
         4. Provide horizontal barriers for complete compartmentalization of individually mounted devices.
      2. PROTECTIVE DEVICES
         1. Type: Provide a 100 percent rated, 3-pole, 480V, low-voltage, solid-state trip, nonfused air circuit breaker, unless otherwise noted on Drawings.
         2. Operating Mechanism: Stored energy, quick-make, quick-break type.
         3. Characteristics:

Mounting: Drawout.

Operation: Manual.

Main and Tie Breaker Trip: Solid-state trip unit with the following functions:

Long-time ampere rating and delay.

Short-time pickup and delay.

Ground fault pickup and delay.

Short-time zone selective interlocking.

Ground fault zone selective interlocking.

Feeder/Branch Breaker Trip: In addition to the requirements for the main and tie circuit breakers, include instantaneous pickup.

* + - * 1. Accessories:

Integral ground fault protection, where required per NEC and as indicated on the Drawings.

Ground fault indicating target.

Push-to-trip button.

Provisions for padlocking in the OPEN position.

Zone selective interlocking to allow the circuit breaker to be interlocked with the downstream circuit breakers so that the breaker closest to the fault will clear the fault without disruption of service to other parts of the distribution system.

Key interlock arrangement where indicated on the Drawings, which requires one main circuit breaker in a double-ended unit substation to be open before the tie circuit breaker can be closed.

Provide shorting blocks for maintenance.

* + - * 1. Manufacturers:

Square D Company Type DS with Digitrip RMS Series 800.

* + - 1. EatonMETERING
         1. See Section 26 09 13, Power Status and Monitoring System for metering equipment.
      2. CONTROL WIRING
         1. Provide 600-volt, Type SIS wire for switchgear control wiring. Install all control wiring complete at the factory, neatly bundled to protect it from mechanical damage.
      3. IDENTIFICATION
         1. Nameplates:

To identify switches, breakers, and other major devices, provide engraved phenolic nameplates with white characters on a black background.

Engrave the nameplates with characters a minimum of 3/16 inches high.

Mount nameplates on the front of door or panels adjacent to the device, and secure with stainless steel screws.

Identify switchgear name, voltage, short circuit ampacity, and source of power.

* + - * 1. Legend: Indicate on the nameplate legend the name of the circuit, panelboard, motor control center or equipment served by the device.
      1. LISTING
         1. The switchgear shall be UL listed as suitable for use as service entrance equipment.
      2. SPACE
         1. Where indicated on the Drawings, "space" shall mean equipped 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.

1. EXECUTION
   * + 1. INSTALLATION
          1. Installation shall meet or exceed all applicable federal, state and local requirements, referenced standards and conform to codes and ordinances of authorities having jurisdiction.
          2. All installation shall be in accordance with manufacturer’s published recommendations.
          3. Field Connections: Make field connections of buses between switchgear sections (rigid connection) and to transformers (flexible metal conduit) with splice bus and hardware provided by the switchgear manufacturer.
          4. Equipment Settings:

Properly set adjustable current and voltage settings as noted on protective device and relay coordination submittals.

Effectively accomplish grounding and bonding.

* + - * 1. Restore all damaged surfaces to factory finish.
        2. Inspection:

Thoroughly inspect the switchgear for items such as loose connections and presence of foreign materials and remedy prior to energizing the switchgear.

All bolted connections shall be torqued to the manufacturer's recommendations.

* + - * 1. Double lugging on one protected device to feed two (2) separate loads will not be permitted.
      1. TESTING
         1. After installation and before acceptance by the Owner provide the services of an independent testing organization (independent from the Contractor) to performance test all ground fault relays in accordance with the NEC.
         2. Proper operation of the zone selective interlocking feature of the short time and ground fault functions shall be satisfactorily demonstrated to the Owner.

This test shall involve passing a primary current through the current sensor with a suitable, low voltage test set and timer, which shall allow verification that the ground fault relays track their published curves and that they actually trip the devices on which they are applied.

This test shall also include the polarity of the current sensors and the satisfactory operation of the Power Status and Monitoring System (see Section 26 09 13).

Trip settings shall be set in accordance with the recommendations and study performed as specified in Section 26 05 73.

* + - * 1. Notify the Owner's representative of this test date fourteen (14) calendar days in advance so the tests can be properly witnessed. Submit copies of test report per Division 01 requirements.

END OF SECTION 26 23 00