

SECTION 26 24 13.12

LOW VOLTAGE SWITCHBOARDS - FIXED MAIN CB, GROUP MOUNTED BRANCH CB

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Main Switchboards - Furnish and install the Service Entrance switchboards as herein specified and shown on the associated electrical drawings. Main circuit breakers shall be electronic trip molded case 80%.
- B. Distribution Switchboards - Furnish and install the Distribution Switchboards as herein specified and shown on the associated electrical drawings. Distribution circuit breakers shall be group mounted electronic trip molded case 80% or thermal magnetic molded case. Basis of design is Square D QED-2 Switchboard.

1.2 REFERENCES

The switchboards and overcurrent protection devices referenced herein are designed and manufactured according to the following appropriate specifications.

- A. ANSI/NFPA 70 - National Electrical Code (NEC).
- B. ANSI/IEEE C12.16 - Solid State Electricity Metering.
- C. ANSI C57.13 - Instrument Transformers.
- D. NEMA AB 1 - Molded Case Circuit Breakers and Molded Case Switches.
- E. NEMA PB 2 - Deadfront Distribution Switchboards, File E8681
- F. NEMA PB 2.1 - Proper Handling, Installation, Operation and Maintenance of Deadfront Switchboards Rated 600 Volts or Less.
- G. NEMA PB 2.2 - Application Guide for Ground Fault Protective Devices for Equipment.
- H. UL 50 - Cabinets and Boxes.
- I. UL 489 - Molded Case Circuit Breakers.
- J. UL 891 - Dead-Front Switchboards.
- K. UL 943 - Ground Fault Circuit Interrupters.
- L. Federal Specification W-C-375B/Gen - Circuit Breakers, Molded Case, Branch Circuit And Service.

1.3 SUBMITTALS

- A. Shop Drawings shall indicate front and side enclosure elevations with overall dimensions shown; conduit entrance locations and requirements; nameplate legends; one-line diagrams; equipment schedule; and switchboard instrument details.

1.4 QUALIFICATIONS

- A. To be considered for approval, a manufacturer shall have specialized in the manufacturing and assembly of switchboards for at least fifty (50) years.
- B. Furnish products listed by Underwriters Laboratories Incorporated and in accordance with standards listed in Article 1.03 - References.
- C. The manufacturing facility shall be registered by Underwriters Laboratories Inc. to the International Organization for Standardization ISO 9002 Series Standards for quality.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Deliver, store, protect, and handle products in conformance with manufacturer's recommended practices as outlined in applicable Installation and Maintenance Manuals.
- B. Each switchboard section shall be delivered in individual shipping splits for ease of handling.
- C. They shall be individually wrapped for protection and mounted on shipping skids.
- D. Inspect and report concealed damage to carrier within their required time period.
- E. Store in a clean, dry space. Maintain factory protection and/or provide an additional heavy canvas or heavy plastic cover to protect structure from dirt, water, construction debris, and traffic. Where applicable, provide adequate heating within enclosures to prevent condensation.
- F. Handle in accordance with NEMA PB 2.1 and manufacturer's written instructions. Lift only by lifting means provided for this express purpose. Handle carefully to avoid damage to switchboard internal components, enclosure, and finish.

1.6 ENVIRONMENTAL REQUIREMENTS

- A. Conform to NEMA PB 2 service conditions during and after installation of switchboards.

1.7 MAINTENANCE MATERIALS

- A. Provide one (1) set of installation and maintenance instructions with each switchboard. Instructions are to be easily identified and affixed within the incoming or main section of the line-up.

1.8 WARRANTY

- A. Manufacturer shall warrant equipment to be free from defects in materials and workmanship for the lesser of one (1) year from date of installation or eighteen (18) months from date of purchase.

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. Subject to compliance with requirements, provide products by one of the following:
 - a. Square D Company – QED-2 Switchboard is basis of design
 - b. Cutler-Hammer, Inc.; Eaton Corporation
 - c. General Electric Company
 - d. Siemens
- B. Substitutions must be submitted in writing three (3) weeks prior to original bid date with supporting documentation demonstrating that the alternate manufacturer conforms to all aspects of the specifications herein.

2.2 SWITCHBOARD – GENERAL

- A. Short Circuit Current Rating: Switchboards shall be rated with a minimum short circuit current rating as indicated on drawings.
- B. Future Provisions: All unused spaces provided, unless otherwise specified, shall be fully equipped for future devices, including all appropriate connectors and mounting hardware.
- C. Enclosure: Type 1 - General Purpose
 - a. Sections shall be aligned front and rear.
 - b. Removable steel base channels (1.5-inch floor sills) shall be bolted to the frame to rigidly support the entire shipping section for moving on rollers and floor mounting.
 - c. The switchboard enclosure shall be painted on all exterior surfaces. The paint finish shall be a medium gray, ANSI #49, applied by the electro-deposition process over an iron phosphate pre-treatment.
 - d. All front covers shall be screw removable with a single tool and all doors shall be hinged with removable hinge pins.
 - e. Top and bottom conduit areas shall be clearly indicated on shop drawings.
- D. Nameplates: Provide 1-inch high x 3 inches engraved laminated (Gravoply) nameplates for each device. Furnish black letters on a white background for all voltages.

- E. Bus Composition: Shall be plated copper. Plating shall be applied continuously to all bus work. The switchboard bussing shall be of sufficient cross-sectional area to meet UL Standard 891 temperature rise requirements. The phase and neutral through-bus shall have an ampacity as shown in the plans. For 4-wire systems, the neutral shall be of equivalent ampacity as the phase bus bar. Tapered bus is not acceptable. Full provisions for the addition of future sections shall be provided. Bussing shall include all necessary hardware to accommodate splicing for future additions.
- F. Ground Bus: Sized per NFPA70 and UL 891 Tables 25.1 and 25.2 and shall extend the entire length of the switchboard. Provisions for the addition of future sections shall be provided.

2.3 SWITCHBOARD - INCOMING MAIN SECTION DEVICES

- A. Main Circuit Breakers - electronic trip molded case standard function 80% rated circuit breakers through 4000A
 - a. All electronic circuit breakers shall have the following time/current response adjustments: Long Time Pickup, Long Time Delay, Short Time Pickup, Short Time Delay, and Instantaneous settings. Ground Fault Pickup and Ground Fault Delay shall be provided per NEC Article 230.95. Each adjustment shall have discrete settings (fully adjustable) and shall be independent of all other adjustments.
 - b. Circuit breaker trip system shall be a microprocessor-based true rms sensing designed with sensing accuracy through the thirteenth (13th) harmonic. Sensor ampere ratings shall be as indicated on the associated drawing.
 - c. Long Time Pickup indication to signal when loading approaches or exceeds the adjustable ampere rating of the circuit breaker shall be provided.

2.4 SWITCHBOARD - DISTRIBUTION SECTION DEVICES

- A. Group mounted circuit breakers through 1200A
 - 1. Circuit breaker(s) shall be group mounted plug-on with mechanical restraint on a common pan or rail assembly.
 - 2. The interior shall have three flat bus bars stacked and aligned vertically with glass reinforced polyester insulators laminated between phases. The molded polyester insulators shall support and provide phase isolation to the entire length of bus.
 - 3. Circuit breakers equipped with line terminal jaws shall not require additional external mounting hardware. Circuit breakers shall be held in mounted position by a self-contained bracket secured to the mounting pan by fasteners. Circuit breakers of different frame sizes shall be capable of being mounted across from each other.
 - 4. Line-side circuit breaker connections are to be jaw type.

5. All unused spaces provided, unless otherwise specified, shall be fully equipped for future devices, including all appropriate connectors and mounting hardware.
6. Electronic trip molded case standard function 80% rated circuit breakers through 1200A
 - a. All electronic circuit breakers shall have the following time/current response adjustments: Long Time Pickup, Long Time Delay, Short Time Pickup, Short Time Delay, and Instantaneous settings. Ground Fault Pickup and Ground Fault Delay shall be provided on 480Y/277V circuit breakers. Each adjustment shall have discrete settings (fully adjustable) and shall be independent of all other adjustments.
 - b. Circuit breaker trip system shall be a microprocessor-based true rms sensing designed with sensing accuracy through the thirteenth (13th) harmonic. Sensor ampere ratings shall be as indicated on the associated drawing.
 - c. Long Time Pickup indication to signal when loading approaches or exceeds the adjustable ampere rating of the circuit breaker shall be provided.
 - d. Furnish thermal magnetic molded case circuit breakers for 250A frames and below.

2.5 MIMIC BUS

- A. Show the entire single line switchboard bus work, as depicted on the factory record drawing, on an engraved laminated plastic (Gravoply) nameplate. The nameplate shall be at least .0625 inch thick and located at eye level on the front cover of the switchboard incoming service section.

2.6 METERING (CUSTOMER)

- A. Manufacturers:
 1. Veris Industries
- B. The switchboard shall be metered using:
 1. Veris Industries Type E50C3A
Digital Power Meter with 0.25% accuracy with the following features:
A, V, kW, kVAR, kVA, PF, F, kWh, kVARh, kVAh, RS-485 communications, data logging including date/time stamping

2.7 METERING TRANSFORMERS

- A. Manufacturer: Shall be Veris Industries.
- B. Current Transformers: Rogowski CT E683 Series Rope Style CTs (length to be determined by manufacturer for proper fit around conductors).
- C. Control Power Transformer (CPT) Connection Fuse Recommendations:

- a. Keep the fuses close to the power source (obey local and national code requirements).
- b. For selecting the fuses and circuit breakers, use the following criteria:
 - i. Select current input capacity based on the installation category and fault current capability.
 - ii. Select over-current protection with a time delay.
 - iii. Use a voltage rating sufficient for the input voltage applied.
 - iv. Provide overcurrent protection and disconnecting means to protect the wiring. For AC installations, use Veris AH02, AH03, AH04, or equivalent.
 - v. Use the earth connection (G) for electromagnetic compatibility (EMC), not a protective earth ground.

2.8 RELATED SECTIONS

- A. [Section 26 27 13]- ELECTRICAL POWER MONITORING & COMMUNICATION
- B. [Section 26 43 13] - TRANSIENT VOLTAGE SURGE SUPPRESSION DEVICES
- C. [Section 26 36 00] - AUTOMATIC TRANSFER SWITCHES

PART 3 EXECUTION

3.1 INSPECTION

- A. Examine area to receive switchboard to provide adequate clearance for switchboard installation.
- D. Check that concrete pads are level and free of irregularities.
- C. Start work only after unsatisfactory conditions are corrected.

3.2 INSTALLATION

- A. Install switchboard in accordance with manufacturer's written guidelines, the NEC, and local codes.

3.3 FIELD QUALITY CONTROL

- A. Inspect completed installation for physical damage, proper alignment, anchorage, and grounding.
- E. Measure, using a Megger, the insulation resistance of each bus section phase-to-phase and phase-to-ground for one minute each, at minimum test voltage of 1000 VDC; minimum acceptable value for insulation resistance is 1 megohms. NOTE: Refer to manufacturer's literature for specific testing procedures.
- F. Check tightness of accessible bolted bus joints using calibrated torque wrench per manufacturer's recommended torque values.

G. Physically test key interlock systems to check for proper functionality.

H. Test ground fault systems by operating push-to-test button.

3.4 ADJUSTING

A. Adjust all operating mechanisms for free mechanical movement per manufacturers specifications.

B. Tighten bolted bus connections in accordance with manufacturer's instructions.

D. Adjust circuit breaker trip and time delay settings to values as instructed by the Engineer.

3.5 CLEANING

A. Touch up scratched or marred surfaces to match original finish.

END OF SECTION