

**SECTION 16400**

**SWITCHBOARDS**

**PART 1 - GENERAL**

1.1 GENERAL

- A. Provisions of Section 16010 "General Requirements for Electrical Work" apply to the Work of this Section.
- B. This Section includes low-voltage service and power distribution switchboards and associated auxiliary equipment rated 600 V and less.

1.2 CODES AND STANDARDS

- A. Products shall comply with the following codes and standards and shall be UL-listed and labeled:

NEMA PB-2	Deadfront Distribution Switchboards
UL 489	Molded Case Circuit Breakers
UL 869	Service Equipment
UL 891	Deadfront Switchboards

1.3 SUBMITTALS

- A. Manufacturer's product data sheets for each type of switchboard, overcurrent protective device, transient voltage suppression device, ground-fault protector, digital power monitor and other components to be provided.
- B. Dimensioned outline drawings, sections, elevations and details, including required clearances and service access required.
- C. Schedule of features, characteristics, ratings, factory settings of individual protective devices, details for conduit entry/exit openings, cable terminal sizes, control wiring diagrams and manufacturers Installation Procedures and Recommendations.

1.4 MANUFACTURERS

- A. Subject to compliance with the requirements of this Section:

Eaton Corporation; Cutler-Hammer Products  
General Electric Co.; Electrical Distribution & Controls  
Siemens Energy & Automation, Inc.  
Square D Co.

1.5 DELIVERY, STORAGE AND HANDLING

- A. Deliver in sections or lengths that can be moved through all doors and pathways entering room switchboard is to be installed in.

- B. Store indoors in clean dry space with uniform temperature to prevent condensation. Protect from exposure to dirt, fumes, water, corrosive substances, and physical damage. Store and handle equipment in accordance with manufacturers instructions.
- C. If stored in areas subjected to weather, cover switchboards to provide protection from weather, dirt, dust, corrosive substances, and physical damage. Remove loose packing and flammable materials from inside switchboards; install electric heating (250 W per section) to prevent condensation.
- D. Handle switchboards in accordance with NEMA Standard PB2.1 "General Instructions for Proper Handling, Installation, Operation, and Maintenance of Deadfront Distribution Switchboards." Use factory installed lifting provisions.

#### 1.6 EXTRA MATERIALS

- A. Spare Fuses: Six spares for each type and rating of fuse or fusible devices used. Include spares for potential transformer and control power fuses.
- B. Touch-Up Paint: 1 half-pint container.

### **PART 2 - PRODUCTS**

#### 2.1 GENERAL

- A. Switchboards shall be metal enclosed and of the sizes, ratings and arrangement shown on the Drawings.
- B. Switchboards shall be provided complete with all overcurrent devices, accessories, engraved labels and trim.
- C. The short circuit ratings of the assembled switchboards are shown on the Drawings. The short circuit rating of every overcurrent device in the panel shall meet or exceed the switchboard rating. Unless otherwise noted on the Drawings, series rated combinations will not be permitted.

#### 2.2 ENCLOSURE

- A. The switchboard shall consist of one or more free standing vertical sections bolted together to form a rigid assembly. Provide barriers between adjacent switchboard sections.
- B. Vertical sections shall be constructed of bolted formed steel channels with code gauge steel side and backplates, and bolt on front trim. All exterior and interior steel surfaces shall be finished in ANSI-61 gray over a rust inhibiting primer.
- C. The enclosure shall be rated NEMA 1.
- D. Vertical sections shall be rear aligned, suitable for installation against a wall. All connections and terminations shall be completely front accessible, with no rear or side access required.

#### 2.3 BUS

- A. The Main Phase Buses, Neutral Bus, and Equipment Ground bus shall be a full-capacity, heat-rated aluminum with aluminum feeder circuit-breaker line connections, rated as shown on the Drawings and sized in accordance with UL 891.
- B. A continuous aluminum ground bus shall be provided for the entire length of the switchboard. Ground Bus shall ¼" by 2" minimum size, and provided with pressure connector terminations for feeder and branch-circuit ground connections. For busway feeders extend insulated equipment grounding cable to busway ground connection and support cable at manufacturers recommended intervals in vertical run.
- C. Neutral Bus shall rated 100% of Phase Bus ratings and be equipped with pressure connectors for outgoing circuit neutral cables.
- D. The Main Phase Buses, Neutral Bus, and Equipment Ground bus shall be capable of future expansion by means of bolt holes or other approved methods.
- E. Buses shall have adequate support and bracing for short circuit currents indicated on drawings.

#### 2.4 OVERCURRENT DEVICES

- A. The main disconnecting device shall be individually fixed mounted, 100 percent rated, solid state, molded case circuit breaker. The circuit breaker shall be true RMS sensing and have the following adjustable functions.
  - o Long-Time Delay
  - o Short-Time Pick-Up
  - o Short-Time Delay
  - o Instantaneous Pick-Up
  - o Ground Fault Pick-Up
  - o Ground Fault Delay
- B. Distribution overcurrent devices shall be trip-free thermal magnetic molded case circuit breakers sized as indicated on the Drawings. Each overcurrent device shall be removable from the front without disturbing adjacent units.
- C. All connections shall be rated for 75°C copper conductors.

#### 2.5 METERING

- A. Metering switchboard will have integral utility revenue meters. See EP651 for size and quantity of utility revenue meters.

#### 2.6 SERVICE ENTRANCE EQUIPMENT

- A. Service entrance equipment shall be UL-listed and labeled as "Suitable for Service Entrance".

#### 2.7 LUGS

- A. Cable connections to main lugs and main disconnecting device shall be compression type lugs.

### **PART 3 - EXECUTION**

**3.1 INSTALLATION**

- A. Switchboards shall be installed in accordance with Section 16050, Installation of Electrical Equipment & NEMA PB 2.1.

**3.2 IDENTIFICATION**

- A. Label switchboards in accordance with Section 16010, General Requirements For Electrical Work.

**3.3 FIELD QUALITY INSPECTION**

- A. Make visual inspection for defects and physical damage, labeling and nameplate compliance with record drawings. Check switchboard mounting, area clearances, alignment and fit of components.
- B. Exercise and perform operational tests of all mechanical components and other operable devices in accordance with manufacturer's instruction manual. Check tightness of all bolted electrical connections with calibrated torque wrench. Refer to manufacturer's instructions for proper torque values.

**3.4 TESTING**

- A. Test insulation resistance for each switchboard bus, component, connecting supply, feeder and control circuit.
- B. Test continuity of feeder.

**3.4 CLEANING**

- F. On completion of installation, inspect interior and exterior of panelboards. Remove paint splatters and other spots. Vacuum dirt and debris; do not use compressed air to assist in cleaning. Repair exposed surfaces to match original finish.

**END OF SECTION 16400**