

**SECTION 26 24 13  
SWITCHBOARDS**

**PART 1 GENERAL**

**1.1 SECTION INCLUDES**

- A. Main and distribution switchboards

**1.2 REFERENCES**

- A. ANSI C12.1 – Electric Meters Code for Electricity Metering
- B. ANSI C39.1 - Requirements for Electrical Analog Indicating Instruments
- C. ANSI/IEEE STD C57.13 – IEE Standard Requirements for Instrument Transformers
- D. FS W-C -375 - Circuit Breakers, Molded Case, Branch Circuit and Service
- E. UL 489 - Molded Case Circuit Breakers, Molded-Case Switches, and Circuit-Breaker Enclosures (UL 489 replaces NEMA AB 1)
- F. NEMA KS 1 - Enclosed and Miscellaneous Distribution Equipment Switches
- G. NEMA PB 2 - Dead Front Distribution Switchboards
- H. NEMA PB 2.1 – General Instructions for Proper Handling, Installation, Operation and Maintenance of Dead front Distribution Switchboards Rated 600 Volts or Less

**1.3 SUBMITTALS**

- A. Submit product data under provisions of Section 01 33 00.
- B. Include front and side views of enclosures with overall dimensions shown; conduit entrance locations and requirements; nameplate legends; size and number of bus bars per phase, neutral, and ground; switchboard instrument details; instructions for handling and installation of switchboard; and electrical characteristics including voltage, frame size and trip ratings, withstand ratings, and time-current curves of all equipment and components.
- C. Submit manufacturer's instructions under provisions of Section 01 33 00.

**1.4 OPERATION AND MAINTENANCE DATA**

- A. Submit operation and maintenance data under provisions of Section 01 77 00 and Section 01 91 00.

**1.5 DELIVERY, STORAGE, AND HANDLING**

- A. Deliver products to the site under provisions of Section 01 60 00.
- B. Store and protect products under provisions of Section 01 60 00.
- C. Store in a clean dry space
  - 1. Maintain factory wrapping or provide an additional heavy canvas or heavy plastic cover to protect units from dirt, water, construction debris, and traffic.
- D. Handle in accordance with NEMA PB2.1 and manufacturer's written instructions.
  - 1. Lift only with lugs provided for the purpose. Handle carefully to avoid damage to switchboard internal components, enclosure, and finish.

**1.6 COMMISSIONING**

- A. Commissioning of a system or systems specified in this section is part of the construction process.
- B. Documentation and testing of these systems, as well as training of the Owner's operation and maintenance personnel, is required in cooperation with the Owner's Representative and the Commissioning Authority.
- C. Project Closeout is dependent on successful completion of all commissioning procedures, documentation, and issue closure.
- D. Refer to Section 01 77 00 - Contract Closeout, for substantial completion details.
- E. Refer to Section 01 91 00 - Commissioning, for detailed commissioning requirements

## **PART 2 PRODUCTS**

### **2.1 ACCEPTABLE MANUFACTURERS**

- A. Square D
- B. General Electric
- C. Cutler Hammer
- D. Siemens/ITE

### **2.2 SWITCHBOARD CONSTRUCTION AND RATINGS**

- A. Provide factory assembled, dead front, metal enclosed, and self-supporting switchboard assembly conforming to NEMA PB2, and complete from incoming line terminals to load side terminations.
- B. Provide and install switchboard electrical ratings and configurations as shown on Drawings.
- C. Line and Load Terminations: Accessible from the front only of the switchboard, suitable for the conductor materials used.
- D. Main Section Devices: Panel mounted or individually mounted.
  - 1. Individually or mounted and compartmented.
- E. Distribution Section Devices: Panel mounted, individually mounted, or individually mounted and compartmented.
- F. Auxiliary Section Devices: Individually mounted or individually mounted and compartmented.
- G. Bus Material: Use copper rated at 1000-amp per square inch.
- H. Bus Connections: Use a bolted type that is accessible from the front for maintenance.
- I. Provide copper ground bus through the length of the switchboard.
- J. Enclosure shall be NEMA PB 2 Type 1 - General Purpose or 3R - Rain tight.
  - 1. Sections shall align at front and rear.
- K. Finish: Manufacturer's standard color, enamel over external surfaces and minimum one coat corrosion-resisting paint or plated with cadmium or zinc on internal surfaces.
- L. Provide surge protection meeting the requirements of 26 43 00.
- M. Pull Box: Same construction as switchboard, size as shown on Drawings.
  - 1. Top and sides shall be removable.
  - 2. Insulating, with a fire resistive bottom and separate openings for each circuit to pass into switchboard.
- N. Pull Section: Same construction as switchboard, size as shown on Drawings, arrange as shown on Drawings.
- O. Future Provisions:
  - 1. Fully equip spaces for future devices with bussing and bus connections, suitably insulated and braced for short circuit currents.
  - 2. Continuous current rating as indicated on Drawings.
- P. Provide instruments and sensors as per 26 24 13-2.6 on main switchboards of 1000-amperes or greater.
- Q. Install neutral and ground bus bars in the front of the switchboard for easy access for maintenance.

### **2.3 SWITCHING AND OVERCURRENT PROTECTIVE DEVICES**

- A. Fusible Switch Assemblies:
  - 1. NEMA KS 1, quick-make, quick-break, load interrupter enclosed knife switch with externally operable handle.
  - 2. Provide interlock to prevent opening front cover with switch in ON position.
  - 3. Handle lockable in OFF position.

4. Fuse Clips: Designed to accommodate Class R fuses, type as specified.
- B. Fusible Switch Assemblies, 800 Amperes and Larger:
  1. Bolted pressure contact switches.
  2. Fuse Clips: Designed to accommodate Class L fuses.
- C. Molded Case Circuit Breakers: UL 489 provides circuit breakers with integral thermal and instantaneous magnetic trip in each pole.
- D. Molded Case Circuit Breakers with Current Limiters shall be UL 489; molded case circuit breakers with replaceable current limiting elements, in addition to integral thermal and instantaneous magnetic trip in each pole.
- E. Current Limiting Molded Case Circuit Breakers UL 489; provide molded case circuit breakers with integral thermal and instantaneous magnetic trip in each pole, coordinated with automatically resetting current limiting elements in each pole.
  1. Provide for an interrupting rating of 100,000-rms amperes symmetrical let-through current and energy level less than permitted for same size Class RK-5 fuse.
- F. Solid-state Molded Case Circuit Breakers: UL 489 with electronic sensing, timing, and tripping circuits for adjustable current settings, ground fault trip, instantaneous trip, and adjustable short time trip.
  1. Provide stationary mounting.
  2. Provide a zero sequence type ground-fault sensor.

## 2.4 INSTRUMENTS AND SENSORS

- A. Provide main switchboard of 1000 amps or greater with a stand alone, microprocessor based, three phase power metering device, with six digit LED display, Ethernet communication card, and BACKNET interface capabilities for the generator to allow remote monitoring of the unit School District Energy Management System and Data NetWork System.
  1. Metering device shall provide metering functions, sag/swell monitoring, trending and forecasting functions, web-enable access directly to the meter, and disturbance monitoring.
  2. Provide a device equal to Square D Power Logic Circuit Monitor Model CM 3350 with Display unit and recessed in the front of the switchboard.
  3. Power Logic Circuit Monitor device shall have all required software and programming to allow monitoring of the electrical power data information via School District Energy Management System and Data NetWork System.
- B. Provide a zero sequence type ground-fault sensor.
- C. Ground Fault Relay: Adjustable ground fault sensitivity from 200 to 1200 amperes time delay adjustable from 0 to 15 seconds.
  1. Provide monitor panel with lamp to indicate relay operation, TEST and RESET control switches.

## 2.5 ALTERNATIVE SYSTEM

- A. Switchboards combined with integrated power distribution system containing switchboard, panelboards, transformers, transient voltage surge suppression devices (TVSS), and other electrical equipment will be acceptable.

## PART 3 EXECUTION

### 3.1 INSTALLATION

- A. Install switchboard in locations shown on Drawings, in accordance with manufacturer's written instructions and NEMA PB 2.1.
- B. Tighten accessible bus connections and mechanical fasteners after placing switchboard.

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- C. Install fuses in each switch.
  - D. Coordinate with energy management system's contractor to insure that the Power Logic Circuit Monitor Device is fully operational upon connection to the School District energy management system.
    - 1. Electrical contractor must furnish and install all required conduits, junction boxes, and power requirements.
  - E. Install ¾" conduit from the Power Logic Circuit Monitor Device to the School District Data Network System.
- 3.2 FIELD QUALITY CONTROL
- A. Inspect completed installation for physical damage, proper alignment, anchorage, and grounding.
  - B. Measure the insulation resistance of each bus section, phase to phase and phase to ground for one minute each.
    - 1. Test voltage shall be 500 volts, and minimum acceptable value for insulation resistance is 2 megohms.
  - C. Check tightness of accessible bolted bus joints using a calibrated torque wrench.
    - 1. Tightness shall be in accordance with manufacturer's recommended values.
- 3.3 ADJUSTING AND CLEANING
- A. Adjust all operating mechanisms for free mechanical movement.
  - B. Touch up scratched or marred surfaces to match original finish.
  - C. Adjust trip and time delay settings to values as instructed by the Architect/Engineer.
- 3.4 FUNCTIONAL PERFORMANCE TESTING
- A. System Functional Performance Testing is part of the Commissioning Process.
    - 1. The Contractor shall perform the Functional Performance Testing and the Commissioning Authority shall witness and document the test.
    - 2. Refer to Section 01 91 00, Commissioning, for functional performance tests and commissioning requirements.
  - B. Systems Readiness Checklists shall be completed and submitted for each piece of equipment included in this section.
  - C. Perform the functional performance testing of Switchboards as part of the electrical system Functional Performance testing.
- 3.5 DEMONSTRATION AND TRAINING
- A. Training of the Owner's operation and maintenance personnel is required in cooperation with the Owner's Representative.
    - 1. Provide competent, factory-authorized personnel to provide instruction to FS personnel concerning the location, operation, and troubleshooting of the installed systems.
    - 2. Schedule the instruction in coordination with the Owner's Representative after submission and approval of formal training plans.
    - 3. Refer to Section 01 91 00, Commissioning, for further contractor training requirements
  - B. Provide demonstration and training for all types of Switchboards installed in this project.

END OF SECTION