

## **SECTION 16442**

### **SWITCHBOARDS**

#### **PART 1 GENERAL**

##### **1.01 SECTION INCLUDES**

- A. Switchboards.
- B. Switchboard accessories.
- C. Automatic Transfer System. – Two breaker source transfer.

##### **1.02 RELATED SECTIONS**

- A. Section 16620 Generators  
See Section 16620-2.8 Automatic Transfer Controls for operation description.

##### **1.03 REFERENCES**

- A. ANSI C12.1 - American National Standard Code for Electricity Metering; 2001.
- B. ANSI C39.1 - American National Standard Requirements for Electrical Analog Indicating Instruments; 1981 (R1992).
- C. IEC 60051-1 - Direct Acting Indicating Analogue Electrical Measuring Instruments and Their Accessories - Part 1: Definitions and General Requirements Common To All Parts; International Electrotechnical Commission; 1997.
- D. IEC 60051-2 - Direct Acting Indicating Analogue Electrical Measuring Instruments and Their Accessories - Part 2: Special Requirements for Ammeters and Voltmeters International Electrotechnical Commission; 1984.
- E. IEEE C12.1 - American National Standard Code for Electricity Metering; Institute of Electrical and Electronic Engineers; 1988.
- F. IEEE C57.13 - IEEE Standard Requirements for Instrument Transformers; Institute of Electrical and Electronic Engineers; 1993 (R 2003).
- G. NECA 400 - Recommended Practice for Installing and Maintaining Switchboards; National Electrical Contractors Association; 2007.
- H. NEMA KS 1 - Enclosed and Miscellaneous Distribution Equipment Switches (600 Volts Maximum); National Electrical Manufacturers Association; 2001 (R2006).
- I. NEMA PB 2 - Deadfront Distribution Switchboards; National Electrical Manufacturers Association; 2006.
- J. NEMA PB 2.1 - General Instructions for Proper Handling, Installation, Operation, and Maintenance of Deadfront Distribution Switchboards Rated 600 Volts or Less; National Electrical Manufacturers Association; 2002.

- K. NETA STD ATS - Acceptance Testing Specifications for Electrical Power Distribution Equipment and Systems; International Electrical Testing Association; 2007.
- L. NFPA 70 - National Electrical Code; National Fire Protection Association; 2008.

#### **1.04 SUBMITTALS**

- A. Product Data: Provide electrical characteristics including voltage, frame size and trip ratings, fault current withstand ratings, and time-current curves of all equipment and components.
- B. Shop Drawings: Indicate 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; and switchboard instrument details.
- C. Test Reports: Indicate results of factory production tests.
- D. Manufacturer's Instructions: Indicate application conditions and limitations of use stipulated by product testing agency. Include instructions for storage, handling, protection, examination, preparation, and installation of product.
- E. Project Record Documents: Record actual locations of switchboards.
- F. Maintenance Data: Include spare parts listing; source and current prices of replacement parts and supplies; and recommended maintenance procedures and intervals.

#### **1.05 QUALITY ASSURANCE**

- A. Conform to requirements of NFPA 70.
- B. Products: Listed and classified by Underwriters Laboratories Inc. as suitable for the purpose specified and indicated.

#### **1.06 DELIVERY, STORAGE, AND HANDLING**

- A. Deliver in 48 inch (219 mm) maximum width shipping splits, individually wrapped for protection and mounted on shipping skids.
- B. 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.
- C. Handle in accordance with NEMA PB 2.1 and manufacturer's written instructions. Lift only with lugs provided for the purpose. Handle carefully to avoid damage to switchboard internal components, enclosure, and finish.

#### **1.07 MAINTENANCE MATERIALS**

- A. Furnish two of each key.

### **PART 2 PRODUCTS**

## 2.01 MANUFACTURERS

- A. Siemens: Sentron Series
- B. Eaton Electrical/Cutler-Hammer
- B. GE Industrial;
- C. Square D; .

## 2.02 SWITCHBOARDS

- A. Description: NEMA PB 2 switchboard with electrical ratings and configurations as indicated and specified.
- B. Ratings: As Indicated on Plans
- C. Main Section Devices: Panel mounted.
- D. Distribution Section Devices: Panel mounted.
- E. Auxiliary Section Devices: Individually mounted.
- F. Bus Material: Copper, standard size.
- G. Bus Connections: Bolted, accessible from front for maintenance.
- H. Fully insulate load side bus bars in rear accessible compartments. Do not reduce spacing of insulated bus.
- I. Ground Bus: Extend length of switchboard.
- J. Insulated Ground Bus: Extend length of switchboard.
- K. Fusible Switch Assemblies: Not Used.
- L. Fusible Switch Assemblies, 800 Amperes and Larger: Not Used.
- M. Molded Case Circuit Breakers: Integral thermal and instantaneous magnetic trip in each pole.
  - 1. Provide circuit breakers UL listed as Type HACR for air conditioning equipment branch circuits.
  - 2. Include shunt trip where indicated.
- N. Molded Case Circuit Breakers with Current Limiters: Not Used.
- O. Current Limiting Molded Case Circuit Breakers: Not Used
- P. Solid-State Molded Case Circuit Breakers: With electronic sensing, timing and tripping circuits for adjustable current settings; UL listed.
  - 1. Ground fault trip, ground fault sensing integral with circuit breaker.
  - 2. Instantaneous trip.
  - 3. Adjustable short time trip.
  - 4. Stationary mounting.
  - 5. Include shunt trip where indicated.

- Q. Line and Load Terminations: Accessible from the front only of the switchboard, suitable for the conductor materials and sizes indicated.
- R. Ground Fault Sensor: Zero sequence type.
- S. Ground Fault Relay: Adjustable ground fault sensitivity from 200 to 1200 amperes, adjustable time delay. Provide monitor panel with lamp to indicate relay operation, TEST and RESET control switches.
- T. Metering Transformer Compartment: For utility company's use; compartment size, bus spacing and drilling, door, and locking and sealing requirements in accordance with Utility – Unisource. .
- U. Pull Section: Not Used
- V. Future Provisions: Fully equip spaces for future devices with bussing and bus connections, suitably insulated and braced for short circuit currents. Provide continuous current rating as indicated.
- W. Pull Box: Removable top and sides, same construction as switchboard.
  - 1. Set front back sufficient distance to accommodate circuit breaker lifting devices.
  - 2. Provide insulating, fire-resistive bottom with separate openings for each circuit to pass into switchboard.
- X. Enclosure: Type 1 - General Purpose.
  - 1. Align sections at front and rear.
  - 2. Finish: Manufacturer's standard light gray enamel over external surfaces. Coat internal surfaces with minimum one coat corrosion-resisting paint, or plate with cadmium or zinc.

### **2.03 AUTOMATIC TRANSFER SYSTEM**

- A. Provide Automatic Transfer System and control of Main Breaker and Generator Breaker in a two source transfer scheme. See operation description in Section 16620-2.8.
- B. Provide interface with generator control panel for start and run signal and engine cool down delay after re-transfer to utility. Upon generator failure, initiate retransfer to Utility source. and Circuit Breaker Lifting Device:
- C. Provide the following Automatic Transfer Functions and Features:
  - 1. Electrical Interlock
  - 2. Mechanical Interlock
  - 3. Time Delay on Transfer
  - 4. Time Delay on Retransfer

5. Voltage Sensing of both sources
6. Phase Sensing of both sources
7. Auto-Manual Switch and Light
8. Control Transformers and Retransfer Relays
9. Engine Start Contacts
10. Bypass of retransfer if emergency fails.
11. Frequency sensing
12. Current sensing
13. Reverse Power Relay
14. Ground Fault Relay
15. Phase indicating lights
16. Load voltage release
17. Time delay for engine cool down.
18. Manual Test Switch – loss of power.
19. Plant Exerciser

D. Factory install and program Automatic Transfer System.

## **2.08 SOURCE QUALITY CONTROL**

- A. Shop inspect and test switchboard according to NEMA PB 2.
- B. Test Automatic Transfer System. Submit test results prior to delivery to jobsite.
- C. Make completed switchboard available for inspection at manufacturer's factory prior to packaging for shipment. Notify Owner at least 7 days before inspection is allowed.

## **PART 3 EXECUTION**

### **3.01 PREPARATION**

- A. Verify that field measurements are as indicated on shop drawings.

### **3.02 INSTALLATION**

- A. Install switchboard in locations shown on drawings, according to NEMA PB 2.1.
- B. Install in a neat and workmanlike manner, as specified in NECA 400.
- C. Tighten accessible bus connections and mechanical fasteners after placing switchboard.

### **3.03 FIELD QUALITY CONTROL**

- A. Perform field inspection and testing.
- B. Inspect and test in accordance with NETA STD ATS, except Section 4.
- C. Perform inspections and tests listed in NETA STD ATS, Section 7.1.

### **3.04 ADJUSTING**

- A. Adjust all operating mechanisms for free mechanical movement.
- B. Tighten bolted bus connections in accordance with manufacturer's instructions.
- C. Adjust circuit breaker trip and time delay settings to values indicated.
- D. Adjust circuit breaker trip and time delay settings to values as instructed by Engineer.

### **3.05 CLEANING**

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

**END OF SECTION**