

SECTION 26 24 13

SWITCHBOARDS

PART 1 GENERAL

1.01 SUMMARY

- A. Section includes main and distribution switchboards.
- B. Related Sections:
 - 1. Division 26 - Grounding and Bonding for Electrical Systems.
 - 2. Division 26 - Identification for Electrical Systems.
 - 3. Division 26 - Enclosed Bus Assemblies.
 - 4. Division 26 - Fuses.
 - 5. Division 33 - Electrical Utility Services: Utility metering equipment.

1.02 REFERENCES

- A. American National Standards Institute:
 - 1. ANSI C12.1 - Code for Electricity Metering.
 - 2. ANSI C39.1 - Requirements, Electrical Analog Indicating Instruments.
- B. Institute of Electrical and Electronics Engineers:
 - 1. IEEE C57.13 - Standard Requirements for Instrument Transformers.
 - 2. IEEE C62.41 - Recommended Practice on Surge Voltages in Low-Voltage AC Power Circuits.
- C. National Electrical Manufacturers Association:
 - 1. NEMA AB 1 - Molded Case Circuit Breakers and Molded Case Switches.
 - 2. NEMA FU 1 - Low Voltage Cartridge Fuses.
 - 3. NEMA KS 1 - Enclosed and Miscellaneous Distribution Equipment Switches (600 Volts Maximum).
 - 4. NEMA PB 2 - Deadfront Distribution Switchboards.
 - 5. NEMA PB 2.1 - General Instructions for Proper Handling, Installation, Operation, and Maintenance of Deadfront Distribution Switchboards Rated 600 Volts or Less.
- D. International Electrical Testing Association:
 - 1. NETA ATS - Acceptance Testing Specifications for Electrical Power Distribution Equipment and Systems.
- E. Underwriters Laboratories, Inc. (UL)
 - 1. 98 - Enclosed and Dead Front Switches.
 - 2. 489 - Molded Case Circuit Breakers and Circuit Breaker Enclosures
 - 3. 977 - Fused Power Circuit Devices
 - 4. 891 - Dead Front Switchboards
 - 5. 1066 - Low Voltage AC and DC Power Circuit Breakers Used in Enclosures

1.03 SUBMITTALS

- A. Division 01 - Submittal Procedures: Submittal procedures.

- B. Submit shop drawings along Short Circuit and Overcurrent Protective Device Coordination Study, Division 26, is approved.
- C. AIC ratings shown on the single line diagrams are approximate values only. The AIC ratings of all submitted equipment must conform to the approved Short Circuit and Overcurrent Protective Device Coordination Study.
- D. The electrical contractor shall submit 1/4"=1'0" scale sketches of all electrical rooms and areas including actual dimensions of all equipment in electrical rooms and indicate clearances per CEC, as well as door swings or other obstacles. Sketches shall be submitted along with or prior to shop drawing submittals. Shop drawing submittal without sketches shall be returned and not reviewed.
- E. 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 for each phase, neutral, (as occurs), ground, isolated ground (as occurs), and switchboard instrument details.
- F. Product Data: Submit electrical characteristics including voltage, frame size and trip ratings, fault current withstand ratings, and time-current curves of equipment and components.
- G. Manufacturer's Instructions: Indicate application conditions and limitations of use stipulated by Product testing agency specified under Regulatory Requirements. Include instructions for storage, handling, protection, examination, preparation, installation, and starting of Product
- H. Test Reports: Submit field tests.
- I. Manufacturer shall provide special seismic certification with submittal.

1.04 CLOSEOUT SUBMITTALS

- A. Division 01 - Execution and Closeout Requirements: Closeout procedures.
- B. Project Record Documents: Record actual locations, configurations, and ratings of switchboards and their components on single line diagrams and plan layouts.
- C. Operation and Maintenance Data: Recommended maintenance procedures and intervals.

1.05 QUALIFICATIONS

- A. Manufacturer: Company specializing in manufacturing products specified in this section with minimum three years documented experience.

1.06 DELIVERY, STORAGE, AND HANDLING

- A. Division 01 - Product Requirements: Requirements for transporting, handling, storing, and protecting products.
- B. Deliver in 48 inch maximum width shipping splits, individually wrapped for protection and mounted on shipping skids.
- C. Accept switchboards on site. Inspect for damage.
- D. Maintain factory wrapping or provide additional canvas or plastic cover to protect units from dirt, water, construction debris, and traffic.
- E. Handle in accordance with NEMA PB 2.1. Lift only with lugs provided. Handle carefully to avoid damage to switchboard internal components, enclosure, and finish.

1.07 ENVIRONMENTAL REQUIREMENTS

- A. Division 01 - Product Requirements.
- B. Conform to NEMA PB 2 service conditions during and after installation of switchboards.

1.08 FIELD MEASUREMENTS

- A. Verify field measurements prior to fabrication.

1.09 SEQUENCING

- A. Division 01 - Summary: Work sequence.
- B. Sequence Work to avoid interferences with building finishes and installation of other products.

PART 2 PRODUCTS

2.01 DISTRIBUTION SWITCHBOARDS

- A. Manufacturers:
 - 1. Eaton Electric / Cutler-Hammer Products
 - 2. Siemens
 - 3. Square D
 - 4. Substitutions: Not Permitted.
- B. Product Description: NEMA PB 2, enclosed switchboard with electrical ratings and configurations as required to complete the program.
- C. Device Mounting:
 - 1. Main Section: Individually mounted and compartmented.
 - 2. Distribution Section: Panel mounted.
 - 3. Auxiliary Section: Individually mounted, compartmented as noted.
- D. Bus:
 - 1. Material: Copper with tin plating, standard size.
 - 2. Connections: Bolted, accessible from front for maintenance.
- E. Ground Bus: Extend length of switchboard.
- F. Line and Load Terminations: Accessible from front only of switchboard, suitable for conductor materials and sizes as required to complete the work.
- G. Utility Metering Compartment: Furnish metering transformer compartment for Utility Company's use, in accordance with Utility Company requirements.
- H. Pull Section: Size as required to complete the work.
- I. Pull Box: Removable top and sides, same construction as switchboard, size as required per program. Furnish insulating, fire-resistive bottom with separate openings for each circuit to pass into switchboard.
- J. Future Provisions: Fully equip spaces for future devices with bussing and bus connections, insulated and braced for short circuit currents. Furnish continuous current rating.

- K. Enclosure: Type 1 - General Purpose. Outside: Type 2 - Raintight.
- L. Align sections at front and rear.
- M. Switchboard Height: 90 inches, excluding floor sills, lifting members and pull boxes.
- N. 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.
- O. Developer/Design Builder is to coordinate the switchboard dimensions with the space allotted. If proposed equipment exceeds these dimensions, it shall be the responsibility of the Developer Design/Builder to coordinate all equipment arrangement within the room with all affected trades to provide all code clearances and proper arrangements. Switchboards that grossly exceed the space allocated and would require an increase in room size are not acceptable

2.02 MOLDED CASE CIRCUIT BREAKER

- A. Manufacturers:
 1. Eaton Electric – Cutler-Hammer Products
 2. Siemens
 3. Square D
 4. Substitutions: Not Permitted.
- B. Product Description: Enclosed, molded-case circuit breaker conforming to NEMA AB 1, FSW-C-375.
- C. Configuration: Inverse time automatic tripping.
- D. Field-Adjustable Trip Circuit Breaker: Circuit breakers with frame sizes 400 amperes and larger have mechanism for adjusting long time, short time and instantaneous setting for automatic operation.
- E. Field-Changeable Ampere Rating Circuit Breaker: Circuit breakers with frame sizes 200 amperes and larger have changeable trip units.
- F. Current Limiting Circuit Breaker: Circuit breaker indicated as current-limiting have automatically-resetting current limiting elements in each pole. Let-through Current and Energy: Less than permitted for same size Class RK-5 fuse.
- G. Solid-State Circuit Breaker: Electronic sensing, timing, and tripping circuits for adjustable current settings; instantaneous trip; and adjustable short time trip; ground fault trip with integral ground fault sensing as required per Code and to provide a working system.
- H. Accessories: Conform to NEMA AB 1.
 1. Shunt Trip Device: 120 volts, AC.
 2. Undervoltage Trip Device: 120 volts, AC.
 3. Auxiliary Switch: 120 volts, AC.
 4. Alarm Switch: 120 volts, AC.
 5. Electrical Operator: 120 volts, AC.
 6. Handle Lock: Provisions for padlocking.
 7. Insulated Grounding Lug: In each enclosure.
- I. Terminal Lugs Size: NEMA AB1. Suitable for copper conductors. Oversize to accommodate oversized feeders as required to meet Code and to complete the work.
- J. Provide circuit breakers, UL listed, as Type HACR for heating, air conditioning and refrigeration branch circuits.

2.03 INSULATED CASE CIRCUIT BREAKER

- A. Manufacturers:
 - 1. Eaton Electric – Cutler-Hammer Products
 - 2. Siemens
 - 3. Square D
 - 4. Substitutions: Not Permitted.
- B. Product Description: Enclosed, insulated-case circuit breaker conforming to NEMA AB 1, suitable for use as service entrance equipment where applied.
- C. Trip Unit: Electronic sensing, timing, and tripping circuits for adjustable current settings; ground fault trip with integral ground fault sensing; instantaneous trip; and adjustable short time trip as required per Code and to complete the work.
- D. Accessories: Conform to NEMA AB 1.
 - 1. Shunt Trip Device: 120 volts, AC.
 - 2. Undervoltage Trip Device: 120 volts, AC.
 - 3. Auxiliary Switch: 120 volts, AC.
 - 4. Alarm Switch: 120 volts, AC.
 - 5. Electrical Operator: 120 volts, AC.
 - 6. Handle Lock: Provisions for padlocking.
 - 7. Insulated Grounding Lug: In each enclosure.

2.04 GROUND FAULT DEVICES

- A. Ground Fault Sensor: Zero sequence type.
- B. Ground Fault Relay: Adjustable ground fault sensitivity from 200 to 1000 amperes, time delay adjustable from 0 to 15 seconds. Furnish monitor panel with lamp to indicate relay operation, TEST and RESET control switches.

2.05 TRANSIENT VOLTAGE SUPPRESSION DEVICES

- A. Product Description: IEEE C62.41, factory-mounted transient voltage surge suppressor, selected to meet requirements for medium exposure and to coordinate with system circuit voltage.

2.06 AMMETERS AND VOLTMETERS

- A. Ammeters: ANSI C39.1; direct-reading, full range, indicating ammeter with 4.5 inch square recessed case and 250 degree scale, white dial with black figures and pointer, 5 ampere, 60 Hertz movement, 1 percent accuracy.
- B. Voltmeters: ANSI C39.1; direct-reading, full range, indicating voltmeter with 4.5 inch square recessed case and 250 degree scale, white dial with black figures and pointer, 120 volt, 60 Hertz movement, 1 percent accuracy.

2.07 METER TRANSFER SWITCHES

- A. Ammeter Transfer Switch: Rotary multistage snap-action type with 600 volt AC-DC silver plated contacts, engraved escutcheon plate, pistol-grip handle, and four positions including OFF.
- B. Voltmeter Transfer Switch: Rotary multistage snap-action type with 600 volt AC-DC silver plated contacts, engraved escutcheon plate, pistol-grip handle, and seven positions including OFF.

2.08 POWER METERS

- A. Watt-hour Meters and Wattmeters: ANSI C12.1; three phase induction type with two stators, each with current and potential coil, rated 5 amperes and 120 volts at 60 Hertz. Meter suitable for connection to 3- and 4-wire circuits. Furnish potential indicating lamps; adjustments for light and full load, phase balance, and power factor; four-dial clock register; integral demand indicator and contact devices to operate remote impulse-totalizing demand meter; ratchets to prevent reverse rotation; removable meter with draw-out test plug; semi-flush mounted case with matching cover.
- B. Impulse-Totalizing Demand Meter: ANSI C12.1; suitable for use with switchboard watt-hour meter, including two circuit totalizing relay; cyclometer; four dial totalizing kilowatt-hour register; positive chart drive mechanism; capillary pen holding minimum one-month ink supply; and roll chart with minimum 31-day capacity. Indicate and record fifteen minute integrated demand of totalized system.
- C. Furnish meters with appropriate multiplier tags.

2.09 METERING TRANSFORMERS

- A. Current Transformers: IEEE C57.13; 5 ampere secondary, wound bushing bar or window type, with double secondary winding and secondary shorting device, primary/secondary ratio as required to complete the work, burden and accuracy consistent with connected metering and relay devices, 60 Hertz.
- B. Potential Transformers: IEEE C57.13; 120 volt single tapped double secondary, disconnecting type with integral fuse mountings, primary/secondary ratio as required to complete the work, burden and accuracy consistent with connected metering and relay devices, 60 Hertz.

2.10 ACCESSORIES

- A. Circuit Breaker Lifting Device: Portable, floor supported, elevating carriage with roller base, for movement of circuit breakers in and out of switchboard structure. Carriage and track on top of each switchboard with lifting device to serve draw-out circuit breakers in switchboard.

2.11 ACCESSORIES

- A. A new printed single line diagram of the entire electrical distribution system as shown on the single line diagram shall be framed, plastic laminated, and mounted in the switchboard room. The diagram shall be a permanent black on white Mylar at least 24" x 36" in size, professionally printed.

2.12 SOURCE QUALITY CONTROL

- A. Furnish shop inspection and testing in accordance with NEMA PB 2.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Division 01 - Administrative Requirements: Coordination and project conditions.
- B. Verify surface is suitable for switchboard installation.

3.02 INSTALLATION

- A. Install in accordance with NEMA PB 2.1.
- B. Provide concrete housekeeping pad under the provisions of Division 3.
- C. Tighten accessible bus connections and mechanical fasteners after placing switchboard.

- D. Install fuses in each switch as indicated and coordinate sizes with connected load.
- E. Install engraved plastic nameplates in accordance with Division 26.
- F. Install breaker circuit directory. Include all changes made to reflect as built conditions.
- G. Ground and bond switchboards in accordance with Division 26.

3.03 FIELD QUALITY CONTROL

- A. Division 01 - Quality Requirements and Execution and Closeout Requirements: Field inspecting, testing, adjusting, and balancing.
- B. Inspect completed installation for physical damage, proper alignment, anchorage and grounding.
- C. Inspect and test in accordance with NETA ATS, except Section 4.
- D. Perform inspections and tests listed in NETA ATS, Section 7.1.

3.04 ADJUSTING

- A. Division 01 - Execution and Closeout Requirements: Testing, adjusting, and balancing.
- B. Adjust all operating mechanisms for free mechanical movement.
- C. Tighten bolted bus connections in accordance with manufacturer's instructions.
- D. Adjust circuit breaker trip and time delay settings to values as indicated by Short Circuit and Overcurrent Protective Device Coordination Study.

3.05 CLEANING

- A. Division 01 - Execution and Closeout Requirements: Final cleaning.
- B. Touch up scratched or marred surfaces to match original finish.

END OF SECTION