

Specification Section 16440 Electrical Panelboards

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This document has undergone the formal review and approval and been reviewed by a Derivative Classifier, and its contents have been deemed unclassified/unlimited release.



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CONSTRUCTION STANDARD SPECIFICATION

SECTION 16440

ELECTRICAL PANELBOARDS

PART 1 - GENERAL

1.01 SUMMARY

This Section describes lighting and appliance and power panelboards rated at 600 volts or less and 1200 amperes or less.

1.02 REFERENCES

A. Related Sections: Refer to the following Sections for related work.

1. Division 1, Section 01330, *Submittal Procedures*
2. Division 9, Section 09900, *Painting*
3. Division 16, Section 16001, *Electrical Work*

B. Related Drawings: Refer to Standard Drawing E-0006STD, *Standard Symbols List and General Notes* for panelboard identification requirements.

C. National Electrical Manufacturers Association (NEMA[®])

PB 1 Panelboards

PB 1.1 General Instructions for Proper Installation, Operation and Maintenance of Panelboards Rated 600 V or Less

250 Enclosures for Electrical Equipment (1000 V Maximum)

D. Underwriters Laboratories, Inc.[®] (UL)

50 Enclosures for Electrical Equipment

67 Panelboards

486A Wire Connectors

489 Molded-Case Circuit Breakers, Molded-Case Switches, and Circuit-Breaker Enclosures

1.03 SUBMITTALS

- A. General: Submit the following in accordance with Conditions of Contract and Division 1, Section 01330, *Submittal Procedures*.
- B. Product data for each type of panelboard, accessory item, and component specified.
- C. Shop Drawings: Include the following for all panelboards.
 - 1. Manufacturer type, style and model number as applicable.
 - 2. Voltage, phase, and current rating, and neutral if required.
 - 3. Short-circuit current rating of panelboard.
 - 4. Main circuit breaker size and type, or main lugs only and location.
 - 5. Tabulation of all branch circuit breakers including type, size, location in panelboard, and circuit numbering.
 - 6. Enclosure dimensions.
 - 7. Enclosure side gutter dimensions (reference 2.03 E).
 - 8. All modifications and additional equipment, including but not limited to copper bus, ground bus bonded to box, circuit breaker locking devices, door-in-door cover, and UL Service Entrance Label as required.

1.04 QUALITY ASSURANCE

- A. All panelboards must be designed, manufactured, and assembled in accordance with the referenced standards.
- B. Listing and Labeling: All panelboards must be listed and labeled by Underwriters Laboratories, Inc., or another nationally recognized testing laboratory (NRTL).
- C. Service Entrance panelboards must be UL/NRTL labeled as suitable for that purpose.
- D. Single-Source Responsibility: Provide panelboard products that are new and from the same manufacturer for each building or job. Panelboard components must be from the same manufacturer, or listed as an assembly thereof.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

- A. Panelboards must be provided from the following approved manufacturers:
 - 1. Eaton/Cutler-Hammer
 - 2. Siemens
 - 3. Square D

- B. Panelboards from a manufacturer other than those listed above require a special specification and prior approval from Sandia National Laboratories (SNL).

2.02 GENERAL

- A. Voltage and current rating, as indicated on panel schedules.
- B. Ampere-interrupting capacity (AIC) as indicated on panel schedules. Series AIC ratings are not acceptable.
- C. Main circuit breaker (MCB) or main lug only (MLO) as indicated on panel schedules. Double or dual main lugs or subfeed lugs are not acceptable.
- D. Panelboards must be in a single enclosure. Two-section panels are not acceptable.
- E. Provide panelboards with size and number of single, double, or triple-pole circuit breakers as indicated on panel schedules. When multipole breakers are scheduled with no further qualifications, provide same with a single operating handle. When multipole breakers are specifically called out as handle-tied single-pole breakers, provide same listed for such use. Single-handle multipole breakers must not be substituted for handle-tie requirements.
- F. Arrange and number circuit breakers exactly as shown on drawings and panel schedules. Single-branch-mounted or subfeed breakers are not acceptable.
- G. Where the word “space” occurs on panel schedules, provide all necessary hardware in the space, including connection straps, mounting brackets, and filler plates, so only the addition of a future circuit breaker is required. Connection straps must be rated a minimum of 100A in panelboards of 400A rating or less and a minimum of 225A in panelboards above 400A rating, unless otherwise noted on panel schedules.
- H. Provide Micarta[®] buttons, small window-frame, or permanent-strip-type identification labels on interior trim to identify circuit number. Do not use adhesive-backed fabric or paper labels alone.

2.03 ENCLOSURES

- A. Must be NEMA-type enclosure as indicated on panel schedules.
 - 1. For exterior mounting, provide NEMA 3S.
 - a. Where NEMA 3S is unavailable, 3R/12 shall be acceptable upon approval by Sandia Electrical Engineer.
- B. Provide flush or surface cover, as indicated on panel schedules.
- C. Front cover must be factory manufactured, UL/NRTL listed, one-piece, hinged “door-in-door” type with the following:
 - 1. Interior hinged door with hand-operated latch or latches as required to provide access to circuit breaker operating handles only; not to energized parts.
 - 2. Outer hinged door to provide access to the entire enclosure, including deadfront and all wiring gutters.

3. Outer door must be securely mounted to the panelboard box with factory bolts, screws, clips, or other fasteners requiring a tool for entry; hand-operated latches are not acceptable.
 4. Both inner and outer doors must be hinged on the right to open left to right.
- D. Include one-piece, removable, inner deadfront cover independent of the panelboard cover.
- E. Provide enclosure with the following side gutter dimensions:
1. Left side: minimum 4" measured from inside lip of the box to the installed deadfront.
 2. Right side: minimum 4" measured from inside lip of the box to the installed deadfront. With the door-in-door cover in place: minimum 3" from installed outer door hinge to the installed deadfront.
- F. Prepare, prime, and paint front trim cover with light gray enamel electro-deposited over phosphatized steel, or baked-on polyester coating.

2.04 BUS

- A. Phase buses must be hard-drawn 98% conductivity copper.
- B. Neutral Bus
1. Must be hard-drawn 98% conductivity copper.
 2. Must be 100% rated (current rating same as phase buses).
 3. Must provide a screw terminal for each breaker position, in addition to the feeder neutral lug.
- C. Grounding Bus
1. Must be hard-drawn 98% conductivity copper.
 2. Must be factory installed, bonded to enclosure.
 2. Must provide a screw terminal for each breaker position, in addition to the feeder grounding conductor lug.

2.05 CIRCUIT BREAKERS

- A. General: Provide circuit breakers as integral components of panelboard with indicated features, ratings, characteristics, and settings.
- B. Mounting: Each circuit breaker must be bolted into position in the panelboard, whether by direct bolted connection to the bus or by being bolted to the panelboard frame. Each circuit breaker must be replaceable without disturbing adjacent units. Plug-on circuit breakers held in place only by the spring force of the bus lug and the pressure of the deadfront are not acceptable.

C. Molded-Case Circuit Breakers

1. Characteristics: Frame size, trip rating, voltage, frequency, number of poles, and short-circuit interrupting capacity rating as indicated on panel schedules.
2. Tripping Device: Quick-make, quick-break toggle mechanism with inverse-time delay and instantaneous overcurrent trip protection for each pole.
 - a. Multipole molded-case circuit breakers must include common internal tripping of all poles.
 - b. Circuit breakers with “handle ties” are not acceptable.
 - c. Half-size circuit breakers with two circuits occupying a single position on the same phase bus are not acceptable.
3. Terminal Lugs: Provide load side of circuit breaker with front-connected UL-listed lugs for copper cable at full frame rating. Provide terminals rated for minimum 75°C.
4. All single-pole circuit breakers must be switching-duty rated.
5. All multipole circuit breakers must be HACR-duty rated.
6. Provide factory-installed circuit breaker handle padlocking devices on all multipole circuit breakers.

PART 3 - EXECUTION

3.01 INSTALLATION - GENERAL

- A. Furnish labor, materials, services, equipment, supplies, and perform operations necessary to install complete, functional electrical panelboards in accordance with this Section, drawings, panel schedules, and manufacturers’ instructions.
- B. Wiring must be trained neatly in wiring gutters. Form wiring to right angles at circuit breaker connections.
- C. Panelboard Identification: Refer to Standard Drawing E-0006STD.
- D. Conductor Identification: All conductors in panel must be tagged, including neutral and ground conductors.
 1. Tags must indicate circuit number.
 2. Install a Brady[®] slip-on label on conductors sized less than #6 AWG and install a Panduit[®] #MP-350C tag and tie-wrap for conductors sized #6 AWG or larger.
 3. Use a Panduit marking pen PX-O or a Sharpie[®] permanent marker for labels.
- E. Provide panel schedule holder: C-Line[®] Products No. 70912 or equal self-adhesive clear heavy vinyl shop ticket holder, size 9” X 12” mounted on the inside of the panelboard interior door. Install two copies of a completely filled out, as-built SNL Microsoft[®] Excel format 8-1/2” X 11” panel schedule. Refer to Section 16001,

Electrical Work, Appendix A: Electrical Circuit Request and Allocation Procedure
for more details.

3.02 MOUNTING

- A. Mount panelboards plumb and rigid without distortion of box.
- B. Arrange flush panels so that enclosure front surface is uniformly flush with wall, and exterior door covers wall to enclosure mating surfaces.
- C. Mount panelboards so that distance from floor to center of top panel does not exceed 6'-6" unless otherwise noted on Drawings.
- D. Grind smooth corners, and file or grind smooth edges of metal angles, channels, straps, and other similar items to be used to support electrical panelboards. Paint to match panelboards, per requirements of Section 09900, *Painting*.

- END OF SECTION 16440 -