

SECTION 26 24 16 PANELBOARDS

PART 1 GENERAL

1.01 REFERENCES

A. The following is a list of standards which may be referenced in this section:

1. National Electrical Contractor's Association (NECA): 407, Recommended Practice for Installing and Maintaining Panelboards.
2. National Electrical Manufacturers Association (NEMA):
 - a. 250, Enclosures for Electrical Equipment (1000 Volts Maximum).
 - b. 289, Application Guide for Ground Fault Circuit Interrupters.
 - c. KS 1, Enclosed Switches.
 - d. PB 1, Panelboards.
 - e. PB 1.1, General Instructions for Proper Installation, Operation and Maintenance of Panelboards Rated 600 Volts or Less.
3. National Fire Protection Association (NFPA): 70, National Electrical Code (NEC).
4. UL:
 - a. 67, Standard for Panelboards.
 - b. 98, Standard for Enclosed and Dead-Front Switches.
 - c. 486E, Standard for Equipment Wiring Terminals for use with Aluminum and/or Copper Conductors.
 - d. 489, Molded-Case Circuit Breakers, Molded-Case Switches, and Circuit Breaker Enclosures.
 - e. 508, Standard for Industrial Control Equipment.
 - f. 870, Wireways, Auxiliary Gutters and Associated Fittings.
 - g. 943, Ground-Fault Circuit-Interrupters.
 - h. 1699, Standard for Arc-Fault Circuit-Interrupters.

1.02 SUBMITTALS

A. Action Submittals:

1. Manufacturer's data sheets for each type of panelboard, protective device, accessory item, and component.
2. Manufacturer's Shop Drawings including dimensioned plan, section, and elevation for each panelboard type, enclosure, and general arrangement.
3. Tabulation of features for each panelboard to include the following:
 - a. Protective devices with factory settings.
 - b. Provisions for future protective devices.
 - c. Space for future protective devices.
 - d. Voltage, frequency, and phase ratings.

- e. Enclosure type.
- f. Bus and terminal bar configurations and current ratings.
- g. Provisions for circuit terminations with wire range.
- h. Short circuit current rating of assembled panelboard at system voltage.
- i. Features, characteristics, ratings, and factory settings of auxiliary components.
- j. Anchorage and bracing drawings and cut sheets, as required by Section 01 88 15, Anchorage and Bracing.

B. Informational Submittals:

- 1. Anchorage and bracing calculations as required by Section 01 88 15, Anchorage and Bracing.
- 2. Manufacturer's recommended installation instructions.

1.03 QUALITY ASSURANCE

- A. Listing and Labeling: Provide products specified in this section that are listed and labeled as defined in NEC Article 100.

PART 2 PRODUCTS

2.01 GENERAL

- A. Provide low-voltage panelboards for application at 600 volts or less in accordance with this section.

2.02 PANELBOARDS

A. Physical Characteristics:

- 1. Busing and Terminal Bars:
 - a. Bus: Silver-plated or tin-plated copper, full sized throughout length
 - b. Neutral Terminal Bus: Copper with suitably sized provisions for termination of neutral conductors, and isolated from box.
 - c. Equipment Ground Terminal Bus:
 - 1) Provide individual mechanical termination points no less than the quantity of breaker pole positions.
 - 2) Provide individual termination points for all other grounding conductors such as feeder, grounding electrode.
 - d. Provision for Future Devices: Equip with mounting brackets, bus connections, and necessary appurtenances for future protective device ampere ratings indicated.

2. Overcurrent Protective Device Provisions:
 - a. Overcurrent Device Mounting and Arrangement: Design panelboards to accommodate device installation and replacement without disturbing adjacent devices and without removing main bus.
 - b. Provisions for Future Overcurrent Device:
 - 1) Provide space, mountings, and bus connections such that like devices may be installed without additional hardware.
 - 2) Panel openings shall be closed with individual removable cover for each provision for future device.
 - 3) Unless otherwise indicated, "spaces" in panelboards shall be fully equipped provision for future like devices.
 - 4) Provisions for future devices shall be suitable devices rated no less than 60 amperes.
 - c. Protective Device Locking: Furnish provisions for handle padlocking for main, subfeed, and branch devices where indicated.
 3. Nameplates: Provide a nameplate for each circuit, blanks for spares.
- B. Functional Characteristics:
1. Provide equipment in accordance with NEMA PB 1, NFPA 70, and UL 67.
 2. Wire Terminations:
 - a. Provide panelboard assemblies, including protective devices, suitable for use with 75 degrees C or greater wire insulation systems at NFPA 70, 75 degrees C conductor ampacity, and in accordance with UL 486E.
 - b. Lugs to be suitable for the termination of copper and aluminum conductors.
 - c. Lugs for termination of conductors shall comply with Section 26 05 05, Conductors.
 - d. Lugs shall be replaceable, bolted mechanical or crimp compression type.
 3. Load Current Ratings: Unless otherwise indicated, load current ratings for panelboard assemblies, including bus and circuit breakers, are noncontinuous as defined by NEC. Continuous ratings shall be 80 percent of noncontinuous rating.
- C. Performance Characteristics:
1. Load Current Ratings:
 - a. Unless otherwise indicated, load current ratings for panelboard assemblies, including bus and circuit breakers, are noncontinuous as defined by NEC. Continuous ratings shall be 80 percent of noncontinuous rating.

- b. Where indicated “continuous” or “100 percent”, selected components and protective devices shall be rated for continuous load current at value shown.
- 2. Short Circuit Current Rating (SCCR):
 - a. Integrated equipment short circuit rating for each panelboard assembly shall be no less than the following, except where higher ratings are indicated:
 - 1) Minimum SCCR at 208Y/120 or 120/240 volts shall be 10,000 amperes or as rms symmetrical, or as shown on the Drawings, whichever is greater.
 - 2) Minimum SCCR at 480Y/277 volts shall be 25,000 amperes rms symmetrical, or as shown on the Drawings, whichever is greater.

2.03 OVERCURRENT PROTECTIVE DEVICES

A. Physical Characteristics: None.

B. Functional Characteristics:

- 1. In accordance with NEMA KS 1, UL 98, and UL 489. Protective devices shall be adapted to panelboard installation. Overcurrent Protective Devices: In accordance with NEMA KS 1, UL 98, and UL 489. Protective devices shall be adapted to panelboard installation.
- 2. Branch Protective Devices:
 - a. Provide Wire Lug Load Connections: Mechanical or crimp compression type, removable/replaceable, and suitable for 75 degrees C rated conductors without derating switch nor conductor ampacity.
 - b. General: Thermal-magnetic unless otherwise indicated, quick-make, quick-break, molded case, of indicating type showing ON/OFF and TRIPPED positions of operating handle. Circuit breakers shall comply with Section 26 05 04, Basic Electrical Materials and Methods.
 - c. Bus Connection: Bolt-on circuit breakers in all panelboards.
- 3. Trip Mechanism:
 - a. Individual permanent thermal and magnetic trip elements in each pole.
 - b. Variable magnetic trip elements with a single continuous adjustment 3X to 10X for frames greater than 100 amps.
 - c. Two and three pole, common trip.
 - d. Automatically opens all poles when overcurrent occurs on one pole.
 - e. Test button on cover.
 - f. Calibrated for 40 degrees C ambient, unless shown otherwise.

4. Unacceptable Substitution:
 - a. Do not substitute single-pole circuit breakers with handle ties for multi-pole breakers.
 - b. Do not use tandem or dual circuit breakers in normal single-pole spaces.
5. Specialty Breakers:
 - a. Where indicated, provide breakers with the following features:
 - 1) Ground Fault Circuit Interrupter (GFCI): Rated to trip on 5-mA ground fault within 0.025 second (UL 943, Class A sensitivity, for protection of personnel). Ground fault sensor shall be rated same as circuit breaker. Breaker shall include push-to-test and reset buttons.
 - 2) Equipment Ground Fault Interrupter (EGFI): Where indicated, equip breaker with ground fault sensor and rated to trip on 30-mA ground fault (UL listed for equipment ground fault protection).
 - 3) Heating and Air Conditioning Rated (HACR): Where indicated to be supplying HVAC equipment, provide breaker UL listed for the protection of such equipment.
6. Solid State Trip Units: Where indicated, equip breakers with solid state trip units.
 - a. Long Time, Short Time, and Instantaneous LSI: Electronic trip unit with fixed long-time trip, adjustable short-time trip and delay, and adjustable instantaneous trip settings.
 - b. Long Time, Short Time, Instantaneous, and Ground (Fault) (LSIG): Electronic trip unit as above and also with adjustable ground fault trip and delay settings.
7. Where indicated “continuous” or “100 percent”, selected components and protective devices shall be rated for continuous load current at value shown.

C. Performance Characteristics: None.

2.04 ENCLOSURES

A. Physical Characteristics:

1. Provide surface-mount panelboard from trim with same dimensions as box front.
2. Finish: Manufacturer’s standard.
3. NEMA 250 Type 1 Branch Panelboard Enclosure:
 - a. Secure front trim to box with concealed trim clamps.
 - b. Overlap flush panelboards front trims with box nominal 3/4 inch on all sides.
 - c. Provide door in panelboard front trim, with concealed hinges, to access protective device operating handles.

- d. Provide multi-point latching for doors over 30 inches in height.
- e. Door Lock: Secure with flush catch and tumbler lock; all panelboards keyed alike, with two milled keys each lock.
- f. Circuit Directory: Metal frame with transparent plastic face and enclosed card, mounted inside each panel door.
- g. Hinged Front Cover (Door-In-Door): Entire front trim hinged to surface box with standard door within hinged trim cover.
- 4. Multi-Section Panelboards: Where more than one section is required, provide multiple panelboard sections with separate fronts.
 - a. Sections shall be suitable for individual mounting to be field interconnected to form a single electrical unit.
 - b. Recessed-mount sections of the same panel shall all have the same size tubs and flush covers.
 - c. Surface-mount multi-section panelboards may be comprised of sections of unequal heights.
 - d. Provide feed-through and main lugs in individual sections as required for field assembly of a complete multi-section panelboard. Unless otherwise indicated, provide feed-through lugs on each section but last.
 - e. Provide neutral and ground terminal bars in each section.

B. Functional Characteristics: None.

C. Performance Characteristics: None.

2.05 SPECIAL FEATURES

A. Physical Characteristics:

- 1. General: Where indicated on the Drawings or schedules, provide special features as specified.
- 2. Fire Alarm Circuits: Identify all branch circuits feeding fire detection, alarm panels, and related equipment with a red, engraved to white core, plastic nameplate attached to the individual branch circuit breakers. Engrave nameplates with "FIRE ALARM CIRCUIT".
- 3. Subfeed: Protective device or lugs indicated, with additional terminals on neutral and ground bus to accommodate feeder.
- 4. Feed-Through Lugs: At opposite end of phase bus from mains, with additional terminals on neutral and ground buses, sized to accommodate feeders indicated.
- 5. Double Main Lugs: Furnish additional terminals on neutral and ground buses, sized to accommodate feeders indicated.

- 6. Surge Arresters:
 - a. Comply with Section 26 43 00, Surge Protection Devices.
 - b. Provide protective device within panelboard as disconnecting means and short circuit protection per manufacturer's recommendation.
 - c. Provide factory mounting within panelboard utilizing UL-recognized mounting device.
- B. Functional Characteristics: None.
- C. Performance Characteristics: None.

PART 3 EXECUTION

3.01 GENERAL

- A. Install in accordance with NECA 407, NEMA PB 1.1, and manufacturers' written installation instructions.
- B. Install securely, plumb, in-line and square with walls.
- C. Install top of cabinet trim 78 inches above floor, unless otherwise shown. Install cabinet so tops of protective device operating handles are no more than 78 inches above the floor.
- D. Ground Fault Protection: Install panelboard ground fault circuit interrupter devices in accordance with installation guidelines of NEMA 289.
- E. Install filler plates in unused spaces.
- F. Wiring in Panel Gutters: Train conductors neatly in groups; bundle and wrap with nylon wire ties.
- G. Mount flush panels uniformly flush with wall finish.
- H. Provide typewritten circuit directory for each panelboard.
- I. Provision for Future Circuits at Flush Panelboards: Stub four 1-inch empty conduits from panel into accessible ceiling space or space designated to be ceiling space in future. Stub four 1-inch empty conduits into raised floor space or to accessible location below slab above grade.
- J. Provide engraved identification for each protective device.

END OF SECTION

