# SECTION 16470 PANELBOARDS

## PART 1 GENERAL

### 1.1 SUMMARY:

A. This Section includes lighting and power panelboards and associated auxiliary equipment rated 600 V or less.

### 1.2 DEFINITIONS:

A. Overcurrent Protective Device (OCPD): A device operative on excessive current that causes and maintains the interruption of power in the circuit it protects.

### 1.3 SUBMITTALS:

A. Product data for each type panelboard, accessory item, and component specified.

B. Shop drawings from manufacturers of panelboards including dimensioned plans, sections, and elevations. Show tabulations of installed devices, major features, and voltage rating. Include the following:

1. Enclosure type with details for types other than NEMA Type 1.
2. Bus configuration and current ratings.
3. Short-circuit current rating of panelboard.
4. Features, characteristics, ratings, and factory settings of individual protective devices and auxiliary components.

C. Wiring diagrams detailing schematic diagram including control wiring, and differentiating between manufacturer-installed and field-installed wiring.

D. Report of field tests and observations.

E. Panel schedules for installation in panelboards. Submit final versions after load balancing.

### 1.4 QUALITY ASSURANCE:

A. Listing and Labeling: Provide products specified in this Section that are listed and labeled.

1. The terms "listed" and "labeled" shall be defined as they are in the National Electrical Code, Article 100.

B. Manufacturer's Qualifications: Firms regularly engaged in manufacture of panelboards and enclosures, of types, sizes and ratings required, whose products have been in satisfactory use in similar service for not less than 5 years.

C. Installer's Qualifications: A firm with at least 3 years of successful installation experience on projects utilizing panelboards similar to those required for this project.

### 1.5 EXTRA MATERIALS:

A. Keys: Furnish six spares of each type for panelboard cabinet locks.

B. Touch-up Paint for panelboards: One half-pint container.

PART 2 - PRODUCTS

2.1 MANUFACTURERS:

A. Manufacturers: Subject to compliance with requirements, provide products by the following:

1. Square D Co.
2. General Electric Co.
3. Siemens Energy & Automation, Inc.
4. Cutler-Hammer, Inc.

2.2 PANELBOARDS, GENERAL REQUIREMENTS:

A. Overcurrent Protective Devices (OCPDs): Provide type, rating, and features as indicated. Comply with Division 16 Section on Overcurrent Protective Devices, with OCPDs adapted to panelboard installation. Tandem circuit breakers shall not be used. Multiple breakers shall have common trip.

B. Enclosures: Cabinets, flush or surface mounted as indicated. NEMA Type 1 enclosure, except where the following enclosure requirements are indicated. Provide galvanized sheet steel cabinet type enclosures, in sizes and NEMA types as indicated, code-gauge, minimum 16-gauge thickness. Construct with multiple knockouts and wiring gutters. Provide baked gray enamel finish over a rust inhibitor coating. Design enclosures for recessed mounting. Provide enclosures which are fabricated by same manufacturer as panelboards, which mate and match properly with panelboards to be enclosed.

1. NEMA 3R:Raintight
2. NEMA 3S:Raintight and dust tight.
3. NEMA 4X:Corrosion-resistant fiberglass enclosure, watertight, dust tight, and resistant to oil and coolant seepage.
4. NEMA 12:Dust tight, dripproof, and resistant to oil and coolant seepage.

C. Front: Hinged trim type, secured to box with 1/4-20-large head slotted captive screws except as indicated. Front for surface-mounted panels shall be same dimensions as box. Fronts for flush panels shall overlap box except as otherwise specified. Provide fronts with hinged trim construction and door with flush locks and keys, all panelboard enclosures keyed alike, with concealed door hinges on inner door, piano hinge on outer trim door, and door swings as indicated.

D. Directory Frame: Metal, mounted inside each panel door with card and clear plastic cover. Directory shall match panelboard configuration, i.e. top to bottom, left to right. Provide permanent panelboard labels for each circuit number.

E. Bus Material: Provide tin plated hard-drawn copper of 98 percent conductivity.

F. Equipment Ground Bus: Adequate for feeder and branch-circuit equipment ground conductors, and bonded to box.

G. Provide copper lugs for incoming feeders and grounds.

H. Service Equipment Approval: Listed for use as service equipment for panelboards having main service disconnect.

I. Provide minimum short circuit current ratings as indicated.

J. Provision for Future Devices: Equip with mounting brackets, bus connections, and necessary appurtenances, for the OCPD ampere ratings indicated for future installation of devices.

K. Special Features: Provide the following features for panelboards as indicated.

1. Isolated Equipment Ground Bus: Adequate for branch-circuit equipment ground conductors; insulated from box to be supplied where indicated.

2. Split Bus: Vertical bus of indicated panels divided into two vertical sections with connections as indicated.

3. Skirt For Surface-Mounted Panels: Same gauge and finish as panel front with flanges for attachment to panel, wall, and floor.

4. Contactors in Mains: Mechanically held, with current rating, poles, and connections as indicated. Conform to Division 16 Section "Motor Controller," except omit overload protection.

5. Control Power Source: Control power transformer of capacity indicated, for contactor shunt trip or other devices. Mount in cabinet of panel indicated. Protect primary with current-limiting OCPD as indicated. Provide fused protection of control circuits.

6. Extra Gutter Space: Dimensions and arrangement as indicated or required.

7. Gutter Barrier: Arranged to isolate section of gutter as indicated.

8. Provide 150 percent sized neutral bus and ground bus and double termination lugs for all 120/208 volt panelboards.

9. Column-Type Panelboard Configuration: Narrow cabinet extended as wireway to overhead junction box equipped with ground and neutral terminal buses.

10. Auxiliary Gutter: Conform to UL 870, "Wireways, Auxiliary Gutters and Associated Fittings."

11. Subfeed: OCPD or lug provision as indicated.

12. Feed-Through Lugs: Sized to accommodate feeders indicated.

13. Surge Arresters: IEEE C62.11, "Standards for Metal-Oxide Surge Arresters for AC Power Circuits," or IEEE C62.1, "Surge Arresters for Alternating Current Power Circuits."

a. Description: Coordinate impulse spark-over voltage with system circuit voltage and provide factory mounting with UL-recognized mounting device.

2.3 LIGHTING AND APPLIANCE BRANCH CIRCUIT PANELBOARDS:

A. Branch OCPDs: Bolt-on circuit breakers, replaceable without disturbing adjacent units.

B. Double-Width Panels: Where more than 42 poles are indicated, provide two panelboards of equal dimensions and with individual fronts on each panelboard.

2.4 DISTRIBUTION PANELBOARDS:

A. Branch-Circuit Breakers: Where OCPDs are indicated to be circuit breakers, use bolt-on breakers except circuit breakers 225-ampere frame size and greater may be plug-in type where individual positive locking device requires mechanical release for removal.

2.5 IDENTIFICATION:

A. General: Refer to Division 16 Section on electrical identification for labeling materials.

B. UL nameplates shall be provided for all panelboards. Information shall include, but not be limited to, manufacturer, model number, serial number, plant or manufacturing location, ampere rating, voltage rating, wire and phase identification and bus short circuit bracing rating.

PART 3 EXECUTION

3.1 INSTALLATION:

A. General: Install panelboards and accessory items in accordance with NEMA PB 1.1, "General Instructions for Proper Installation, Operation and Maintenance of Panelboards Rated 600 Volts or Less" and manufacturers' written installation instructions.

B. Ground Fault Protection: Install panelboard ground fault circuit interrupter devices in accordance with installation guidelines of NEMA 289, "Application Guide for Ground Fault Circuit Interrupters."

C. Mounting: Plumb and rigid without distortion of box. Mount flush panels uniformly flush with wall finish.

D. Circuit Directory: Typed and reflective of final circuit changes required to balance panel loads. Obtain approval before installing.

E. Install filler plates in unused spaces.

F. Provision for Future Circuits at Flush Panelboards: Stub one 1 inch empty conduit from panel for each set of 3 spares or spaces into accessible ceiling space or space designated to be ceiling space in future. Stub one 1 inch empty conduits for each set of 3 spares or spaces into raised floor space or below slab other than slabs on grade.

G. Auxiliary Gutter: Install where two panels are vertically mounted. Use gutter for branch circuit wiring to lower panel.

H. Wiring in Panel Gutters: Train conductors neatly in groups, bundle, and wrap with wire ties after completion of load balancing.

3.2 IDENTIFICATION:

A. Identify field-installed wiring and components and provide warning signs in accordance with Division 16 Section on electrical identification.

3.3 GROUNDING:

A. Connections: Make equipment grounding connections for panelboards as indicated.
B. Provide ground continuity to main electrical ground bus indicated.

3.4 CONNECTIONS:

A. Tighten electrical connectors and terminals, including grounding connections, in accordance with manufacturer's published torque values. Where manufacturer's torque values are not indicated, use those specified in UL 486A and UL 486B.

3.5 FIELD QUALITY CONTROL:

A. Upon completing installation of the system, perform the following tests:

1. Make insulation resistance tests of panelboard buses, components, and connecting supply, feeder, and control circuits.

2. Make continuity tests of circuits.

B. Procedures: Make field tests and inspections and prepare panelboard for satisfactory operation in accordance with manufacturer's recommendations and these specifications.

C. Schedule tests with at least one week of advance notification.

D. Reports: Provide report written reports of tests and observations. Report defective materials and workmanship and unsatisfactory test results. Include records of repairs and adjustments made.

E. Labeling: Upon satisfactory completion of tests and related effort, apply a label to tested components indicating results of tests and inspections, responsible organization and person, and date.

F. Visual and Mechanical Inspection: Include the following inspections and related work:

1. Inspect for defects and physical damage, labeling, and nameplate compliance with requirements of up-to-date drawings and panelboard schedules.

2. Exercise and perform of operational tests of all mechanical components and other operable devices in accordance with manufacturer's instruction manual.

3. Check panelboard mounting, area clearances, and alignment and fit of components.

4. Check tightness of bolted electrical connections with calibrated torque wrench. Refer to manufacturer's instructions for proper torque values.

5. Verify that proper grounding bushings/bonding/ and panel enclosure bonding is complete.

6. Verify isolated neutral bar and neutral connections.

G. Electrical tests: Include the following items performed in accordance with manufacturer's instruction:

1. Insulation resistance test of buses. Insulation resistance less than 100 megohms is not acceptable.

2. Ground resistance test on system and equipment ground connections.

3. Test main and subfeed overcurrent protective devices in accordance with Section "Overcurrent Protective Devices."

H. Retest: Correct deficiencies identified by tests and observations and provide retesting of panelboards by testing organization. Verify by the system tests that the total assembly meets specified requirements.

3.6 CLEANING:

A. Upon completion of installation, inspect interior and exterior of panelboards. Remove paint splatters and other spots, dirt, and debris. Touch up scratches and marks of finish to match original finish.

END OF SECTION 16470