

SECTION 16442

PANELBOARDS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes distribution and branch circuit panelboards, electronic grade branch circuit panelboards, (and load centers).
- B. Related Sections:
 - 1. Section 16050 – Basic Electrical Materials and Methods
 - 2. Section 16491 – Fuses
 - 3. Section 16412 – Circuit Breakers
 - 4. Section 16411 – Fusible Switch Assemblies

1.2 REFERENCES

- A. NECA (National Electrical Contractors Association) – Standard of Installation
- B. NEMA FU 1 – (National Electrical Manufacturers Association) - Fuses.
- C. NEMA KS 1 – Enclosed and Miscellaneous Distribution Equipment Switches (600 Volts Maximum)
- D. NEMA ICS 2 – Industrial Control and Systems: Controllers, Contactors, and Overload Relays, Rated Not More Than 2000 Volts AC or 750 Volts DC
- E. NEMA ICS 5 – Industrial Control and Systems: Control Circuit and Pilot Devices.
- F. NEMA PB 1 – Panelboards
- G. NEMA PB 1.1 – Instructions for Safe Installation, Operation and Maintenance of Panelboards Rated 600 Volts or less.
- H. NETA ATS (International Electrical Testing Association) – Acceptance Testing Specifications for Electrical Power Distribution Equipment and Systems.

1.3 SUBMITTALS:

- A. Shop Drawings: Indicate outline and support point dimensions, voltage, main bus ampacity, integrated short circuit ampere rating, circuit breaker and fusible switch arrangement and sizes. Front view elevation, floor plan, top view, single line schematic diagram, nameplate schedule, conduit entry, exit locations, component list, cable terminal sizes.
- B. Product Data: Submit electrical characteristics including voltage, frame size and trip ratings, and fault current withstand ratings, and time-current curves of all equipment and components.

1.4 CLOSEOUT SUBMITTALS

- A. Project Record Documents: Record actual locations of panelboards and record actual circuiting arrangements.
- B. Operation and Maintenance Data: Submit spare parts listing and recommended maintenance procedures and intervals.
- C. Section 01700 – Closeout and Turnover Procedures

1.5 QUALIFICATIONS

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

1.6 MAINTENANCE MATERIALS

- A. Provide two of each panelboard keys. All panelboards shall be keyed alike (to the Owner's current keying system).

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Equipment shall be handled and stored according to the manufacturer's instructions. One copy of these instructions shall be included with the equipment at time of shipment.

PART 2 - PRODUCTS

2.1 DISTRIBUTION PANELBOARDS (See Equipment List)

- A. Products Description: NEMA PB 1, circuit breaker type, fusible switch type, panelboards. Similar to Cutler-Hammer type Pow-R-Line 4.

B. Service Conditions:

1. Temperature 20 to 100 degrees F
2. Altitude: 200 feet above sea level

- C. Panelboard Bus: Copper, current carrying components, ratings as indicated. Provide copper ground bus in each panelboard.
- D. Minimum integrated short circuit rating: 65,000 amperes rms symmetrical for 208 volt panelboards; 65,000 amperes rms symmetrical for 480 volt panelboards, or as indicated. Provide fully rated panelboards; series ratings to achieve specified AIC are not acceptable.
- E. Fusible Switch Assemblies: NEMA KS 1, quick-make, quick-break, load interrupter enclosed knife switch with externally operable handle. Provide interlock to prevent opening front cover with switch in ON position. Handle lockable in OFF position. Fuse clips: Designed to accommodate NEMA FU 1, Class (R) (J) fuses. Refer to specification section 16411.
- F. Molded Case Circuit Breakers: NEMA AB 1, circuit breakers with integral thermal and instantaneous magnetic trip in each pole. Provide circuit breakers UL listed as Type HACR for air conditioning equipment branch circuits. Refer to specification section 16412.
- G. Molded Case Circuit Breakers with Current Limiters: NEMA AB 1, circuit breakers with replaceable current limiting elements, in addition to integral thermal and instantaneous magnetic trip in each pole. Refer to specification section 16412.
- H. Current Limiting Molded Case Circuit Breakers: NEMA AB 1, circuit breakers with integral thermal and instantaneous magnetic trip in each pole, coordinated with automatically resetting current limiting elements in each pole. Interrupting rating 100,000 symmetrical amperes, let-through current and energy level less than permitted for same size NEMA FU 1, Class RK-5 fuse. Refer to specification section 16412.
- I. Controller for induction motors rated in horsepower.
1. Two-speed Controllers: Include integral time delay transition between FAST and SLOW speeds.
 2. Full-voltage Reversing Controllers: Include electrical interlock and integral time delay transition, between FORWARD and REVERSE rotation.
 3. Control Voltage: 120 volts, 60 Hertz.

4. Overload Relay: NEMA ICS 2; bimetal, melting alloy.
 5. Auxiliary Contacts: NEMA ICS 2, two each normally open field convertible contacts in addition to seal-in contact.
 6. Cover Mounted Pilot Devices: NEMA ICS 5, standard, (heavy), duty, oil tight type.
 7. Pilot Device Contacts: NEMA ICS 5, Form Z, rated A150.
 8. Pushbuttons: Unguarded type.
 9. Indicating Lights: Transformer OR LED type.
 10. Selector Switches: Rotary type.
 11. Relays: NEMA ICS 2.
 12. Control Power Transformer: 120 volt secondary, 350 VA minimum, in each motor starter, as scheduled. Provide fused secondary, and bond unfused leg of secondary to enclosure.
- J. Circuit Breaker Accessories: Trip units and auxiliary switches as indicated.
- K. Enclosure: NEMA PB 1, Type _____, dependent on location
- L. Cabinet Front: Door-in-door type, screws, hinge and latch, hinged door with flush lock, metal directory frame, finished in manufacturer's standard gray enamel.
- M. Nameplates: Provide an engraved nameplate for each circuit breaker according to the drawings.

2.2 BRANCH CIRCUIT PANELBOARDS

- A. Product Description: NEMA PB 1, circuit breaker type, lighting and appliance branch circuit panelboard.
- B. Panelboard Bus: Copper, current carrying components, ratings as indicated. Provide copper ground bus in each panelboard; (provide insulated ground bus where scheduled).
- C. For non-linear load applications subject to harmonics provide 200% rated, plated copper, solid neutral.
- D. Minimum Integrated Short Circuit Rating: 10,000 amperes rms symmetrical for 240 volt panelboards; 14,000 amperes rms symmetrical for 480 volt panelboards, or as indicated.

Provide fully rated panelboards; series ratings to achieve specified AIC are not acceptable.

- E. Molded Case Circuit Breakers: NEMA AB 1, bolt-on or plug-in type thermal magnetic trip circuit breakers, with common trip handle for all poles, listed as Type SWD for lighting circuits, Type HACR for air conditioning equipment circuits, Class A ground fault interrupter circuit breakers where scheduled. Do not use tandem circuit breakers.
- F. Current Limiting Molded Case Circuit Breakers: NEMA AB 1, circuit breakers with integral thermal and instantaneous magnetic trip in each pole, coordinated with automatically resetting current limiting elements in each pole. Interrupting rating 100,000 symmetrical amperes, let-through current and energy level less than permitted for same size NEMA FU 1, Class RK-5 Fuse.
- G. Enclosure: NEMA PB 1, Type 12 or 3R.
- H. Cabinet Front: Door-in-door type, concealed hinge, metal directory frame, and flush lock all keyed alike. Finish in manufacturer's standard gray enamel.
- I. Breakers for power in a building shall be located on the floor in which they serve.

2.3 LOAD CENTERS

- A. Minimum Integrated Short Circuit Rating: 10,000 amperes rms symmetrical.
- B. Molded Case Circuit Breakers: NEMA AB 1 or NEMA 3R etc. plug-on type thermal magnetic trip circuit breakers, with common trip handle for all poles, listed as Type SWD for lighting circuits, Class A ground fault interrupter circuit breakers where indicated. Do not use tandem circuit breakers.
- C. Enclosure: General Purpose, or Rainproof.
- D. Box: Flush, or Surface type. Without door, with door, and pull ring and latch, lock on door. Finish in manufacturer's standard gray enamel.

PART 3 – EXECUTION

3.1 EXISTING WORK

- A. Disconnect abandoned panelboards, and load centers. Remove (provide blank cover for) abandoned panelboards and load centers.

- B. Ensure access to existing panelboard, and load centers, which remain active and which require access. Modify installation or provide access panel as appropriate.
- C. Clean and repair existing panelboards, and load centers, which remain or are to be reinstalled.
- D. Provide new circuit breakers of the same type and manufacturer in existing circuit breakers. Remanufactured and rebuilt circuit breakers are not permitted unless they are provided by the original panel manufacturer and approved for use in the specific panel.

3.2 INSTALLATION

- A. Install panelboards, and load centers, in accordance with NEMA PB 1.1 and the NECA “Standard of Installation”
- B. Install panelboards, and load centers, plumb. Install recessed panelboards and load centers flush with wall finishes.
- C. Height: 6 feet to top of panelboard, and load center. Install panelboards taller than 6 feet with bottom no more than 4 inches above floor.
- D. Provide filler plates for unused spaces in panelboards.
- E. Provide typed circuit directory for each branch circuit panelboard, and load center. Revise directory to reflect circuiting changes required to balance phase loads.
- F. Provide engraved plastic nameplates under the provisions of Section 16050.
- G. Provide spare conduits out of each recessed panelboard to an accessible location above the ceiling or below the floor. Minimum spare conduits: 5 empty 1 inch. Identify each as SPARE.
- H. Ground and bond panelboard enclosure according to Section 16050. Connect equipment ground bars of panels as required by NEC Article 517.

3.3 FIELD QUALITY CONTROL

- A. Section 01400 – Quality Requirements: Testing and Inspection Services
- B. Section 01700 – Execution Requirements: Testing, adjusting, and balancing.
- C. Inspect and test in accordance with NETA ATS, except Section 4.
- D. Perform circuit breaker inspections and test listed in NETA ATS, Section 7.6

- E. Perform switch inspections and tests listed in NETA ATS, Section 7.5
- F. Perform controller inspections and tests listed in NETA ATS, Section 7.16.1

3.4 ADJUSTING

- A. Section 01700 – Execution Requirements: Testing, adjusting, and balancing
- B. Section 01750 – Starting and Adjusting: Requirements for starting and adjusting.
- C. Measure steady state load currents at each panelboard feeder; rearrange circuits in the panelboard to balance the phase loads to within 20 percent of each other. Maintain proper phasing for multi-wire branch circuits.

END OF SECTION