SECTION 26 24 16

PANELBOARDS

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes distribution and branch circuit panelboards, electronic grade branch circuit panelboards, [and load centers].

1.2 REFERENCES

A. NECA (National Electrical Contractors Association) - Standard of Installation


C. NEMA FU 1 (National Electrical Manufacturers Association) - Low Voltage Cartridge Fuses.

D. NEMA ICS 2 (National Electrical Manufacturers Association) - Industrial Control and Systems: Controllers, Contactors, and Overload Relays, Rated Not More Than 2000 Volts AC or 750 Volts DC.

E. NEMA ICS 5 (National Electrical Manufacturers Association) - Industrial Control and Systems: Control Circuit and Pilot Devices.

F. NEMA KS 1 (National Electrical Manufacturers Association) - Enclosed and Miscellaneous Distribution Equipment Switches (600 Volts Maximum).

G. NEMA PB 1 (National Electrical Manufacturers Association) - Panelboards.

H. NEMA PB 1.1 (National Electrical Manufacturers Association) - General Instructions for Proper Installation, Operation, and Maintenance of Panelboards Rated 600 Volts or less.


1.3 SUBMITTALS

A. Section 01 33 00 - Submittal Procedures: Requirements for submittals.

B. Shop Drawings: Where custom panels are submitted, provide 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.

C. Product Data: Submit catalog data showing specified features and options selected of standard products.

1.4 CLOSEOUT SUBMITTALS

A. Project Record Documents: Record actual locations of panel boards and panel board schedule showing circuit numbers.

B. Operation and Maintenance Data: Submit spare parts listing and recommended maintenance procedures and intervals.

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 key. All panelboards shall be keyed alike to match existing panel boards in building.

B. DELIVERY, STORAGE AND HANDLING

1. Equipment shall be handled and stored according to the manufacturer’s instruction. One copy of these instructions shall be included with the equipment at time of shipment.

PART 2 -PRODUCTS

2.1 Acceptable Manufacturers

A. General Electric

B. Square D

C. Siemens

D. Cutler Hammer/Eaton

2.2 Generally follow NEMA standards except as follows:

A. Provide plug-in type breakers for 208 volts and bolt-on type for 480 volts. Branch circuit breakers shall be molded case, bolt-on, thermal magnetic type, ambient temperature compensated. Main and feeder breakers shall be molded case or insulated case type.

B. Fuses and Fused Switches: Fused distribution switchboards shall be used where high short circuit currents prevent the economical use of circuit breakers or as specifically approved. Fuses shall be current-limiting, time delay type and fuse clips shall be provided with rejection
features to prevent the use of improper fuses. A full complement of spare fuses shall be provided.

C. Cabinets shall be provided with stretcher-leveled steel doors and trim of code thickness, complete with concealed butt hinges, one door over interior and one which exposes all wiring. Flush, combination spring catch and all-metal locks shall be provided on each door with good fitting joints between doors and trim, and with screws securing the outer door. Locks on all panelboards, cabinets, and switchboards shall be keyed alike. Doors thirty-six (36) inches and over shall be secured with slottedhead, one-quarter turn captive speed fasteners, located at the top and bottom of the door in addition to the lock. Clamp-type holders will not be accepted. Provide hinged rear covers for free standing switchboards.

E. For non-linear load applications subject to harmonics provide 200% rated, plated copper, solid neutral 208Y/120V panel boards.

D. 208Y/120V panelboards serving non-linear loads shall have grounded conductors sized 200% of ungrounded conductors.

F. Provide a full capacity ground bus in addition to insulated neutral bus.

G. Each new panel shall be installed leaving not less than twenty-five (25) percent of the breaker positions spare, with associated copper bus and hardware provided for future breaker installation. Bus shall extend full length of panelboard.

H. If fused distribution switchboards are used, provide spare fuses and fuse storage enclosure.

I. Do not use circuit breakers with integral remote control devices; use lighting relays in a separate enclosure.

2.3 DISTRIBUTION PANELBOARDS

J. Product Description: NEMA PB 1 panelboard. Cutler-Hammer type Pow-R-Line 4, or equal.

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

L. Panelboard Bus: Copper, current carrying components, ratings as indicated. Provide separate ground bus in each panelboard.

M. 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.

N. 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.
O. Molded Case Circuit Breakers: UL 489, 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.

P. Molded Case Circuit Breakers with Current Limiters: UL 489, circuit breakers with replaceable current limiting elements, in addition to integral thermal and instantaneous magnetic trip in each pole.

Q. Current Limiting Molded Case Circuit Breakers: UL 489, 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.

R. 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 or less.
   5. Auxiliary Contacts: NEMA ICS 2, 2 field convertible contacts in addition to seal-in contact.
   6. Cover Mounted Pilot Devices: NEMA ICS 5, as required for installation.
   8. Indicating Lights: Transformer OR LED type.
  11. Control Power Transformers: secondary to match control voltage, 350 VA minimum, in each motor starter, as scheduled. Provide fused secondary, and bond unfused leg of secondary to enclosure ground.

S. Circuit Breaker Accessories: Trip units and auxiliary switches as indicated.

T. Enclosure: NEMA PB 1.
   1. Nameplates: Provide an engraved nameplate for each circuit breaker according to the drawings.

2.4 BRANCH CIRCUIT PANELBOARDS

A. Product Description: NEMA PB1, circuit breaker type, lighting and appliance branch circuit panelboard.

B. Panelboard Bus: Copper, current carrying components, ratings as indicated. Provide ground bus in each panelboard [provide insulated ground bus where scheduled].
C. 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.

D. Molded Case Circuit Breakers: UL 489, 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.

E. Current Limiting Molded Case Circuit Breakers: UL 489, 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.

F. Enclosure: NEMA PB 1, Type 12 OR 3R.

G. Metering: Mains supply shall have utility grade metering per FDG 16211. Panels rated 800 A or more shall have sub-metering for all branch circuits. Metering shall be compatible with Stanford’s electrical SCADA system. Recommended device is Schneider/SquareD PowerLogic ION 6200, with Integrated Display, Standard Power Supply, RS-485 communication and Enhanced #1 Measurement Package (P/N suffix A0A0P).

2.5 ELECTRONIC GRADE PANELBOARD

A. Integral Surge Suppressor:

1. Suppressers shall be component recognized in accordance with UL 1449, Standard for Safety, Transient Voltage Surge Suppressers and UL 1283, Electromagnetic Interference Filters.

2. Suppressers shall be independently tested with the category C3 high exposure waveform (20 kV-1.2/50us, 10kA-8/20 us) per IEEE C62.41 - 1991.

3. Suppressers shall incorporate copper bus bars for the surge current path.

4. Suppressers shall be constructed using surge current modules (MOV based). Each module shall be fused with user replaceable 200,000 AIR rated fuses. The status of each module shall be monitored on the front cover of the panelboard enclosure as well as on the module.

5. Suppressers shall be equipped with an audible alarm, which shall activate when any one of the surge current modules has failed. An alarm on/off switch shall be provided to silence the alarm and an alarm push-to-test switch shall be provided to test the alarm. The switches and alarm shall be located on the front cover of the panelboard enclosure.

6. Suppressers shall meet or exceed the following criteria:
   a. Maximum single impulse current rating shall be no less than 80kA per phase.
   b. Pulse Lift Test: Capable of protecting against and surviving 5000 IEEE C62.41 Category C transients without failure or degradation.
   c. The clamping voltage shall no exceed the following:
Voltage | L-N | N-G | L-G
--- | --- | --- | ---
208Y/120 | 500V | 500V | 500V
480Y/277 | 1000V | 1000V | 1000V

7. The suppresser shall have a response time no greater than five nanoseconds for any of the individual protection modes.
8. Suppressers shall be designed to withstand a maximum continuous operating voltage (MCOV) of not less than 115% of nominal RMS voltage.
9. Visible indication of proper suppresser connection and operation shall be provided. The indicator lights shall indicate which phase as well as which module is fully operable.
10. Suppressers shall have a minimum EFI/RFI filtering of 34dB at 100kHz with an insertion loss ratio of 50:1 using Mil Std. 220A methodology.

2.3 LOAD CENTERS

A. Product Description: Circuit breaker load center, with bus ratings as indicated.
B. Minimum Integrated Short Circuit Rating: 10,000 amperes rms symmetrical.
C. Molded Case Circuit Breakers: UL 489 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.

PART 3 -EXECUTION

3.1 EXISTING WORK
A. Disconnect abandoned panelboards and load centers. Provide blank cover for abandoned panelboards and load centers. Any panelboards and load centers which are to be reinstalled or reused shall be cleaned and repaired.
B. Ensure access to existing panelboard and load centers which remain active and which require access. Modify installation or provide access panel as appropriate.

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.
A. Free-standing switchboards, distribution panels, etc., shall be accurately aligned, leveled, and bolted in place on full-length channels securely fastened to the floor, and braced for seismic restraint in accordance with CAC Title 24.

D. Provide filler plates for unused spaces in panelboards.

E. Provide typed circuit directory for each branch circuit panelboard and load center. Panelboard directories shall be arranged in numerical order, and shall show the number of the room in which each outlet served by each panelboard circuit is located. The room numbers used shall be verified and shall not necessarily be those used on the drawings. Directories shall be mounted in a six (6) inch by eight (8) inch metal frame under glass or transparent plastic inside each panelboard door. Each circuit shall be identified on a panel directory. The configuration of the panel directory shall be the same as the panel itself. Revise directory to reflect circuiting changes required to balance phase loads.

F. Provide engraved plastic nameplates as specified elsewhere in Stanford Facilities Design Guidelines. Panelboard numbers shall be shown on the exterior of the panel. Feeder breakers and breakers feeding individual pieces of equipment shall be separately labeled with engraved, laminated bakelite nameplate.

G. Provide spare conduits out of each recessed panelboard to an accessible location. Minimum spare conduits: provide minimum of three empty 1 inch.

H. Ground and bond panelboard enclosure. Connect equipment ground bars of panels as required by NEC.

I. All new panelboards in buildings with ARC Flash labeling shall be calculated and labeled for Arc Flash Hazard warning per FDG 26 05 73.

3.3 FIELD QUALITY CONTROL

A. Section 26 08 00 - Electrical Systems Acceptance Testing.

B. Inspect and test in accordance with NETA ATS, except Section 4.

C. Perform circuit breaker inspections and tests listed in NETA ATS, Section 7.6.

D. Perform switch inspections and tests listed in NETA ATS, Section 7.5.

E. Perform controller inspections and tests listed in NETA ATS, Section 7.16.1.

END OF SECTION