

## PART 1 - GENERAL

### 1.1 SUMMARY

- A. Section Includes:
  - Distribution panelboards.
  - 1. Lighting and appliance branch circuit panelboards.

### 1.2 DEFINITIONS

- A. SVR: Suppressed voltage rating.

### 1.3 PERFORMANCE REQUIREMENTS

- A. Seismic Performance: Panelboards shall withstand the effects of earthquake motions determined according to SEI/ASCE 7. The term "withstand" means "the unit will remain in place without separation of any parts from the device when subjected to the seismic forces specified and the unit will be fully operational after the seismic event."

### 1.4 SUBMITTALS

- A. Product Data: For each type of panelboard, switching and overcurrent protective device, transient voltage suppression device, accessory, and component indicated. Include dimensions and manufacturers' technical data on features, performance, electrical characteristics, ratings, and finishes.
- B. Shop Drawings: For each panelboard and related equipment.
  - 1. Include dimensioned plans, elevations, sections, and details. Show tabulations of installed devices, equipment features and ratings.
    - a. Verify space available with equipment sizes and code required working clearances prior to submitting shop drawings.
  - 2. Detail enclosure types and details for types other than NEMA 250, Type 1.
  - 3. Detail bus configuration, current, and voltage ratings.
  - 4. Short-circuit current rating of panelboards and overcurrent protective devices.
  - 5. Detail features, characteristics, ratings, and factory settings of individual overcurrent protective devices and auxiliary components.
  - 6. Include wiring diagrams for power, signal, and control wiring.
  - 7. Include time-current coordination curves for each type and rating of overcurrent protective device included in panelboards. Submit on translucent log-log graph paper; include selectable ranges for each type of overcurrent protective device.
- C. Seismic Qualification Certificates: Submit certification that panelboards, overcurrent protective devices, accessories, and components will withstand seismic forces defined in Division 26 Section "Vibration and Seismic Controls for Electrical Systems." Include the following:
  - 1. Basis for Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation.
  - 2. Dimensioned Outline Drawings of Equipment Unit: Identify center of gravity and locate and describe mounting and anchorage provisions.

3. Detailed description of equipment anchorage devices on which the certification is based and their installation requirements.
- D. Field Quality-Control Reports:
1. Test procedures used.
  2. Test results that comply with requirements.
  3. Results of failed tests and corrective action taken to achieve test results that comply with requirements.
- E. Panelboard Schedules: For installation in panelboards and UW electronic records keeping.
- F. Operation and Maintenance Data: For panelboards and components to include in emergency, operation, and maintenance manuals. In addition to items specified in Division 01 Section "Operation and Maintenance Data", include the following:
1. Manufacturer's written instructions for testing and adjusting overcurrent protective devices.
  2. Time-current curves, including selectable ranges for each type of overcurrent protective device that allows adjustments.

## 1.5 QUALITY ASSURANCE

- A. Testing Agency Qualifications: Member company of NETA or an NRTL.
1. Testing Agency's Field Supervisor: Currently certified by NETA to supervise on-site testing.
- B. Source Limitations: Obtain panelboards, overcurrent protective devices, components, and accessories from single source from single manufacturer.
- C. Product Selection for Restricted Space: Drawings indicate maximum dimensions for panelboards including clearances between panelboards and adjacent surfaces and other items. Comply with indicated maximum dimensions.
- D. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- E. Comply with NEMA PB 1.
- F. Comply with NFPA 70.

## 1.6 COORDINATION

- A. Coordinate layout and installation of panelboards and components with other construction that penetrates walls or is supported by them, including electrical and other types of equipment, raceways, piping, encumbrances to workspace clearance requirements, and adjacent surfaces. Maintain required workspace clearances and required clearances for equipment access doors and panels.

## PART 2 - PRODUCTS

### 2.1 MANUFACTURER

- A. General Electric, Eaton Corporation - Cutler Hammer, Siemens, Square D or Approved Equal.

### 2.2 GENERAL REQUIREMENTS FOR DISTRIBUTION, LIGHTING AND APPLIANCE BRANCH-CIRCUIT PANELBOARDS

- A. Fabricate and test panelboards according to IEEE 344 to withstand seismic forces defined in Division 26 Section "Vibration and Seismic Controls for Electrical Systems."
- B. Enclosures: Flush or surface-mounted cabinets, as indicated on drawings or panel schedules.
1. Rated for environmental conditions at installed location.
  2. Indoor Dry and Clean Locations: NEMA 250, Type 1.
    - a. Other Wet or Damp Indoor Locations: NEMA 250, Type 4.
  3. Hinged Front Cover: Entire front trim hinged to box and with standard door within hinged trim cover. Key identically.
  4. Where two cabinets are located adjacent to each other in finished areas, provide matching trim, same height.
  5. Where remote controlled switch or contactor is mounted in panelboard, mount on same frame as panelboard interior, with dedicated access door and key lock
  6. Finishes:
    - a. Panels and Trim: Steel factory finished immediately after cleaning and pretreating with manufacturer's standard two-coat, baked-on finish consisting of prime coat and thermosetting topcoat.
    - b. Back Boxes: Galvanized steel.
  7. Directory Card: Inside panelboard door, mounted in metal frame with transparent protective cover, type written. Hand written is not acceptable.
- C. Incoming Mains Location: As determined by contractor unless noted otherwise.
- D. Phase, Neutral, and Ground Buses:
1. Material: Hard-drawn copper, 98 percent conductivity.
  2. Panelboards shall have full ampacity bussing throughout and shall be full size in regard to number of possible pole spaces. Bussing shall be identified with phases reading left to right.
  3. Neutral bus shall be mounted independently of equipment ground bus, and in no case shall neutral bus be used as equipment ground bus, or vice versa.
  4. Equipment Ground Bus: Adequate for feeder and branch-circuit equipment grounding conductors; bonded to box and located on back of panelboard. Shall have lug or lugs from equipment grounding conductor from switchboard or distribution board and screw type terminals for connection of equipment green ground wire in same quantity as number of poles in panel.
  5. Extra-Capacity Neutral Bus: Provide neutral bus rated 200 percent of phase bus and UL listed as suitable for nonlinear loads when noted on drawings.
  6. Split Bus: Vertical buses divided into individual vertical sections.

- E. Conductor Connectors: Suitable for use with conductor material and sizes.
  - 1. Material: Hard-drawn copper, 98 percent conductivity.
  - 2. Main and Neutral Lugs: Mechanical type.
  - 3. Ground Lugs and Bus-Configured Terminators: Mechanical type, UL listed for both steel and aluminum.
  - 4. Feed-Through Lugs: Mechanical type, suitable for use with conductor material. Locate at opposite end of bus from incoming lugs or main device.
  - 5. Extra-Capacity Neutral Lugs: Rated 200 percent of phase lugs mounted on extra-capacity neutral bus.
- F. Future Devices: Mounting brackets, bus connections, filler plates, and necessary appurtenances required for future installation of devices.
- G. Panelboards rated for 400 amps and above shall accept 225 amp frame circuit breakers.
- H. Panelboard Short-Circuit Current Rating: Fully rated to interrupt symmetrical short-circuit current available at terminals.
  - 1. Minimum interrupting ratings shall be 14,000 (RMS Symmetrical) at 480/277V and 10,000 (RMS Symmetrical) at 208/120V.

## 2.3 OVERCURRENT PROTECTIVE DEVICES

- A. Molded-Case Circuit Breaker (MCCB): Comply with UL 489, with interrupting capacity to meet available fault currents.
  - 1. Thermal-Magnetic Circuit Breakers: Inverse time-current element for low-level overloads, and instantaneous magnetic trip element for short circuits. Adjustable magnetic trip setting for circuit-breaker frame sizes 400 A and larger.
  - 2. Electronic trip circuit breakers with rms sensing; field-replaceable rating plug or field-replaceable electronic trip; and the following field-adjustable settings:
    - a. Instantaneous trip.
    - b. Long- and short-time pickup levels.
    - c. Long- and short-time time adjustments.
  - 3. Molded-Case Circuit-Breaker (MCCB) Features and Accessories:
    - a. Standard frame sizes, trip ratings, and number of poles.
    - b. Lugs: Mechanical style, suitable for number, size, trip ratings, and conductor materials.
    - c. Application Listing: Appropriate for application; Type SWD for switching fluorescent lighting loads; Type HID for feeding fluorescent and high-intensity discharge (HID) lighting circuits.
    - d. Shunt Trip: 120-V trip coil energized from separate circuit, set to trip at 55 percent of rated voltage.
    - e. Undervoltage Trip: Set to operate at 35 to 75 percent of rated voltage without intentional time delay.
    - f. Multipole units enclosed in a single housing or factory assembled to operate as a single unit.
- B. Circuit breakers shall be the same manufacturer as panelboard.

- C. Where spare is indicated, panelboard shall be provided with the specified branch circuit breaker, full ampacity bussing and mounting hardware. Where space is indicated, panelboard shall be provided with full ampacity bussing and mounting hardware to accommodate future installation of branch circuit breaker.

## 2.4 NAMEPLATES

- A. Engraved nameplates per Section 26 05 53 - Identification for Electrical Systems permanently attached to panelboard front. Include panel name with 3/8" letters, voltage, phase and wire and where fed from (e.g., 208Y/120, 3 phase, 4 wire, Fed From Panel PCD-NN00-N01 Located in Room NE118, or 480Y/277, 3 phase, 4 wire) in 3/16 inch characters.
- B. Nameplate color:
  - 1. Normal system - white letters on black.
  - 2. Emergency system - white letters on red.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Receive, inspect, handle, and store panelboards according to NEMA PB 1.1.
- B. Examine panelboards before installation. Reject panelboards that are damaged or rusted or have been subjected to water saturation.
- C. Examine elements and surfaces to receive panelboards for compliance with installation tolerances and other conditions affecting performance of the Work.
- D. Proceed with installation only after unsatisfactory conditions have been corrected.

### 3.2 INSTALLATION

- A. Install panelboards and accessories according to NEMA PB 1.1.
- B. Equipment Mounting: Install panelboards on concrete bases, 4-inch (100-mm) nominal thickness.
  - 1. Install dowel rods to connect concrete base to concrete floor. Unless otherwise indicated, install dowel rods on 18-inch (450-mm) centers around full perimeter of base.
  - 2. For panelboards, install epoxy-coated anchor bolts that extend through concrete base and anchor into structural concrete floor.
  - 3. Place and secure anchorage devices. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
  - 4. Install anchor bolts to elevations required for proper attachment to panelboards.
  - 5. Attach panelboard to the vertical finished or structural surface behind the panelboard.
- C. Temporary Lifting Provisions: Remove temporary lifting eyes, channels, and brackets and temporary blocking of moving parts from panelboards.

- D. Comply with mounting and anchoring requirements specified in Division 26 Section "Vibration and Seismic Controls for Electrical Systems."
- E. Mount panelboard cabinet plumb and rigid without distortion of box. Mount recessed panelboards with fronts uniformly flush with wall finish and mating with back box.
- F. Panelboards installed recessed in fire rated walls shall be adequately boxed or backed with fire rated material and shall be approved by Fire Marshal. The final construction shall equal or exceed fire rating of the wall.
- G. Locate in dedicated spaces. Coordinate project construction so piping, ducts, etc. are routed around dedicated spaces above and in front of panelboards per code.
- H. Verify space available with equipment sizes and code required working clearances prior to installation.
- I. Install overcurrent protective devices and controllers not already factory installed.
  - 1. Set field-adjustable, circuit-breaker trip ranges.
- J. Install filler plates in unused spaces.
- K. Arrange conductors in gutters into groups and bundle and wrap with wire ties after completing load balancing.
- L. Comply with NECA 1.

### 3.3 WIRING

- A. Conform to applicable sections of these specifications and NEMA PB 1.1. Conductors and terminations per Section 26 05 19 Low Voltage Electrical Power Conductors and Cables. Coverplates in open knockouts.
- B. Panelboards shall be wired and connected after installation at locations shown. Pre-wiring off site and splicing of branch circuit in wireway above or below panelboard is not permitted.

### 3.4 CIRCUIT INDEX AND LABELS

- A. Typed circuit index (panelboard schedule) with odd circuits on left, even circuits on right, listing each circuit by number with complete load designation, (i.e. Receptacle room \_\_\_\_, lights room \_\_\_\_, etc.). Room names/numbers per actual room identification assigned by owner at project completion (assigned room numbers may differ from drawings). Mount inside door with transparent protective cover. Provide number labels on circuit breakers to match index.
- B. Provide electronic panelboard schedules to the Owner immediately following work associated with each panelboard shutdown and provide a final complete set of electronic panelboard schedules included with the O&M submittal.
- C. Install nameplate as per Part 2.
- D. Relabel all power outlets affected when there is a panelboard change.

### 3.5 GROUNDING

- A. Provide per Section 26 05 26 - Grounding and Bonding for Electrical Systems.

### 3.6 FIELD QUALITY CONTROL

- A. Testing Agency: Engage a qualified testing agency to perform tests and inspections.
- B. Acceptance Testing Preparation:
  - 1. Test insulation resistance for each panelboard bus, circuit breakers 100 amp and larger, connecting supply, and feeder.
- C. Tests and Inspections:
  - 1. Perform each visual and mechanical inspection and electrical test stated in NETA Acceptance Testing Specification. Certify compliance with test parameters.
  - 2. Correct malfunctioning units on-site, where possible, and retest to demonstrate compliance; otherwise, replace with new units and retest.
- D. Panelboards will be considered defective if they do not pass tests and inspections.
- E. Prepare test and inspection reports, including a certified report that identifies panelboards included and that describes scanning results. Include notation of deficiencies detected, remedial action taken, and observations after remedial action.

### 3.7 ADJUSTING

- A. Adjust moving parts and operable component to function smoothly, and lubricate as recommended by manufacturer.
- B. Set field-adjustable circuit-breaker trip ranges as specified in Division 26 Section "Overcurrent Protective Device Coordination Study."

### 3.8 CLEANING

- A. Prior to final inspection, clean panelboard interiors, adjust trims, covers, hinges and locks and refinish marred or scratched covers to original conditions. Remove paint splatters and other spots. Vacuum dirt and debris; do not use compressed air to assist in cleaning. Repair exposed surfaces to match original finish.

### 3.9 PROTECTION

- A. Temporary Heating: Apply temporary heat to maintain temperature according to manufacturer's written instructions.

**END OF SECTION**