

# **DIVISION 26 – ELECTRICAL**

## **26 24 00 SWITCHBOARDS AND PANELBOARDS**

### **PART 1 - GENERAL**

#### 1.01 SUMMARY

- A. Section includes switchboards, distribution panelboards, and lighting and appliance branch circuit panelboards.

#### 1.02 PERFORMANCE REQUIREMENTS

- A. Seismic performance: Switchboards and panelboards shall withstand the effects of earthquake motions determined according to the most current USGS adopted seismic zone.
  - 1. 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".

### **PART 2 - PRODUCTS**

#### 2.01 GENERAL REQUIREMENTS FOR SWITCHBOARDS AND PANELBOARDS

- A. Enclosures: Flush and surface mounted cabinets.
  - 1. Rated for environmental conditions at installed location.
    - i. Indoor dry and clean locations: NEMA 250, Type 1.
    - ii. Outdoor locations: NEMA 250, Type 3R.
    - iii. Kitchen and wash down areas: NEMA 250, Type 4X, stainless steel.
    - iv. Other wet or damp indoor locations: NEMA 250, Type 4.
  - 2. Front: Secured to box with concealed trim clamps. For surface-mounted fronts, match box dimensions; for flush-mounted fronts, overlap box.
  - 3. Hinged front cover: Entire front trim hinged to box and with standard door within hinged trim cover.
  - 4. Directory card: Typewritten only; inside panelboard door; mounted in transparent card holder. Hand-written cards will not be accepted.
- B. Incoming mains location: Top or Bottom, as required for the installation.
- C. Phase, neutral, and ground buses: Hard-drawn copper, 98 percent conductivity.

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- D. 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.
  - 4. Feed-through lugs:
    - i. Mechanical type, suitable for use with conductor material.
    - ii. Locate at opposite end of bus from incoming lugs or main device.
    - iii. Shall not be acceptable between floors.
    - iv. Shall be used only for side-by-side panel installations.
  - 5. Sub-feed (double) lugs:
    - i. Mechanical type suitable for use with conductor material.
    - ii. Locate at same end of bus as incoming lugs or main device.
- E. Future devices: Install bussing for full length of panelboard. Provide mounting brackets, bus connections, filler plates, and necessary appurtenances required for future installation of devices.
- F. Panelboard short circuit current rating: Fully rated for the available fault current. Series-rated panelboards shall be pre-approved by the WSU Construction Manager or Engineering Services. These shall typically be used only where fully rated panelboards are not economical or do not exist for the available fault.
- G. All switchboards and panelboards shall be of one manufacturer for entire project.

#### **2.02 DISTRIBUTION SWITCHBOARDS**

- A. Manufacturers:
  - 1. Eaton Electrical Inc.; Cutler-Hammer Business Unit
  - 2. General Electric Company; GE Consumer & Industrial - Electrical Distribution
  - 3. Siemens Energy & Automation, Inc.
  - 4. Square D; a brand of Schneider Electric

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- B. Switchboards: Conform to NEMA PB 2.
- C. Doors: Exterior switchboards shall be secured with vault-type latch; lock and keys per section 08 70 00 Hardware and Keying.
- D. Where main overcurrent protection is required, circuit breakers are preferred.
- E. Overcurrent protective devices:
  - 1. Bolt-on circuit breakers only; stab-in circuit breakers shall not be accepted.
  - 2. Provide fused switches only if recommended by the equipment manufacturer or where magnitude of available fault prevents the use of circuit breakers.

#### **2.03 DISTRIBUTION AND BRANCH CIRCUIT PANELBOARDS**

- A. Panelboards shall be dead front, 20-inches wide, surface or recessed mounted, have copper busing and 100% rated isolated neutral, a ground bus, and accept bolt-on circuit breakers only.
  - 1. Recessed panelboards shall have a single 1” empty conduit for every three spaces and spares, stubbed to accessible space for future use.
- B. Manufacturers:
  - 1. Eaton Electrical Inc.; Cutler Hammer Business Unit
  - 2. General Electric Company; GE Consumer & Industrial - Electrical Distribution
  - 3. Siemens Energy & Automation, Inc.
  - 4. Square D; a brand of Schneider Electric
- C. Panelboards: Conform to NEMA PB 1.
- D. Mains: Circuit breaker or Main Lugs only.
- E. Branch overcurrent protective devices: Bolt-on circuit breakers, replaceable without disturbing adjacent units.
  - 1. Panelboard circuit breakers shall be thermal-magnetic, quick break, quick make, trip indicating. Multi-pole circuit breakers shall have a common trip.
  - 2. Breakers shall be rated for the following:

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- i. 208Y/120 volt panelboards: 10,000 AIC symmetrical, minimum.
  - ii. 480Y/277 volt panelboards: 14,000 AIC symmetrical, minimum.
- F. Doors: Concealed hinges; secured with flush latch; lock and keys per section 08 70 00 Hardware and Keying.
- G. Wire connections shall be rated for 75 degrees Celsius.
- H. A minimum of 25% spares/spaces shall be provided in each panelboard.
- I. Panelboards shall be mounted with top at six foot-six inches (6'-6") above the floor.
- J. Selective TVSS protection only where protection of electronic equipment is required.

#### **2.04 SERVICE ENTRANCE SWITCHBOARDS**

- A. Provide copper bussing rated at 1,000 amperes per square inch. Space for future disconnects shall have complete provisions made so that only the adding and connecting of the device will complete the installation.
- B. TVSS protection required at all Service Entrance Switchboards.
- C. All breakers within service entrance switchboards shall be 100% rated.
- D. All shunt breakers used for load shedding shall be motorized on and off, and shall be connected and controlled by the WSU BAS.

#### **2.05 ELECTRICAL METERING**

- A. Meters shall be installed as follows:
- 1. Main Metering: Each main building service and/or feeder entrance at the first overcurrent protective device, or as otherwise designated by the WSU Facilities Services Energy Group.
  - 2. Sub-Metering: As required by local jurisdiction or as designated by the WSU Facilities Services Energy Group.
- B. Provide meter as described below:
- 1. Standard Model: SEL 735 power revenue meter, vertical configuration number "0735VX00944CXXXXXX16102XX."
  - 2. Centerline of the meter is to be 54" – 66" above finished floor.

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3. The meter shall have direct Ethernet connection to the Facilities Services Private Network Ethernet Switch.
- C. Each meter cubicle shall have a phenolic label, white face/black letters (3/8" min.), with the following engraved information (example only):

MS-1 Main 480V Service Switchgear Meter  
Meter Location Number: PB0050\_ENMAAA480  
CT Ratio: 200/5, PT Ratio: 1/1

D. Switchboard Meter Installation:

1. Electrical switchboards shall be provided with meter enclosure cubicle with hinged front door allowing safe access to the rear face of the meter, Current Transformer (CT) shorting blocks, etc., for inspection, testing, and calibration while switchboard is in service.
  - i. CT terminal blocks shall be shorting style and all CT terminations shall utilize ring tongue connections.
  - ii. Switchboard manufacturer shall install a complete functional metering system, in accordance with meter manufacturer's specifications and recommendations, to include CTs and potential taps. Switchboard meters shall not be field-installed.
  - iii. Switchboard manufacturer shall confirm that meter potential and current input phasing and polarity are correct.

E. Panelboard Meter Installation:

1. Electrical panelboards shall be provided with a separate meter mounted in a NEMA 4X enclosure with hinged front door allowing safe access to the rear face of the meter, Current Transformer (CT) shorting blocks, etc., for inspection, testing, and calibration while panelboard is in service.
  - i. CT terminal blocks shall be shorting style and all CT terminations shall utilize ring tongue connections.
2. Contractor shall install a complete functional metering system, in accordance with meter manufacturer's specifications and recommendations, to include CTs and potential taps.
3. Contractor shall confirm that meter potential and current input phasing and polarity are correct.

F. Contractor shall contact WSU Engineering Services, through the Construction Manager, for assistance with meter setup files.

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- G. Prior to transformer secondary terminations, Contractor shall coordinate with WSU Construction Manager to schedule a meeting to confirm correct phasing from utility substation bus to switchgear bus and meter.
- H. Meter commissioning shall include comparison to values gathered simultaneously using a Contractor-provided portable 3-phase energy meter and shall include confirmation that voltage/current phasor relationships are correct and positive ABC rotation exists. WSU Facilities Services Energy Group representative must be present during meter commissioning.

#### **2.06 ENCLOSED SWITCHES: FUSED AND NON-FUSED**

- A. Switches shall have copper bussing, be quick break, quick make and rated heavy duty. Switches shall have a defeatable cover interlock and have provisions for padlocking. A neutral bus shall be provided for circuits requiring a neutral.

#### **2.07 ACCESSORY COMPONENTS AND FEATURES**

- A. Portable test set:
  - 1. For testing functions of solid-state trip devices without removing from panelboard. Include relay and meter test plugs suitable for testing panelboard meters and switchboard class relays.

## **PART 3 - EXECUTION**

### **3.01 INSTALLATION**

- A. Install all switchboards and panelboards that extend to the floor on 4-inch concrete housekeeping pads.
- B. Mount panelboard cabinet plumb and rigid without distortion of box. Surface mounted panelboards are preferable for ease of maintenance and for adding new circuits. While recessed panelboards are less desirable, they are to be mounted with fronts uniformly flush with wall finish and with provisions for future circuit expansions (coordinate with WSU PM/CM).
- C. Panels shall not be installed in underground vaults, tunnels, etc.
- D. Where programmable solid-state breakers are used, copies of the manufacturer's user guide and maintenance instructions shall be made available on the breaker enclosure and the facility Operations and Maintenance (O&M) manuals.

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**PART 4 - QUALITY (NOT APPLICABLE)**

**PART 5 - WARRANTY (NOT APPLICABLE)**

**PART 6 - TRAINING REQUIREMENTS (NOT APPLICABLE)**

**PART 7 - STOCK AND SPARE PARTS (NOT APPLICABLE)**

**PART 8 - PRE-INSTALL REQUIREMENTS (NOT APPLICABLE)**

**PART 9 - SPECIAL INSPECTIONS (NOT APPLICABLE)**

**PART 10 - SHOP DRAWINGS (NOT APPLICABLE)**

**PART 11 - SPECIAL INSTRUCTIONS OR PROVISIONS (NOT APPLICABLE)**

**END OF SECTION**