

**PART I: GENERAL**

1.01 Wiring Devices

- A. This section of the standard includes design requirements for wiring connections, including receptacles and switches to equipment specified in other sections.
  - a. All Emergency Circuits shall be identified by Red Outlets, Switches, Covers, Face Plates, Junction Boxes, and Covers

1.02 Dry Type Transformers

- A. This section includes enclosed dry type transformers for lighting and power loads, with primaries and secondary rated 600 volts and less.

1.03 Disconnect Switches

- A. This section includes enclosed switches for use as disconnects in service and distribution systems rated 600 volts and less.

1.04 Metal Enclosed Distribution Switchgear

- A. This section includes metal enclosed switchgear for application at 600 volts and less.

1.05 Panel boards

- A. This section includes enclosed fusible switch and circuit breaker panel boards for feeders, and circuit breaker type lighting and appliance branch circuit panel boards.

1.06 Busway

- A. This section includes feeder and plug-in busway in ratings 150 amperes to 5000 amperes, 600 volts and less.

1.07 Reference Standard

- A. Reference standard Common Work Results for Electrical for related information on underground ducts and manholes, building wire and cable, raceways and boxes, cable trays, full short circuit device, coordination and arc fault study, and enclosed switches.

**PART 2: PRODUCTS**

2.01 Wiring Devices

- A. Electrical Requirements

1. All electrical switches and outlets used shall be equal to Hubbell heavy duty, specification grade or equivalent quality.
2. Minimum 20 ampere rated switches shall be used for lighting and power loads. In cases where wall dimmers are used, the dimmer shall be solid-state design with flicker noise control. Minimum accepted manufacturer and quality – Lutron Nova T Series.
3. Device faceplates shall be smooth finish hard plastic. Project Service Provide (PSP) shall coordinate color requirements with building architect. Galvanized face plates shall be used for all surface mounted devices.
  - a. Hallway receptacle faceplates shall be stainless steel.
  - b. Residence life buildings faceplates shall be colored vinyl
  - c. Emergency Curcuits shall be identified by Red Outlets & Face Plates

## 2.02 Dry Type Transformers

- A. Up to 5 kVA: (1ph and 3ph) shall be totally enclosed, self-cooled dry-type with a 150° C insulation system that will not exceed a 80° C rise at a maximum ambient temperature of 40 degrees C.
- B. 5 kVA to 25 kVA: (1ph and 3ph) shall be totally enclosed, solid fill, self cooled with a 180° C insulation system that will not exceed a 110° C rise at maximum ambient temperature of 40 degrees.
- C. 30 kVA and above: shall be open, self-cooled dry-type, designed for free convection of air through the windings with a 220° C insulation system that will not exceed a 150° C rise at maximum ambient temperature of 40 ° C.
- D. Taps in the high voltage winding shall be four each 2-1/2% FCBN for the following ratings: 30 KVA and above, three phase; 5 KVA through 25 KVA, single phase. Taps shall be two each 5% FCBN for all other units except that units rated below 1.0 KVA do not require taps. Additional or smaller taps may be supplied (10% total BN required) if it is the manufacturer's standard.
- E. Transformer windings can be copper or aluminum.

## 2.03 Not Used

## 2.04 Disconnect Switches

- A. Use heavy duty type fused and non-fused, enclosed switches only.

## 2.05 Metal Enclosed Distribution Switchgear

- A. Switchgear shall be metal enclosed construction, front and rear access, NEMA 1 drip- proof, ANSI C37/UL1558, rated 600V and shall operate on a 480/277 or 208/120 volt, three-phase, solidly grounded wye, 60 Hz system. The switchboard shall be designed in accordance with the latest NEMA, ANSI, and IEEE standards applicable to this equipment. These standards shall be referenced in the project specifications.
- B. Use only ANSI C37.15/UL1066, draw out mounted, power circuit breakers in the switchgear.
- C. Metering:
1. Coordinate location of sub-metering & requirements with SHSU.
  2. Sub-metering shall be 13 Terminal, KW, KWH, Demand, with KYZ output capability.
- D. Bussing
1. The bus shall be insulated copper with a current density of 1000A/in<sup>2</sup>. The insulation shall be class B (130 degree C) rated material. Bus connections (including the tie bus) shall be accessible from the rear of the switchboard. All bussing shall be braced for the maximum available fault current.
  2. Neutral bars shall be full capacity rated.
  3. Provide a ground bus through the full length of each section of the switchboard.
  4. Provide a disconnecting means for the neutral either in the form of a link, or similar conducting piece, designed to make connection between two suitable terminals or consisting of a terminal plate or stud provided with a suitable wire connection. Simple removal of bolts from a single bus bar is not acceptable.
- E. Professional Service Provider (PSP) shall require the manufacturer to provide a mimic bus. Show bussing, connections and devices in single line form using black laminated plastic strips securely attached on the front panels of the switchboard.
- F. Main and Tie section devices shall be individually mounted and compartmented.
- G. Distribution section devices shall be individually mounted and compartmented.
- H. Auxiliary section devices shall be individually mounted and compartmented.
- I. Provide switchboard on 4" housekeeping pad with suitable angle iron embedded in concrete to allow for proper alignment and anchoring as recommended by the manufacturer.
- J. Future provisions: Switchboard shall be designed with future spaces (15% minimum) equipped with breakers and such that the future additions may be readily made in the field.

K. The power circuit breakers shall be equipped with a solid state tripping system consisting of individual phase monitoring current sensors, a solid state processing device, and a flux transfer shunt trip. The following protective modes or the equivalents shall be provided as a part of the solid state tripping:

1. All breakers shall have long-time pick-up of at least to 1.25 times sensor rating and a long time delay of at least 4 to 36 seconds at 6 times sensor rating.
2. All breakers shall have short time pick-up of at least 4 to 12 times sensor rating and a short delay time of at least to 0.05 seconds at 2.5 times short delay pick-up.
3. Only the feeder breakers shall have instantaneous pick-up (At least 4 to 12 times sensor rating). Instantaneous operation is not required on the Mains or Tie breakers. If provided instantaneous element must be capable of being disabled.
4. Ground fault protection is required and shall include zone interlocking between feeder circuits and the appropriate main breaker.

#### 2.06 Panel boards

- A. Panel board bus shall be 98% conductivity copper. Bus shall be installed completely throughout panel to permit addition of new bolt-on breakers in available space in future without modifying bus.
- B. All panel boards shall have door locks. The front cover shall be a door in door arrangement with the inner door hinged to allow breaker handle access.

#### 2.07 Buss way

- A. Provide copper busway only.
- B. Service entrance busway to be furnished with switchgear. For exterior applications to include 240 volt rated space heaters to operate at 120 volts.

### **PART 3: EXECUTION**

#### 3.01 Wiring Devices

- A. Modular Furniture Spine (no telecommunications outlets) shall not be connected to a general purpose receptacle and must be connected by a furniture whip.
- B. A typical single person office space should contain a minimum of four duplex receptacles.
- D. A typical open office shall contain a minimum of four duplex receptacles and one communications outlet per workstation.

### 3.02 Dry Type Transformers

- A. Larger transformers for facilities shall be designed for location on the ground floor if possible. The PSP is responsible for coordinating maximum transformer weights and anticipated floor loading with the project structural engineer.
- B. Transformers installed in electrical rooms shall be designed and sized in coordination with architect and door dimensions. All transformers sized above 225 kVA shall require double doors or doors in excess of standard 36" width.
- C. Transformers 15 kVA and above are to be floor mounted.
- D. PSP shall provide detail layouts of electrical rooms indicating transformer locations drawn to scale with special mounting instructions as appropriate.
- E. All transformers are to be given an alphanumeric label that will relate the transformer on the room detail to the transformer on the single line diagram.
- F. The single line diagram shall indicate the alphanumeric identifier, the transformer size (kVA), and the primary and secondary voltages.
- G. Transformers for Non-Linear Loads (K-rated) shall be used at the PSP's discretion.

### 3.05 Metal Enclosed Distribution Switchgear

- A. PSP shall show equipment room layout, drawn to scale, indicating location of equipment and busway routing for interconnection.
- B. PSP shall label the switchboard consistently on the single-line diagram and the room layout.
- C. Single-line diagram shall indicate board size and required short circuit rating.
- D. PSP shall furnish a detailed specification indicating detailed control wiring, meter requirements and special construction requirements not outlined in the design standard.

### 3.06 Panel boards

- A. Branch circuit panel boards shall not serve loads on more than one level of a building.
- B. Molded case circuit breakers shall be bolt-on type only.
- C. Do not mount panel boards in hallways or other public spaces.
- D. Provide a separate panel board for labs or other high density electrical utilization equipment spaces where the power requirements exceed 12 poles, and locate the panel board near the entrance.

- E. Provide door locks on all panel boards.
- F. Lighting panel boards shall serve only lighting loads and should contain 15% spare capacity in both load and circuit breaker count.
- G. Receptacle panel boards, power distribution panel boards, main switchboards and motor control centers should contain 25% minimum spare capacity in both load and circuit breaker count.
- H. Panel boards should be designed in the electrical room detail layout such that feeder piping is minimized and installed efficiently. Provide a minimum of two 1" empty conduits from each flush mounted panel to an accessible point above the ceiling.
- I. Panel boards shown on single line diagram shall indicate required short circuit amps interrupting capacity (AIC) rating. (may be shown in panel schedules if single-line diagram not appropriate.)
- J. Provide panel locations drawn to scale in electric room detail plans.
- K. Panel boards shall be labeled with a descriptor indicating location, reference voltage level, and primary loads served.
- L. Panel schedules shall be provided indicating panel size, AIC rating, whether main circuit breaker or main lug only style, main breaker size. Panel schedules shall indicate load information in kVA per phase.

### 3.07 Busway

- A. Clearly indicate bus duct ratings and locations on drawings.