

SECTION 26 20 00 – LOW VOLTAGE ELECTRICAL TRANSMISSION

PART 1: GENERAL

1.1 Wiring Devices

- 1.1.1 This section of the standard includes design requirements for wiring connections, including receptacles and switches to equipment specified in other sections.

1.2 Dry type transformers shall be manufactured by Square D or Siemens.

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

1.3 LV Power Factor Capacitors

- 1.3.1 This section includes unit capacitors for power factor correction.

1.4 Enclosed Switches

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

1.5 Metal Enclosed Distribution Switchboards

- 1.5.1 This section includes enclosed dead-front and switchboards for application at 600 volts and less.

1.6 Panelboards

- 1.6.1 This section includes enclosed fusible switch and circuit breaker panelboards for feeders, and circuit breaker type lighting and appliance branch circuit panelboards.

1.7 Busway

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

PART 2: PRODUCTS

2.1 Wiring Devices

2.1.1 Electrical Requirements

- 2.1.1.1 All electrical switches and outlets used shall be equal to Hubbell or T&B heavy duty, specification grade or equivalent quality.
- 2.1.1.2 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 or Leviton.

2.1.1.3 Device faceplates shall be smooth finish hard vinyl. Project Service Provide (A/E) shall coordinate color requirements with building architect. Use of plastic faceplates is strictly prohibited. Galvanized face plates shall be used for all surface mounted devices.

2.2 Dry Type Transformers

2.2.1 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 an 80° C rise at a maximum ambient temperature of 40° C.

2.2.2 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°.

2.2.3 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.

2.2.4 Taps in the high voltage winding shall be four each 2½% 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.

2.2.5 Transformers used to supply 120 volt lighting or other circuits from 277 volt lighting circuits shall have a Busman type HPC fuse holder mounted in the terminal connection compartment, connected to the primary, with a properly rated Busman type KTK fuse, removable from outside the connection compartment.

2.2.6 Transformer windings can be copper or aluminum with prior approval.

2.3 LV Power Factor Capacitors

2.3.1 The capacitor unit shall be indoor, metal enclosed, and factory assembled, pre-wired tested and ready for installation.

2.3.2 Capacitor unit shall be sized such that the building will operate at no worse than 95% power factor.

2.3.3 Capacitor bank shall be rated for a life expectancy of at least 20 years. The enclosure shall be freestanding type NEMA 12. The assembly shall be accessible from the front with a continuously hinged door with a three point locking handle mechanism.

2.3.4 All capacitor cells shall be three phase industrial grade, metal encased, and utilizing threaded type terminals installed with insulating plastic terminal plate. Only three phase units shall be furnished. Single phase units that have been interconnected shall not be allowed. The capacitors shall be specifically designed for power factor correction and continuous duty.

2.3.5 The following control type items shall be included with each assembly:

2.3.5.1 A microprocessor based field programmable automatic power factor controller shall be provided and designed with the following features:

2.3.5.1.1 Digital LED readout or meter indication of actual power factor and power factor set point. The set point shall be continually adjustable to settings that are leading or lagging from 0.7 inductive to 0.7 capacitive.

- 2.3.5.1.2 Capacitor step display on number of steps activated and the number available.
- 2.3.5.1.3 Automatic or manual mode of operation.
- 2.3.5.2 Instrument transformers shall be provided for the necessary inputs into the automatic controller. Control and potential transformers shall be appropriately fused on both sides of the primary and secondary.
- 2.3.5.3 Control power transformers shall be provided, if required, for the contractors and associated equipment.
- 2.4 Enclosed Switches
 - 2.4.1 Use heavy duty type, enclosed switches only.
- 2.5 Metal Enclosed Distribution Switchboards
 - 2.5.1 Switchgear shall be dead-front construction, hinged double doors with stops, rated 600 volts 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.
 - 2.5.2 Use only circuit breakers in the switchboard. If series rated circuit breakers with current limiting fuses are required due to system fault current the series rating shall be noted and UL listed.
 - 2.5.3 Metering:
 - 2.5.3.1 Coordinate location of metering requirements with the University. If metering at the distribution switchboard is required use a Square D meter, compatible with Ion Enterprise software. The meter must be capable of data logging in the event of an outage (power supply backup). The meter must include an Ethernet gateway and communicate via Modbus protocols
 - 2.5.4 Bussing
 - 2.5.4.1 The bus shall be insulated copper with a current density of 1000A/in². The insulation shall be class B (130° 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.
 - 2.5.4.2 Neutral bars shall be full capacity rated.
 - 2.5.4.3 Provide a ground bus through the full length of each section of the switchboard.
 - 2.5.4.4 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.
 - 2.5.5 A/E 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.
 - 2.5.6 Main and Tie section devices shall be individually mounted and compartmented.

- 2.5.7. Distribution section devices shall be individually mounted and compartmented.
- 2.5.8. Auxiliary section devices shall be individually mounted and compartmented.
- 2.5.9. 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.
- 2.5.10. Future provisions: Switchboard shall be designed with future spaces (e.g.: 7 breakers on 42 circuit panel) (15% minimum) equipped with breakers and such that the future additions may be readily made in the field.
- 2.5.11. 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:
 - 2.5.11.1. 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.
 - 2.5.11.2. 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.
 - 2.5.11.3. 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.
 - 2.5.11.4. Ground fault protection is required and shall include zone interlocking between feeder circuits and the appropriate main breaker.

2.6 Panelboards

- 2.6.1. 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.
- 2.6.2. All panel boards shall have door locks. The front cover shall be a door in door arrangement with the inner door, with interior, hinged to allow breaker handle access.

2.7 Busway

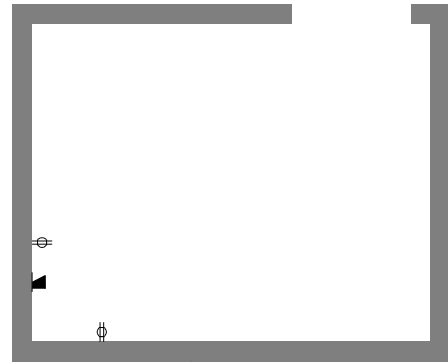
- 2.7.1. Provide copper busway only.
- 2.7.2. Service entrance busway to be furnished with switchgear and include 240 volt rated space heaters to operate at 120 volts, as needed.

PART 3: EXECUTION

3.1 Wiring Devices



Detail 6.26.20-1: Typical Single Person Office Exterior Wall (no outlets)



Detail 6.26.20-2: Typical Open Office Space Modular Furniture Spine (no telecommunications outlets)

3.2 Dry Type Transformers

- 3.2.1 Larger transformers for facilities shall be designed for location on the ground floor if possible. The A/E is responsible for coordinating maximum transformer weights and anticipated floor loading with the project structural engineer.
- 3.2.2 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.
- 3.2.3 Transformers 15 kVA and above are to either be wall mounted or floor mounted on a housekeeping pad. Up to 15 kVA may be wall or trapeze mounted if appropriate for the room layout.
- 3.2.4 A/E shall provide detail layouts of electrical rooms indicating transformer locations drawn to scale with special mounting instructions as appropriate.
- 3.2.5 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.
- 3.2.6 The single line diagram shall indicate the alphanumeric identifier, the transformer size (kVA), and the primary and secondary voltages.
- 3.2.7 Transformers for Non-Linear Loads (K-rated) shall be used at the A/E's discretion.
- 3.2.8 Special letters for differing emergency systems on ID (red labels for emergency power).

3.3 LV Power Factor Capacitors

- 3.3.1 The A/E shall show on the single line diagram the planned locations for installing power factor correction capacitor banks.

- 3.3.2 The drawings shall also indicate location of the capacitor banks in a detail of the electrical room layout.
- 3.3.3 The capacitor assembly shall be installed a minimum of 200' measured along the electrical route from the nearest SCR drive or as indicated in the VFD manufacturer's Harmonic Analysis Study.

3.4 Enclosed Switches

- 3.4.1 No requirements.

3.5 Metal Enclosed Distribution Switchboards

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

3.6 Panelboards

- 3.6.1 Branch circuit panelboards shall not serve loads on more than one level of a building.
- 3.6.2 Molded case circuit breakers shall be bolt-on type only.
- 3.6.3 Do not mount panelboards in hallways or other public spaces. Where an obsolete panel is being replaced in an existing public space, the new panel shall be flush mounted.
- 3.6.4 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 to and within the space. Provide door locks on all panel boards.
- 3.6.5 Lighting panelboards shall be 277v and shall serve only lighting loads and should contain 15% spare capacity in both load and circuit breaker count.
- 3.6.6 Receptacle panelboards, power distribution panelboards, main switchboards and motor control centers should contain 25% minimum spare capacity in both load and circuit breaker count.
- 3.6.7 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.
- 3.6.8 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 is not appropriate.)
- 3.6.9 Provide panel locations drawn to scale in electric room detail plans.
- 3.6.10 Panelboards shall be labeled with a descriptor indicating location, reference voltage level, primary loads served, and source.

3.6.11 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.

3.6.12 Distribution panel boards (400A & up) shall have a minimum of 10" of gutter space on both sides.

3.6.13 Label utilization equipment with circuit number

3.7 Busway

3.7.1 Clearly indicate bus duct ratings and locations on drawings.

END OF 26 20 00