

---

## 260500 COMMON WORK ELECTRICAL

### Part 1 – GENERAL

#### 1.1 Description

A. This section details the guidelines and expectations for the design and installation of electrical systems and equipment on Johns Hopkins University Homewood Campus. Project conditions and requirements vary, thus precluding the absolute adherence to the items identified herein in all cases. However, unless there is adequate written justification and approval from the JHFRE Engineering and Energy Department, it is expected that these guidelines will govern the design and specifications.

B. There are four primary substations on campus, each receiving two 13,200 volt feeders from BGE: Wyman Substation (Wyman Precinct), Substation No. 1 (South Power Plant), Substation No. 2 (Homewood Field), and Substation No. 3 (North Chiller Plant).

#### 1.2 Submittals

A. When designing a new building, the engineer shall submit preliminary loads to determine which campus loop the building should be fed from. When renovating an existing building, the engineer shall submit revised loading if the future load is anticipated to be higher than the current building load to ensure that existing capacity is available on the loop that is serving the building.

#### 1.3 Quality Assurance

A. All work must meet NEC standards and be UL listed.

#### 1.4 Delivery and storage

A. Material deliveries and storage areas to be approved by Owner.

B. Material storage to comply with manufacturer's recommendations.

### Part 2 – PRODUCTS

2.1 The acceptable manufacturers for electrical equipment, including: switchboards, panel boards, motor centers, motor starters, service disconnects, and unit sub-stations, will be UL listed.

A. Maintenance Material Requirement:

1. Fuses: Equal to 10% of quantity installed for each size and type, but no fewer than three of each size and type.

#### 2.2 Preferred Vendors:

A. Square D/Schneider Electric

B. Eaton/Cutler-Hammer

## 2.3 Panelboards and Switchboards

A. Provide full-length busbars with ratings as required.

B. Provide full-length neutral busbar. Lugs shall be provided and sized appropriately for each outgoing circuit that requires a neutral connection.

C. Provide copper ground bus. Lugs shall be provided and sized appropriately for each outgoing circuit.

D. Provide a factory installed main circuit breaker in all panelboards. Branch mounted main circuit breakers are not permitted.

E. Panels of "x" amperage will be:

1. Fed with cables rated at that amperage or greater,
2. Backed up with panels/breakers of at least that amperage
3. Be outfitted with a main breaker in the panel of that same amperage.

F. All breakers shall be rated 167°F. Circuit breakers shall be thermal-magnetic, molded-case bolt-on type with permanent inverse time-current overload and instantaneous magnetic tripping units and suited for the particular load which they serve.

G. Shunt trip breakers shall have 120VAC coils.

H. Provide 25% spare capacity in each panelboard for both demand and space. Spaces allocated for future use shall be fully bussed and complete with mounting hardware and filler plates.

1. Panels shall have a minimum # of 30 poles. Panels in electric rooms shall have a minimum # of 42 poles.

2. All I-Line type distribution panels shall have 99" of breaker mounting space to ensure room for required spare breaker capacity.

I. Provide door-in-door/fully hinged trim for all panels.

J. Match NEMA rating of panelboard to associated environment.

K. Provide typed panelboard directory. Handwritten directories are not permitted. When circuiting at existing panelboard is changed, a new typed circuit directory shall be provided. Prints created by a designer will have the panel directories completed on the print. It will be up to the contractor to assure that all labels are in place and correct.

L. Provide self-adhesive name tag with voltage, amperage, and source identified. All labels shall contain panel name and the source of power with the following color scheme:

1. Normal Power: White label with black lettering
2. Emergency/Life Safety: Red label with white lettering

M. Switchboards shall be dead-front, metal-enclosed and self-supporting type.

N. All switchboards shall be equipped with digital power meters that are incorporated into JHU's electric metering software: Schneider Electric/Square D Series ION 9000 (formerly PM8000).

1. Meters shall report via LAN.

2. Run a Cat 6 (or equal) Cable in 3/4" EMT from patch panel in the local Network Cabinet to EACH meter. Do not daisy-chain meters.

3. Contract SE/Square D to perform all Startup/Programming of meter(s) and integration with campus Power Monitoring Expert (PME) System.

O. Provide a 4" housekeeping pad under all switchboards.

P. Panelboards and switchboards utilized for service entrance shall have an appropriate UL labeled as suitable for service entrance. Ground fault protection shall be provided on service entrance breakers.

Q. Provide Main-Tie-Main configuration for all dual feed services with automatic transfer capability.

R. Provide mimic bus on the front of each switchboard.

S. Load center panels are prohibited. All circuit breakers shall be bolt-on.

T. Provide remote HMI station for operating switchboard without need for PPE gear.

## 2.5 Wire and Cable

A. For all building wiring, utilize NEMA WC 70; single copper conductor insulated wire; 600 volt rated insulation; 194° F maximum operating temperature for dry, wet and damp locations.

B. Utilize thermoplastic-insulated wires and cables: NEMA WC 5, UL 83; Type THWN-2 in the following locations:

1. Branch Circuits: Designed to utilize multi-wire distribution with a maximum of six current carrying conductors in raceway. Each branch circuit shall have an individual neutral.

2. Class 1 Control Circuits: Single conductors in raceway where ambient temperature is greater than 32°F.

C. Utilize thermoset-insulated wires and cables: NEMA WC 3, UL 44; Type XHHW-2 in the following locations:

1. Feeder Circuits: Single conductors in raceway.

2. Class 1 Control Circuits: Single conductors in raceway where ambient temperature is less than 32°F.

D. Utilize type XLEP, multiple twisted conductors covered with an overall non-metallic jacket for all class 2 and class 3 control and signal circuits.

E. Minimum wire size for branch circuit and power wiring shall be #12 AWG, and #14 AWG for remote control signal circuit and interlock wiring.

F. All wiring #10 AWG and smaller shall be solid.

2.6 Wire Identification and Color Coding: shall be continuous on all wiring

A. 120/208V, WYE

Phase A	Black
Phase B	Red
Phase C	Blue
Neutral	White
Ground	Green

B. 277/480V, WYE

Phase A	Brown
Phase B	Orange
Phase C	Yellow
Neutral	Gray
Ground	Green with yellow stripes

### Part 3 – EXECUTION

3.1 All conductors of any voltage will be copper and installed in an approved raceway or cable management system as listed below:

A. Electrical circuits shall be in conduit for facilities that may require future changes to electrical systems such as laboratories, shops, and mechanical equipment rooms. For these situations, all electrical branch circuits shall be in conduit. Electrical Metallic Tubing (EMT) with compression fittings shall be used for interior branch circuits and exterior circuits shall be in rigid galvanized conduit.

B. Utilize RGS conduit for all exterior applications and interior applications when located in wet or damp locations or subject to physical damage.

C. For office, classrooms and residence hall space, where electrical requirements are less likely to change, metal clad (MC) cable is acceptable for portion of the branch circuit. The home-run portion of the circuit should be in EMT from the electrical panel (or sub-panel) to a junction box in a corridor where the circuit begins to branch off into the office, classroom or residence room. Metal-clad cable is also allowable for connections to lights above drop ceilings and for connections to vibrating equipment, but must be less than 6' in length.

D. All low voltage wiring, including fire cabling and controls wiring, shall be in cable tray or conduit in main corridors. Wiring inside of wall cavities shall be in conduit. Bridal rings or J hooks are

acceptable outside of main corridors. Fire and control wiring shall be separated in some manner and uniquely identifiable.

E. See Section 260510 for requirements of Underground Work.

3.2 Electrical equipment rooms will have no other equipment in them other than that designed to deliver electrical service to the building. Rooms will be dry and have clean ventilation sized to keep room temperature at 75° F year around.

3.3 Wires and cabling of different voltages shall not be mixed in raceways or conduits.

3.4 Minimum conduit size will be 3/4" on all home runs to panels.

3.5 Neatly train and bundle all feeders and branch circuit conductors. Identify branch circuits inside panelboard and at wiring device with self-adhesive wire tag attached to the wire. All junction boxes shall be labeled with circuit numbers. Conduit shall be labeled every 30' with the circuit number.