# Facility Operations

## Electrical Construction Standards

### Part 1

1. All electrical installations concerning PSU facilities shall be in compliance with the National Electric Code (NFPA 70) with the following additions/exceptions.
2. A licensed electrician shall be on site at all times of electrical work or construction.
3. All lighting fixtures shall be manufactured be HE Williams, Lithonia, or Keystone.
4. All inside lighting shall be 4000k and outside lighting shall be 5000k unless previously approved by owner.
5. All rooms shall have Watt Stopper occupancy sensors installed. Sensors shall be set for a maximum of 10 minutes.
6. Outside lighting will be controlled by a Square D Power Link panel. If Power Link is not available, outside lighting shall be controlled by a single photo eye and or a time clock. (Do not use individual photo eyes mounted in each fixture). If Power Link is not available, a single point manual override switch shall be installed within or next to the outside lighting controls. The manual override switch shall control all outside lighting.
7. All conductors shall be THHN copper, and a minimum size #12, unless previously approved by owner.
8. The contractor is to notify the office of Planning Design and Construction and PSU Electrical Department at least 24 hours in advance of any scheduled power outage.
9. Nothing smaller than ½" flexible metal conduit will be allowed, except as stated in these standards. Flexible metal conduit lengths are subject to PSU Facility Operations approval.
10. MC type cable will be allowed for lighting in accessible ceiling spaces or where fished into existing wall spaces. MC cable shall not be installed horizontally in any wall. MC cable lengths are subject to PSU approval.

11. FMC, MC, etc. shall not be used in place of EMT.
12. No more than six light fixtures shall be placed on a single lighting whip or drop.
13. Slack wires shall be installed on all fixtures that use an entire ceiling grid space. Two wires on each fixture, located in opposite corners.
14. All panels must be labeled correctly.
15. All junctions shall be marked with associated panel designation. Junctions shall also be marked with voltage, if multiple voltages are available in the building.
16. All panels and breakers associated with the building emergency system must be painted red.
17. Conductors shall be identified at all termination points and in all pull boxes by the following method of color:

| 120 - 208 volt | 277 - 480 volt |
|---|---|
| Phase A – Black | Phase A – Brown |
| Phase B – Red | Phase B – Orange |
| Phase C – Blue | Phase C – Yellow |
| Neutral – White | Neutral – Grey |
| Ground – Green | Ground – Green |

18. No conduit shall be installed in concrete slabs or floors, or under concrete slabs.
19. No electric hot water heaters.
20. Leviton, Pass & Seymore and Hubbell are the only accepted manufacturers for switches, receptacles and other devices.
21. All switches and receptacle plate covers shall be marked with a label describing the panel and circuit number.
22. It is not permissible to share neutrals with more than one circuit.
23. A grounding conductor shall be installed in all conduits, flex, raceway, etc.
24. A grounding jumper shall be installed in all junctions, switch boxes, etc., and be bonded to the grounding conductor.

# EMERGENCY LIGHTING

25. Generator backup systems with Automatic Transfer Switch is preferred method to power emergency lights and exit signs. Natural gas is first choice, if approved by KSFMO.

26. Generator systems shall be configured with a dry set of contacts for both generator run and generator alarm status.

27. Upon completion of generator installation, a 2-hour building load test shall be completed, followed by a 2-hour 100% full load test. Load tests shall be conducted in accordance with the current edition of NFPA 110.

28. Emergency lighting shall always be on and serve as security lighting. If switching of the emergency lighting circuit is required, install Bodine brand generator transfer device for automatic switch override upon power failure. The sensing circuit for the generator transfer device shall be non-switched extension of the normal lighting (non-generator) circuit.

29. Emergency light fixtures will be identified by a red label attached to the fixture.

30. Emergency lighting shall be LED type fixtures. Fluorescent or incandescent bulbs will not be accepted.

31. Building Emergency Lighting will be fed from a separate breaker panel (same panel as exit signage).

32. If a central emergency lighting inverter system must be used instead of a generator, the inverter shall be Myers brand with automatic, programmable self-diagnostic operation and configured with a set of dry contacts for system alarm status.

33. For buildings not equipped with a generator or inverter, emergency lighting shall be permitted to utilize a self-contained battery for emergency operation. Individual LED troffers and strip fixtures shall have Bodine brand, self-diagnostic emergency drivers installed. Battery powered wall/ceiling packs and sign/light combo packs shall be Dual-Lite brand and shall be equipped with the Spectron self-diagnostic option.

34. A dedicated circuit shall be provided for battery units (for testing purposes). Only exit signage shall be permitted to share the same circuit.

35. Remodels in buildings will move existing battery backup system circuits to generator circuits.

# EXIT SIGNAGE

1. Lighted exits signs shall be LED.
2. Lighted exit signs shall be fed from the generator lighting panel or central emergency lighting inverter.
3. For buildings not equipped with a generator or inverter, exit signs shall be permitted to utilize a self-contained battery for emergency operation. Signs shall be Dual-Lite brand and include the Spectron self-diagnostic option.
4. A dedicated circuit shall be provided for battery-powered units (for testing purposes). Only emergency lighting shall be permitted to share the same circuit.
5. Remodels will replace existing incandescent or fluorescent exit signs with new LED exit signs.

# Facility Operations

## Electrical Construction Standards

### Part 2

1. Electrical Distribution & control equipment will be provided by the Owner.
2. Electrical equipment is to be Schneider Electric/ Square D.
3. All new or remodeled electrical distribution equipment to have Arc Flash Hazard/ Incident Energy Analysis Study completed and labels attached to equipment (NFPA 70E).
4. All electrical distribution equipment shall be sized to allow for a minimum 25% future growth.
5. Standard Copper Bus.
6. All distribution equipment to be Circuit Breaker type. Fusible equipment is not acceptable.
7. All new main Service Equipment to be provided with a Square D Power Logic advanced power quality meter with support for Ethernet communications.
8. All new main Service Equipment to have a single main Circuit Breaker with group mounted Circuit Breaker branch distribution.
9. SPD (TVSS) shall be integral to the distribution equipment. SPDs shall be Square D SurgeLogic, providing replaceable modules and 10-year guarantee.
10. All 250-volt breaker panels shall be NQ type and utilize QOB breakers, unless previously approved by owner.
11. All 480-volt breaker panels shall be NF type and utilize EDB type breakers.
12. I-Line distribution panels to use standard plug on construction.
13. All NF Panelboards for use as Powerlink remote panels to utilize the series G4 3500 controller with integral web server.

14. All electrical services must be able to communicate with Power Logic and have at least one Powerlink panel.

15. Provide 1” conduit from Power Logic Panel to Communications room.

16. All panelboards to be main breaker type unless its feeder is in the same room within clear sight and less than 15 ft from its remote disconnect.

17. All panelboard trims to be hinged trim design allowing access to the wire gutter by one person without removing the trim from the box.

18. Engraved nameplates to be provided by the manufacturer for switchboards, panelboards and motor control centers as simple designation only, white face with black letters. All nameplates requiring additional copy’s to be provided by the electrical contractor.

19. All switchboard breakers to have handle padlock attachments.

20. Lockout disconnects for use with motors, condensing units, etc. shall be non-fusible circuit breaker type.

21. VFDs to E-Flex type with FV bypass, 5% Line Reactor, HOA & speed pot, 1-10 volt DC input speed signal, RUN/POWER ON/ FAULT/ BYPASS pilot lights and field start up and commissioning.

22. Dry type transformers to be aluminum wound, 150 degree C temperature rise, NEMA Standard sound levels, TP1 design and supplies with mechanical lug kits.

23. All primary electrical conductors 600 volt or higher that is buried underground shall be four feet deep in plastic conduit and encased with at least 8” of red concrete all other conduits under 600 volts shall be buried at least 24” deep.

# Facility Operations

## Electrical Construction Standards

### Part 3

## Fire Alarm Systems

1. Honeywell XLS FACP (Fire Alarm Control Panels).
2. Must interface with current Campus Honeywell front end Fire Alarm Network.
3. XLSNET shall be single-mode fiber with HS-NCM cards, unless otherwise specified.
4. A key switch or individual preprogrammed buttons shall be provided at the fire alarm control panel to disable notification appliances, door release hardware, air handler shutdown, egress lighting, and elevator recall.
5. Where batteries do not fit inside the FACP enclosure, battery cabinets shall be mounted adjacent to the FACP, 60 inches above the finished floor to the top of the cabinet.
6. Voice evacuation systems shall have pre-recorded messages for fire alarm, tornado warning, all clear, testing, and testing complete. The tornado warning and all clear messages shall be executable from both the fire alarm panel and the EBI front end.
7. Where the code allows, duct detectors shall be programmed as supervisory devices and shall not initiate a general alarm.
8. Contractors shall furnish no less than one (1) each or 5% of the total number of initiation devices including, but not limited to, pull stations, smoke detector, heat detectors, monitoring modules and remote test stations.
9. Remote test stations mounted seven (7) feet or more above finished floor shall be magnetically operated. Remote test stations mounted less than seven (7) feet above finished floor shall be key operated.

10. Do not use smoke detector sounder bases as notification appliances.

11. Use the correct room numbers (what University Planning Design and Construction uses as room numbers, not architects room numbers) to insure proper descriptors are entered during programming of the FACP.

12. Provide 1" conduit pathway in building from FACP to Tele Communication room.

13. All exposed cable above the ceiling will be Plenum rated and fastened by J hooks to wall unless specified to be in conduit.

14. All concealed conduit shall be painted red. Junction box covers shall be painted red and labeled "Fire Alarm".

15. All wall mounting boxes for notification and initiating devices and conduit runs visible to the eye will be Wire Mold unless Fire Alarm manufactures boxes are used.

16. Wire Mold runs will be 500 series.

17. Breakers providing power to Fire Alarm Control Panels will be locked on and labeled in accordance with the National Fire Alarm Code.

18. In construction areas where existing smoke sensing equipment is to remain, devices shall be covered with a barrier to prevent dust contamination and nuisance alarms. A device maintenance report shall be completed before and after construction. Devices shall remain covered until room has been cleaned for occupancy. The contractor will be responsible for cleaning or replacement of devices which the contamination level has increased 5% or greater on the post-construction report.

19. After remodels are completed the addressable fire alarm system and front-end software will be updated with new descriptors (room numbers, additions, and deletions, etc.).

20. All fire alarm devices that are to be relocated or temporarily repositioned during construction will be the contractor's responsibility with work being performed by NICET certified technicians or factory trained personnel.

21. Front end will be fully functional at time of issuance or Certificate of Occupancy.

22. Notification appliances shall be labeled with the circuit number and device number. The device with the end of line resistor shall also be labeled with EOLR.

23. Imitation devices and control modules shall be labeled with the loop number and device address on the detector base, outside of pull station, or module cover plate.

24. Monitor modules shall be provided to supervise status of generator, emergency lighting inverter, and sump pump power/high water level where applicable.

25. Wiring Preferred Color Code and wire sizes (depending on loop length):

    A. Signature Loop - Initiating Circuit- twisted pair 18 awg solid red jacket type FPLP: Blk = - RED =+

    B. Notification Circuitry- Combination Horn Strobe- 14 awg stranded THHN: Blk = - Red=+

    C. XLS Data Bus cable to/from FACP- 2 twisted pair 18 awg solid Red Jacket type FPLP: Yel = - Red = + & Blk = - Blu =+

    D. Door Holding Circuitry- pair 14 awg stranded THHN unless voltage calculation calls for 12 awg stranded THHN Blue = Load & White = Neutral

# Electronics

## 1. Door Security

A. Must interface with current Campus Honeywell EBI front end.

B. Existing Security points need to be added to the new addressable fire/security systems and front-end software when buildings are upgraded or completely remodeled.

## 2. Synchronized Clocks

A. All synchronized clocks installed in PSU Facilities shall be model Valcom VIP-D625A. Clocks will be powered over ethernet and connected to a local PSU ITS networking switch.