

DIVISION 26 ELECTRICAL

1. GENERAL

- A. The following design development narrative describes the Electrical system requirements for the EHRM Infrastructure Upgrades project at Cincinnati and Ft. Thomas VA campuses based on our understanding of the project scope and applicable codes, criteria, and regulatory standards.

2. DESIGN CONDITIONS AND APPLICABLE CODES

- A. The electrical system will be in accordance with the following standards and design guidelines. The specific requirements of these standards are not included in this document.
1. VA OIT - Infrastructure Standard for Telecommunication Spaces Version 3.1
 2. NFPA 70 - National Electrical Code - 2020
 3. NFPA 72 - National Fire Alarm and Signaling Code - 2019
 4. NFPA 101 - Life Safety Code - 2018
 5. NFPA 75 - Standard for the Fire Protection of Information Technology Equipment
 6. IESNA Illuminating Engineering Society of North American
 7. International Building Code (IBC), 2018
 8. National Electrical Manufacture's Association (NEMA)
 9. Federal Guidelines Institute Guidelines for the Design and Construction of Healthcare Facilities
 10. ASHRAE 90.1 Energy Standard for Buildings Except Low-Rise Residential Buildings (IESNA Cosponsored) 2013
 11. All applicable Federal, State, City and Local Codes, Regulations, Ordinances, Publications and Manuals

3. DEMOLITION SCOPE

- A. All the existing lights, devices and switches will be removed from the existing rooms for the new TR rooms. The existing circuits will be modified to maintain circuit continuity.

4. NEW SCOPE

- A. TR room Electrical Panels:
- a. Each TR room will be provided with an emergency panelboard and normal power panelboard, except for Buildings 3, 8, Parking Garage, TB, and TE, as shown on the drawings.
 1. The emergency panelboard source is from an automatic transformer switch (ATS) fed by the emergency generator system.
 - a. TR rooms that serve the hospital areas will be classified as critical equipment and the generator source will be from the level 1 Emergency Power Source (EPS) fed from parallel generators on Critical branch.
 2. The normal panelboard source is from the normal utility source distribution.

3. TR rooms that do not serve hospital areas will still be fed from an available circuit on the Emergency Power Source (EPS) generator branch.
The normal source for the normal power panelboard and emergency power panelboard will be fed from two different distribution board sources.
 4. The TR panelboards neutral bus will be sized 200% of current carrying bus.
 5. The neutral conductor to all new TR panels from upstream panels will be up sized by one conductor size.
 6. The TR panels will be 120/208/3ph/4w panels. Each panel will be sized per the electrical demand.
 7. Each panel in the TR room will be provided with main bus remote meter and remote surge protection device.
 - b. Buildings 3, 8, Parking Garage, TB, and TE will have one electrical panel off the building service equipment.
 - c. Building 1 will be provided with a new ATS and transformer powered from existing switchboard ESWB for generator back up power. The normal power will be fed from switchboards US-1C and US-1D. US-1D will feed the normal side of the new ATS.
- B. Lighting:
- a. TR rooms will be provided with suspended LED 4000k, 80CRI+, strip light fixtures.
 - b. Light level will be an average of 40FC at 30".
 - c. Light fixtures shall be controlled by ceiling occupancy sensor with wall mount low voltage dimming control / over-ride switch. The sensor will turn the lights on automatically at 50% level and will provide auto off after room is vacant for 15 minutes. The wall switch will allow user to manually turn on lighting to 100% level.
 - d. The light fixtures will be fed from the emergency generator branch panel in the TR room.
- C. Server Room A437
- a. Existing UPS
 1. Existing 3rd floor UPS is a 160 KVA with 15% average load (18 KVA).
 2. Existing 4th floor UPS is an 80 KVA with 45% average load (36 KVA).
 3. The average total load of existing 17 racks is 54KVA.
 - b. Renovated Server Room / UPS Design
 1. The 3rd floor UPS shall remain and be used to power the server room new racks.
 2. The 4th floor 80KVA UPS will be removed and replaced with a 100KVA UPS with 10 minute back up.
 3. OIT Standard Calculations are as follows:
 - a. Renovated Server room will have 19 racks
 - b. $3.5 \text{ KVA per rack} = 3.5\text{KVA} \times 19 = 66.5\text{KVA}$
 - c. Equipment power supply, 66.5KVA is less than 80kVA rating.
 - d. $85\% \text{ of UPS rating } (0.85 \times 80\text{kVA} = 68 \text{ KVA})$
 - c. Racks will be fed from A and B side branch panel circuits each source from A and B side UPS respectively. The racks will be provided with underfloor L21-20 or L21-30 receptacle. The room has limited above ceiling space. Power track busway would interfere with racks doors.

- d. The server room will have (2) 100 amp 120/208v/3ph/4w panels not feed from the UPS1 or UPS2. One on critical branch and the other on normal branch. These panels are for miscellaneous loads, lights, dry agent and EPO power.
 - e. Lights in server room will be controlled by ceiling occupancy sensor and low-voltage wall switch. The sensor will turn the lights on automatically at 50% level and will provide auto off after room is vacant for 15 minutes. The wall switch will allow user to manually turn on lighting to 100% level during normal operations. The lighting will also turn to full brightness during emergency critical power loss.
 - f. The room will be provided with (3) emergency power off button (EPO) systems. Each system will have one button per door entering the space.
 - 1. One EPO system will shut down UPS1.
 - 2. Second EPO will shut down UPS2.
 - 3. Third EPO will shut down Normal panel, Critical panel and HAVC equipment serving the room.
- D. TR Electrical Devices:
- a. Receptacles, and power connections will be provided to meet the requirements of Infrastructure Standard for Telecommunications Spaces. These devices will be circuited to the panel in the space. The neutral will be up sized by 1 size from panel to rack connection (OIT 4.2.4).
 - 1. 1 Rack PDU will be provided with one 20-amp 4w+G twist lock receptacle from the two panels in the room.
 - 2. 2 Rack PDU will be provided with one 30-amp 4w+G twist lock receptacle from the two panels in the room.
 - 3. 3 Rack PDU will be provided with one 60-amp 4w+G junction box with wipe to PDU, from the two panels in the room.
 - 4. When the room has more than 3 Racks, the above configurations will be used.
 - 5. Each wall, in TR, will be provided with two duplex receptacles per wall.
- E. Fire Alarm (NFPA 75)
- a. TR Rooms:
 - 1. TR rooms that feed Hospital will be provided with smoke detection devices.
 - 2. TR rooms with sprinkler pipe, will be provided with tamper and flow switches as required.
 - 3. Fire alarm will monitor the activation of TR rooms when they have a clean agent suppression system.
 - b. Server rooms (rating 2 and 3)
 - 1. Server rooms will be provided with smoke detection devices.
 - a. Smoke detector will be provided above ceiling or below floor when the spaces are used for air flow.
 - 2. Server room will be provided with tamper and flow switch for sprinkler system.
 - 3. Fire alarm will monitor the activation of Server room clean agent suppression.
- F. Other Electrical Items:
- a. 120V circuit will be provided from the critical power panel for door security.

- b. The mechanical equipment that services the TR space will be fed from the emergency generator source panelboard.

Distribution Equipment, and Branch Circuit Panelboards

- A. The distribution panelboards and branch circuit panelboards will have copper phase, neutral and ground buses. Load centers will not be allowed and multi-section, such as double-section, panelboards will not be allowed. The maximum number of circuit breakers in a panelboard will not exceed 42. The neutral bus in each panelboard will be 200% fully rated and have an adequate number of terminals to accept one neutral conductor termination for each branch circuit. All circuit breakers will be bolt-on type and fully rated for the available short circuit fault current. Circuit breakers will be thermal-magnetic, except that fully adjustable electronic-trip circuit breakers will be used when necessary for fault and overcurrent coordination.
- B. New transformers will have copper windings and be K13 rated.
- C. See one-line diagram for a general system arrangement.
- D. Each TR minimum panelboard requirement will be two dedicated electrical branch circuit breaker panelboards, 120/208v, 3-phase, 100 ampere main shunt trip circuit breaker, with 42 spaces. Loads will include, but not be limited to: convenience receptacles, rack receptacles, and HVAC equipment (including split systems).
- E. Distribution Equipment and Branch Panelboards with significant nonlinear load will have the neutral sized for the larger of either 1.73 times the phase conductor or one size larger than the phase conductor. The neutral feeding these panels shall be counted as a current carrying conductors.

Surge Protection Devices

- A. Externally mounted Type 1 or Type 2 surge protective devices will be provided at the main distribution panelboard and as necessary, at the panelboards serving electrically sensitive equipment.

Metering

- A. Panelboards in the TR rooms will be provided with meter.

Grounding and Bonding

- A. The existing electrical system is grounded in accordance with the National Electrical Code.
- B. An equipment grounding conductor will be routed with branch circuit and feeder conductors and bonded to a ground bus or ground lug at each end and in all pull boxes and cabinets.

Wiring Devices and Branch Circuits

- A. Wiring devices and branch circuits will be provided for all equipment and areas as required in the scope of work. The convenience outlets will be heavy-duty specification grade, 20 ampere, 125 volt rated duplex devices, except where heavy duty hospital grade is required by NFPA requirements.

Wiring and Raceways

- A. All wiring (120 volts and above) will consist of individual conductors run in raceway. All conductors will be copper. Conductor insulation will THHN-THWN or XHHW-2, as required for the application, with a minimum size of #12 AWG except for control wiring which may be #14 AWG and special systems such as public address will be minimum size as required by the respective manufacturer and other conditions such as voltage drop.
- B. All interior conduits will be EMT and no smaller than ½-inch in diameter.
- C. Flexible metal conduit will only be used for light fixture whips and connections to motors and other vibrating equipment; lengths will not exceed six feet. Liquid tight flexible metal conduit will be employed where exposed to moisture or outdoors. Flexible metal cables, including AC and MC cables, are prohibited.
- D. All interior electrical equipment will be NEMA 1 construction.

Interior Lighting

- A. Interior lighting will generally consist of new chain hung strip LED type fixtures with prismatic acrylic lens, 4000K CCT, 80CRI and LED driver.
- B. New lighting will meet ASHRAE 90.1 lighting power density requirements.
- C. Lighting will be controlled to meet ASHRAE 90.1 requirements. See lighting control scheme mentioned for TR rooms and Server room within this document.