

SECTION 26 10 00**MEDIUM-VOLTAGE ELECTRICAL DISTRIBUTION AND FEEDER ENTRANCE****PART 1 - DESIGN DIRECTIVES****1. SECTION DESCRIPTION**

- A. Campus buildings' electrical feeder entrances above 1000 V.

1. Electrical feeder design requirements.
2. Architectural requirements.
3. Energizing requirements.
4. Other ancillary items.

2. CAMPUS ELECTRICAL SYSTEM DESCRIPTION

- A. All power on campus is distributed underground.

1. Power Supplied to Dartmouth College: From the Liberty Utilities local area overhead 13.2 kV distribution system to two campus substation locations.
 - a. South Campus Substation: Power is transformed from 13.2 kV to 4.16 kV.
 - 1) Serves campus heating plant 's interconnected generation.
 - 2) Serves as source for twelve (six loop circuits) 4.16 kV underground distribution feeders serving campus buildings.
 - b. North Campus Substation: An interconnection point supplying six (three loop circuits) 13.2 kV underground distribution feeders serving campus buildings.
 - c. Each Loop: Normally operated as two radial feeders with an open center point.

- B. Buildings Served from Campus Medium Voltage Distribution System shall have:

1. Either of the following:
 - a. If served by a Loop Feeder: Two 15 kV loop switches
 - b. If served by a Radial Feeder: One 15 kV disconnect switch
2. A 15 kV switch with overcurrent protection shall be supplied for the building transformer.

- C. Most buildings on campus receive electric power from the college owned medium voltage distribution system.

1. The "service" conductors entering the building, for the purposes of code compliance, are considered to be feeders, not service entrances.
2. The rules governing these conductors and main disconnects for each building are found in NEC article 225.

3. DESIGN CRITERIA

- A. Design of campus medium-voltage electrical distribution up to the building Medium Voltage (MV) entrance feeder and equipment shall be by Dartmouth FOM-Engineering and Utilities' approved medium-voltage electrical engineers.
 - 1. Approved Engineers shall design or review the following:
 - a. Medium-voltage substations.
 - b. Medium voltage overcurrent protection and relaying.
 - c. Coordination.
 - d. Feeder extensions and relocations.
 - e. Underground infrastructure design and specifications.
 - f. Review MV building entrance equipment.
 - 2. FOM-Engineering:
 - a. Provides the interface and relationship between project designer and medium-voltage system design and/or review.
 - 3. Dartmouth's Engineering and Utilities Group:
 - a. Maintains a model of campus electrical system and can provide information from this system model to project design engineers upon request.
- B. Planning for Feeders to Buildings:
 - 1. Undertaken in coordination with FOM-Engineering and Utilities early in design process.
- C. Dartmouth and Town of Hanover Interpretation of NEC:
 - 1. Where NEC refers to, "... installations under single management, where documented safe switching procedures are established and maintained for disconnection, and where the installation is monitored by qualified individuals ..." Dartmouth College and the Town of Hanover agree this is not applicable to Dartmouth's operations.

4. CONSTRUCTION DOCUMENT REQUIREMENTS

- A. Design Documents: Complete grounding details. Include sizes of conductors and location of main system bonding jumper.
- B. Medium Voltage Feeder Entrances: Must have sufficient physical length/distance between feeder entrance and Medium voltage switch cabinet to allow pull-boxes (where necessary) and minimum bending radius of feeders.
- C. Documents shall show details that provide for MV feeder entrances to be in separate raceways (conduits/wireways) from ductbank entrance to the 15 kV loop switch.

5. ARCHITECTURAL REQUIREMENTS

- A. Main Electric Rooms: Must have the following.
 - 1. Painted walls and sealed floors.
 - 2. Doors must have locking panic hardware.

- a. Metal-clad type MV equipment with no exposed cables: Keying to be 7 Mead/Mech.
 - b. Open-vault type MV equipment with exposed cables: Keying to be 7 Elect.
 - c. Where open-vault-type MV equipment that shares space with LV electrical equipment; a chain-link fence with gate shall be provided to provide separation.
- 3. Doors must have signage indicating “DANGER – High Voltage Electric”
 - a. Signage will be provided by FOM-EL Shop

6. DEFINITIONS, ABBREVIATIONS

- A. NEC - National Electrical Code, latest edition adopted by New Hampshire
- B. MV – Medium Voltage

7. RELATED SECTIONS

- A. Section 26 24 13 - Switchgear, Switchboards, Panelboards and Circuit Breakers.
- B. Section 26 05 26 - Grounding and Bonding for Electrical Systems.
- C. Section 26 05 43 - Underground Ducts and Raceways for Electrical Systems.
- D. Section 26 05 13 - Medium Voltage Cables And Terminations
- E. Project Close-Out Docs
- F. FOM Turnover Procedure - contact FOM Director of Operations for turnover procedures.

PART 2 - PRODUCTS

- 2.1 Not Applicable

PART 3 - EXECUTION

3.1 MEDIUM VOLTAGE (>1000V) DISCONNECTS, TRANSFORMERS, FEEDERS, GROUNDING

- A. Location of Disconnects: “Nearest the point of entrance of conductors” per NEC; approximately 15 feet of conductor length.
- B. Grounding and System Bonding Jumper: See Section 26 05 26 – Grounding and Bonding for Electrical Sections.

3.2 ELECTRICAL ENERGIZING REQUIREMENTS of MEDIUM-VOLTAGE ELECTRICAL EQUIPMENT

- A. Prior to Energizing Medium-Voltage Equipment: Complete the following tasks.
- B. Short Circuit, Coordination Study and Arc Flash Hazard Analysis:

1. Final short circuit, coordination study and arc flash hazard analysis must be submitted and approved by DC-FOM Engineering and Engineer of record.
2. Protective Device Settings: Adjusted per the coordination study.

C. Start-Up and Testing:

1. Manufacturer's start-up must be completed.
2. 3rd Party Electrical Testing: Completed per specifications by 3rd party testing contractor.
 - a. MV cables.
 - b. MV switchgear.
 - c. Transformers.
 - d. Secondary circuit breakers.
3. Secondary Main Breakers: Tested by primary injection test.
4. All Startup and Test Reports: Delivered to DC-FOM Engineering and project commissioning agent.

D. Main Electric Room: The following is to be completed.

1. Electric Room Doors with Locking Panic Hardware: to be installed and functional.
 - a. Lock Cores, shall be by FOM-Lockshop: 7Mead/Mech (with pass-key for Contractor) where MV electrical equipment is enclosed.
 - b. Cores and/or Padlocks, by FOM-Lockshop: 7Elect where MV electrical equipment is exposed.
2. Electric Room Doors: Signage by FOM-EL Shop is to be installed.
3. Exposed MV Cables: Electric vault fencing with gate, must be installed, and grounding completed.
4. Ventilation fans and ductwork: Installed and operational.
5. Wall and Ceilings: Sealed and painted.
6. Floors: Sealed.
7. Firestopping: Complete.
8. Fire-Protection - Sprinkler System: Complete and operational.
9. Any Other Equipment Installation and/or Construction: Complete and operational.

E. Electric Room and Electric Equipment Maintenance Cleaning:

1. Cleaning: Electrical equipment to be cleaned and free of all dust and dirt; wiped down with lint-free rags. Cleanliness Acceptance: By FOM-EL Shop.
2. Electric Rooms:
 - a. Maintained, cleaned, and made free of dust and dirt. HEPA vacuum floors and surfaces, protecting electrical equipment from fine dust.
 - b. Sealed and protected from dust and dirt entry. Energized electrical equipment must be maintained free from dust until turnover to Dartmouth FOM.
3. Cleanliness Acceptance: By FOM-EL Shop.
4. If Electrical Equipment Becomes Contaminated with Dust/Dirt After Energizing:
 - a. Reclean equipment.

- b. Equipment will need to be re-accepted by FOM-EL Shop.
- F. Energizing Planning:
 - 1. Project Team:
 - a. Keep FOM- Electrical Engineer and FOM-Electric Shop apprised of project's anticipated schedule for energizing through project's construction schedule.
 - b. Schedule meeting with FOM-Electric Shop and FOM-Electrical Engineer three weeks in advance of planned energizing and then once per week thereafter up to the date of the energize procedure.
 - 2. AHJ Approval for Energizing: Provide in writing to FOM-Engineering and Utilities.

3.3 FINAL TURNOVER

- A. Signage: Complete and affixed to electrical equipment.
 - 1. Labelling and Marking of Electrical Equipment: Completed.
- B. Arc Flash Labels: Affixed.
- C. Meters: Operating and configured correctly. IP addresses to be set,. Meters and/or gateways must be communicating over IP network.
 - 1. Meter Labels Including IP Addresses: Provided by FOM-EL Shop.
 - 2. FOM-Engineering and Utilities will follow-up with configuration of meters to energy and power monitoring software.
- D. Training: Provided to FOM-EL Shop and FOM-Engineering and Utilities.
 - 1. Two sessions scheduled with approval of FOM with minimum notice of two weeks.
- E. Final Review/Acceptance of Installation: By FOM-Engineering and Utilities, Commissioning Agent, and Engineer of Record.
 - 1. Written Report: Provided to FOM-Engineering and Utilities, and for files.
- F. Electrical Equipment to be free from dust until turnover to Dartmouth FOM.
 - 1. Cleanliness Acceptance: By FOM-EL Shop. Provide written acceptance to FOM-Engineering and Utilities for inclusion in final acceptance.
- G. As-Builts and O&Ms: Turned over to FOM Project Close-Out Manager after review and acceptance by FOM-Engineering and Utilities.
- H. Turnover: Contact FOM Director of Operations for turnover procedures.

END OF SECTION