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| SUNY State University Construction Fund | **Directive: 26-1 Campus and Building Electrical Distribution Systems**<br>**Responsible Office: Design & Construction**<br>**Last Revised Date: January 2023** |

# SUMMARY

This Directive provides the consultants with the requirements of the State University Construction Fund (SUCF) for SUNY projects. The requirements detailed within are to be implemented into the project's specifications and/or drawings. The intent is not for the specifications or drawings to reference back to this document for compliance nor is it intended to override or amend the applicable laws or codes where either is more stringent.

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# Section 1 – CAMPUS ELECTRICAL DISTRIBUTION SYSTEMS

## A. GENERAL

1. Most campuses are provided with a medium voltage (5kV – 15kV) electrical service and distribute power to each building with medium voltage switchgear, underground electrical feeders, and pad mounted switches and transformers at each building. The medium voltage electrical distribution system is typically arranged in a loop or dual radial configuration and each building is served from redundant feeders. The campus owns and maintains the entire electrical distribution system.

## B. DESIGN PHASE INVESTIGATION

1. It is the responsibility of the design team to determine the source of power, condition, and adequacy to serve the new and existing loads. This typically involves the review of existing electrical plans, one-line diagrams, electrical studies and metered data as well as performing site investigations.
2. Where site investigations involve existing manholes, handholes, ductbanks or other existing electrical equipment, the assistance of an electrician may be necessary. Provide SUCF with the draft scope of services for this investigation for review prior to hiring the electrician. This investigation should be completed during the schematic design phase. The schematic design phase report shall indicate the existing manhole dimensions, butterfly drawings of the manholes, condition of the ancillary equipment in the manhole (cable supports, grounding, ladders, etc.), the size and configuration of the ductbank, mandrel results and the type and condition of the ductbank. The schematic design phase electrical drawings shall indicate the locations of all new and existing electrical equipment needed to power the building.
3. When electrical metering data is not available, it may be necessary to hire an electrician to install temporary meters. This meter(s) shall be installed for a minimum of 30-days and shall continuously record the highest average kilowatts reached and maintained for a 15-minute interval.
4. An electrical load letter shall be provided to the electrical utility company for all new building projects and for projects that increase the total building electrical demand. A draft of the load letter shall be provided with the design manual submission and the information provided with the load letter shall be coordinated with the utility company's requirements.

## C. MEDIUM VOLTAGE FEEDERS, DUCTBANKS AND MANHOLES

1. General
   a. Provide new medium voltage feeders for new construction or significant building renovation projects.
   b. Determine how the new feeders are to be connected to the existing medium voltage electrical system, identify feeder conductor sizes and cable requirements.
2. Feeders
   a. All new feeders shall be provided with single shielded copper conductors with ethylene-propylene-rubber (EPR) insulation. Conductors shall be MV-105 rated with 133% insulation level. Confirm conductor requirements with campus standards.

b. Inside of manholes, and handholes shall be arc proofed with fire tape.

3. Ductbank
   a. Feeders shall be installed in new ductbank unless existing ductbank has been confirmed to be adequately sized and in good condition.
   b. Minimum buried depth shall be 30" below finished grade.
   c. Pitch a minimum of 0.5% away from buildings and equipment, pitch towards manholes and handholes.
   d. Conduit shall include pull wire.
   e. Provide detectable warning tape 12" below finished grade
   f. The new ductbank shall be encased in reinforced concrete with 5" schedule 80 PVC conduit.
   g. Provide one spare conduit for each active conduit.
4. Manholes
   a. Shall be provided for all underground feeder connections and as required to accommodate cable pulling. Provide pulling irons within each manhole. The maximum distance between manholes or between a manhole and a building shall be no more than 300'.
   b. The minimum interior clear work area shall be 8'Lx8W'x7'H. It shall be provided with non-metallic cable supports, grounding, and all other required ancillary equipment. Ancillary equipment in existing manholes used for new feeders shall be replaced when found in poor condition.
   c. Manholes shall be precast concrete with an applied joint sealant to withstand maximum hydrostatic pressures at installation location with ground water level at grade.
   d. All manhole penetrations shall be sealed watertight.
   e. Manhole structure and cover shall be H-20 rated
      1) Manhole covers shall be cast iron, a minimum of 30" in diameter, with label cast in identifying the service.

## D. MEDIUM VOLTAGE SWITCHES

1. Each building shall be served from dedicated medium voltage switch(es) arranged in a loop or dual radial configuration.
2. Exterior locations shall use pad mounted, gas insulated type switchgear.
3. Interior locations shall use fused air interrupter type switches or pad mounted, gas insulated type switchgear.
4. Coordinate with Campus standards for switch requirements.

## E. MEDIUM VOLTAGE TRANSFORMERS

1. Each building shall be served from a dedicated medium voltage transformer.
2. Exterior transformers shall be provided with a liquid filled, less flammable type of insulating fluid.
3. Interior transformers shall be dry type with a cast-coil type of construction (unless Campus standards differ).
4. For projects that require transformers to be assembled in buildings, this work shall be performed by the manufacturer's trained and certified field technicians. All UL listings and warranties shall be maintained.

5. Coordinate with Campus standards for transformer requirements.

# Section 2 – BUILDING ELECTRICAL DISTRIBUTION SYSTEMS

## A. MAIN SECONDARY ELECTRICAL DISTRIBUTION EQUIPMENT

1. The main secondary electrical distribution equipment shall be located in a dedicated electrical room and shall be switchgear or switchboard type of construction. Panelboards, load centers or similar equipment are not acceptable.
2. All main and feeder circuit breakers in the main secondary equipment shall be insulated-case or molded case with electronic trip units (long, short, instantaneous, and ground).
3. The preferred voltage of the main secondary distribution equipment is 480/277V.
4. Confirm the arrangement type (single-ended, double-ended, unit substation, etc.) of the main secondary equipment with campus standards.

## B. SECONDARY ELECTRICAL DISTRIBUTION EQUIPMENT

1. The secondary electrical distribution equipment (switchboards, panelboards, transformers) shall be located in equipment rooms or closets. Branch circuit panelboards, with **campus approval**, may be located in classrooms or corridors.
2. Molded-case type circuit breakers with electronic trip units shall be provided for all main circuit breakers and 250A or larger rated feeder circuit breakers.
3. Switchgear, switchboards and panelboards shall be provided with 20% breaker space for future loads.

## C. METERING

1. For buildings greater than 25,000 sq. ft. the electrical distribution equipment shall be arranged to allow metering of the total building electrical energy, HVAC systems, interior lighting, exterior lighting, and receptacle circuits.
2. Buildings equipped with a Building Management System (BMS) shall have the meters integrated to display and record the data.
3. Meter Capabilities
   a. The metering shall be capable of recording in 15-minute intervals and report the data in hourly, daily, monthly, and annually totals.
   b. The metering data must be able to be retained for a minimum of 36 months.

## D. EMERGENCY AND STANDBY ELECTRICAL DISTRIBUTION EQUIPMENT

1. Emergency and Standby Generator
   a. An emergency generator shall be provided for high-rise buildings and any building with a fire pump. For all other buildings, an emergency or standby generator is optional, and it shall be confirmed with the project scope and the campus if a generator should be provided.
   b. Natural gas is the preferred fuel type for the generator; however, this shall be confirmed with the campus. The capacity of any existing natural gas system to fuel the generator shall be confirmed as part of the project.
   c. The generator shall provide emergency and legally required stand-by power to equipment as required by the Building Code as well as other optional stand-by loads as requested by

the campus. Typical optional stand-by loads include HVAC equipment to maintain minimal heating, elevators, IT/data communication systems, fume hoods, laboratory refrigerators and freezers.

d. Confirm with the campus if a load bank should be provided with the generator. If required by the campus, the load bank shall be sized for at least 50% of the generator kW rating.
e. Generators can be located indoors or outdoors. Coordinate location preference with the campus standards.

2. Automatic Transfer Switches:
   a. Provide dedicated automatic transfer switches for the emergency loads (life safety, critical, and equipment) and the legally required and optional stand-by loads.
   b. Automatic transfer switches for health care occupancies shall be provided with a manual bypass. Confirm with the campus if manual bypass should be provided for other occupancies.
   c. The emergency electrical distribution equipment shall not be located in the main electrical room when the main distribution equipment is rated 480/277V and is equal to or greater than 1,000A.
3. Fire protection for emergency system feeders shall comply with the National Electrical Code for assembly occupancies for not less than 1000 persons; buildings above 75 feet in height; and for health care occupancies.

# Section 3 – DRAWINGS AND SPECIFICATIONS

## A. DRAWING REQUIREMENTS

1. Electrical Demolition Site Plan
   a. Indicate the locations of existing manholes, ductbanks, medium voltage feeders, switches, and transformers that power the building and provide detailed notes describing the associated electrical removal work.
   b. Provide detailed notes describing any required power outages to perform the removal work. This may require de-energizing other buildings powered from the radial or loop feeders and performing this work during restricted periods.
2. Electrical Site Plan
   a. Indicate the location of the source of power, medium voltage feeders, ductbanks, manholes, switches, transformers, and secondary feeders into the building.
   b. Provide detailed notes describing how the new medium voltage feeders are to be connected to existing feeders or medium voltage distribution equipment.
   c. Provide detailed notes describing any required power outages to perform the new electrical work. This may require de-energizing other buildings powered from the radial or loop feeders and performing this work during restricted periods.
   d. Provide profile sections indicating new and existing utilities for the entire length of new electrical ductbanks.
3. Electrical Demolition Floor Plans
   a. Indicate the location of all existing electrical distribution equipment and provide notes describing the electrical work to remove this equipment and associated conduit and wiring.

This equipment includes, medium voltage switches, medium voltage transformers, main secondary switchgear or switchboards, distribution panelboards, power and lighting branch circuit panelboards, generators, and automatic transfer switches.

4. Electrical Floor Plans
   a. Indicate the location of all electrical distribution equipment. This equipment includes, medium voltage switches, medium voltage transformers, main secondary switchgear or switchboards, distribution panelboards, power and lighting branch circuit panelboards, generators, automatic transfer switches and the conduit routing path for significant feeders.
   b. Provide an enlarged plan of the main electrical rooms drawn at ¼" scale with the National Electrical Code required clearances shown.
   c. All electrical equipment is to be drawn to scale and be based on the largest footprint from the specified acceptable manufacturers.
   d. Provide overall floor plans indicating the pathway for removing and bringing in the electrical equipment into the building. Architectural drawings may be needed to indicate any work for enlarging existing opening or for protecting existing floor and wall systems or for maintaining egress in occupied buildings.
5. Electrical Demolition One-line Diagram
   a. Indicate how the existing building's electrical system is connected to the existing campus medium voltage electrical system and the equipment, feeders, and connections to be removed.
   b. Indicate all existing medium voltage equipment, main secondary switchgear or switchboards, motor control centers, panelboards, transformers, generators and automatic transfer switches to be removed with their associated electrical ratings.
6. Electrical One-line Diagram
   a. Indicate how the new electrical system is connected to the existing campus medium voltage electrical system.
   b. Indicate all new medium voltage equipment, main secondary switchgear or switchboards, panelboards, transformers, generators and automatic transfer switches with their associated electrical ratings and feeders.
   c. This diagram shall indicate the ratings for all feeder overcurrent devices that power other distribution equipment. A simplified riser diagram is not acceptable.
7. Panel Schedules:
   a. Provide panel schedules for all new or existing modified electrical panels. Schedules to indicate the electrical load data for each overcurrent device as well as the total connected and diversified load.

## B. SPECIFICATION REQUIREMENTS

1. Provide Division 26 technical specifications using the standard Construction Specifications Institute (CSI) format.
2. Indicate (3) acceptable manufacturers for each of the products identified in Part 2 of the specification. It must be confirmed that each of the acceptable manufacturer's products can meet the technical and space requirements for the project.

3. Indicate the testing requirements in Part 3 of the specification. At a minimum, products shall be tested per the latest National Electrical Testing Association (NETA) Acceptance Testing Specifications (ATS) requirements.