NC State University Design and Construction Guidelines
Division 26 Transmission and Distribution

1.0 Purpose

A. This section provides the NC State requirements for the campus distribution system. Campus buildings are served by the medium voltage distribution system.

2.0 General Requirements

A. The designer shall consolidate mechanical and electrical equipment on the building site. Equipment shall be located adjacent to service areas and loading docks.

B. The designer and the contractor shall protect the landscape and avoid disturbance of any area within the drip line of trees when routing underground lines.

C. Drawings shall include single-line diagrams, plans, and details such as circuit designations, conduit routing, wire types and sizes, conduit types and sizes, enclosure and equipment classifications, and circuit breaker types.

D. Medium Voltage Distribution

1. NC State's North, South, and Central precincts east of Gorman St. are supplied electrical power at one point of delivery from the Sullivan Site Substation. NC State operates and maintains the 12,470/7,200-Volt, grounded-Y medium voltage distribution system. It is installed primarily in an underground conduit and manhole system.
2. Centennial Biomedical Campus (CBC) is supplied electrical power from the CBC Substation. NC State operates and maintains the 22,860/13,200-Volt, grounded-Y medium voltage distribution system. It is installed primarily in an underground conduit and manhole system.
3. The Centennial Campus is supplied electrical power from the Centennial Substation. NC State operates and maintains the 22,860/13,200-Volt, grounded-Y medium voltage distribution system. It is installed primarily in an underground conduit and manhole system.
4. Provisions shall be made for the installation of metering and current transformers (CTs).
5. NC State will perform the operation of all primary voltage switches on the campus electrical distribution systems. Any requests for switching shall be made a minimum of 10 working days in advance.
6. The contractor shall provide all grounding locks, signs, and other safety equipment. The contractor shall solidly ground all high-voltage circuit conductors before starting work and the grounding must remain on circuit conductors while work is being performed. The contractor shall remove all locks,

grounds, signs, and other safety equipment after work is completed. NC State shall inspect the system before contractor can operate any new equipment.

7. NC State delivers primary power to campus loads through totally enclosed metal-clad switchgear. Feeder loops are protected by removable air insulated circuit breaker units. Over-current and fault protection for each feeder consists of circuit relays, one in each phase and one for ground fault protection. Sectionalizing load-break switches connect individually fused high-voltage building laterals into the looped circuits. Air-insulated sectionalizing switches are required.
8. Individually protected load-break switch devices with resettable fault interrupters shall be used to protect all transformers. Pad-mounted transformers shall have distribution-type lightning arrestors that include suitable barriers to separate high- and low-voltage compartments.

E. Secondary Voltage Distribution Systems

1. The secondary voltage ratings of transformers shall be 120/208 Volt three-phase, 120/240 Volt single-phase, 277/480 Volt three-phase, or 277 Volt single-phase, depending upon the type of load served. Some high load situations may necessitate a 4,160 Volt, three-phase secondary.
2. Large mechanical loads and lighting loads require a 277/480 Volt system with sub-feeders to dry-type transformers serving 120/208 Volt receptacle and small motor loads. Design shall use a two-voltage system for loads 500 KVA and larger.
3. Freestanding switchgear is required to accommodate building service-entrance power requirements. The disconnecting means shall consist of either an air circuit breaker or molded case circuit breaker.
4. All bus-bar structures shall be braced to withstand the mechanical forces associated with a bolted fault current available at the terminals of the switchgear. All circuit breakers shall have an interrupting capability equal to or greater than the fault currents available at the terminals of the circuit breaker. The designer shall calculate fault currents based upon unlimited short circuit KVA available from the primary system, and limited only by the self-impedance of the service-entrance conductors.
5. Secondary power distribution load centers shall be equipped with main circuit breakers. Panels shall not be located in janitorial closets, storage rooms, or in open or unprotected areas. Locate power and lighting panels in a separate electrical room. Mechanical and electrical equipment rooms shall be separate from telecommunications closets and spaces. A minimum conduit size of 3/4” is required for all installations. Flex or EMT runs no greater than six (6) feet are allowed to switches, fixtures, etc.

6. Neutral conductors shall be sized at 200% of phase conductors on Y-grounded systems subject to harmonic loads.