GROUNDING AND BONDING FOR ELECTRICAL

Scope

Provide grounding in accordance with the requirements of the NEC, these guidelines, and University Inspection Authorities.

The resistance of the completed ground system for standard installations shall not exceed 5 ohms. If any special equipment being installed requires a lower ground system resistance, that equipment manufacturer's maximum ground resistance shall apply.

The incoming power to the building shall always be considered the building's 'Service' (as defined by NEC Article 230), even if power is from another University facility. Size the bonding conductor in accordance with Article 230.

If equipment being installed requires a special or an isolated ground system, the equipment manufacturer's requirements shall be considered. Single point radial (star) ground systems are acceptable. Avoid providing an isolated ground system unless absolutely necessary to meet a manufacturer's warranty requirements.

When installing a new substation, either in an existing building or in an addition, connect the ground mats of the substations together. Also connect the new substation to building steel, the associated incoming duct bank (when a new duct bank entrance is installed), and to all water services.

Material Requirements

Grounding system conductors making up the grounding mat and associated ground risers, and/or for encasement in concrete shall be No. 4/0 AWG bare, stranded copper.

Ground conductors for all power distribution equipment, end-use equipment and all branch circuits, shall be insulated stranded copper conductors, color coded green or (a continuous) green color with 1 or more yellow stripes. The size shall be in accordance with NEC, except that none shall be smaller than No. 12 AWG.

Underground and concrete encased ground connections, all connections to and a-part-of the main substation grounding bar, and all ground connections to structural steel, shall be made using Cadweld exothermic weld-type connectors, or "Burndy Hyground" connectors.

Exposed ground connections to power generation and distribution equipment shall be made using copper compression ground fittings or compression lugs bolted to the equipment.

Splices and taps of ground conductors No. 8 AWG and larger shall be of the Cadweld exothermic weld type. Tape or coat all exposed splices and taps.

Design Requirements

Extend ground conductors from the ground system to all switchgear, transformers, unit substations, motor controllers, panelboards, control panel ground buses, and ground bars. Equipment rated above 480 volts, or 600 amperes shall be grounded by two independent grounding conductors.

The enclosures of all switchgear, transformers, unit substations, motor controls and panelboards shall be grounded by a separate grounding conductor to the ground system.

Motors rated 460 volts and below shall be securely bonded to the ground system either by means of a stranded copper ground conductor connected to building steel, or by a motor feeder ground conductor. Motors rated above 460 volts shall be bonded by 2 independent ground conductors.

A separate grounding conductor shall be used for all new feeders and branch circuits. Ground underground duct banks for primary or secondary power cables with a No. 4/0 AWG bare stranded copper ground wire that is run within the duct banks and is grounded at both ends.

Conduit shall not be used as the ground conductor.

Ground each manhole with 4 - 3/4 inch diameter by 10 feet long ground rods, one driven inside or outside of the manhole at each corner. Connect the ground rods with a No. 4/0 AWG bare, stranded copper ground wire loop. Pigtails from the ground wire loop shall be used to ground the manhole cover frame, ladder, concrete inserts or cable racks, duct ground wires, and the shields of any primary cables that are spliced in the manhole.

Ground the lightning protection system to separate ground rods. The main ground system shall not be used. Connect the lightning protection ground system, to the main grounding system, after the lightning protection system is completed and tested

Ground instrumentation and electronic devices in accordance with the NEC or the manufacturer's recommendations, whichever is stricter.

Conduits, cable trays and all other raceways shall be grounded/bonded in accordance with the NEC.

The shields of medium-voltage shielded power cables shall be grounded at both ends. The shields of shielded power cables spliced in a manhole shall also be grounded in the manhole.

The shields of shielded instrumentation cables shall have their drain wires grounded at one end only. The shield at the other end of the cables shall be isolated from ground.

Provide protection for ground conductors subject to physical damage or abuse. Where metallic conduit is used for physical protection of a ground conductor, the conductor shall be bonded to the conduit at both ends.

Installation Requirements

Instruct the Contractor to test the grounding in accordance with Section 16950, and to provide the University Project Coordinator with test reports