SECTION 26 05 26

GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS

PART 1 - DESIGN DIRECTIVES

1.1 DESIGN CRITERIA

A. The following grounding electrodes must be connected to and utilized when available at the building under construction:

1. Metal underground water pipe: In contact with the earth for 10 feet or more.
2. Metal frame of building when effectively grounded.

    a. Effectively grounded: Building steel must be bonded to the reinforcing steel in the foundation and the footing under the foundation.

3. Concrete encased electrodes.

B. Grounding electrodes: Must be provided and utilized at building under construction:

1. Ground ring.
2. Concrete encased electrodes.
3. Counterpoise.

C. Supplementary grounding electrode: Counterpoise. For existing buildings, renovations, and where supplementary grounding electrodes are required by the NEC.

D. Ground ring conductors: Connect building steel to a conductor that rings entire foundation of building. A point of attachment is made at two vertical steel members at each exterior wall of the building.

1. Minimum of 4/0 bare copper.
2. Buried to a depth of at least 4 feet below grade.
3. Connections from ring to building steel: 4/0 copper. Exothermically weld connection at point of attachment to ring and building.

E. Counterpoise: Supplementary grounding electrode.

1. Construction:

    a. Three 10-foot by ¾-inch copper clad steel rods driven into the ground in a pattern of an equilateral triangle with sides of 8 feet.
    b. Grounding electrode conductors: Attached to each rod in counterpoise by exothermic welding or hydraulic crimp.
    c. A loop of wire originating and ending inside the building will make up the grounding electrode conductor from the counterpoise.
    d. Test: Remote earth test set to verify an impedance of 25 ohms or less.

F. Grounding bus bar: Provide as part of grounding electrode system in all facilities.

1. Where building receives power from medium voltage distribution system:

a. Construct inside the main electric vault.
b. Must be 2-inch by ¼-inch hard drawn copper bar.
c. Attachment to wall: 18 to 24 inches above floor.

1) Standoff Insulators: Spaced 18 inches apart over entire length of bar.

d. Location: Behind high voltage loop switches and extend at least the entire length of two walls inside the room making it accessible for connections.
e. Grounding electrodes connections to bar: Bolt-connected compression connections.
f. Grounding electrode conductors from separately derived systems: Connected to the grounding bus bar regardless of their location in the building.

2. Where building receives power from a low-voltage source:

a. Constructed inside the main electric room.
b. Must be 2-inch by ¼-inch by 36-inch long, minimum, hard drawn copper bar.
c. Attachment to Wall: 18 inches to 24 inches above the floor

1) Standoff insulators: Spaced 18 inches apart over entire length of bar.

d. Location: Near the building's main disconnect.
e. Grounding electrodes connections to bar: Bolt-connected compression connections or exothermic welding.
f. Grounding electrode conductors from separately derived systems: Connected to the grounding bus bar regardless of their location in the building.

G. At each separately derived system: The system bonding jumper and grounding electrode conductor connection must be located in the same equipment enclosure.

1. At unitized secondary substation: Connection shall be made in the switchboard section just before the main breaker.
2. At individual interior transformer and associated switchboard or panelboard: Connection shall be made in the transformer enclosure.
3. Where a building is fed from an exterior pad-mounted transformer, the grounding system shall be provided as follows:

a. A system bonding jumper connection shall be made in the transformer enclosure and,
b. A system bonding jumper to the building grounding electrode conductor connection shall be made at the building main disconnect.
c. The feeder from the transformer to the building shall not contain a grounding conductor. See Low-Voltage Electrical Feeder Entrance.
d. The transformer shall not have overcurrent devices on the secondary feeder(s).

H. Emergency and stand-by generators:

1. Grounding and bonding connection (where the generator is configured as a separately derived system): At generator output terminals or in the main overcurrent device enclosure, wherever is most practical.
2. Generator frames: Bonded to grounding electrode system.

I. Grounding in Manholes: Per "MV electric manhole neutral and bonding connections" detail drawing. See Section 26 05 43 - Underground Ducts and Raceways for Electrical Systems.

J. UL Master labeled lightning protection system:

1. Instruct electrical contractor to obtain a quotation from a certified design and installation firm to be included as an add-alternate to electrical subcontract price.

1.2 CONSTRUCTION DOCUMENT REQUIREMENTS

A. Design documents: Complete grounding details. Include sizes of conductors and location of main system bonding jumper.

B. Grounding system for each building: Detail on design drawings. It is not the responsibility of the electrical contractor.

1. Detailed design drawings: Show size and type of conductor and raceway for grounding the main building feeder and every separately derived system within a facility.
2. Grounding electrodes: Clearly identify locations and types.

1.3 DEFINITIONS, ABBREVIATIONS

A. National Electrical Code (NEC): Latest edition adopted by the state of New Hampshire.

1.4 RELATED SECTIONS

A. Section 26 24 13 - Switchgear, Switchboards, Panelboards and Circuit Breakers

B. Section 26 21 00 - Low-Voltage Electrical Feeder Entrance

C. Section 26 10 00 - Medium-Voltage Electrical Distribution and Feeder Entrance

PART 2 - PRODUCTS

2.1 NO SPECIAL REQUIREMENTS

PART 3 - EXECUTION

3.1 INSTALLATION

A. Grounding electrode conductors must be installed in non-metallic raceways.

END OF SECTION