

SECTION 26 05 26
GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS

PART 1 GENERAL

1.01 REFERENCES

- A. The following is a list of standards which may be referenced in this section:
1. Institute of Electrical and Electronics Engineers (IEEE): C2, National Electrical Safety Code (NESC).
 2. National Fire Protection Association (NFPA): 70, National Electrical Code. (NEC).

1.02 SUBMITTALS

- A. Action Submittals:
1. Shop Drawings:
 - a. Product data for the following:
 - 1) Exothermic weld connectors.
 - 2) Mechanical connectors.

1.03 QUALITY ASSURANCE

- A. Provide the Work in accordance with NFPA 70, National Electrical Code (NEC). Provide material and equipment labeled or listed by a nationally recognized testing laboratory or other organization acceptable provide a basis for approval under NEC.
- B. Materials and equipment manufactured within the scope of standards published by UL:
1. Confirm conformance with UL standards.
 2. Supply with an applied UL listing mark.

PART 2 PRODUCTS

2.01 GROUND ROD

- A. Physical Characteristics:
1. Material: Copper-clad steel.
 2. Diameter: Minimum 3/4 inch.
 3. Length: 10 feet.

- B. Functional Characteristics: None.
- C. Performance Characteristics: None.

2.02 GROUND PLATE

- A. Physical Characteristics:
 - 1. Copper-clad steel.
 - 2. Minimum 16-inch height by 10-inch width by 1/4-inch thickness.
 - 3. Electrogalvanized finish.
- B. Functional Characteristics: As specified in Section 26 05 05, Conductors.
- C. Performance Characteristics: None.

2.03 GROUND CONDUCTORS

- A. Physical Characteristics: None.
- B. Functional Characteristics: As specified in Section 26 05 05, Conductors.
- C. Performance Characteristics: None.

2.04 CONNECTORS

- A. Physical Characteristics:
 - 1. Compression Type:
 - a. Compress-deforming type; wrought copper extrusion material.
 - b. Single indentation for conductors 6 AWG and smaller.
 - c. Double indentation with extended barrel for conductors 4 AWG and larger.
 - d. Barrels prefilled with oxide-inhibiting and antiseizing compound and sealed.
 - 2. Mechanical Type: Split-bolt, saddle, or cone screw type; copper alloy material.
- B. Functional Characteristics:
 - 1. Compression Type:
 - a. Outdoor: Listed as suitable for direct-buried application.
- C. Performance Characteristics: None.

2.05 GROUNDING WELLS

- A. Physical Characteristics: Ground rod box, complete with cast-iron riser ring and traffic-rated cover marked "GROUND ROD."
- B. Functional Characteristics: None.
- C. Performance Characteristics: None.

PART 3 EXECUTION

3.01 GENERAL

- A. Grounding: In compliance with NFPA 70 and IEEE C2.
- B. Ground electrical service neutral at service entrance equipment with grounding electrode conductor to grounding electrode system.
- C. Ground each separately derived system neutral with common grounding electrode conductor to grounding electrode system.
- D. Bond together all grounding electrodes that are present at each building or structure served to form one common grounding electrode system.
- E. Bond together system neutrals, service equipment enclosures, exposed noncurrent-carrying metal parts of electrical equipment, metal raceways, ground conductor in raceways and cables, receptacle ground connections, and metal piping systems.
- F. Shielded Instrumentation Cables:
 - 1. Ground shield to ground bus at power supply for analog signal.
 - 2. Expose shield minimum 1 inch at termination to field instrument and apply heat shrink tube.
 - 3. Do not ground instrumentation cable shield at more than one point.

3.02 WIRE CONNECTIONS

- A. Ground Conductors: Install in conduit containing power conductors and control circuits above 50 volts.
- B. Nonmetallic Raceways and Flexible Tubing: Install equipment grounding conductor connected at both ends to noncurrent-carrying grounding bus.
- C. Connect ground conductors to raceway grounding bushings.
- D. Extend and connect ground conductors to ground bus in all equipment containing a ground bus.

- E. Connect enclosure of equipment containing ground bus to that bus.
- F. Bolt connections to equipment ground bus.
- G. Bond grounding conductors to metallic enclosures at each end, and to intermediate metallic enclosures.
- H. Junction Boxes: Furnish materials and connect to equipment grounding system with grounding clips mounted directly on box, or with 3/8-inch machine screws.
- I. Metallic Equipment Enclosures: Use furnished ground lug; if none furnished, tap equipment housing and install solderless terminal connected to box with machine screw. For circuits greater than 20 amps use minimum 5/16-inch diameter bolt.

3.03 MOTOR GROUNDING

- A. Extend equipment ground bus via grounding conductor installed in motor feeder raceway; connect to motor frame.
- B. Nonmetallic Raceways and Flexible Tubing: Install an equipment grounding conductor connected at both ends to noncurrent-carrying grounding bus.
- C. Motors Less Than 10 hp: Use furnished ground lug in motor connection box. If none furnished, provide compression, spade-type terminal connected to conduit box mounting screw.
- D. Motors 10 hp and Above: Use furnished ground lug in motor connection box. If none furnished, tap motor frame or equipment housing; furnish compression, one-hole, lug type terminal connected with minimum 5/16-inch brass threaded stud with bolt and washer.
- E. Circuits 20 Amps or Above: Tap motor frame or equipment housing. Install solderless terminal with minimum 5/16-inch diameter bolt.

3.04 GROUND RODS

- A. Install full length with conductor connection at upper end.
- B. Install with connection point below finished grade, unless otherwise shown.
- C. Space multiple ground rods by one rod length.
- D. Install to 8 feet below local frost depth.

3.05 GROUNDING WELLS

- A. Install for ground rods located inside buildings, asphalt and paved areas, and where shown on the Drawings.
- B. Install riser ring and cover flush with surface.
- C. Place 6 inches of crushed rock in bottom of each well.

3.06 CONNECTIONS

- A. General:
 - 1. Abovegrade Connections: Install exothermic weld, mechanical, or compression-type connectors; or brazing.
 - 2. Belowgrade Connections: Install exothermic weld or compression type connectors.
 - 3. Remove paint, dirt, or other surface coverings at connection points to allow good metal-to-metal contact.
 - 4. Notify Contracting Officer prior to backfilling ground connections.
- B. Exothermic Weld Type:
 - 1. Wire brush or file contact point to bare metal surface.
 - 2. Use welding cartridges and molds in accordance with manufacturer's recommendations.
 - 3. Avoid using badly worn molds.
 - 4. Mold to be completely filled with metal when making welds.
 - 5. After completed welds have cooled, brush slag from weld area and thoroughly clean joint.
- C. Mechanical Type:
 - 1. Apply homogeneous blend of colloidal copper and rust and corrosion inhibitor before making connection.
 - 2. Install in accordance with connector manufacturer's recommendations.
 - 3. Do not conceal mechanical connections.

3.07 METAL STRUCTURE GROUNDING

- A. Bond metal sheathing and exposed metal vertical structural elements to grounding system.
- B. Bond electrical equipment supported by metal platforms to the platforms.
- C. Provide electrical contact between metal frames and railings supporting pushbutton stations, receptacles, and instrument cabinets, and raceways carrying circuits to these devices.

3.08 METAL WATER PIPES

- A. Bond metal water pipe/pipes located within the pipe entrance to buildings to the grounding electrode system.

3.09 MANHOLE AND HANDHOLE GROUNDING

- A. Install one ground rod inside each manhole and handhole larger than 24-inch by 24-inch inside dimensions.
- B. Ground Rod Floor Protrusion: 4 inches to 6 inches above floor.
- C. Make connections of grounding conductors fully visible and accessible.
- D. Connect all noncurrent-carrying metal parts and any metallic raceway grounding bushings to ground rod with 6 AWG copper conductor.

3.10 TRANSFORMER GROUNDING

- A. Bond neutrals of transformers within buildings to system ground network and to any additional indicated grounding electrodes.

3.11 LIGHTNING PROTECTION SYSTEMS

- A. Bond lightning protection system ground terminals to building or structure grounding electrode system.

3.12 SURGE PROTECTION EQUIPMENT GROUNDING

- A. Connect surge arrestor ground terminals to equipment ground bus.

END OF SECTION