

SECTION 26 05 26

GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes:

1. Rod electrodes.
2. Wire.
3. Mechanical connectors.
4. Exothermic connections.

B. Related Sections:

1. Division 03 - Concrete Reinforcing: Bonding or welding bars when reinforcing steel is used for electrodes.
2. Division 33 - Site Grounding: Site related grounding components for buildings and facilities.

1.02 REFERENCES

A. Institute of Electrical and Electronics Engineers:

1. IEEE 142 - Recommended Practice for Grounding of Industrial and Commercial Power Systems.
2. IEEE 1100 - Recommended Practice for Powering and Grounding Electronic Equipment.

B. International Electrical Testing Association:

1. NETA ATS - Acceptance Testing Specifications for Electrical Power Distribution Equipment and Systems.

C. National Fire Protection Association:

1. NFPA 70 - National Electrical Code.
2. NFPA 99 - Standard for Health Care Facilities.

1.03 SYSTEM DESCRIPTION

A. Grounding systems use the following elements as grounding electrodes:

1. Metal building frame.
2. Concrete-encased electrode.
3. Ground ring specified in Division 33.
4. Metal underground gas piping system.
5. Rod electrode.
6. Plate electrode.

1.04 PERFORMANCE REQUIREMENTS

A. Grounding System Resistance: 5 ohms maximum.

1.05 SUBMITTALS

A. Division 01 - Submittal Procedures: Requirements for submittals.

- B. Product Data: Submit data on grounding electrodes and connections.
  - C. Test Reports: Indicate overall resistance to ground and resistance of each electrode.
  - D. Manufacturer's Installation Instructions: Submit for active electrodes.
  - E. Manufacturer's Certificate: Certify Products meet or exceed specified requirements.
- 1.06 CLOSEOUT SUBMITTALS
- A. Division 01 - Execution and Closeout Requirements: Requirements for submittals.
  - B. Project Record Documents: Record actual locations of components and grounding electrodes.
- 1.07 QUALITY ASSURANCE
- A. Provide grounding materials conforming to requirements of NEC, IEEE 142, and UL labeled.
- 1.08 QUALIFICATIONS
- A. Manufacturer: Company specializing in manufacturing Products specified in this section with minimum three years documented experience.
  - B. Installer: Company specializing in performing work of this section with minimum five years experience.
- 1.10 REGULATORY REQUIREMENTS
- A. Conform to requirements of ANSI/NFPA 70.
  - B. Furnish products listed and classified by Underwriters Laboratories, Inc. or testing firm acceptable to authority having jurisdiction as suitable for purpose specified and shown.
- 1.11 DELIVERY, STORAGE, AND HANDLING
- A. Division 01 - Product Requirements: Requirements for transporting, handling, storing, and protecting products.
  - B. Accept materials on site in original factory packaging, labeled with manufacturer's identification.
  - C. Protect from weather and construction traffic, dirt, water, chemical, and mechanical damage, by storing in original packaging.
  - D. Do not deliver items to project before time of installation. Limit shipment of bulk and multiple-use materials to quantities needed for immediate installation.
- 1.12 COORDINATION
- A. Division 01 - Administrative Requirements: Requirements for coordination.
  - B. Complete grounding and bonding of building reinforcing steel prior concrete placement.

## PART 2 PRODUCTS

### 2.01 ROD ELECTRODES

- A. Product Description:
  - 1. Material: Copper-clad steel.
  - 2. Diameter: 3/4 inch.
  - 3. Length: 10 feet.
- B. Connector: Connector for exothermic welded connection.

### 2.02 WIRE

- A. Material: Stranded copper.
- B. Foundation Electrodes: 2/0 AWG.
- C. Grounding Electrode Conductor: Copper conductor bare.
- D. Bonding Conductor: Copper conductor bare.

### 2.03 MECHANICAL CONNECTORS

- A. Description: Bronze connectors, suitable for grounding and bonding applications, in configurations required for particular installation.

### 2.04 EXOTHERMIC CONNECTIONS

- A. Product Description: Exothermic materials, accessories, and tools for preparing and making permanent field connections between grounding system components.

## PART 3 EXECUTION

### 3.01 EXAMINATION

- A. Division 01 - Administrative Requirements: Verification of existing conditions before starting work.
- B. Verify final backfill and compaction has been completed before driving rod electrodes.

### 3.02 PREPARATION

- A. Remove paint, rust, mill oils and surface contaminants at connection points.

### 3.03 EXISTING WORK

- A. Modify existing grounding system to maintain continuity to accommodate renovations.
- B. Extend existing grounding system using materials and methods as specified.

### 3.04 INSTALLATION

- A. Install in accordance with IEEE 142.

- B. Install rod electrodes at locations as required to complete the work. Install additional rod electrodes to achieve specified resistance to ground.
- C. Install grounding and bonding conductors concealed from view.
- D. Install grounding well pipe with cover at each rod location. Install well pipe top flush with finished grade.
- E. Install minimum 4 AWG bare copper wire in foundation footing.
- F. Install grounding electrode conductor and connect to reinforcing steel in building columns. Electrically bond steel together.
- G. Equipment Grounding Conductor: Install separate, insulated conductor within each feeder and branch circuit raceway. Terminate each end on suitable lug, bus, or bushing.
- H. Connect to site grounding system. Refer to Division 33.
- I. Install a continuous and complete grounding electrode system using existing underground cold water system and building steel. Where water piping is not available install artificial station ground by means of driven rods or buried electrodes.
- J. Permanently ground entire light and power system in accordance with CEC, including service equipment, distribution panels, lighting panelboards, switch and starter enclosures, motor frames, grounding type receptacles, and other exposed non-current carrying metal parts of electrical equipment.
- K. Accomplish grounding of electrical system by using insulated grounding conductor installed with feeders and branch circuit conductors in conduits. Size grounding conductors in accordance with CEC. Install from grounding bus of serving panel to ground bus of served panel, grounding screw of receptacles, lighting fixture housing, light switch outlet boxes, cable trays or metal enclosures of service equipment. Ground conduits by means of grounding bushings on terminations at panelboards with installed number 12 conductor to grounding bus.
- L. Grounding electrical system using continuous metal raceway system enclosing circuit conductors in accordance with CEC.
- M. Permanently attach equipment and grounding conductors prior to energizing equipment.

### 3.05 FIELD QUALITY CONTROL

- A. Division 01 - Quality Requirements and Execution and Closeout Requirements: Field inspecting, testing, adjusting, and balancing.
- B. Inspect and test in accordance with NETA ATS, except Section 4.
- C. Grounding and Bonding: Perform inspections and tests listed in NETA ATS, Section 7.13.
- D. Perform ground resistance testing in accordance with IEEE 142.
- E. Perform leakage current tests in accordance with NFPA 99.
- F. Perform continuity testing in accordance with IEEE 142.
- G. When improper grounding is found on receptacles, check receptacles in circuits and correct. Perform retest.

END OF SECTION