

## **SECTION 18450 SIGNAL GROUNDING**

### **PART 1 - GENERAL**

#### **1.01 DESCRIPTION**

- A. Section includes requirements for a grounding system for the equipment shelter and all other wayside equipment apparatus.

#### **1.02 REFERENCE STANDARDS**

- A. American Railway Engineering and Maintenance of Way Association (AREMA):
  - 1. Communications and Signals Manual of Recommended Practices (C&S Manual). When following the recommendations of the AREMA C&S Manual substitute the word "shall" for the word "should" in the applicable Manual Part.
- B. ASTM International (ASTM):
  - 1. B8 Specification for Concentric-Lay-Stranded Copper Conductors, Hard, Medium-Hard, or Soft
- C. National Fire Protection Association (NFPA):
  - 1. 70 National Electrical Code (NEC)

#### **1.03 SUBMITTALS**

- A. Submit Schematic Drawings showing the design and detail of the proposed grounding system for the signal and power equipment proposed to be furnished and installed.
- B. Submit catalog cuts or drawings showing the type of components to be used for the proposed grounding system(s).
- C. Submit Installation and Test Procedure proposed for all equipment grounding.
- D. Submit test reports.

#### **1.04 QUALITY ASSURANCE**

- A. Materials and equipment furnished and installed under this Section shall conform to all applicable State and local ordinances pertaining to electrical power installations and the National Electrical Code (NEC).

## **PART 2 – PRODUCTS**

### **2.01 GENERAL**

- A. Ground rods shall be copper-clad stainless steel, in accordance with AREMA C&S Manual Part 11.3.4. The rod shall be at least 10 feet in length and at least 3/4-inch diameter.
- B. Ground rod clamps shall be made of a cast bronze clamp body, with non-ferrous set-screws in accordance with the recommendations of AREMA C&S Manual Part 11.3.4.
- C. Internal ground wire, from the equipment to the ground bus, shall be insulated No. 6 AWG standard copper wire in accordance with the recommendations of AREMA C&S Manual Part 11.4.1. Insulated ground wire shall be colored green.
- D. Provide a grounding bus of nickel-plated hard drawn pure copper in the equipment shelters.
- E. Bare Ground Wire: Soft drawn copper, Class A or Class B stranded, shall meet the requirements of ASTM B8. Sizing of ground wire shall be in accordance with the NEC, except where sizes specified herein or shown on the Contract Drawings are larger than those required by NEC; UL listed, Label A for lightning protection conductors. Grounding cable shall be continuous without joints or splices throughout its length.
- F. Bolted Grounding Connectors: Use connectors made of high strength electrical bronze, with silicon bronze clamping bolts and hardware in accordance with AREMA C&S Manual Part 11.3.4; designed such that bolts, nuts, lock washers, and similar hardware which might nick or otherwise damage the ground wire, shall not make direct contact with the ground wire.

### **2.02 MATERIALS**

- A. Ground rods: As manufactured by Copperweld Corp. or Engineer approved equal.
- B. Ground wire as specified herein.
- C. Cadweld connections: As manufactured by Erico International Corp. or Engineer approved equal.

## **PART 3 - EXECUTION**

### **3.01 INSTALLATION**

- A. General
  - 1. Ground the following as described herein and in accordance with the applicable requirements of the National Electrical Code (NEC) and local city electrical codes: Service equipment, motor frames, switchgear and equipment enclosures, lighting and power panelboards, transformers,

raceways, fences and gates, building or structure steel frames, lighting standards, floodlight poles, and power/light pullboxes/maintenance holes.

2. The grounding system shall preclude any closed loop grounding arrangements.
3. Do not ground connection(s) to the track rails; do not use the neutral conductors of the ac power supply.
4. Grounding under these specifications shall conform to AREMA C&S Manual Part 11.4.1. In cases where these instructions differ, the Engineer will make final decision.
5. Ground wire/cable runs shall be as short and straight as possible and shall not be interrupted by any device.

B. Exterior: Equipment Shelter Grounding

1. At equipment shelters, drive four ground rods into the ground, one near each corner of a structure. At equipment cases, drive two ground rods into the ground, at opposite corners of the structure. The ground rods shall be a minimum of 6 feet apart and shall be driven below ground level. Dig a 12 inch deep trench between the ground rods. Electrically connect each of the ground rods connected to the others, using a No. 2 AWG bare stranded copper cable, welded using "Cadweld" or an equivalent thermal process. Coat Cadweld connections with epoxy resin. Place the ground wires in the bottom of the trench. Backfill trench, returning the soils removed during construction of the trench.
2. Cadweld shelter's copper ground cables to the ground rods.
3. Ground resistance, as measured by the "Fall-Of Potential" method, shall not exceed 15 ohms.
4. Where flexible conduit is used, provide a bonding jumper.

C. Interior: Equipment Grounding

1. Equip shelters with a prime ground terminal securely attached electrically to the shelter structure and to the made ground network.
2. Run ground connections from lightning arresters and equipment chassis separately to ground buses in the shelters, as shown on Contract Drawings. Connect ground buses to the prime ground with green insulated No. 2 AWG stranded wire.
3. Properly ground equipment that is powered by or switches voltages greater than 35 volts ac or dc.
4. Properly ground equipment that has conductors that leave the shelter.

### 3.02 TESTING AND INSPECTION

- A. Ground Resistance Testing: Verify that resistance between ground buses and absolute earth, as measured by the "Fall-Of Potential" method, does not exceed 15 ohms without benefit of chemical treatment or other artificial means.
- B. Test Reports: Provide test reports to the Engineer upon completion of ground tests that completely describe ground resistance test procedures and test results. Test reports shall be signed by a technician and witnessed by a representative of the Engineer.
- C. Prior to final acceptance by the Engineer, the Contractor shall have the new ac power service inspected by state and local jurisdictional authority(s) as required.

**END OF SECTION**