

## SECTION 16450

### GROUNDING

#### PART 1 - GENERAL

##### 1.1 Description

- A. This Section includes the following:
1. Facility ground grid and ground rod system.
  2. Ground riser extensions to structural steel, electrical equipment, and mechanical equipment.
- B. **Related Work Specified Elsewhere**
- Field Testing..... Section 16950

##### 1.2 References

1. **American Society For Testing and Materials (ASTM)**  
ASTM B8 - Concentric-Lay Stranded-Copper Conductors, Hard, Medium-Hard, or Soft.
2. **National Electrical Safety Code (NESC)**
3. **National Fire Protection Association (NFPA)**  
70 - National Electrical Code.  
70E – Standard for Electrical Safety in the Workplace
4. **Underwriters' Laboratories (UL)**  
467 - Electrical Grounding and Bonding Equipment.
5. **Occupational Safety and Health Administration, OSHA.**
6. All electrical and control equipment and material shall bear the recognized Underwriters Laboratories, Inc. (UL) seal of approval. It is

Vendor's responsibility to obtain local inspection approval for all non-UL labeled equipment and pay all fees in connection with the same.

### **1.3 Submittals**

- A.** Submit as specified in Section 1330.
- B.** Includes, but not limited to, catalog cuts for the following:
  - 1.** Ground Rods.
  - 2.** Cable.
  - 3.** Grounding Lugs.

## **PART 2 - MATERIALS**

### **2.1 Acceptable Manufacturers**

#### **A. Ground Rods**

- 1.** Joslyn Manufacturing and Supply Company.
- 2.** Copperweld Bimetallics Group.
- 3.** Knight-Metalcraft, Division of Whitaker Cable.
- 4.** ITT Blackburn Company, a Division of International Telephone and Telegraph Corporation.
- 5.** Harger

#### **B. Cable-to-Equipment Ground Lugs**

- 1.** Burndy Corporation (Burndy).
- 2.** Knight-Metalcraft, Division of Whitaker Cable.
- 3.** Harger

### **2.2 Wire and Cable**

- A.** Type BC2 as specified in this Division (Section 16120).

**B. Conductor Sizes**

1. As indicated for specific connections.
2. For required connections not indicated, use conductor size not less than No. 2/0 AWG if buried in earth or cast in concrete, or No.2 AWG at other locations, unless otherwise noted.

**2.3 Ground Rods**

- A. Copper-clad steel or copper-alloy sectional-type rods.
- B. One end pointed to facilitate driving.
- C. 3/4-inch diameter x 10 feet long with diameter and length stamped near top of rod.

**2.4 Connection Materials**

- A. Cable-to-cable and cable-to-rod cable-to-connector connections of exothermic-welding-type process.

**B. Cable-To-Equipment Ground Lugs**

1. Compression type.
2. Bolted to equipment housing with silicon bronze bolts and lock washers.

**2.5 Coatings**

**A. Coal Tar**

1. Kop Coat - No. 50.
2. Tnemec - 46-449.

**PART 3 - EXECUTION**

- 3.1 Inspection:** Do not cover up connections before they are inspected by Engineer.

**3.2 Installation**

**A. Wire and Cable**

1. Install using as few joints as possible.
2. Protect against abrasion by several wrappings of rubber tape at all points where cable leaves concrete in exposed areas.
3. Suitably protect cable against damage during construction.
4. Replace or suitably repair cable if damaged by anyone before final acceptance.
5. All Connections to be metal to metal. Remove all paint, grease, dirt, etc. before making connections.

**6. In Exposed Installations**

- a. Route runs as indicated.
- b. Route along the webs of columns and beams, and in corners where possible for maximum physical protection.
- c. Support at intervals of 3 feet or less with nonmagnetic clamp-type supports.
- d. Where exposed and no natural protection available, provide physical protection as required to protect ground conductor.

**7. In Buried Installations**

- a. Lay in bottom of trench or in other excavations at least 30 inches below finished grade.
- b. Maintain clearance of at least 12 inches from all underground metal piping or structures, except where connections thereto are specifically indicated.
- c. Backfill as specified in DIVISION 2.

**B. Ground Rods**

1. Install rods as indicated by driving and not by drilling or jetting.
2. Drive rods into undisturbed earth where possible.
3. Where rods must be installed in excavated areas, drive rods into earth after compaction of backfill is completed.
4. Drive to a depth such that top of rods will be approximately 18 inches below final grade or subgrade, and connect main grid ground cable thereto.

**C. Connections**

1. Conform to manufacturer's instructions.
2. Chemically degrease and dry completely before welding.
3. Apply one coat of coal tar coating at 15 mils dry film thickness to all exothermic-welded connections to be buried.
4. **Make connections to equipment as follows:**
  - a. Make up clean and tight to assure a low-resistance connection with resistance not exceeding 1 ohm.
  - b. Install so as not to be susceptible to mechanical damage during operation or maintenance of equipment.
  - c. Provide direct copper connection to buried ground grid system.
  - d. Prior to making connections remove all paint, grease, etc. from connection location.

**D. Metallic Conduit Grounds**

1. Adequately and properly ground at all terminal points and wherever isolated from equipment or grounded steel.
2. Where extending into floor-mounted equipment from below, connect to equipment ground bus or frame.

3. Where extending into manholes, handholes, or cable trenches, connect to the ground riser or cable at that structure using grounding bushings.

**E. Rack Grounds**

1. Ground at intervals not to exceed 20 feet.
2. Ground all continuous runs as well as isolated sections at least at one point.

**F. Box Grounds:** Unless grounded by conduit system, ground all boxes by direct copper connection to the buried ground grid system.

**G. Motor Grounds:** Ground all motors with "identified" ground conductor in addition to conduit system. Route in conduit with phase conductors unless external ground is indicated.

**3.3 Field Testing:** Specified in Section 16950.

**PART 4 MEASUREMENT AND PAYMENT**

**4.1 Measurement**

**A.** No measurement will be made for this item.

**4.2 Payment**

**A.** Payment will be made at the contract lump sum price bid and shall be considered full payment for providing labor and materials to perform this work.

**\*\* END OF SECTION 16450 \*\***