

## **SECTION 26 45 00 - GROUNDING**

### **PART 1 - GENERAL**

#### **1.1 WORK INCLUDED**

- A. Provide a complete grounding system meeting or exceeding the requirements of Article 250 of the latest National Electrical Code. Install all raceway systems, including metal conduit, wireways, pullboxes, junction boxes, bus ducts, enclosures, and motors, to provide a continuous ground path with the lowest possible impedance.

#### **1.2 DESCRIPTION OF WORK**

- A. This section includes minimum requirements for the following:
  - 1. Conductors
  - 2. Ground Rods
  - 3. Molded Fusion Welds
  - 4. Hardware

#### **1.3 QUALITY ASSURANCE**

- A. All grounding systems shall be installed in a neat and workmanlike manner. All methods of construction that are not specifically described or indicated in the Contract Documents shall be subject to the control and approval of the Owner's Representative. Equipment and materials shall be of the quality and manufacture indicated. The equipment specified is based upon the acceptable manufacturers listed. Where "approved equivalent" is stated, equipment shall be equivalent in every way to that of the equipment specified and subject to approval.
- B. Materials specified herein shall comply with the latest applicable requirements of:
  - 1. The National Electrical Code, Article 250.

#### **1.4 SUBMITTALS**

- A. Provide five (5) sets or electronic files of product data for the following:
  - 1. Ground Rods
  - 2. Molded Fusion Welds
  - 3. Grounding System Test Reports.

### **PART 2 - PRODUCTS**

#### **2.1 CONDUCTORS**

- A. Exposed grounding conductors such as bars, straps, cables, flexible jumpers, braids, shunts, etc., shall be bare copper unless otherwise called for.

- B. Conductors shall be copper, as called for in Specification Section 261200 - Conductors.
- C. Provide conductors with THHN/THWN insulation. Sizes #10 AWG and smaller shall be green in color. Conductor sizes #8 AWG and larger may have green taped bands at each end, and in all pullboxes.
- D. Acceptable Manufacturers:
  - 1. Same as for 600 volt conductors.

## **2.2 GROUND RODS**

- A. Solid copper or copper clad steel cylindrical rods, 3/4 in. minimum diameter, minimum 10 ft. long.
- B. Acceptable Manufacturers:
  - 1. Copperweld or approved equivalent

## **2.3 CONNECTORS, CLAMPS, TERMINALS**

- A. Provide bronze mechanical connectors and clamps. Solderless compression terminals shall be copper, long-barrel, NEMA two bolt.
  - 1. Acceptable Manufacturers:
    - a) Burndy
    - b) Anderson
    - c) T & B
    - d) Penn-Union
    - e) Approved Equivalent

## **2.4 MOLDED FUSION WELDS**

- A. Provide fusion welds designed for size and type of cable, rods, or assembly. Solder prohibited for connections.
  - 1. Acceptable Manufacturers:
    - a) Cadweld
    - b) Metalweld
    - c) Thermoweld
    - d) Approved Equivalent

## **PART 3 - EXECUTION**

### **3.1 INSTALLATION**

- A. Service Entrance
  - 1. Solidly ground the electrical service at the service entrance. Provide a

grounding electrode conductor from the service entrance ground bus to a minimum of two (2) grounding electrodes, as follows:

- a) Metal water pipe, ahead of the meter.
- b) Building steel
- c) Made grounding electrode grid.

2. For a grounded electric service, solidly connect the grounded (neutral) conductor to the service entrance ground bus. Do NOT make any grounding connections to any grounded conductors on the load side of the service disconnecting means.

3. Provide a bare, copper, #4/0 bonding jumper across the water meter.

B. Raceway Systems:

1. All metal supports, cable trays, frames, sleeves, brackets, braces, etc. for the raceway system, panelboards, switchboards, switches, enclosures, starters, controls, etc., which are not rigidly secured to and in contact with the raceway system, or which are subject to vibration and loosening, shall be bonded to the raceway system. Size the bonding conductor in accordance with NEC Article 250, Table 250-122.

2. Terminate rigid conduit at all boxes, cabinets, and enclosures tightly with two locknuts and a bushing.

3. Conduit which runs to or from all boxes, cabinets, or enclosures having concentric or eccentric knockouts which partially perforate the metal around the conduit and hence impair the continuity of system ground circuits shall be provided with bonding jumpers sized in accordance with NEC Article 250, Table 250-122. Connect the bonding jumper between a grounding type bushing on the conduit and a ground bus or stud inside the box, cabinet, or enclosure.

4. Provide bonding jumpers sized in accordance with NEC Article 250, Table 250-122 for all conduit expansion joints.

5. Provide a grounding conductor in all flexible metallic conduit and liquid-tight conduit, sized in accordance with NEC Article 250, Table 250-122.

6. Provide a grounding conductor in all nonmetallic runs of conduit and raceway, sized in accordance with NEC Article 250, Table 250-122.

7. Provide isolated ground conductors of systems as called for on the plans.

C. Ground Grid:

1. Provide a minimum of 3 ground rods, ¾" minimum diameter, 10 feet long, driven on 10 foot centers, with top of rod 12 inches below finished grade, and located as called for on plans. Refer to the "Made Grounding Electrode Ground Grid" detail on the drawings.

2. Connect with size #4/0 AWG copper conductors as called for.
  3. Connecting conductors shall be located within 6 inches of the top of the ground rod.
  4. Provide two size #4/0 AWG grounding conductors from the ground grid to the service entrance ground bus.
  5. Provide one size #4/0 AWG grounding conductor from the ground grid or service entrance ground bus to the service side of nearest metallic cold water and/or sprinkler main.
  6. Provide one size #4/0 AWG grounding conductor from the ground grid or service entrance ground bus to building steel.
  7. Provide molded fusion welds for all below grade connections. Molds shall be new, unused, and shall be replaced when worn or broken.
  8. Required ground grid resistance to earth shall be 25 ohms maximum.
- D. Secondary Electrical Systems:
1. Solidly ground all transformer neutral conductors and enclosures to building steel, or a cold water pipe 1" or larger in size as called for in Table 250-122 of the National Electrical Code.
  2. Provide an equipment grounding conductor from the point of termination back to the ground bus of the serving panelboard, switchboard, or transformer. Do not splice equipment grounding conductors.
  3. Provide an equipment grounding conductors from the point of termination back to the ground bus of the serving panelboard, switchboard, transformer, or switchgear.
  4. The grounding conductors contained in the interstices of interlocked armor cable shall be connected to the ground bus at every equipment termination point and to each other and to system ground; ground at every splice location.
- E. Emergency Generators:
1. Do NOT ground the generator neutral conductor at the generator.
  2. Circuit the generator neutral to the secondary electrical distribution system neutral.
  3. Connect the generator neutral system neutral so as not to negate any ground fault protective equipment applied to distribution system.
  4. Connect the generator frames to system ground with conductor as sized in accordance with NEC Table 250-122.

F. Power Company Requirements:

1. Size #4/0 grounding conductor from service entrance equipment to meter panel.
2. One 3/4" diameter by 10' long ground rod and size #4/0 AWG grounding conductor at each riser pole.
3. Meet power company requirements.

**3.2 TESTS**

A. Grounding:

1. Grounds and grounding systems shall have a resistance to solid earth ground not exceeding following values:
  - a) For grounding secondary service neutral: 25 Ohms
  - b) For grounding non-current carrying metal parts associated with secondary distribution system: 25 Ohms
2. Providing grounding tests to verify the above values. Where these values are not met, add additional ground rods or connections in order to meet these values.

**END OF SECTION**

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