

**SECTION 16060 –ELECTRICAL – GENERAL GROUNDING****PART 1 GENERAL****1.1 REQUIREMENTS**

- A. Grounding systems shall be as indicated on construction drawings and as required by NFPA 70 and ANSI C2
- B. Reference NEC Article 250 for general grounding requirements that apply to the complete installation, including but not limited to, medium and low voltage equipment, switches, switchgear, cable sheaths, cable shields, and conduit installations.

**1.2 SUBMITTALS**

- A. Submit product data for each type of product being provided. Mark the data sheet for the product being provided with an identifying mark or arrow. Provide the following:
  - 1) Mechanical grounding clamps and connections.
  - 2) Proposed Test Equipment
  - 3) Grounding test results
  - 4) Grounding conductors
  - 5) All other grounding specific materials.

**PART 2 PRODUCTS****2.1 GROUNDING MATERIALS**

- A. Mechanical connections: For accessible connections in lieu of a thermic type process, a compression ground grid connector of a type which uses a hydraulic compression tool to provide the correct circumferential pressure may be used. Tools and dies shall be as recommended by the manufacturer. An embossing die code or other standard method shall provide visible indication that a connector has been adequately compressed on the ground wire.
- B. Ground conductors:
  - 1) Size No. 6 AWG or smaller shall be identified by a continuous green outer finish along its entire length. Sizes larger than No. 6 AWG shall be identified by either a continuous green outer finish along its entire length or at the time of installation by a distinctive green marking at its terminal.

- 2) Grounding conductors shall be stranded-bare copper conforming to ASTM B 8, Class B, for sizes No. 6 AWG and larger, and shall be solid-bare copper conforming to ASTM B 1 for sizes No. 8 and smaller.
  - 3) Cable sheaths, cable shields, conduit and equipment shall be grounded with No. 6 AWG unless noted otherwise on project electrical drawings.
- C. Cable sheaths, cable shields, conduit, and equipment shall be grounded in accordance with NEC Article 250 and all applicable references within.

### **PART 3 EXECUTION**

PART 3 EXECUTION below pertains to typical installations, some of which do not apply to this project. CONTRACTOR shall reference this section of the specifications for the project specific requirements regarding the grounding that is to be installed for this project.

#### **3.1 INSTALLATION**

- A. Provide a bare or insulated equipment grounding conductor which shall be separate from the electrical system neutral conductor. The equipment grounding conductor shall be colored green and shall be continuous from a connection at the Service Entrance Equipment Ground to all switchboards, distribution and branch panelboards. Equipment grounding conductors shall be provided in all branch circuits serving convenience outlets, receptacles, and portable and permanently installed electric appliances, equipment apparatus, and other miscellaneous metal enclosing bodies including light switch boxes normally within contact of personnel. Branch circuit grounding conductors shall be sized in accordance with the NEC. Connections at panelboards, outlets, and equipment apparatus shall be made in an approved and permanent manner. Resistance to ground shall not exceed 25 ohms.
- B. All ground connections shall be made on surfaces which have been cleaned of all paint, dirt, oil, etc., so that connections are bare metal to bare metal contact. All ground connections shall be tight, and shall be made with UL-listed grounding devices, fittings, bushings, etc. Bond bushings of raceway systems to ground lugs in boxes, cabinets, motors and equipment to assure electrical continuity of all metallic components of the electrical systems. Comply with the requirements of NEC Articles 250D, 250E, 250F, 250G, 250J and 250K as applicable.

- C. Where ground fault protection is employed, ensure that connection of ground and neutral does not interfere with correct operation of fault protection.
- D. All equipment enclosures, motor and transformer frames, conduits systems, cable armor, and similar items shall be grounded by a separate ground wire from the equipment ground installed with the power cable, tied directly to the ground system.
- E. Exposed connections shall be made by means of approved grounding clamps. Exposed connections between different metals shall be sealed with no-oxide paint Grade A or approved equal.
- F. The CONTRACTOR shall exercise care to insure good continuous ground, in particular between the conduit system and equipment frames and enclosures. Where necessary, jumper wires shall be installed.
- G. Multiple conductors in a single lug are not permitted. Each grounding conductor shall terminate in its own terminal lug.
- H. Flexible metal conduit, liquid-tight flexible conduit or nonmetallic rigid conduit is not permitted to be used as a grounding conductor.
- I. Provide bare or insulated, green conductor for grounding conductors installed in conduit or raceways. Reference NEC Article 352, Section 60 for running a ground wire through a non-conducting conduit when required for equipment grounding. For 3 Phase wiring, provide a green wire ground conductor with the phase conductors in each conduit. This green wire ground conductor shall be used to provide ground continuity between the equipment or device and the metallic conduit raceway system.
- J. The metallic electrical raceway may not be used as the grounding conductor.

### 3.2 TESTING:

- A. The CONTRACTOR shall test the ground resistance of the system. All test equipment shall be provided by the CONTRACTOR and approved by the ENGINEER. Dry season resistance of the system shall not exceed 25 ohms. If such resistance cannot be obtained with the system as shown, the CONTRACTOR shall provide additional grounding as directed by the ENGINEER without additional payment.
- B. Perform ground resistance tests for existing grounding installations before any wire is connected. Take measurements in normally dry weather, not less than 48 hours after rainfall. Ground resistance shall also be measured

for each piece of equipment grounded to the ground electrode. Use a portable ground testing megger to test each ground or group of grounds. The instrument shall be equipped with a meter reading directly in ohms or fractions thereof to indicate the ground value of the ground electrode under test. Provide one copy of the ground megger manufacturer's directions, indicating the method to be used. CONTRACTOR shall submit field test results to the ENGINEER.

END OF SECTION