

## SECTION 26 05 26 – GROUNDING

### PART 1 - GENERAL

#### 1.1 SUMMARY

- A. Extent of electrical grounding and bonding work is indicated by Drawings and Schedules and as specified herein. Grounding and bonding work is defined to encompass systems, circuits, and equipment.
- B. Type of electrical grounding and bonding work specified in this section includes the following:
  - 1. Solidly grounded.

#### 1.2 CODES AND STANDARDS

- A. Electrical Code Compliance: Comply with applicable local electrical code requirements of the authority having jurisdiction, and NEC as applicable to electrical grounding and bonding, pertaining to systems, circuits and equipment.
- B. UL Compliance: Comply with applicable requirements of UL 467, 486A, and 869, pertaining to grounding and bonding of systems, circuits and equipment. Provide grounding and bonding products which are UL-listed and labeled for their intended usage.
- C. NRTL: Connectors shall be listed and labeled by an NRTL acceptable to authorities having jurisdiction for applications in which used and for specific types, sizes, and combinations of conductors and other items connected.

### PART 2 - PRODUCTS

#### 2.1 MATERIALS AND COMPONENTS

- A. General: Except as otherwise indicated, provide electrical grounding and bonding system assembly of materials, including, but not limited to, cables/wires, connectors, solderless lug terminals, grounding electrodes and plate electrodes, bonding jumper braid, surge arresters, and additional accessories needed for a complete installation. Where more than one type component product meets indicated requirements, selection is Installer's option. Where materials or components are not indicated, provide products which comply with NEC, UL, and IEEE requirements and with established industry standards for those applications indicated.
- B. Conductors: Unless otherwise indicated, provide electrical grounding conductors for grounding system connections that match power supply wiring materials and are sizes according to NEC.
- C. Bonding Plates, connectors, Terminals, and Clamps: Provide electrical bonding plates, connectors, terminals, lugs and clamps as recommended by bonding plate, connector, terminal and clamp Manufacturers for indicated applications.
- D. Ground Electrodes and Plates:
  - 1. Grounding Electrodes: Solid copper, 5/8" diameter by 10 feet.

2. Grounding Electrodes: Steel with copper welded exterior, 3/4" diameter by 10 feet.
- E. Electrical Grounding connection Accessories: Provide electrical insulating tape, heat shrinkable insulating tubing, welding materials, bonding straps, as recommended by accessories Manufacturers for type service indicated.
- F. Direct Burial Compression Grounding System similar to Panduit's Structural Ground "Direct Burial Compression Grounding System" shall also be acceptable where exothermic connections are specified. Direct Burial System shall meet IEEE Standard 837-2002. System shall also meet UL 467. Contractor shall be responsible for providing all Grounding plates, connectors, cables, hydraulic crimping tool, etc. for a complete system. All other Direct Burial Grounding system manufacturers shall be submitted for approval prior to bidding.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Examine areas and conditions under which electrical grounding and bonding connections are to be made and notify Architect/Engineer in writing of conditions detrimental to proper completion of work. Do not proceed with work until unsatisfactory conditions have been corrected in a manner acceptable to Installer.

### 3.2 INSTALLATION OF ELECTRICAL GROUNDING AND BONDING SYSTEM

- A. General: Install electrical grounding and bonding system as indicated, in accordance with Manufacturer's instructions and applicable portions of NEC, NECA's "Standard of Installation", and in accordance with recognized industry practices to ensure that products comply with requirements.
- B. Coordinate with other electrical work as necessary to interface installation of electrical grounding and bonding system work with other work.
- C. Branch Circuits: Install a minimum 12 AWG ground wire in each 20A circuit and conduit run and to connect to each device. Size larger circuit ground wires as per NEC Table 250-122.
- D. Exothermically weld grounding conductors to underground grounding electrodes.
- E. Ground electrical service system neutral at service entrance equipment to grounding electrodes per NEC Article 250. Grounding conductor shall be 4/0 copper, unless otherwise noted.
- F. Direct burial compression grounding system similar to T&B and Panduit shall also be acceptable. System shall meet IEEE Standard 837-2002. System shall meet UL.
- G. Ground each separately-derived system neutral to separate grounding electrode.
- H. Connect together system neutral, service equipment enclosures, exposed noncurrent carrying metal parts of electrical equipment, metal raceway systems, grounding conductor in raceways and cables, receptacle ground connectors, and plumbing systems.
- I. Terminate feeder and branch circuit insulated equipment grounding conductors with grounding lug, bus, or bushing.

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- J. Connect grounding electrode conductors to copper electrodes as per N.E.C., building steel and 1" diameter, or greater, metallic cold-water pipe using a suitably sized ground clamp. Provide grounding electrode connection to concrete slab rebar to meet NEC. Provide 4/0 copper conductor for all connections.
- K. Tighten grounding and bonding connectors and terminals, including screws and bolts, in accordance with Manufacturer's published torque tightening values for connectors and bolts. Where Manufacturer's torquing requirements are not indicated, tighten connections to comply with tightening torque values specified in UL 486A to assure permanent and effective grounding.
- L. Route grounding connections and conductors to ground and protective devices in shortest and straightest paths as possible to minimize transient voltage rises.
- M. Apply corrosion-resistant finish to field-connections, buried metallic grounding and bonding products, and places where factory-applied protective coatings have been destroyed, which are subjected to corrosive action.
- N. Install clamp-on connectors on clean metal contact surfaces, to ensure electrical conductivity and circuit integrity.
- O. Provide ground wire connection to all electrical boxes and wiring devices.
- P. Provide #6 AWG copper ground conductor connection to all cable trays. Cable tray grounding shall be continuous.
- Q. Provide minimum #6 AWG ground connection from transformer to building steel. Provide larger conductor as required per NEC and drawings.
- R. Bond service ground conduit to grounding conductor if conduit is metallic.
- S. The contractor shall be responsible to provide grounding connection on gas piping where an appliance or mechanical piece of equipment has gas and electric circuit run to it. The ground conductor size shall be the same size as the electrical branch circuit run to the appliance or equipment to meet the NEC. article 250.
- T. Air-Duct Equipment Circuits: Install insulated equipment grounding conductor to duct-mounted electrical devices operating at 120 V and more, including air cleaners, heaters, dampers, humidifiers, and other duct electrical equipment. Bond conductor to each unit and to air duct and connected metallic piping. Connect with same size ground as ground feeding circuit.
- U. Water Heater, Heat-Tracing, and Antifrost Heating Cables: Install a separate insulated equipment grounding conductor to each electric water heater and heat-tracing cable. Bond conductor to heater units, piping, connected equipment, and components. Connect with same size ground as ground feeding circuit.
- V. Poles Supporting Outdoor Lighting Fixtures: Install grounding electrode and a separate insulated equipment grounding conductor in addition to grounding conductor installed with branch-circuit conductors.
- W. Ground Ring: Install a grounding conductor, when indicated, electrically connected to each building structure ground rod and to each steel column, extending around the perimeter of building.
  - 1. Install 4/0 AWG, unless noted otherwise, tinned-copper conductor for ground ring and for taps to building steel.
  - 2. Bury ground ring not less than 24 inches from building's foundation.

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- X. Connections: Make connections so possibility of galvanic action or electrolysis is minimized. Select connectors, connection hardware, conductors, and connection methods so metals in direct contact are galvanically compatible.
  - 1. Use electroplated or hot-tin-coated materials to ensure high conductivity and to make contact points closer in order of galvanic series.
  - 2. Make connections with clean, bare metal at points of contact.
  - 3. Make aluminum-to-steel connections with stainless steel separators and mechanical clamps.
  - 4. Make aluminum-to-galvanized-steel connections with tin-plated copper jumpers and mechanical clamps.
  - 5. Coat and seal connections having dissimilar metals with inert material to prevent future penetration of moisture to contact surfaces.

3.3 FIELD QUALITY CONTROL

- A. Upon completion of installation of electrical grounding and bonding systems, test ground resistance of each separately derived system with ground resistance tester. Where tests show resistance-to-ground is over 25 ohms, take appropriate action to reduce resistance to 25 ohms, or less, by driving additional ground rods; then retest to demonstrate compliance.
  - 1. Provide type-written report in O&M manual documenting test results.
- B. Contractor shall coordinate with local inspector to provide tests as required, and provide additional tests as required.

END OF SECTION 26 05 26