

SECTION 260526

GROUNDING AND BONDING SYSTEM

PART 1 GENERAL

1.1 STIPULATIONS

- A. The specifications sections "General Conditions of the Construction Contract", "Special Conditions", and "Division 1 - General Requirements" form a part of this Section by this reference thereto, and shall have the same force and effect as if printed herewith in full.
- B. Requirements of the following sections apply to this Section:
 - 1. Section 260000 - Basic Electrical Requirements.
 - 2. Section 260001 - Basic Electrical Materials and Methods.

1.2 SUMMARY

- A. This Section includes solid grounding of electrical systems and equipment. It includes basic requirements for grounding for protection of life, equipment, circuits, and systems. Grounding requirements specified in this Section may be supplemented in other sections of these Specifications.
- B. Related Sections: The following sections contain requirements that relate to this Section:
 - 1. Section 260519 - Wires and Cables.

1.3 QUALITY CONTROL

- A. Listing and Labeling: Provide products specified in this Section that are listed and labeled. The terms "listed" and "labeled" shall be defined as they are in the National Electrical Code, Article 100.
- B. Field Testing Organization Qualifications: To qualify for acceptance, the independent testing organization must demonstrate, based on evaluation of organization submitted criteria conforming to ASTM E 699, that it has the experience and capability to conduct satisfactorily the testing indicated.
- C. Electrical Component Standard: Components and installation shall comply with NFPA 70, "National Electrical Code" (NEC).
- D. UL Standard: Comply with UL 467, "Grounding and Bonding Equipment."

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by the following listed manufacturers, or equivalent manufacturer as approved by the Professional:
 - 1. Molded Fusion Welding Material
 - a. Cadweld
 - 2. Clamps/Connectors
 - a. Anixter Bros. Inc.
 - b. Burndy
 - c. Erico Products
 - d. Ideal Industries, Inc.
 - e. O-Z/Gedney Co.
 - f. Thomas & Betts Corp.

2.2 GROUNDING AND BONDING PRODUCTS

- A. Products: Of types indicated and of sizes and ratings to comply with NEC. Where types, sizes, ratings, and quantities indicated are in excess of NEC requirements, the more stringent requirements and the greater size, rating, and quantity indications govern.

2.3 WIRE AND CABLE CONDUCTORS

- A. General: Comply with Section 260519 - Wires and Cables. Conform to NEC Tables, except as otherwise indicated, for conductor properties, including stranding.
- B. Equipment Grounding Conductor: Green insulated.

2.4 MISCELLANEOUS CONDUCTORS

- A. Joints and Connections - Molded fusion welding process using proper mold and the number, size and type cartridge for the joint or connection. Water-pipe connection, silicon bronze approved mechanical connector designed for the pipe and cable to be bonded.
- B. Typical Equipment (power or telecom) Room Ground Terminal Bar:
 - 1. Copper 1/4 inch thick by 2-1/2 inch wide by length shown on the drawings, unless otherwise indicated, with two (2) rows of holes on 1-1/2 inch centers for 1/2 inch bolt, to receive cables two (2) directions.

2.5 CONNECTOR PRODUCTS

- A. General: Listed and labeled as grounding connectors for the materials used.
- B. Pressure Connectors: High conductivity plated units.

- C. Bolted Clamps: Heavy duty units listed for the application.
- D. Exothermic Welded Connections: Provided in kit form and selected for the specific types, sizes, and combinations of conductors and other items to be connected.

2.6 GROUNDING ELECTRODES

- A. Ground Rods: Copper-clad steel with high-strength steel core and electrolytic-grade copper outer sheath, molten welded to core.
 - 1. Size: 3/4 inch by 10 feet.
- B. Plate Electrodes: Copper plates, minimum 0.10 inch thick, size as indicated.

PART 3 EXECUTION

3.1 GENERAL

- A. All equipment, whether furnished by this Division or by others, shall be grounded.
- B. Provide building grounding as shown on Drawing Numbers.

3.2 INSTALLATION

1. Provide, in the same raceway with the associated phase and/or neutral conductors, a green colored equipment ground conductor having the same type insulation and connected as described below.
2. Install a ground conductor in each raceway to augment the circuit formed by the metallic raceway system. Bond the conductor to each box or enclosure in which access is possible. Size conductor as specified, shown or required by Code, whichever is larger. Install a grounding bushing and bonding jumper to the enclosure or contained ground bus for the following: each termination of conduits 1 inch trade size and larger at a switchboard, panelboard, or other enclosure, each location where multiple ring knockouts are damaged during conduit installation, each location where conduits are stubbed up into floor mounted enclosures; each conduit termination at a painted enclosure where paint is not removed before installation of raceway and each feeder.
3. All branch circuits shall be provided with an equipment grounding conductor sized per NEC Table 250.95. This includes all lighting and power branch circuits.
4. Provide a ground conductor to all light switches, receptacles, motors, light fixtures and all other branch circuit loads.
5. Install a ground conductor inside all flexible raceways (e.g., flexible steel, liquid tight). Bond the conductor to the enclosure or ground bus in the nearest box or access on either side of the flexible section. Size conductor as specified, indicated, or required by Code, whichever is larger.
6. Install a ground conductor in all sectional raceways with removable covers for access (e.g. plug in strips, surface raceway systems, and wire ways) unless specified otherwise. Size conductor in accordance with the NEC for the largest phase conductor size installed in raceway, or as indicated. Bond all sections of the raceway to the ground conductors. Connect all receptacle ground terminals in the raceway to the ground conductor, and make other ground connections shown on Drawings.

7. Grounding cable shall not be buried directly in concrete, but a conduit sleeve shall be provided where cable passes through concrete.
8. Where ground conductors are shown on Drawings and for all feeders, the use of the metallic raceway in place of the ground conductor will not be permitted. Where PVC conduit is used, be responsible for installing a code sized ground conductor, whether shown or not.
9. Make grounding connections electrically ahead of any overcurrent or disconnect device or tap connection such that disconnection of neutral load conductors does not interfere with or remove the system ground connection. Use separate lugs on the transformer neutral terminal for neutral and main grounding jumper when cable is used for transformer connections.
10. Make all connections to the grounding electrode system accessible.
11. Install equipment room ground terminal bar in equipment rooms where indicated. Mount bar by anchors and bolts using 1 1/2 inch long segments of 1/2 inch rigid conduit as spacer between bar and wall. Use a minimum of two supports 18 inch on center. Connect all grounding electrode system conductors, system enclosure ground bus, and other indicated electrode systems to the terminal bar.
12. Unless indicated otherwise, form the equipment ground circuit with rigid metallic raceways (e.g. EMT, rigid steel conduit) where used. Install a bonding jumper for continuity around all fittings and terminations where the conductive raceway is made non continuous.
13. Bond all grounding conductors to boxes or enclosures at each access point. Do not use building steel as equipment grounding path. Use welded ground connections, at least where such are buried in soil, installed below slabs on grade, or embedded in concrete.
14. Bond all conductive metallic piping system in each mechanical equipment room as required by NEC 250 80/B. Minimum size of conductors as required by NEC. Locate all connections where access is unrestricted for inspection. Looping of conductor from one system to another is acceptable provided the conductor is without splice.

3.3 TESTS

- A. Verify that the ground resistance of new ground terminal related to emergency power distribution system, does not exceed 3 Ohms. Measure by a suitable ground resistance test set operated in strict accordance with the manufacturer's instructions. Use appropriate solutions to adjust the grounding resistance in case it comes more than 3 Ohms.
- B. Verify there are no accidental grounds on the service(s) by measuring the resistance between the neutral and ground, with the bonding jumper(s) open.
- C. Submit certified test results of the above prior to final acceptance of the facility.
- D. Submit report on resistivity of the soil to meet required specifications. This includes all other systems that are required to be grounded and bounded.

END OF SECTION 260526