

Design Standard

Grounding and Bonding for Electrical Systems

Purpose:

This design standard has the purpose of creating a consistent application for the grounding and bonding of electrical systems throughout the East Side Union High School District, therefore achieving a standard of quality for maintenance, reliability, and operational efficiency throughout all renovation and new building projects. This design standard also covers grounding of water service, gas service, telecommunications and other systems.

Design Standard:

Ensure grounding and bonding of electrical service, circuits, equipment, signal and communications systems.

Design and specify the installation of equipment grounding such that metallic structures, enclosures, raceways, junction boxes, outlet boxes, cabinets, machine frames, portable equipment and other conductive items in close proximity with electrical circuits operate continuously at ground potential and provide a low impedance path for possible ground fault currents. Grounding Electrode Conductor shall be a bare copper stranded conductor.

Supplement the grounded neutral of the secondary distribution system with an equipment grounding system to properly safeguard the equipment and personnel.

The grounding system shall meet the following installation requirements based on Code requirements and standard industry practices:

- Concrete Encased Ground Electrode (“Ufer ground”):
 - i) From the service equipment ground bus install grounding electrode conductor to footing/foundation rebar.
 - ii) Bond the grounding electrode conductor to independent steel rebars.
 - iii) Protect grounding electrode conductor extension from footing/foundation to service equipment with rigid PVC conduit. Do not use metal conduit for grounding electrode conductor protection.
- Ground Rod Electrode:
 - i) Coordinate placement of ground rods and interconnecting conductor in base of building concrete footing prior to placement of concrete.
 - ii) Install stranded bare copper conductor in base of perimeter concrete footing, minimum gauge: #3/0.
 - iii) Layout conductor to provide maximum exposure to earth in the perimeter footing. Do not fold conductor.
 - iv) Bond to driven ground rods.

- v) Tap at center ground rod and extend ground electrode conductor to service ground bus. Install grounding electrode conductor extension in rigid PVC conduit for physical protection. Do not use metal conduit for grounding electrode conductor protection.
- Water Service Grounding: Bond building ground electrode and water service pipe to service ground bus. Connect to water pipe on utility side of isolating fittings or meters, bond across water meters.
- Other Piping Systems: Bond gas piping system, fire sprinkler piping system and other metal piping systems to service equipment ground bus.
- Raceways:
 - i) Ground metallic raceway systems. Bond to ground terminal with code size jumper except where code size or larger grounding conductor is included with circuit, use grounding bushing with lay-in lug.
 - ii) Connect metal raceways, which terminate within an enclosure but without mechanical connection to the enclosure, by grounding bushings and ground wire to the grounding bus.
 - iii) Where equipment supply conductors are in flexible metallic conduit, install stranded copper equipment grounding conductor from outlet box to equipment frame.
 - iv) Install equipment grounding conductor, code size minimum in raceway systems.
- Feeders and Branch Conduits:
 - i) Install continuous insulated equipment copper ground conductors within the following circuits; feeders, circuits for computer systems and other circuits as required.
 - ii) Where installed in a continuous solid metallic raceway system and larger sizes are not detailed, provide insulated equipment ground conductors for feeders and branch circuits sized in accordance with Table 250-122.
 - iii) Install isolated ground conductors for electrically sensitive equipment. Install isolated grounding conductors isolated from the equipment ground system except at the common ground connection at the service equipment. Provide isolated ground bus in panelboards isolated from the equipment ground system.
- Boxes, Cabinets, Enclosures and Panelboards:
 - i) Bond grounding conductors to enclosure with specified conductors and lugs. Install lugs only on thoroughly cleaned contact surfaces.
 - ii) Bond sections of service equipment enclosure to service ground bus.
- Motors, Equipment and Appliances: Install code size equipment grounding conductor from outlet box to (motor) equipment frame or manufacturer's designated ground terminal.
- Receptacles: Connect ground terminal of receptacle to equipment ground system by No. 12 conductor bolted to outlet box except isolated grounds where noted. Self-grounding nature of receptacle devices does not eliminate conductor bolted to outlet box.

- Telecommunications Grounding System: Mount telecommunications main grounding busbar (TMGB) in each MDF. Mount a telecommunications grounding busbar (TGB) in each IDF. Install main telecommunications bonding backbone (TBB) conductor continuous from the MDF to every IDF. Bond the TMGB to the main building electrical grounding system and the nearest acceptable structural ground with a 3/0 AWG copper equipment grounding conductor.
- Separately Derived Systems: Ground each separately derived system.

Approved Manufacturers:

- Ground Rods
 - i) Weaver
 - ii) Thomas & Betts
 - iii) Talley
- Grounding Connectors
 - i) Burndy Hyground Compression Systems
 - ii) Erico/Cadweld
 - iii) Amp Ampact Grounding System
- Pipe Grounding Clamps
 - i) Burndy GAR Series
 - ii) O-Z Gedney
 - iii) Thomas & Betts
- Telecommunication Grounding Bus Bar
 - i) Chatsworth
 - ii) Erico
 - iii) Square D
 - iv) Panduit

Substitutes Allowed:

Yes, if performance and quality equivalency can be evidenced.

Associated Design Standards and Construction Specifications:

- Division 22 Plumbing Design Standards
- Division 23 HVAC Design Standards
- Division 25 Integrated Automation Design Standards
- Division 26 Electrical Design Standards
- Division 27 Communications Design Standards
- Division 28 Electronic Safety and Security Design Standards

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