

# SERVICE GROUNDING & BONDING

## 2016 CALIFORNIA ELECTRICAL CODE SECTIONS 250.50, 250.104

*The following are general requirements for service grounding and bonding based on the 2013 CA Electrical Code. This handout is intended to provide only general information, for further information contact the Building & Safety Division.*

### **CEC Section 250.50 Grounding Electrode System and Grounding Electrode Conductor**

**250.50 Grounding Electrode System.** All grounding electrodes as described in 250.52(A)(1) through (A)(7) that are present at each building or structure served shall be bonded together to form the grounding electrode system. Where none of these grounding electrodes exist, one or more of the grounding electrodes specified in 250.52(A)(4) through (A)(8) shall be installed and used.

*Exception: Concrete-encased electrodes of existing buildings or structures shall not be required to be part of the grounding electrode system where the steel reinforcing bars or rods are not accessible for use without disturbing the concrete.*

### **CEC Section 250.104 Bonding of Piping Systems and Exposed Structural Metal.**

**(A) Metal Water Piping.** The metal water piping system shall be bonded as required in (A)(1), (A)(2), or (A)(3) of this section. The bonding jumper(s) shall be installed in accordance with 250.64 (A), (B), and (E).

**(1) General.** Meter water piping system(s) installed in or attached to a building or structure shall be bonded to the service equipment enclosure, the grounded conductor at the service, the grounding electrode conductor where of sufficient size, or to the one or more grounding electrodes used. The bonding jumper(s) shall be sized in accordance with Table 250.66 except as permitted in 250.104(A)(2) and (A)(3).

**(2) Buildings of Multiple Occupancy.** In buildings of multiple occupancy where the metal water piping system(s) installed in or attached to a building or structure for the individual occupancies by use of nonmetallic water piping, the metal water piping system(s) for each occupancy shall be permitted to be bonded to the equipment grounding terminal of the switchgear, switchboard or panelboard enclosure (other than service equipment) supplying that occupancy. The bonding jumper shall be sized in accordance with Table 250.122, based on the rating of the overcurrent protective device for the circuit supplying the occupancy.

**(3) Multiple Buildings or Structures Supplied by a Feeder(s) or Branch Circuit(s).** The metal water piping system(s) installed in or attached to a building or structure shall be bonded to the building or structure disconnecting means enclosure where located at the building or structure, to the equipment grounding conductor run with the supply conductors or to the one or more grounding electrodes used. The bonding jumper(s) shall be sized in accordance with 250.66, based on the size of the feeder or branch circuit



conductors that supply the building or structure. The bonding jumper shall not be required to be larger than the largest ungrounded feeder or branch circuit conductor supplying the building or structure.

**(B) Other Metal Piping.** If installed in, or attached to, a building or structure, a metal piping system(s), including gas piping, that is likely to become energized shall be bonded to any of the following:

- (1) Equipment grounding conductor for the circuit that is likely to energize the piping system
- (2) Service equipment enclosure
- (3) Grounded conductor at the service
- (4) Grounding electrode conductor, if of sufficient size
- (5) One or more grounding electrodes used

The bonding conductor(s) or jumper(s) shall be sized in accordance with 250.122, using the rating of the circuit that is likely to energize the piping system(s). The points of attachment of the bonding jumper(s) shall be accessible.

Informational Note No. 1: Bonding all piping and metal air ducts within the premises will provide additional safety.

Informational Note No. 2: Additional information for gas piping systems can be found in Section 7.13 of the NFPA 54-2012, *National Fuel Gas Code*.

**(C) Structural Metal.** Exposed structural metal that is interconnected to form a metal building frame and is not intentionally grounded or bonded and is likely to become energized shall be bonded to the service equipment enclosure; the grounded conductor at the service; the disconnecting means for buildings or structures supplied by a feeder or branch circuit; the grounding electrode conductor, if of sufficient size; or to one or more grounding electrodes used. The bonding jumper(s) shall be sized in accordance with Table 250.66 and installed in accordance with 250.64(A), (B), and (E). The points of attachment of the bonding jumper(s) shall be accessible unless installed in compliance with 250.68(A), Exception No. 2.

**(D) Separately Derived Systems.** Metal water piping systems and structural metal that is interconnected to form a building frame shall be bonded to separately derived systems in accordance with (D)(1) through (D)(3).

**(1) Metal Water Piping System(s).** The grounded conductor of each separately derived shall be bonded to the nearest available point of the metal water piping system(s) in the area served by each separately derived system. This connection shall be made at the same point on the separately derived system where the grounding electrode conductor is connected. Each bonding jumper shall be sized in accordance with Table 250.66 based on the largest ungrounded conductor of the separately derived system:

*Exception No. 1: A separate bonding jumper to the metal water piping system shall not be required where the metal water piping system is used as the grounding electrode for the separately derived system and the water piping system is in the area served.*

*Exception No. 2: A separate water piping bonding jumper shall not be required where the metal frame of a building or structure is used as the grounding electrode for a separately derived system and is bonded to the metal water piping in the area served by the separately derived system.*

**(2) Structural Metal.** Where exposed structural metal that is interconnected to form the building frame exists in the area served by the separately derived system, it shall be bonded to the grounded conductor of each separately derived system. This connection shall be made at the same point on the separately derived system where the grounding electrode conductor is connected. Each bonding jumper shall be sized in accordance with Table 250.66 based on the largest ungrounded conductor of the separately derived system.

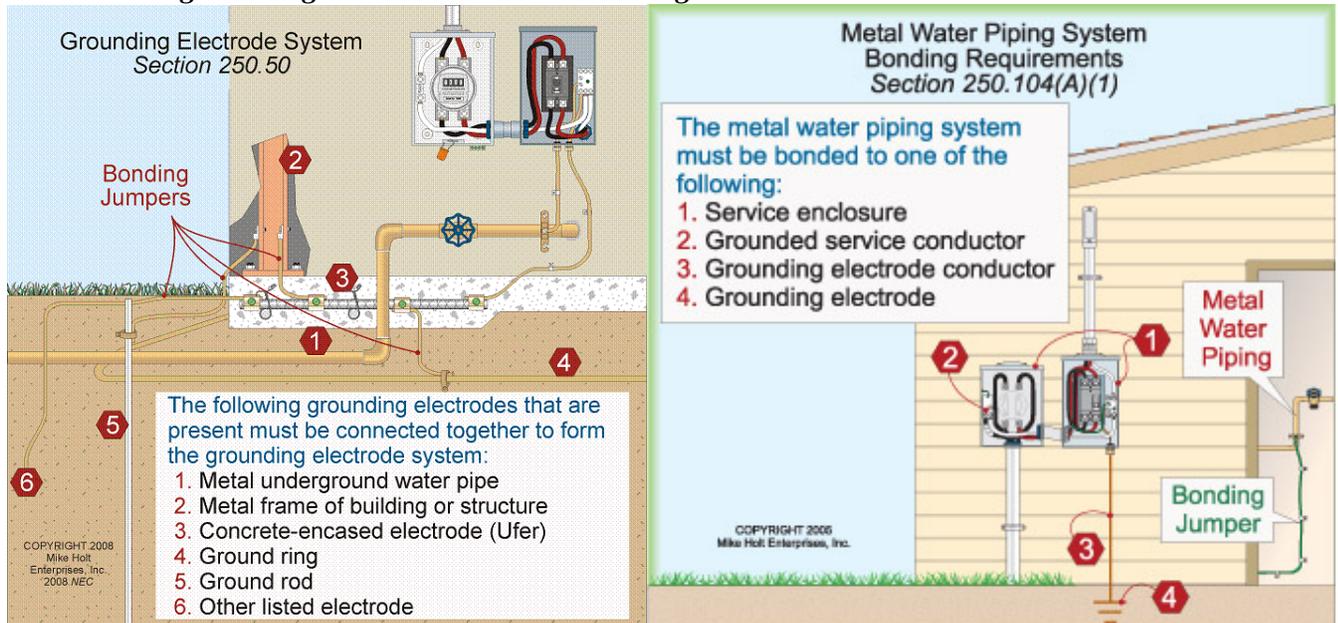
*Exception No. 1: A separate bonding jumper to the building structural metal shall not be required where the metal frame of a building or structure is used as the grounding electrode for the separately derived system.*

*Exception No. 2: A separate bonding jumper to the building structural metal shall not be required where the water piping of a building or structure is used as the grounding electrode for a separately derived system and is bonded to the building structural metal in the area served by the separately derived system.*

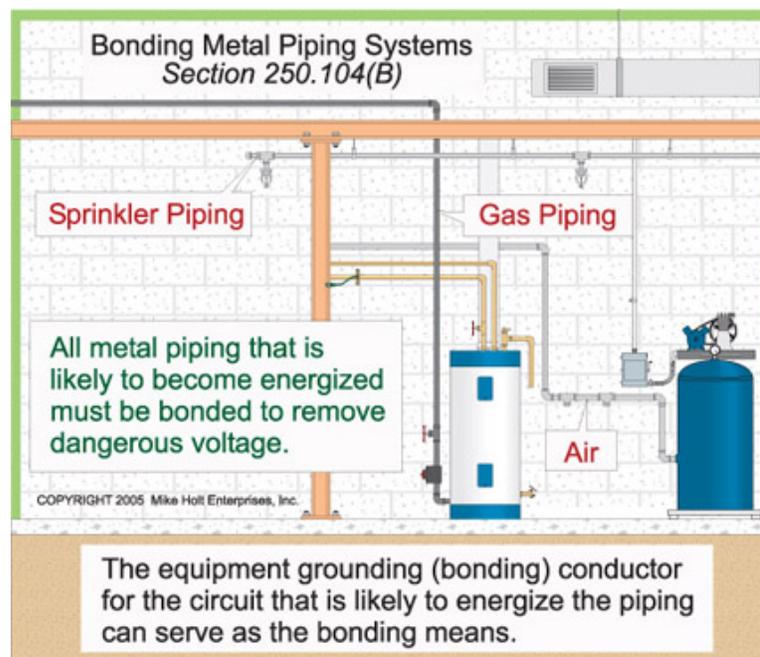
**(3) Common Grounding Electrode Conductor.** Where a common grounding electrode conductor is installed for multiple separately derived systems as permitted by 250.30(A)(6), and exposed structural metal that is interconnected to form the building frame or interior metal piping exists in the area served by the separately derived system, the metal piping and the structural member shall be bonded to the common grounding electrode conductor in the same area served by the separately derived system.

*Exception: A separate bonding jumper from each derived system to metal water piping and to structural metal members shall not be required where the metal water piping and the structural metal members in the area served by the separately derived system are bonded to the common grounding electrode conductor.*

**All available grounding electrodes shall be used to ground a new service CEC 250.50**



**Bonding Interior Metal Water Pipe 250.104(A)(1)**



**Bonding Other Metal Piping System 250.104(B)**