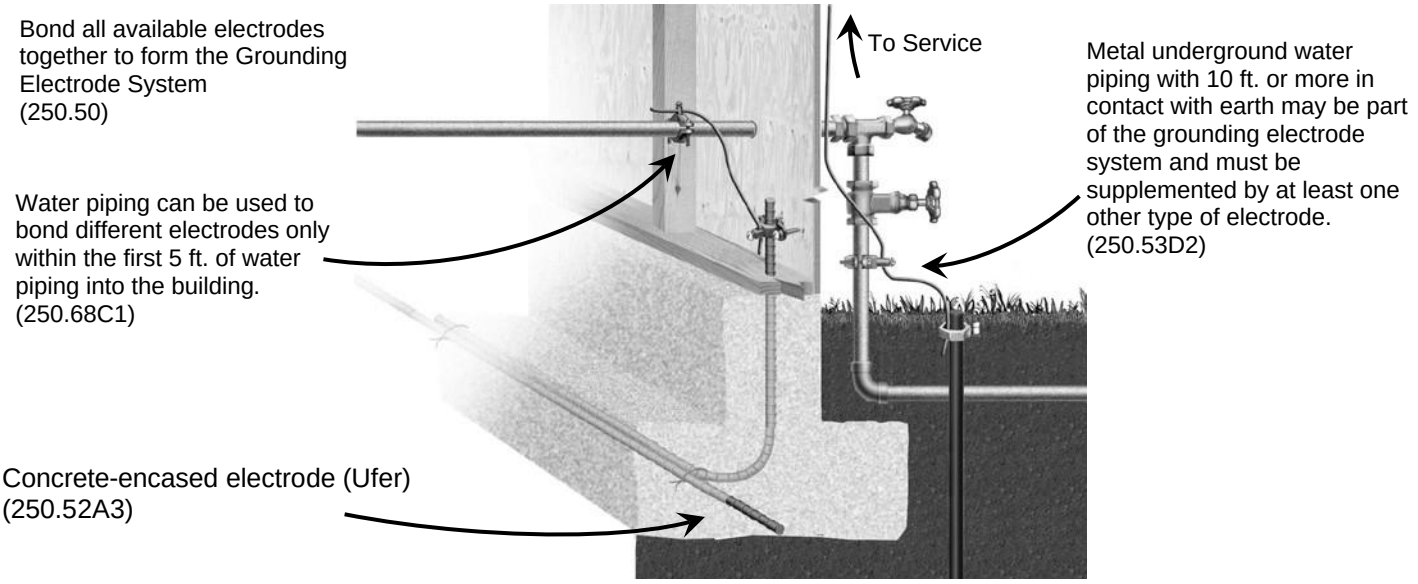
City of San Bruno
Community & Economic Development Department
Building Division
567 El Camino Real
San Bruno, CA 94066 Phone (650) 616-7074

2022 CALIFORNIA ELECTRICAL CODE GROUNDING ELECTRODE SYSTEMS



- A concrete-encased electrode (Ufer) is optional when new footings are created in direct contact with soils. (250.52 (A) (3)). It can be a minimum of 20 linear feet of #4 or larger rebar in the foundation footing, or a bare 4 AWG copper wire (Ground Ring). Pieces of rebar can be spliced with the usual steel tie wires to obtain the required 20 feet. Rebar that is normally present as part of the footing design can be used as the Ufer. The connection to the Ufer must be accessible; a piece of rebar is typically located behind a blank cover installed on a mud ring at the clamp location.
- Metal underground water piping with 10 feet or more in contact with earth may also be used as part of the system (250.52A1). Clamps to copper water tubing must be listed for same. Bonding jumpers must be installed around unions, regulators, or filters on the incoming line (250.53D1). Metal water piping must always be supplemented with one or more other electrodes (250.53D2).
- Ground rods must be driven their full depth of 8' minimum (250.53(4)), though when the grounding electrode conductor requires protection, a slight amount of the rod can stick out above the ground surface.
- Ground rod shall be 8' in length, 5/8" in diameter and shall be stainless steel AND copper or zinc coated
- All available electrodes must be bonded together (250.50).
- Connections to water piping must be made no further than 5 feet from the pipe's point of entry into the building (250.68C1).
- Bonding conductors and grounding electrode conductors are sized based upon the service conductor size. Grounding electrode conductors ending at a Ufer never need be larger than 4 AWG (250.66B), and those ending at ground rods never need be larger than 4AWG (250.66A). Water pipe conductors are sized as follows:

Copper Service Entrance Size	Aluminum Service Entrance Size	Grounding Electrode Conductor Size
≤ 2	≤ 1/0	8
1 or 1/0	2/0 or 3/0	6
2/0 or 3/0	4/0 or 250 kcmil	4
4/0 – 350 kcmil	> 250 – 500 kcmil	2
> 350 – 600 kcmil	> 500– 900 kcmil	1/0

- 8 AWG grounding electrode conductors always require protection (250.64B). 6 AWG conductors do not require protection where closely following the building surface and not exposed to physical damage. 4 AWG conductors and larger require protection when exposed to physical damage. Protection shall be RMC, IMC, RTRC, EMT, or cable armor.
- A Grounding Electrode Conductor, (GEC), shall be connected to the Grounded Service Conductor in a wireway or other accessible enclosure on the supply side of the service disconnect means.
- Protection for the grounding electrode conductor can be schedule 80 PVC conduit. If the protection is metal tubing, it must be bonded at each end. Bonding at the panel cannot be with ordinary locknuts (250.64G). Grounding type locknuts can be used when no concentric knockouts remain; bond bushings are required with remaining concentrics or reducing washers. Bonding at the electrode is with a clamp made for the purpose that connects either to the electrode or to the conductor.
- The conductor from the service equipment to the grounding electrode system must be installed in a single piece without splices (except splices made with irreversible connections or exothermic welding) (250.64C). Bonding conductors that connect the different parts of the grounding electrode system can be separate wires.
- Buildings or structures supplied by feeders or branch circuits shall have a grounding electrode or grounding electrode system installed in accordance with Part III of article 250. The GEC shall be connected in accordance with 250.32 (B) or (C) EXCEPTION: Where only a single branch circuit supplies the building or structure and the branch circuit includes an equipment grounding conductor.