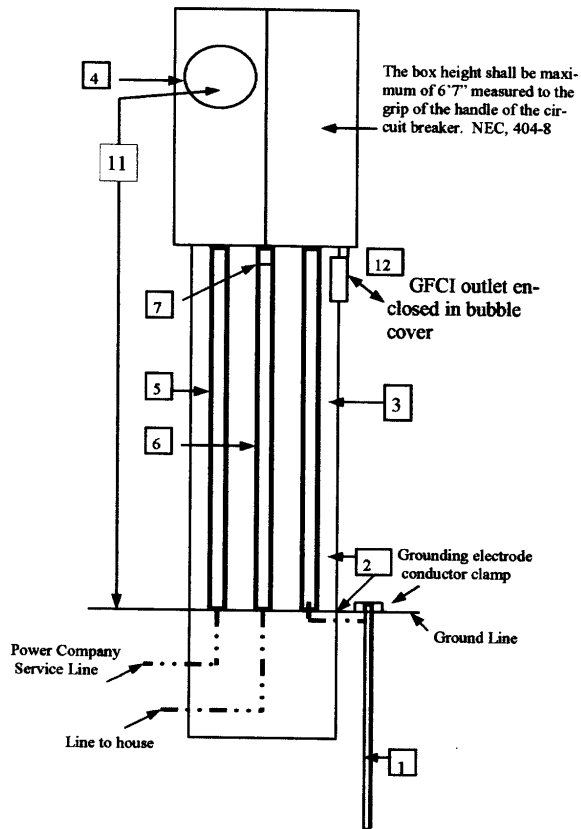


HUMBOLDT COUNTY & CITY OF WINNEMUCCA BUILDING DEPARTMENTS
UNDERGROUND ELECTRICAL SERVICE HANDOUT



1. Ground Electrode Conductor may be:
 - a. Rods of iron or steel or stainless steel at least 5/8" in diameter
 - b. Rods of listed nonferrous metal (copper or copper clad) not less than 1/2" diameter
 - c. Pipe or conduit not less than 3/4" trade size & where of iron or steel shall have the outer surface galvanized or otherwise metal coated for corrosion protection
 - d. The electrode shall be installed such that at least 8' of length is in contact with the soil. NEC, Section 250-52 A(5)
 - e. The grounding electrode conductor clamp shall be installed above ground
2. Grounding Electrode Conductor—Bare #6 copper for 100 amp service. Bare #4 copper for 200 amp service. NEC Table 250-66.
Shall be enclosed in approved conduit & connected to ground rod. If using metal conduit enclosure see attached for bonding of conduit.
3. Wood pole—6x6 square pressure treated
4. Meter base—(socket) with main disconnect breaker NEC 230-70. General means shall be provided to disconnect all conductors in a building or structure from the service entrance conductors. The disconnect shall be an external disconnect installed immediately adjacent to the meter locations. Switch boards and panels shall comply with NEC, Article 408.
5. Service conduit Schedule 80 sunlight resistant PVC (8' long min) Size conduit per wire size installed. Secure conduit to pole.
6. Load side conduit, Schedule 80 sunlight resistant PVC or metallic conduit. Size conduit per wire size.
7. Conduit access fitting (optional). Install approved fittings and bushings.
8. Electrical lines burial depth
 - a. Direct burial cables—24"
 - b. Rigid metal conduit—6"
 - c. Intermediate metal conduit—6"
 - d. Rigid nonmetallic conduit (Sunlight resistant PVC) approved for direct burial—18"
 - e. All wiring installed in conduit shall be approved for underground or wet location.
9. If a backer board is used it shall be of rot resistant material. Unistrut preferred
10. Panels shall be attached to the pole with lag bolts or other means that provide a permanently secured connection. NEC 110.13
11. Sierra Pacific Power Company requires 48" from the ground to the center of the meter socket.
12. For temporary electric for construction purposes a GFCI outlet or circuit breaker shall be installed & wired appropriately. Receptacles used in wet locations outdoors will be required to have an enclosure that is weatherproof and remains so even when plug is inserted. (Bubble covers required). NEC Article 406.8(B)
13. Contact the local power company for specific utility company requirements. Commercial equipment is required to be preapproved by the power company.
Sierra Pacific Power—(775)623-3667
Harney Electric—(775)272-3336

Revised 5/2006

Contractor Informational Bulletin

The Humboldt County Building Department and the City of Winnemucca Building Department have joined together in an effort to increase uniformity of construction code enforcement within Humboldt County. The information provided here will be enforced equally and consistently by both jurisdictions.

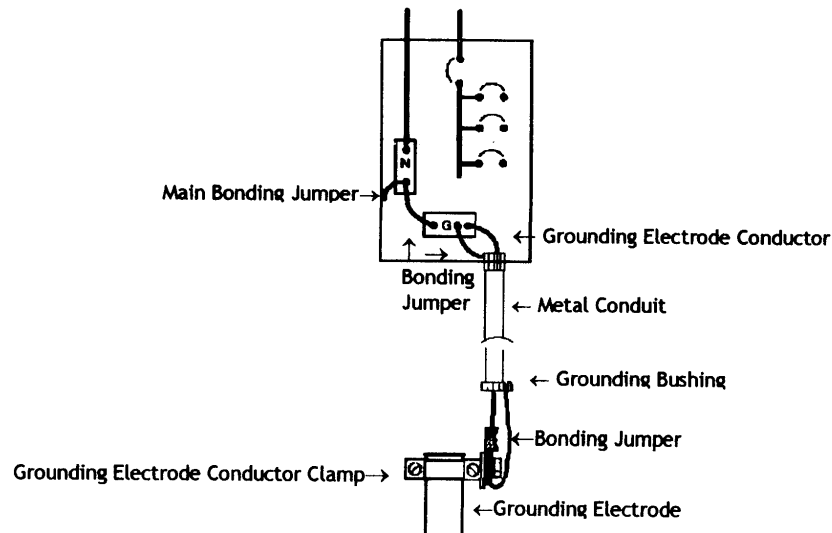
E-2000-01

REVISED: JANUARY 2005

Bonding of the Grounding Electrode Conductor Enclosure

2002 NEC 250-64(e) and 250-92(a)(3)

Regardless of the conductor size or the threat level of potential physical damage, protection shall be provided for the Grounding Electrode Conductor (GEC). In situations where a metallic raceway is used to provide physical protection for the Grounding Electrode Conductor (GEC), the end of the conduit where it terminates in space shall be made electrically continuous through bonding. An allowable method to achieve this would be to increase the length of the GEC during the installation and then after attachment to the GEC clamp double the conductor back to a grounding bushing attached to the end of the metallic raceway. Or use Rigid Nonmetallic Conduit (RNC) as a means of physical protection.



Section 250-92(a)(3) is intended to clarify that where metal raceways, boxes, or enclosures contain a grounding electrode conductor, both ends of the raceway, box, or enclosure must be bonded to the grounding electrode conductor as illustrated in Figure 250.29. Bonding the raceway to the conductor reduces the impedance and minimizes the potential differences between the electrical equipment and ground. See also Sections 250-64(e) and 250-102(a). - 1999 National Electrical Code Handbook

As stated in the National Electrical Code Handbook, by making the metallic raceway continuous through bonding this will reduce the impedance placed on the Grounding Electrode Conductor (GEC). As you will see in the table below, specifically the last two columns on the right, impedance is doubled within a GEC that passes through a non-continuous length of metal conduit that is not properly bonded. This effect is caused by the EMF (Electro-Motive Force) generated by the conductor, which in turn causes the conduit to become magnetized. Furthermore, since a low impedance path for fault current is necessary to facilitate the operation of over-current devices during a ground fault, this should be treated as a very serious life safety issue and should be stressed to your employees.

Comparison of Copper Grounding Electrode Conductors When Used With And Without Steel Conduit For Physical Protection					
Copper Wire Size (AWG)	DC Resistance Of Bare Wire (Ohms/100')	Size of Conduit Enclosing Conductor	Approximate Resistance of Conduit (Ohms/100') *	Approximate Impedance of Conductor in Conduit (Ohms/100' at 500 Amps Sq. In. Density) *	
				Conduit Bonded At BOTH ends	Conduit NOT Bonded
8	0.07780Ω	½	0.0321Ω	0.105Ω	0.210Ω
6	0.04910Ω	¾	0.0242Ω	0.078Ω	0.156Ω
4	0.03080Ω	¾	0.0242Ω	0.078Ω	0.156Ω
2	0.01940Ω	1	0.0154Ω	0.056Ω	0.112Ω
0	0.01220Ω	1	0.0154Ω	0.056Ω	0.112Ω
00	0.00967Ω	1	0.0154Ω	0.056Ω	0.112Ω
000	0.00766Ω	1 ¼	0.0120Ω	0.044Ω	0.088Ω

* These values are approximate but sufficiently accurate for all practical purposes. Manufacturing tolerances for conduit, although quite satisfactory for it's physical requirements, can vary the resistance up to about 15 percent compared to standard dimensions.

LAEL Soares Book On Grounding - Sixth Edition, J.Philip Simmons © 1996 International Association of Electrical Inspectors