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**CATHODIC PROTECTION RECTIFIERS
INSTALLATION AND PURCHASING DATA**

O-11.1

Department: Gas Distribution and Technical Services Section: Gas Engineering and Planning
 Approved by: [REDACTED] Date: 10-18-02

Rev. #04: This document replaces Revision #03. For a description of the changes, see Page 4.

Purpose and Scope

This gas standard describes how to install a cathodic protection rectifier. It also provides purchasing data and illustrates rectifier installations.

Acronyms

ac: alternating current
 Amp(s): ampere(s)
 AWG: American wire gauge
 Cu: copper
 HMWPE: high molecular weight polyethylene
 PVC: polyvinyl chloride

General Information

1. Install the rectifier cabinet at eye level if the local conditions permit. In areas exposed to pedestrians or vehicles, maintain an 8' minimum distance between the base of the rectifier and ground level.
2. The electric service from the secondary to the safety switch must be installed by the appropriate PG&E electric department employees, depending on the type of service (e.g., new or existing residential or customer service).
3. Protect the wire with plastic conduit installed from the base of the pole to the anode(s) and to the gas main. The conduit prevents potential damage from digging, sharp rocks, gophers, etc.
 Note: Only a qualified engineer, qualified person, or qualified corrosion mechanic has the authority to place a rectifier in operation.
4. Secure the rectifier, safety switch cover, and safety switch handle with a Company-approved locking device.
5. Ensure that the wire connecting the rectifier to the anode(s) and gas main is a minimum AWG #10 if the rectifier output is 6 amps or less. Increase the wire size for higher current output or for excessive distances. Use the excess of the anode cable to extend from the anode to the rectifier without splices, where practical.
6. Install an electric meter when the rectifier current rating is more than 50 amps or when the power is not supplied by PG&E, unless a flat fee billing agreement can be reached with the other party.
7. Use a continuous wire with no splices to connect the ground rod to the solid, neutral bus inside the disconnect switch box. Test the resistance of the grounding system (see Item 16 below).
8. Tighten all the bushings, locknuts, and fittings with a wrench.
9. The maximum distance between rigid conduit supports shall be 5'.
10. Restrict the rectifier installation to one quadrant of the pole. Consult with the appropriate PG&E electric department employees when selecting which quadrant to use.
11. Ground the submersible rectifier case if it is metallic.
12. Enclose the grounding wire in a molding or conduit and as required by local codes.
13. Install the subsurface rectifier's waterproof, fusible disconnect in the ac hot leg (black wire).
14. See Gas Standard O-16, "Corrosion Control of Gas Facilities," for limits on current outputs.
15. Ensure that the pole-mount rectifiers are supplied with a switching assembly and connectors.

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16. If the ground resistance of the first ground rod is greater than 25 ohms, install a second ground rod (with a continuous ground wire) 6' from the first ground rod.

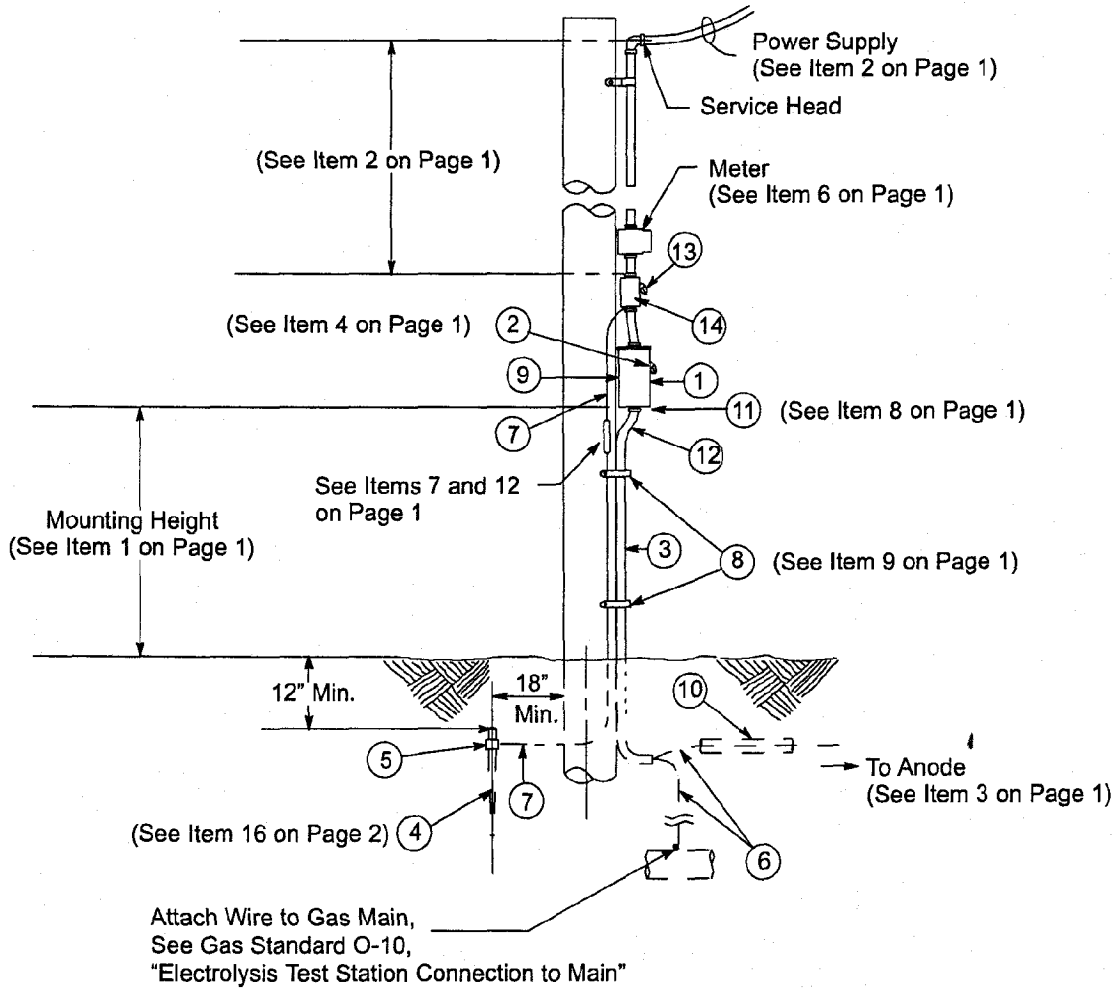


Figure 1
Pole-Mounted Rectifier Installation

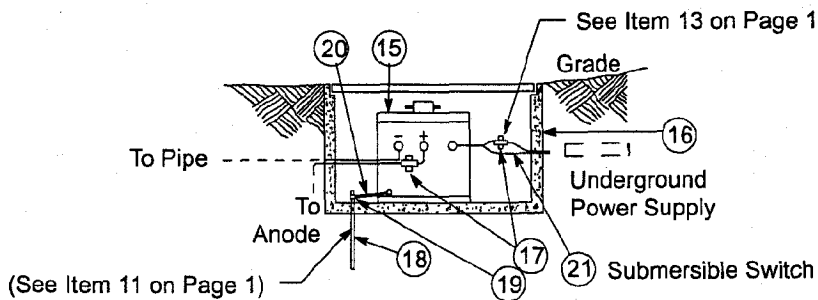


Figure 2
Subsurface Rectifier Installation

Cathodic Protection Rectifiers Installation and Purchasing Data

Table 1 Bill of Material for Pole-Mounted Rectifiers

Component	Quantity	Description	Code
1	1	Rectifier, Air-Cooled, 115 Volt. See Table 3 on Page 3 for Selection.	-
2	1	Padlock, Corporation	170040
3	As Required	Conduit, 1" PVC (Conduit, Rigid, Steel, Galvanized, 1", Code 390120 is Acceptable)	360305
4	1	Ground Rod, 5/8" x 8'	187013
5	1	Clamp, Ground Rod, 5/8"	187012
6	As Required	Wire, Cu HMWPE, 1/C #10 Solid, 600 Volt	294472
7	As Required	Wire, Grounding, AWG #6, Bare Copper	290072
8	As Required	Straps, Pipe, Galvanized, 1"	176004
9	As Required	Lag Screws, Steel, Galvanized, 1/4" x 2-1/2"	196022
10	As Required	Conduit, Plastic, PVC, 1/2", Schedule 40	360368
11	2	Locknut, Conduit, Galvanized, T & B #143, 1"	390269
12	1	Flex Connector Tubing	017140
13	1	Safety Equipment Lock	170115
14	As Required	Switch Safety Outdoor, 30 Amp	012680

Table 2 Bill of Material for Subsurface Rectifiers

Component	Quantity	Description	Code
15	1	Rectifier, Submersible, 115 Volt. See Table 3 on Page 3.	-
16	1	24" x 36" Precast Concrete Box, 10" Extension	Footnote 1
17	2	Waterproof, Fusible Disconnect, 30 Amp, TRON, HEB	349954
18	1	Ground Rod, 5/8" x 8'	187013
19	1	Clamp, Ground Rod, 5/8"	187012
20	As Required	Wire, Grounding, AWG #6, Coated, Copper	291016
21	1	Submersible Switch	

¹ Gas Standard K-42, "Precast Boxes 24" x 36", 30" x 48", and 30" x 60"

Table 3 Codes for 115 Volt Rectifiers

Description	Code
Pole-Mounted, Air-Cooled, 40 Volt Output, Complete Installation With Case, Universal, 5 Amp, ES-B-40-C	270314
Pole-Mounted, Air-Cooled, 20 Volt Output, Complete Installation With Case, Universal, 5 Amp, ES-B-20-C	Footnote 1
Retrofit for Existing Pole-Mount, Goodall Type F, 5 Amp, 40 Volt, Universal, ES-F-40-5	270403
Retrofit for Existing Pole-Mount, Goodall Type F, 5 Amp, 20 Volt, Universal, ES-F-20-5	Footnote 1
Underground, Western Rectifier Model WUSTA-40-5-U, 40 Volt, 5 Amp, With 50 mV-5 Amp Shunt	274102

¹ The 20 volts units are recommended for use with low resistance (5 ohms or lower) anode beds. Contact the senior gas distribution engineer at [REDACTED] for ordering information.

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Revision Notes

Revision 04 has the following changes:

1. Eliminated a use of the A-2 compound.
2. Added the submersible switch (Component 21) to Figure 2 on Page 2 and Table 2 on Page 3.
3. Improved language of Item 3, Item 4, and Item 6 on Page 1.
4. This document is part of Change 51.