

Section 11

Electric Switchboards: 601 Through 25,000 Volts and Primary Services

11.1. Scope

This section provides application and installation details for high-voltage switchboard metering equipment ranging from 601 through 25,000 volts.

11.2. General Requirements

The following general requirements apply when installing high-voltage electric switchboards and primary services.

Find reference information for interconnections and primary services in Section 11.4. on Page 11-8.

NOTE: PG&E will require a transparent, insulated, inner door as a safety barrier in front of the termination section for all switchboards 601 volts through 25,000 volts. Construct the safety door from a solid piece of clear acrylic that is 1/4" thick and resistant to damage by impact or puncture. Ensure the acrylic is rated for the voltage served. The safety door must extend a minimum of 10 inches below the terminating bus and must cover all energized parts on the switchboard. The acrylic door must be operable with hinges on one side, and a handle and provisions to secure the door in the open and closed positions on the opposite side. This requirement will be effective starting with the release of the 2012 *Greenbook*.

A. The specific switchboards voltages represented in this section are:

- 2,400
- 4,160
- 12,000
- 17,200
- 20,780

B. Applicants must ensure that manufacturers contact PG&E *before* fabricating the switchboards and request the specific information listed below.

- Service voltage, phase, and wiring.
- Meter panel requirements for the applicable rate schedule.
- Service-termination location.
- Switchboard and/or meter location.
- Size and number of service conductors.
- Other information and specifications necessary for fabricating switchboards (e.g., Equipment Utility Service Requirements Committee [[EUSERC](#)], Section 400 requirements).

- C. A manufacturer must submit three sets of drawings of the proposed equipment to PG&E for approval **before** manufacturing the equipment. The drawings must include the contractor's name and address, the applicant's name, and the job location. Field-design changes are **not** permitted without obtaining PG&E's approval before making the changes.
- D. PG&E must furnish and install fuses for voltage transformers (VTs), as well as for the following equipment.
 - Meters
 - Metering transformers
 - Test switches
 - All secondary wiring from the metering transformers to the metersWhen more than one switchboard is required, install a separate service section. Ensure that it is separated completely (i.e., barriered) from other service sections, pull sections, or service switches and disconnects.

11.3. Specific Requirements for High-Voltage Switchboards

The applicant must ensure that the equipment described below is provided and that the included construction requirements are followed precisely when installing high-voltage switchboards.

- A. Provide and install the insulation barrier between the potential transformer (PT) disconnect switches and the PT section. The voltage disconnect switch **must** be visible when the instrument transformer door and the outer door of the switchboard are opened.
- B. Ensure that the insulated cables and conductors are made available to PG&E. PG&E personnel will make the connections between the PT fuse holders and metering PTs. Use only the "no-load" types of PT disconnect switches.
- C. Provide individual pulling eyes above each of the current transformer (CT) positions to aid CT lifting.
- D. Ensure that all ground buses are solid bus bars with dimensions of at least 1/4 inch x 2 inches. Ground buses must be constructed from either **copper** or **aluminum**.
- E. Do **not** use flex braid on any section of ground buses.
- F. Ensure that a ground bus bar is used for the PT disconnect.
- G. Ensure that ground buses do **not** obstruct internal compartments, openings, conduits, or accesses to utility facilities, equipment, or extended work areas.
- H. Ensure that the ground bus is located in front of the panel to provide better accessibility for any work to be performed.
- I. Only use a gang-operated disconnect. The disconnect must have grounds in a blade-and-jaw configuration when it is opened. Do **not** use fused-drawer disconnect devices or fused, removable, section-type disconnect devices.

- J. Ensure that workspaces and clearances meet the required state and local codes. Ensure that there is an unobstructed, 8-foot area cleared in front of all access doors. This area is required for installing and removing PG&E's safety grounds. Maintain this clearance area at all times.
- K. Concrete pads must extend a minimum of 48 inches, as measured from the outside of the equipment's outer doors.
- L. Ensure that a neutral lug is provided in the PT section. Use this lug to terminate the neutral circuit that is connected to the ground bus section on the CT compartment.
- M. Ensure the requirements in Subsection 5.2.1 are followed.
- N. Ensure that permanent marking or labeling, indicating the service voltage being supplied, is included on all electric meter panels and all equipment doors or panels that provide access to the service terminations, PTs, and CTs.
- O. Provide a bare bus that is 4 inches above *and* below the CTs. PG&E will use this bare bus as a safety ground.

As an alternative, applicants may provide a grounding knob on both the line and load sides of the bus at the location of each CT.
- P. Ensure that the primary taps for PTs are connected to the line side of the metering CTs.

Another alternative allows applicants to mount the meter panel in front of the CT termination compartment if, when the meter panel is open, the compartment is isolated fully by a removable or hinged barrier. This barrier must be sealable using stud and wing assemblies.

Connect the primary taps for the PTs only to the line side of metering CTs.
- Q. **Do not install ball studs** to attach safety grounds on the line and load side of the CT bus units.
- R. Ensure that the maximum amount of operating force required to open and close a PT disconnect switch is no more than 50 foot-pounds.
- S. Install two ground rods and conduits for the primary service as shown in Figure 11-1 on Page 11-4. These two ground rods are in addition to others that are installed for the switchboard.
- T. Submit a termination section drawing detail to your local service planning representative that includes the position of the conduit(s), ground rods, and additional internal components.

Notes in Reference to Figure 11-1

1. Primary conduits must be centered in the window, as shown.
2. Maintain a 6-foot minimum separation between ground rods.
3. The ground wire must be a continuous wire that connect to and runs from the outside ground rod, under the pad, to the primary window, then above the pad through the primary window, to the inside ground rod. Then, from the inside ground rod to the switchboard ground bus termination inside the termination section.

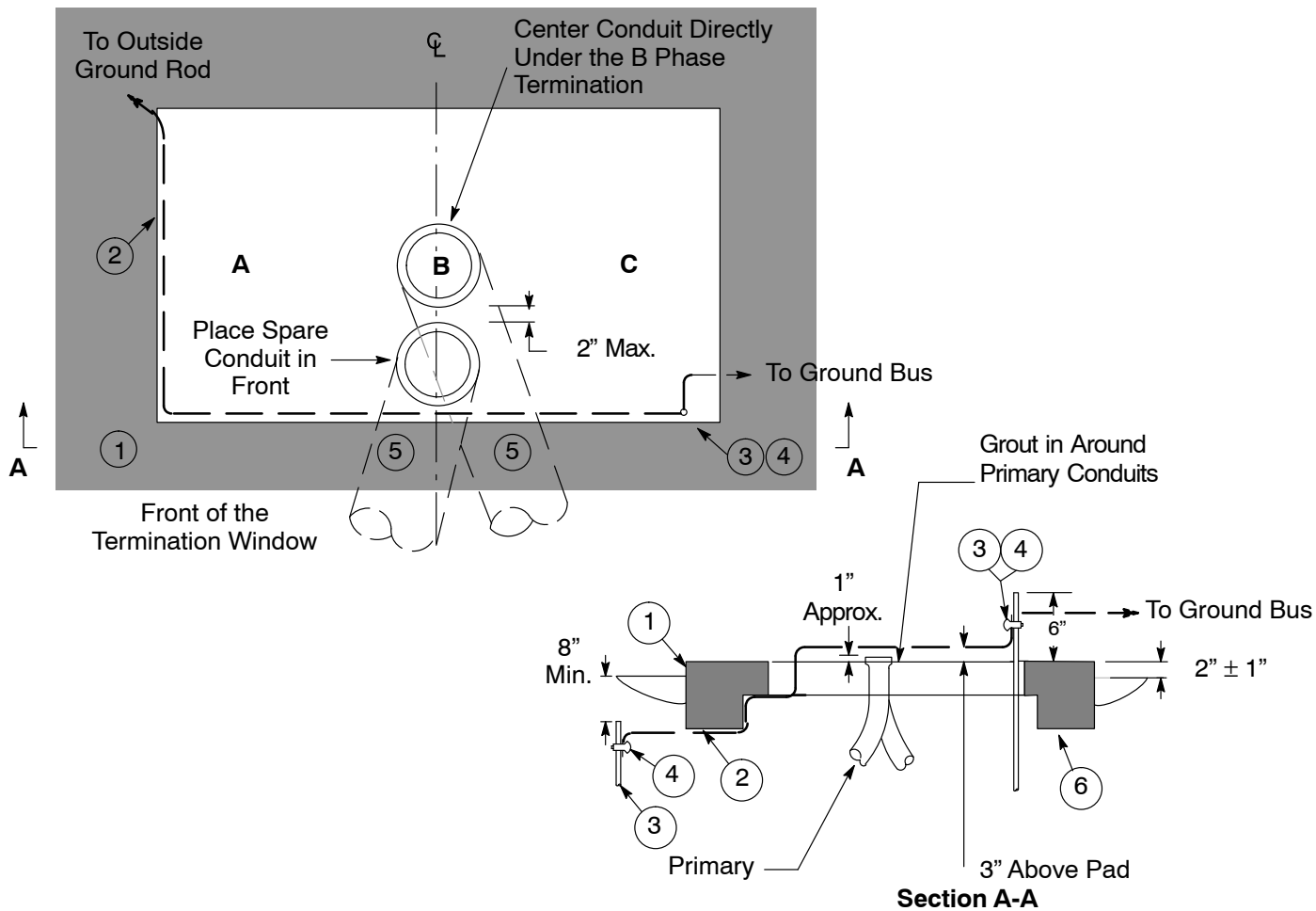


Figure 11-1
Primary Switchboard Termination Section Pad Detail

Table 11-1 Bill of Materials for Concrete Pad

Item	Quantity	Description	Code	Doc. No.
1	1	Pad, Concrete, Reinforced (size as required)	-	-
2	As required	Wire, #2 AWG, Solid, Soft Drawn, Bare Copper ¹	290074	-
3	2	Ground Rod, 5/8" x 8', Copperclad	187013	013109
4	2	Clamp, Ground Rod, for Item 3	187012	
5	As required	Conduit, Type and Size (as required)	-	062288
6	As required	Compacted Backfill	-	-

¹ When the pad is installed for PG&E by others, it is acceptable to use either solid or stranded wire.

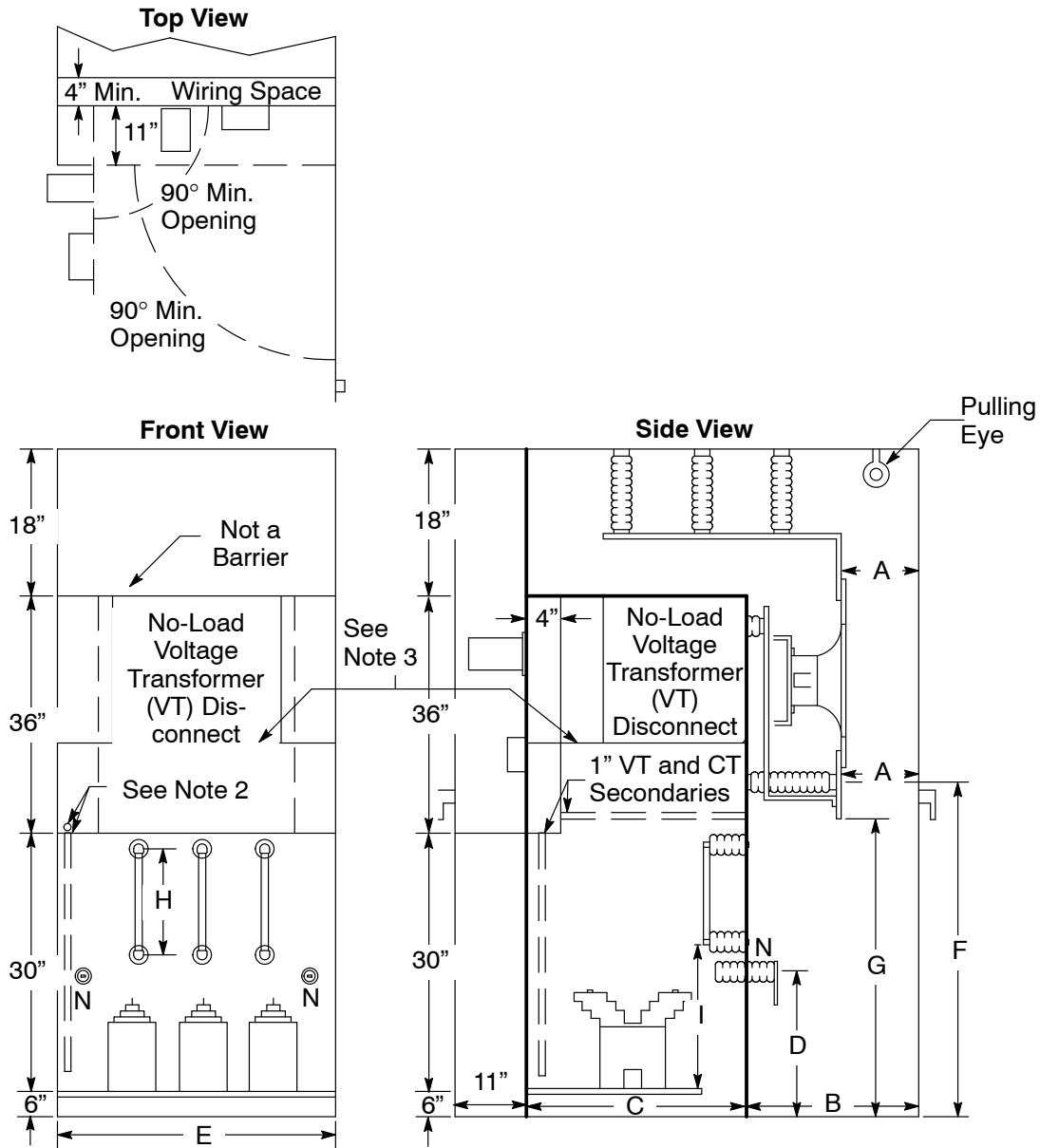


Figure 11-2
Typical, High-Voltage Metering Enclosure: 2,400-Volt Through 15,000-Volt Service

Notes in reference to Figure 11-2.

1. Install the meter's panel hinge on the opposite side from the enclosing door hinge on a weatherproof unit. This allows the meter panel to be opened a full 90°.
2. Locate the 1-inch VT and CT secondary circuits on the same side as the meter's panel hinges.
3. Electrically insulated barrier.
4. Applicants must ask the local service planner to contact the PG&E electric meter department to ensure that the types and models of instrument transformers they intend to install (i.e., VTs and CTs) are approved for use in high-voltage switchgear.

Table 11-2 Dimensions for High-Voltage Meter Enclosures

Specifications	Switchboard Voltage Rating			
	2,400	4,160/4,800	7,200/17,000	20,800/25,000
	(In Inches)			
Minimum, Bare-Bus Clearance Ø to Ground	3-1/2	3-1/2	6	7-1/2
Minimum, Bare-Bus Clearance Ø to Ø	5	5	7-1/2	9
Dimension A	5 Min. 10 Max.	5 Min. 10 Max.	8 Min. 10 Max.	9 Min. 15 Max.
Dimension B	24 Min.	24 Min.	24 Min.	36 Min.
Dimension C	24 Min.	24 Min.	24 Min.	36 Min.
Dimension D	12 Min.	12 Min.	12 Min.	12 Min.
Dimension E	36 Min.	48 Min.	48 Min.	60 Min.
Dimension F	42 Min. 48 Max.	42 Min. 48 Max.	42 Min. 48 Max.	56 Min. 60 Max.
Dimension G	36 Min.	36 Min.	36 Min.	48 Min.
Dimension H Fuse-Mounting Clip: Center	8-1/2	8-1/2	11-1/2	16-1/8
Dimension H Fuse Ferrule Diameter	1-5/8	1-5/8	1-5/8	1-5/8
Dimension I To Bottom of Fuse Clip or Bus Extension	18	18	18	18

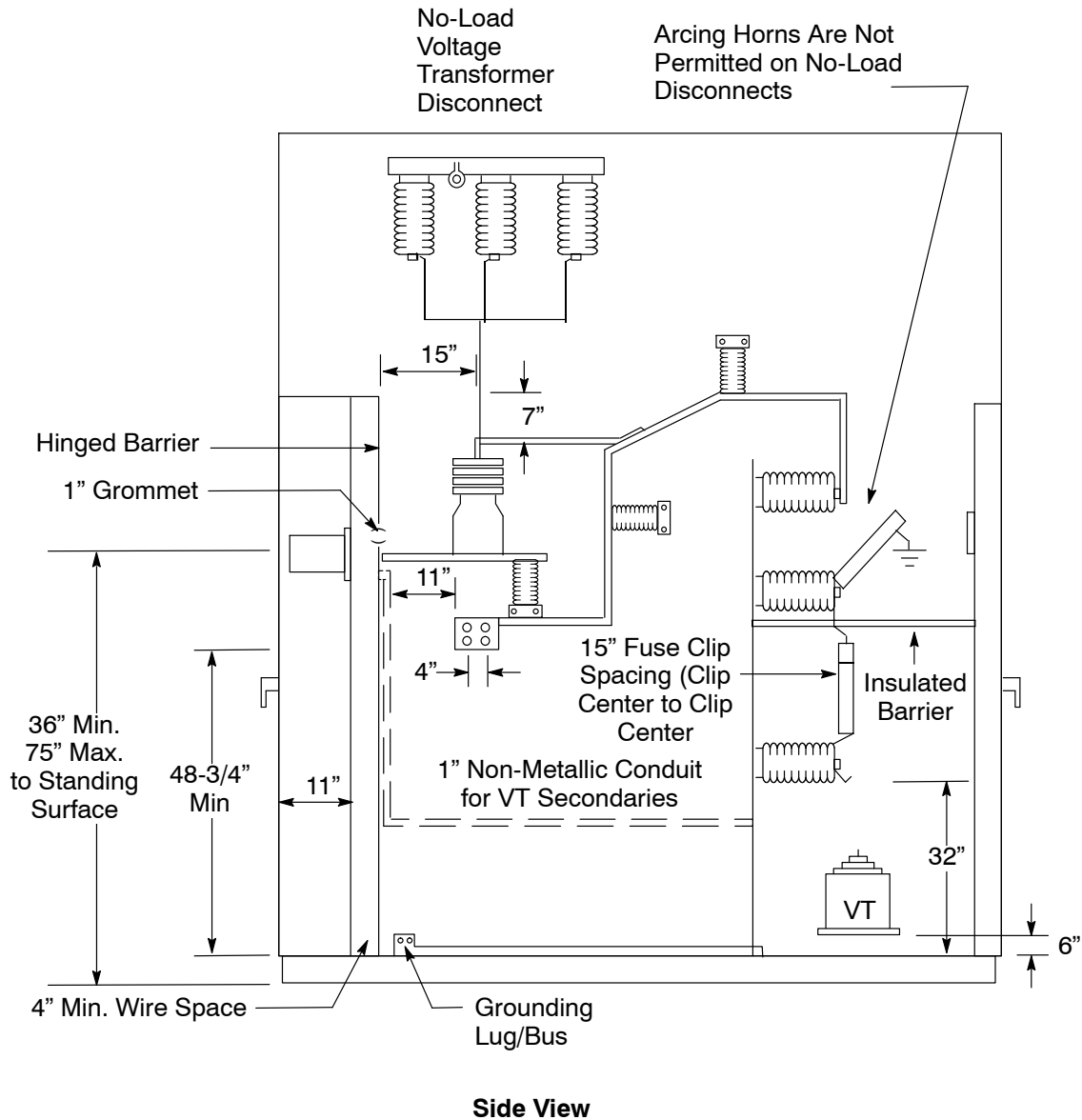


Figure 11-3
Typical, High-Voltage Metering Enclosure 15,001 to 25,000 Volt Service

Notes in reference to Figure 11-3 above and Figure 11-4 on Page 11-8.

1. For rear access to the door, refer to EUSERC Drawing 400, Sheet 2, Note 7.
2. Connect the primary taps for VTs to the line side of metering CTs.
3. When switchgear is mounted on rails, include a permanent platform, level with the bottom of the enclosure, in the switchgear installation to provide a clear and level working space in front of the meeting compartment.
4. Ensure that the grounding bus extends on either the left or right side of the CT compartment's access area. Also ensure that the grounding terminals are two aluminum-bodied mechanical lugs accepting a range of 6 AWG through 250 KCMIL conductors. Finally, ensure that they are identified with a label reading "SAFETY GROUNDING POINT FOR UTILITY USE ONLY."

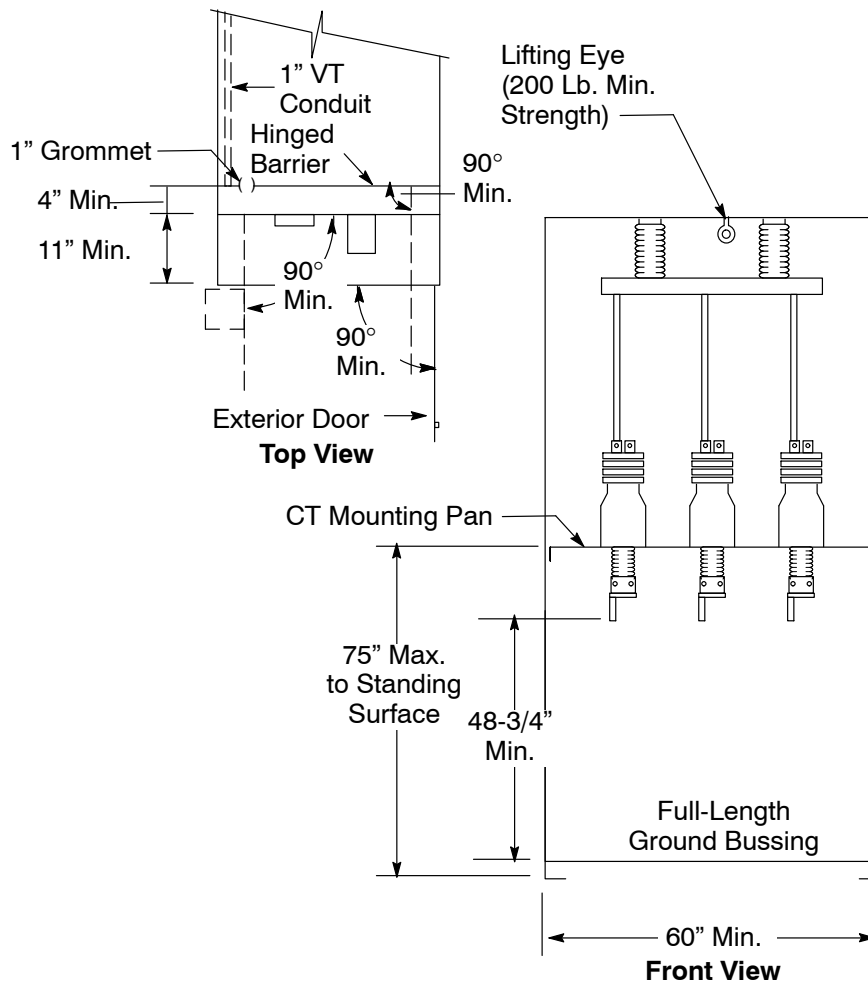


Figure 11-4
Typical, High-Voltage Metering Enclosure 15,001 to 25,000 Volt Service

11.4. Interconnection Requirements and Primary Services

When new or existing applicants request services above 600 volts, refer to Bulletin [2004PGM-11](#), "Technical Requirements for Electric Service Interconnection at Primary Distribution Voltages," for technical information about primary services. This bulletin is located in [Appendix B](#). If applicants intend to interconnect their generation facilities to PG&E's power system, they must refer to the [PG&E Distribution Interconnection Handbook](#) (<http://www.pge.com/mybusiness/customerservice/nonpgeutility/generateownpower/distributedgeneration/interconnectionhandbook/index.shtml>).