

ELECTRIC & GAS SERVICE REQUIREMENTS

(TD-7001M)

2022–2023

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***Pacific Gas and
Electric Company***TM

Pacific Gas and Electric Company (PG&E)
Electric and Gas Service Requirements
(TD-7100M)

Architects and Engineers

Electrical Contractors

Plumbing Contractors

City and County Building Inspectors

Manufacturers of Electrical Equipment

Pacific Gas and Electric Company Employees

2022–2023 Edition

(Supersedes All Previous Editions and Revisions)

The *Electric and Gas Service Requirements* (i.e., *Greenbook*) is a guide to Pacific Gas and Electric Company (PG&E) requirements and policies for establishing electric and gas service to new or remodeled applicant installations. The illustrations and explanations in this manual describe how to construct and install services and equipment. Alternate designs and installations that do not meet the requirements in this manual will not be approved.

In addition to the utility requirements, local or state officials may stipulate additional provisions for the installation of equipment and materials that are in their authorized areas of responsibility and jurisdiction.

Should you have any questions regarding this manual, please call your local PG&E representative (see [Table FM-1, “Service Planning Office and Inspection Desk Contact Information,”](#) starting on Page iv.).

Applicant gas and electric service and meter installation arrangements are subject to PG&E’s review and approval.

Applicants should contact their local PG&E representatives as soon in the planning process as possible.

NOTE: The acronym PG&E is used throughout this manual to designate Pacific Gas and Electric Company.



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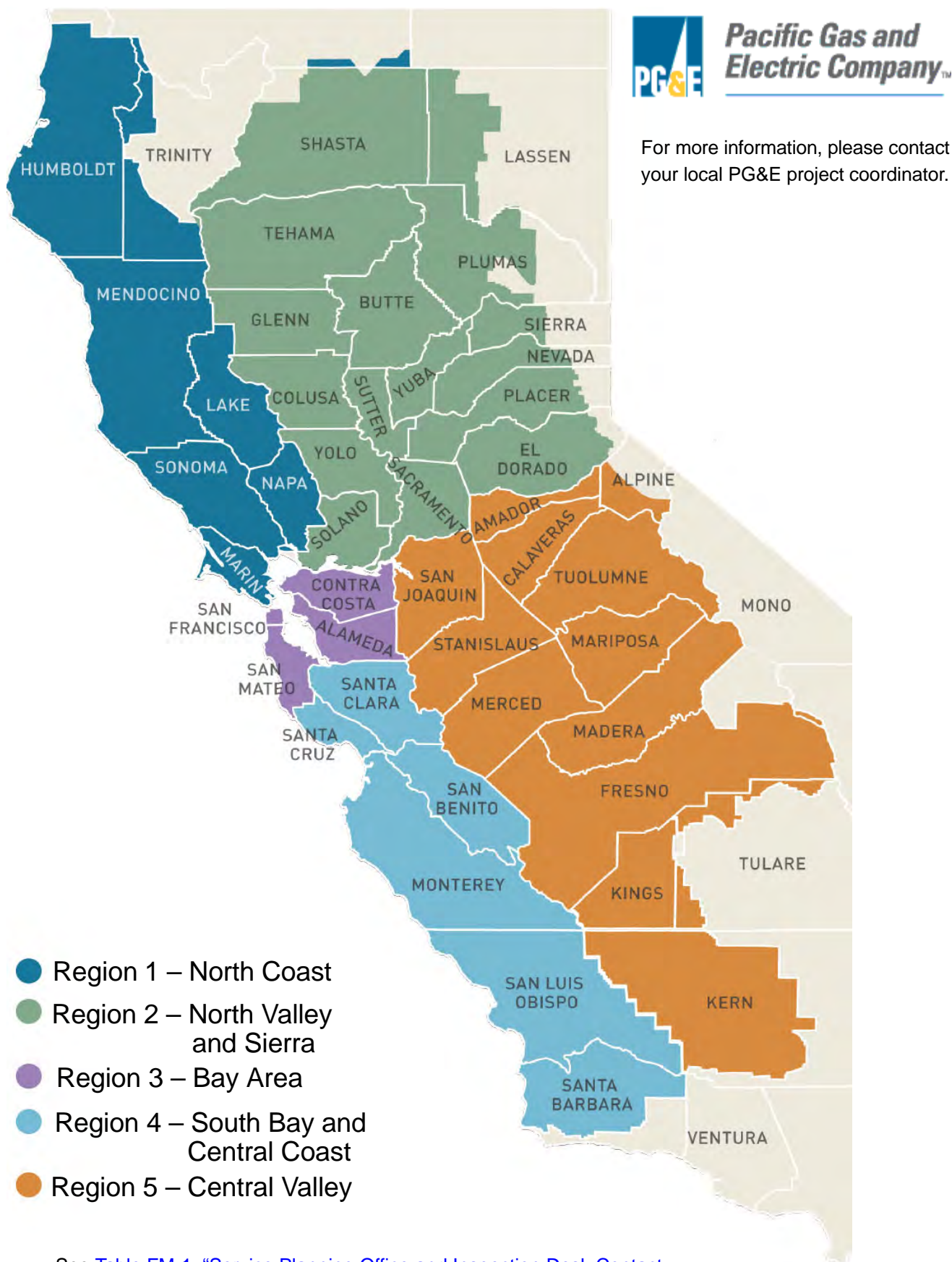
The PG&E *Electric and Gas Service Requirements* (i.e., *Greenbook*) is updated and published regularly. The 2022–2023 *Greenbook* supersedes all previous editions and revisions and the requirements, here in, are effective until a new revision is released the following year.

Notice: This Manual Is Subject to Change

Information and requirements in this manual are subject to change over time.

PG&E may revise its design and construction documents relating to applicant service requirements between updates to this manual. Except when required by law, PG&E applies only those construction and design specifications, standards, terms, and conditions that apply to a new extension of service project for the 18 months following the date the application for a new extension of service project is approved. The Approval Date of a new extension of service application refers to the earlier of either the effective date of the contract for the extension of gas and/or electric service or the date that PG&E first invoices the customer for the extension of gas and/or electric service. These requirements apply as long as applicants complete the approved projects within 18 months. If the applicant has not started construction within 18 months of PG&E's initial approval, PG&E may review the design and, if warranted, refresh the cost estimate. If the applicant does not fulfill obligations under the extension agreement, PG&E may, at its discretion, cancel the agreement (see Provisions Form 62-0982, Section 20). PG&E can then request another review of the design before approving construction activities.

The online versions of the *Electric & Gas Service Requirements*, located at www.pge.com/greenbook, are updated as quickly as possible when changes occur. The bound manual is not reprinted until the next scheduled print date regardless of changes in processes or requirements. **Therefore, it is imperative that applicants for all gas and electric service projects consult the online version of this manual (www.pge.com/greenbook) before finalizing project plans.**



See [Table FM-1, “Service Planning Office and Inspection Desk Contact Information.”](#) starting on Page iv.

Table FM-1 Service Planning Office and Inspection Desk Contact Information

Service Planning Office and Inspection Desk Contact Information							
Region	Division	Cities Covered	Work Center	Address	Zip Code	Phone	Email
Region 1: North Coast	Humboldt	Ukiah, All Mendocino and Lake Counties Inland	Ukiah	2641 N. State St	95482	(707) 468-3914	EDLHCCDUkiah@pge.com
Region 1: North Coast	Humboldt	Eureka, Arcata, Mckinleyville, Fortuna, Garberville, Alderpoint, Ferndale, Trinidad, Benbow, Blue Lake, Rio Dell, Redway, Shelter Cove, Willow Creek, Orick, Loleta, Cutten, Humboldt Hill, Scotia, Myers Flat, Weott, Samoa, Hydesville, Phillippsville, Fields Landing, Myrtle town, Big Lagoon, Miranda, Redcrest, Manila, Pine Hills, Bayview	Eureka	2555 Myrtle Ave	95501	(707) 445-5533	LHCCDEureka@pge.com
Region 1: North Coast	North Bay	Mill Valley, Kentfield, Greenbrae, Madera, Larkspur, Ross, Sausalito, Tiburon, Marin City, Belvedere, Novato, San Rafael, San Anselmo, Fairfax, Nicasio, Woodacre, Forest Knolls, Lagunitas, Point Reyes, Inverness, Dog Town, Bolinas, Stinson Beach, Olema, Muir Beach, Parts of Marshall	San Rafael	1220 Andersen Dr	94901	(415) 257-3130 (415) 257-3431	EDLHCCDSanRafael@pge.com
Region 1: North Coast	North Bay	Napa, Rutherford, Yountville, Saint Helena, Deer Park, Calistoga, Angwin Pope Valley, Berryessa, Vallejo, Benicia, American Canyon	Napa	1850 Soscol Ave, Suite 105	94559	(707) 257-5918	EDLHServiceDeskNapa-@pge.com
Region 1: North Coast	Sonoma	Sonoma, Petaluma, Cotati, Rohnert Park, Sebastopol, Santa Rosa, Windsor, Healdsburg, Cloverdale, Bodega, Bodega Bay, Annapolis, Cazadero, Duncan Mills, El Verano, Eldridge, Forestville, Geyserville, Jenner, Kenwood, Penngrove, Rio Nido, Stewarts Point, Vineburg, Valley Ford, The Sea Ranch Glen Ellen, Graton, Stewarts Point	Santa Rosa	3965 Occidental Rd	95401	(707) 579-6477	EDLHCCDSantaRosa@pge.com

Table FM-1 Service Planning Office and Inspection Desk Contact Information (continued)

Service Planning Office and Inspection Desk Contact Information							
Region	Division	Cities Covered	Work Center	Address	Zip Code	Phone	Email
Region 2: North Valley and Sierra	North Valley	Chico, Oroville, Lake Almanor, Willows, Orland, Paradise	Chico	460 Rio Lindo Ave	95926	(530) 894-4707	EDLHCCDChico@pge.com
Region 2: North Valley and Sierra	North Valley	Redding, Cottonwood, Igo, Ono, Shasta, City of Shasta Lake, Lakehead-O'Brien, Anderson, Burney, Johnson Park, Bieber, New Bieber, Old Station, Hat Creek, Palo Cedro, Bella Vista, Shingletown, French Gulch, Whiskeytown, Round Mountain, Montgomery Creek, Millville, Oak Run, Whitmore, Mountain Gate, Big Bend, McArthur, Fall River Mills, Little Valley, Cassel, Corning, Paskenta, Red Bluff, Mineral, Paynes Creek, Platina, Manton, Vina, Los Molinos, Gerber, Tehama, Flourney, Wildwood in SE Trinity County only, Lassen County	Redding	3600 Meadow View Dr	96002	(530) 246-6537 (530) 246-6527	EDLHCCDRedding@pge.com
Region 2: North Valley and Sierra	Sacramento	Sacramento, Elk Grove, Rancho Cordova, Folsom, Citrus Heights, Carmichael, Fair Oaks, North Highlands, Galt, Orangevale, Antelope, Rio Linda, Gold River, Rosemont, Rancho Murieta	Sacramento	5555 Florin Perkins Rd	95826	(916) 386-5112	EDLHCCDSacramento@pge.com
Region 2: North Valley and Sierra	Sacramento	Vacaville, Fairfield, Dixon, Rio Vista, Allendale, Suisun City, Birds Landing, Woodland, Davis, Yolo, Winters, Knights Landing, Clarksburg, Dunnigan, Guinda, Esparto, West Sacramento	Vacaville	158 Peabody Rd	95688	(707) 449-5791 (707) 449-5702	EDLHCCDVacaville@pge.com
Region 2: North Valley and Sierra	Sacramento	Arbuckle, Butte City, College City Colusa, Dunnigan, Grimes, Maxwell, Meridian, Williams, East Nicolaus, Elverta, Live Oak, Nicolaus, Pleasant Grove, Rio Oso, Sutter Yuba City, Browns Valley, Dobbins, Linda, Marysville, Plumas Lake, Arboga, Olivehurst, Oregon House, Smartsville, Big Oak Valley, Wheatland	Marysville	29 4th St	95901	(530) 634-6442	EDLHCCDMarysville@pge.com

Table FM-1 Service Planning Office and Inspection Desk Contact Information (continued)

Service Planning Office and Inspection Desk Contact Information							
Region	Division	Cities Covered	Work Center	Address	Zip Code	Phone	Email
Region 2: North Valley and Sierra	Sierra	Auburn, Alta, Soda Springs, Dutch Flat, Colfax, Meadow, Vista, Foresthill, Cool, Georgetown, Garden Valley, Newcastle, Penryn, Loomis, Granite Bay, Sheridan, Pleasant Grove, Rocklin, Roseville, Lincoln, Grass Valley	Auburn	12840 Bill Clark Way	95602	(530) 889-3271	AuburnInspectionRequests@pge.com
Region 2: North Valley and Sierra	Sierra	Placerville, Diamond Springs, El Doarado, Camino, Somerset, Grizzly Flats, Pollock Pines, Kyburz, Twin Bridges, Strawberry Shingle Springs, Rescue, Lotus, Coloma, Cameron Park, El Dorado Hills	Placerville	4636 Missouri Flat Rd	95667	(530) 621-7275	EDLHCCDPlacerville@pge.com
Region 3: Bay Area	Diablo	Antioch, Pittsburg, Bay Point, Byron, Knightsen, Bethel Island, Brentwood, Oakley, Discovery Bay	Antioch	2111 Hillcrest Ave	94509	(925) 779-7716	Antiochinspectionlogs@pge.com
Region 3: Bay Area	Diablo	Concord, Walnut Creek, Pleasant Hill, Martinez, Briones, Clyde, Danville, Alamo, Clayton, Blackhawk, Diablo, Moraga, Orinda, Lafayette, Pacheco	Concord	1030 Detroit Ave	94518	(925) 779-7716	Antiochinspectionlogs@pge.com
Region 3: Bay Area	East Bay	Oakland, Emeryville, Piedmont, Alameda	Oakland	4801 Oakport St	94601	(510) 437-2088	InspectionDeskOakport@pge.com
Region 3: Bay Area	East Bay	Richmond, El Sobrante, El Cerrito, Berkeley, Hercules, Crockett, Kensington, San Pablo, Rodeo, Albany, Pinole, Port Costa	Richmond	1100 South 27th St	94804	(510) 231-2939	InspectionDeskRichmond@pge.com
Region 3: Bay Area	Mission	Fremont, Newark, Union City, Hayward, San Leandro, San Lorenzo, Castro Valley, Dublin, Livermore, Pleasanton, San Ramon, Sunol	Hayward	24300 Clawiter Rd	94538	(510) 784-3317	missiondivisioninspectiondesk@pge.com
Region 3: Bay Area	Peninsula	Atherton, Belmont, Brisbane, Broadmoor Village, Burlingame, Colma, Daly City, East Palo Alto, El Granada, Emerald Hills, Foster City, Half Moon Bay, Ladera, La Honda, Loma Mar, Menlo Park, Millbrae, Miramar, Montara, Moss Beach, Pacifica, Stanford, Palomar Park, Pescadero, Portola Valley, Princeton, Redwood City, San Bruno, San Carlos, SFO Airport, San Mateo, San Gregorio, South San Francisco, Woodside	San Carlos	275 Industrial Rd	94070	(650) 598-7353	PNSPInspections@pge.com
Region 3: Bay Area	San Francisco	San Francisco	San Francisco	2180 Harrison St	94110	(415) 695-7519	sanfranciscotrenchinspections@pge.com

Table FM-2 Service Planning Office and Inspection Desk Contact Information (continued)

Service Planning Office and Inspection Desk Contact Information							
Region	Division	Cities Covered	Work Center	Address	Zip Code	Phone	Email
Region 4: Central Coast	Central Coast	Salinas, Watsonville, Santa Cruz, Monterey, King City, Hollister, Castroville	Salinas	356 Alisal St	93901	(831) 784-3614	CentralCoastInspect@pge.com
Region 4: Central Coast	De Anza	Los Altos, Los Altos Hills, Cupertino, Sunnyvale, Mountain View, Campbell, Los Gatos, Saratoga, Monte Sereno, and some areas in San Jose	Cupertino	10900 N Blaney	95014	(408) 725-2202	DASPInspections@pge.com
Region 4: Central Coast	Los Padres	San Luis Obispo, Pismo Beach, Grover Beach, Arroyo Grande, Oceano, Los Osos, Morro Bay, Cambria, Cayucos, San Simeon, Nipomo, Santa Maria, Orcutt, Santa Ynez, Buellton, Los Olivos, Los Alamos, Solvang, Sisquoc, Lompoc, Guadalupe, Casmalia, Carpinteria	San Luis Obispo	5325 S. Higuera	93401	(805) 546-5247	NA
Region 4: Central Coast	Los Padres	Templeton, Atascadero, Santa Margarita, Shandon, Creston, Paso Robles, San Ardo, Bradley, San Miguel, Adelaide, Lockwood, Carrisa Plains, Cholame, Parkfield, Parkhill	Templeton	160 Cow Meadow PI	93446	(805) 434-4460	NA
Region 4: Central Coast	Los Padres	Nipomo, Santa Maria, Orcutt, Santa Ynez, Buellton, Los Olivos, Los Alamos, Solvang, Sisquoc, Lompoc, Guadalupe, Casmalia, Carpinteria	Santa Maria	2445 Skyway Dr	93455	(805) 346-2241	NA
Region 4: Central Coast	San Jose	San Jose, Alviso, Milpitas, San Clara, San Martin, Morgan Hill, Gilroy	San Jose	308 Stockton Ave	95126	(408) 299-1024	SJSPInspections@pge.com
Region 5: Central Valley	Fresno	Fresno, Selma, Dinuba, Lemoore, Coalinga, Corcoran, Auberry, Avenal, Caruthers, Clovis, Fowler, Friant, Hanford, Huron, Kerman, Kettleman City, Kingsburg, Orange Cove, Prather, Reedley, San Joaquin, Sanger, Shaver Lake, Tulare, Visalia	Fresno	3580 E California Ave	93760	(559) 263-7312	fresnodivisioninspectionrequest@pge.com
Region 5: Central Valley	Kern	Bakersfield, Buttonwillow, McFarland, Tupman, Taft, Cuyama, Maricopa, McKittrick, Shafter, Wasco, Lost Hills, Valley, Ridgecrest, Lamont, Arvin, Lebec	Bakersfield	4101 Wible Rd	93313	(661) 398-5711	kerninspections@pge.com

Table FM-1 Service Planning Office and Inspection Desk Contact Information (continued)

Service Planning Office and Inspection Desk Contact Information							
Region	Division	Cities Covered	Work Center	Address	Zip Code	Phone	Email
Region 5: Central Valley	Stockton	Stockton, Tracy, Angels Camp, Lathrop, Mountain House, Ripon, Escalon, Manteca, Mokelumne City, Clements, Wallace, Lodi, Thornton, Acampo, Youngstown, Woodlake, Collierville, Lockeford, Banta, Waterloo, Burnham, Linden, Farmington, Oakdale, Knights Ferry, Riverbank, Victor, Morada, French Camp	Stockton	3136 Boeing Way	95206	(209) 272-8643	stocktondivisioninspectionrequest@pge.com
Region 5: Central Valley	Yosemite	Merced, Madera, Los Banos, Oakhurst, Mariposa, Santa Nella, Gustine, Dos Palos, Mendota, Firebaugh, Atwater, Winton, Livingston, Planada, Snelling, La Grange, Legrand, Bass Lake, Ahwahnee, North Fork Coarsegold, Raymond, Oakdale, Jamestown, Sonora	Merced	4155 East Childs Ave	93725	(209) 726-6373	YosemiteDivisionInspectionRequest@pge.com
Region 5: Central Valley	Yosemite	Modesto, Newman, Gustine, Patterson, Turlock, Ceres, Oakdale, Riverbank, Escalon, Sonora, Jamestown, Delhi, Knights Ferry, Waterford, Salida, Crows Landing, Tuolumne	Modesto	1524 North Carpenter Rd	95351	(209) 576-6562	YosemiteDivisionInspectionRequest@pge.com

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SECTION 1

GENERAL

SECTION 1 GENERAL



Know what's below.
Call before you dig.

Section 1 General

Safety Alert

Contacting overhead or underground electric lines or equipment and natural gas pipelines can cause serious injury or death. Any part of a crane, scaffold, construction material, antenna, cable, rope, guy wire, or tool that touches an overhead electric line or penetrates an underground cable can become energized. Penetrating an underground natural gas line with a backhoe or other tool can cause a violent explosion.



WARNING

To avoid potential accidents, do *not* begin to excavate before identifying underground facilities.

State law requires applicants to contact [Underground Service Alert \(USA\)](#) by **dialing 811 at least 2 working days before excavation** (weekends and holidays excluded). Ensure that you call [USA](#) when planning underground work, before digging begins, to allow adequate time for [USA](#) to determine the location of underground gas and electric lines or equipment. ***The potential for an accident exists if applicants fail to request USA to identify underground utility facilities before excavation begins.***



USA

First, the applicant must mark the excavation area with white paint. Then, [USA](#) arranges for participating companies to mark the locations of their underground facilities at the jobsite. **This is a free service.** See the [USA](#) color-code identifiers below and on the back of this manual.

Additional information is available at www.pge.com/digsafely. Also, see [USA](#) services at the [USA North](http://www.usanorth.org) website at <http://www.usanorth.org>. [USA](#) is a locating service for excavation only. Do not use [USA](#) for design purposes.



Dig Safely

Table 1-1 USA Color Coding¹

Excavation Sites & Underground Facilities	Marking Color
Proposed Excavation	White
Temporary Survey Markings	Pink
Electric	Red
Gas–Oil–Steam Chemical	Yellow
Communication CATV	Orange
Water	Blue
Reclaimed Water Irrigation Slurry	Purple
Sewer	Green

¹ Call 2 working days before you dig.

Arc-Flash Hazard Warning

All applicants or persons authorized by PG&E who are working on, working near, or observing others working on any PG&E equipment, enclosures, or other facility **potentially are exposed** to arc-flash hazards and are required to wear flame-resistant (FR) clothing. The requirement to wear FR clothing applies to everyone. Applicants and their personnel must wear FR clothing before being allowed access to perform work in and around PG&E facilities. Also, applicants and their personnel must ensure that they wear the appropriate level of FR clothing for the job being performed. The tags on all FR garments must clearly identify them as flame resistant and clearly indicate the arc rating hazard risk category (HRC). All garments must have a minimum rating of HRC 2.

See [Appendix A, “Acronyms and Glossary.”](#) for a definition of facilities.

1.1. Purpose

NOTE: For the purpose of this manual, the word “applicant” is used generically to refer to the Pacific Gas and Electric Company (PG&E) customer, or to the person or persons representing the PG&E customer in the application/construction process, including a contractor, design consultant, or installer. The word “customer” is used only when the word “applicant” is not applicable. Also, PG&E is sometimes referred to as the “Company” throughout this manual.

This manual is designed to help applicants establish gas and electric service. By reading the mandates published in this manual, applicants will understand not only the steps required to apply for service, but also the legal and safety requirements driving those steps. PG&E provides this manual to all gas and electric applicants in an effort to ensure that the Company can continue to deliver safe, uniform service.

The 2022-2023 *Greenbook* supersedes all previous editions and revisions. This manual is a collection of requirements and policies for establishing electric and gas service to new or remodeled installations. The *Greenbook* typically is updated at least annually; however, PG&E’s building requirements, as well as gas and electric design standards, are subject to change throughout the year. **It is important that all applicants consult the online version of the *Greenbook* before finalizing project plans.**

In addition to the requirements provided in this manual, applicants for gas or electric service also must comply with federal regulations and with all applicable [tariffs](#), as well as the rules and general orders set forth by the California Public Utilities Commission (CPUC).

1.1. (continued)

These regulations and orders include, but are not limited to, the following documents:

- [General Order \(G.O.\) 95, “Rules for Overhead Electric Line Construction”](#)
- [G.O. 112-F, “Rules Governing Design, Construction, Testing, Operation, and Maintenance of Gas Gathering, Transmission, and Distribution Piping Systems”](#)
- [G.O. 128, “Rules for Construction of Underground Electric Supply and Communication Systems”](#)
- [Code of Federal Regulations \(CFR\), Title 49, “Transportation,” Part 192, “Transportation of Natural and Other Gas by Pipeline: Minimum Federal Safety Standards”](#)

Finally, applicants must comply with all other federal, state, and local regulations. These regulations may include a Federal Aviation Administration (FAA) review for structures that impinge on navigable airspace. In such cases, the FAA requires filing notice of proposed construction a **minimum of 45 days before starting the proposed construction**. The FAA may issue a determination of hazard to air navigation and recommend actions to mitigate or eliminate that hazard. For additional information, please contact your PG&E project coordinator.

1.2. Permits and Inspections

Builders who are constructing new buildings or remodeling existing buildings must conform to the following guidance documents.

- A. The current provisions of city and county ordinances.
- B. Rules on file with, or issued by, the CPUC.
- C. Applicable rules and laws of the state of California, including, but not limited to, the following three codes.
 - Plumbing codes
 - Mechanical codes
 - Electric codes

Local and state ordinances require applicants to obtain the appropriate permits and final inspections before PG&E establishes services to any building or structure.

In areas where local ordinances governing gas or electrical installations do not exist, or where inspections provided by local jurisdictions for such installations are not available, the applicant must obtain written confirmation from a qualified person that the facilities meet the requirements specified in this manual.

PG&E will **not** establish gas or electric service until the gas piping or electric service facilities are installed satisfactorily.

NOTE: Gas meter release forms obtained from a permitting agency must include the specific, requested pressure (e.g., 7-inches w.c., 2 psig, 5 psig).

1.2. (continued)

PG&E's inspection process includes service requirements that are **not** governed by local or state codes. Parts of the applicant's installation may require approval by state, local, **and PG&E inspectors**.

1.2.1. Pre-Construction Meetings

All applicant-installed and shared construction jobs require a pre-construction meeting. Pre-construction meetings provide a time to discuss safety requirements and expectations and to complete a pre-construction meeting checklist.

The pre-construction meeting is intended to:

- Introduce key individuals and exchange contact information.
- Discuss the project timelines.
- Advise personnel about construction obligations and requirements.
- Review construction drawings and gas service records (GSRs).
- Discuss warranty obligations.
- Clarify roles and responsibilities.
- Discuss proper PG&E operator qualifications for covered tasks.
- Confirm if there is a Facility at Risk letter.
- Confirm applicant responsibilities for as-built documentation.

The PG&E job owner is responsible for scheduling and facilitating pre-construction meetings and for ensuring that [Form TD-4462M-F01, "Pre-Construction Meeting Checklist."](#) is completed. Participants in formal pre-construction meetings **must include**:

- Applicant and the applicant's representative
- Applicant's contractor
- PG&E's senior new business representative (SNBR), new business representative (NBR), or industrial power engineer (IPE)
- PG&E's gas and electric inspectors
- Representatives from all other joint trench utilities
- Corrosion mechanic, as needed

Responsible PG&E employees and contract personnel must follow Company qualifications, operator qualifications (OQs), standards, and procedures related to job-specific inspections.

1.3. Applying for Building and Renovation Services



Residential

An [Application for service process](#) online form is required for all new gas or electric services, as well as for relocating or rearranging existing services. Whether you are building or renovating your home, expanding your business facility, or opening a facility at a new location, you can apply on the Internet at “[Customer Connections Online](#)” (www.pge.com/customerconnections) and track your project with our new online tools.

Also, at the PG&E Internet websites below, you will find guides for getting started, process overviews, project cost ranges, online applications, and more. This information is provided to help you plan your project and get started. For more information, visit the following web pages.

- [Residential](#)
- [Small & Medium Business](#)
- [Large Business](#)



Nonresidential

Applicants without Internet access may contact the Building and Renovation Service Center 1-877-743-7782. PG&E representatives will provide you with details about the process and assist you with applying for service.

The process for installing or changing gas and electric services takes time and planning. PG&E recommends you contact us early in the process with accurate load information and the date that the services are required to allow for adequate time to complete your service request.

Large-capacity gas meters, electric transformers, or other special equipment often require **several months lead time** to ensure a timely delivery from the manufacturer.

Applicants must contact their local PG&E project coordinators when approved construction plans change, or when situations that affect PG&E’s service arrangements occur during construction, so that mutually satisfactory, alternate arrangements can be made.

To assist PG&E in its goal to deliver safe, uniform service, applicants should **use the following guidelines when transmitting electronic drawing files for architectural, mechanical, and civil site plans.**

1. PG&E’s electronic drawing tool is AutoCAD, .DWG format. Ensure that submitted electronic drawings are either readable using, or compatible with, AutoCAD.
2. Applicants can upload documents at PG&E’s “[Customer Connections Online](#)” (www.pge.com/customerconnections) Internet website. Drawings also may be sent as an email-attached file.
3. Applicants who do not use the online option described in Number 2. above should send drawings for large projects in a zipped format.
4. Use layering, if possible, and preserve the layering when transferring files to PG&E.

Customer
Connect

1.3. (continued)

5. Save all drawings in model space instead of paper space.
6. Make drawing plans two dimensional, with the “Z” elevation at zero.
7. Ensure that any External Reference Files (Xref) or drawing updates maintain a consistent insertion point.
8. Include all related drawing files (e.g., elevations, landscape plans, other proposed underground facilities).

Please contact your local PG&E project coordinator if you have any questions.

PG&E is committed to complying with all federal, state, and local environmental laws, regulations, and rules. Applicants must provide PG&E with copies of permits showing that they have met all environmental compliance requirements when submitting applications for service. See the [“Applicant Responsibilities for Environmental Reviews for Service Requests”](#) letter for more information. Applicants can obtain copies of this letter from their local PG&E project coordinators.

Project permits or approvals may contain conditions that require or restrict certain service designs or construction activities by PG&E, applicants, agents, consultants, or contractors. The applicant must bring these conditions to PG&E’s attention to ensure that the requirements or restrictions are included in the project design during the planning and construction phases. When submitting the service application, the applicant must provide PG&E with a written copy of any special conditions, identifying the requirements or restrictions that affect the project design and/or PG&E installation activities.

1.4. Changes in Requirements

PG&E may revise its design and construction documents relating to applicant service requirements between updates to this manual. Except when required by law, PG&E will apply only those construction and design specifications, standards, terms, and conditions that are applicable to a new extension of service project for the 18 months following the date the application for a new extension of service project is approved. The approval date of a new extension of service application refers to the earlier of either the effective date of the contract for the extension of gas and/or electric service or the date when PG&E first invoices the customer for the extension of gas and/or electric service.

These requirements apply as long as applicants complete approved projects within 18 months. If the applicant has not initiated construction within 18 months of PG&E’s initial approval, PG&E may review the design and, if warranted, refresh the cost estimate.

If the applicant does not fulfill obligations under the extension agreement, PG&E may, at its discretion, cancel the agreement (see Provisions Form 62-0982, Section 20). PG&E can then request another review of the design before approving construction activities.

Also, for applicant design jobs, refer to the [Understanding applicant design and installation responsibilities](#) website. On applicant design jobs, the version of the design and construction document that is in effect on the date PG&E approves and signs-off on the final Globals package determines the requirements that the design must meet. The Globals package is valid for 90 days.

1.4. (continued)

When building projects are divided into separate phases (or tracts) where some of the construction phases will not be completed for more than 18 months from the date the project is approved, PG&E will initiate a review of the design and apply current PG&E construction and design specifications, standards, forms, and conditions that are applicable to the remaining phases of the project.

Applicants are encouraged to contact PG&E **early in the planning stages** of their projects. By consulting with their local project coordinators, applicants are made aware of the current construction requirements **before** they initiate any design work.

Do not perform construction using an unauthorized or preliminary drawing. The applicant assumes full responsibility for errors, omissions, or changes if the project is constructed using either preliminary drawings or drawings that are not approved by PG&E.

PG&E will not accept or assume ownership of facilities installed by the applicant before the construction design is completed and approved by PG&E. Additional facilities, even if provided at no cost to PG&E, represent increased plant in the rate base. This includes associated, long-term increases in taxes and maintenance expenses.

Applicants are responsible for any additional design changes or reconstruction costs that may be required if PG&E does not accept unapproved facilities. PG&E will not energize or pressurize a system that has not received final design approval and passed all inspections.

Engineering and construction documents or requirements are incorporated into new editions of this manual; however, revisions are made periodically. Applicants can obtain revised engineering documents or requirements in two ways:

- Find these documents on PG&E's Internet site (www.pge.com/greenbook).
- These documents are available through your local PG&E project coordinators.

Some of the information contained in this manual is based on government codes and ordinances that are subject to change as determined by the governmental authorities. PG&E does **not** assume responsibility for keeping information in this manual current with these government codes, ordinances, or other requirements. Applicants should consult the responsible governmental agency with questions about the applicability of any construction procedures or requirements.

1.5. **Additional Nonresidential (Commercial and Industrial) Service Information**

For electric installations of more than 600 volts (V), refer to [Section 11, "Electric Switchboards: 601 Volts Through 25,000 Volts, and Primary Services."](#) Generally, this manual does **not** include information about large nonresidential (i.e., commercial or industrial) gas loads; however, PG&E provides applicants with individual job-design specifications after they request service.

1.6. Design and Construction

1.6.1. PG&E's Responsibilities

PG&E is responsible for planning, designing, and engineering its service facilities and service laterals using Company standards for design, materials, and construction.

1.6.2. Applicant's Responsibilities

Residential and nonresidential applicants for gas and/or electric extensions and services may select a contractor to design their facilities.

PG&E requires a clear path from existing distribution facilities to the location on the applicant's jobsite where the services will be connected. Depending on the project, the applicant may need permits or approvals for these supply lines in order to comply with federal, state, and local requirements, regulations, and rules (including environmental laws).

Local PG&E project coordinators can provide applicants with information about available options for clearing supply lines, as well as any associated design and contract requirements for their projects.

Before designing their projects, applicants and/or their contractors must complete PG&E's [Application for service process](#) online form, provide applicable construction plans, and submit any required project deposits to PG&E.

1.6.3. Providing Access to PG&E Electric Facilities

Applicants are required to provide access roads on their properties to PG&E pad-mounted or subsurface (i.e., transformer or switch) facilities. The roads must be accessible to PG&E at all times and constructed with either a Class 2 or an AB road base that is a minimum of 10 feet wide, with 18 feet of vertical clearance above. Also, there must be a 30-foot radial, hammerhead-style turn-around area at the end of the roads.

Do not place equipment more than 15 feet away from the edge of the road to facilitate the placement of the equipment using lifting equipment. Failure to design for and construct based on this guidance may result in the requirement that the applicant sign a Rule 16 Special Facilities Lifting Agreement whereby, during construction, maintenance, and operations, the applicant will be responsible for fees associated with PG&E's specialized lifting contractors and equipment.

Avoid placing equipment immediately below, or in the vicinity of, overhead transmission, distribution, secondary voltage supply, and communication lines, when possible.

This guidance promotes the safe operation of the electric grid. By limiting equipment installation below energized lines, the chance that specialized lifting equipment contact an overhead energized line is minimized. Additionally, if safe working clearances cannot be maintained when working with specialized lifting equipment, restoration efforts could be delayed and necessitate an emergency shutdown, or require the temporary removal of the lines, to complete work safely.

1.6.3. (continued)

In cases where locations exist where equipment can be placed to minimize the possibility of exposure to live lines, these locations must be used. PG&E and the applicant must work together to identify a mutually agreeable location for installing the equipment safely. Only after all local relocation efforts have been exhausted and local service planning agrees that this installation could be safely considered, should the proposed installation be submitted to the Distribution Standards department for the consideration of variance. When a location cannot be agreed to that meets with the intent of this guidance, PG&E has the final decision on placement of the equipment.

Refer to [Numbered Document 051122, “Clearances and Location Requirements for Enclosures, Pads, and Underground Equipment,”](#) for additional requirements. When in doubt, contact your local PG&E Electric Construction supervisor for guidance before approval of a design.

1.6.4. Installing Transformers

PG&E will specify the type of transformer installations to be constructed on applicants' premises.

Applicants may contact their local PG&E project coordinators to obtain specific transformer requirements for their projects.

PG&E's standard transformer installations for residential, commercial, and industrial services, excluding agricultural areas, are described in Item A. and Item B. below:

- A. A pole-bolted transformer in overhead areas when the applicant's load does **not** require a 75 kilovolt ampere (kVA) or greater transformer.
- B. A pad-mounted transformer in underground areas or in an area with overhead facilities when PG&E determines that the applicant's load requires a 75 kVA or greater transformer.

As described in [Electric Rule 15, “Distribution Line Extensions,”](#) and [Electric Rule 16, “Service Extensions,”](#) found online at <https://www.pge.com/tariffs/index.page>, requests for the installation of a subsurface transformer are not allowed when it is technically feasible to install a pad-mounted transformer.

PG&E's standard transformer installations for agricultural services are described in item C. below:

- C. A pole-bolted transformer in overhead areas when the applicant's load does not exceed the capability of PG&E's largest available kilovolt ampere (kVA) overhead transformers for the voltage and phase being served.

If required or requested, the installation of a pad-mounted transformer is also allowed.

Also see Subsection 1.17., “Standard Service Voltage and Load Limitations,” on Page 1-24.

1.6.3. (continued)

Applicants must provide space on their premises at locations approved by PG&E for standard transformer installations *if* PG&E determines that the load to be served requires a separate transformer installation to serve only the applicant.

NOTE: For reasons of safety and reliability, PG&E does **not** allow applicants to install water sprinklers to cool off transformers.

1.6.5. Underground Electric Service Extensions

Applicants must ensure that an underground service is installed, where required, to comply with applicable tariff schedules, laws, ordinances, or similar requirements of governmental authorities having jurisdiction, and may be necessary as determined by PG&E where an applicant's load requires a separate, 75-kVA or greater transformer installation. For more information, see [Electric Rule 16](#).

1.7. Connecting and Sealing Services

A. PG&E provides standard service to applicants as described below.

1. Establish service at one service delivery point, through one meter, and at one voltage class or pressure.
2. Design service to extend from the connection to the distribution facilities along the shortest, most practical, and most available route to the service termination facility or service delivery point, as determined by PG&E.
3. PG&E may require a service location to be closer to the distribution facilities in the following instances:
 - In areas where the nearest building is a considerable distance (i.e., 200 feet or more) from the property line.
 - If, in PG&E's judgment, there is a potential hazard between the property line and service location.

B. The requirements for standard service are described below.

1. Only authorized PG&E employees can connect or disconnect PG&E's gas or electric service to the building or structure.
2. Unauthorized persons must not tamper with or break PG&E seals placed on meters and associated service equipment.
3. Only authorized PG&E employees can remove, replace, or interfere with PG&E's meters, seals, connections, padlocks, or other locking devices.
4. Applicants must call PG&E if it is necessary either to disconnect the service or remove the meter because of remodeling, alterations, or other activities.

1.7. (continued)

5. Applicants must **not** connect house gas pipes or other applicant facilities to the plugged side of the gas service-tee fitting. That fitting is for PG&E's use only.
6. Applicants may place gas and electric service and metering equipment in dedicated rooms within buildings when approved by PG&E.
7. Applicants must **not** locate service termination enclosures in the interior, inhabitable area of residences.
8. Applicants must ensure that all service and metering facilities are readily accessible.
9. PG&E must review and approve of all service and meter locations and arrangements **before installing** any metering facilities, service-termination enclosures, or other utility service facilities.
10. The applicant assumes the risk for any work performed without requesting PG&E's advanced approval. PG&E can charge the applicant if it is necessary to make changes to unapproved work.
11. An unauthorized connection to PG&E's gas or electric facilities, or to facilities used to provide utility services, may be a violation of the [California Penal Code, Part 1, "Crimes and Punishments," Title 13, "Crimes Against Property," Chapter 5, "Larceny," Part 498, and Chapter 15, "Malicious Injuries to Railroad Bridges, Highways, Bridges, and Telegraphs," Part 593c](#). Violators could be subject to damages pursuant to [California Civil Code, Division 3, "Obligations," Part 4, "Obligations Arising From Particular Transactions," Title 3.5, "Utility Services," Section 1882](#), et. Sequitur. These sections address connecting to utility meters and facilities and diverting utility services. They specifically prohibit any person from tampering with, making, or causing to be made any connection or reconnection with property owned or used by the utility to provide utility service, without the utility's authorization or consent.
12. Applicants or their contractors must not paint, color, or discolor the gas and electric facilities, including the meters.

1.8. Access to an Applicant's Residence, Building, or Property

PG&E has the right to access Company facilities located on an applicant's premises at any time, for any purpose connected with furnishing gas and/or electric service. These purposes include, but not limited to, the following activities:

- Reading meters.
- Inspecting utility facilities.
- Making routine repairs.
- Performing maintenance and emergency work.
- Exercising any and all rights secured to PG&E either by law or under PG&E's tariff schedules, including [Electric Rule 16, "Service Extensions,"](#) and [Gas Rule 16, "Gas Service Extensions."](#)

1.9. Overhead Electric Lines

The [California Division of Occupational Safety and Health \(Cal/OSHA\), Title 8, Division 1, “Department of Industrial Relations,” Chapter 4, “Division of Industrial Safety,” Subchapter 4, “Construction Safety Orders,” Article 15, “Cranes and Derricks in Construction,” Section 1612, “Power Line Safety,”](#) and the associated sub-articles, require that minimum safe working and traveling distances be maintained from cranes and derricks to overhead electric lines.

In support of these regulations, PG&E provides the voltage for overhead lines within two business days of receiving a customer inquiry. Call the PG&E Building and Renovation Service Center (BRSC) at 877-743-7782 or Customer Service at 1-800-743-5000.

[Cal/OSHA, Title 8, Chapter 4, Subchapter 5, “Electrical Safety Orders,” Group 2, “High-Voltage Electrical Safety Orders,” Article 37, “Provisions for Preventing Accidents Due to Proximity to Overhead Lines \(Formerly Article 86\), Section 2946, “Provisions for Preventing Accidents Due to Proximity to Overhead Lines,”](#) requires that minimum safe working distances be maintained from overhead electric lines. Specific requirements taken from the regulation are shown in Table 1-2, “Minimum Safe Working Distances (Scaffolds, Equipment, Tools, Structures, and People),” and Table 1-3, “Minimum Safe Working Distances (Boom-Type Lifting or Hoisting Equipment),” both on Page 1-12.

Table 1-2 Minimum Safe Working Distances (Scaffolds, Equipment, Tools, Structures, and People)

Nominal Voltage (Phase-to-Phase)				Minimum Required Clearance (Feet)
	600	–	50,000	6
over	50,000	–	345,000	10
over	345,000	–	750,000	16
over	750,000	–	1,000,000	20

1.9. (continued)

Table 1-3 Minimum Safe Working Distances (Boom-Type Lifting or Hoisting Equipment)

Nominal Voltage (Phase-to-Phase)				Minimum Required Clearance (Feet)
	600	–	50,000	10
over	50,000	–	75,000	11
over	75,000	–	125,000	13
over	125,000	–	175,000	15
over	175,000	–	250,000	17
over	250,000	–	370,000	21
over	370,000	–	550,000	27
over	550,000	–	1,000,000	42

Contact a local PG&E project coordinator with any questions about working near overhead electric lines or about nominal voltage.

1.10. Underground Electric Lines and Gas Pipelines

As mentioned on Page 1-1, state law requires applicants to contact [USA](#) by dialing 811 at least 2 working days before excavation (weekends and holidays excluded). Applicants **must** call [USA](#) when *planning* underground work (**before digging begins**) to allow adequate time for [USA](#) to determine the locations of underground transmission and distribution gas and electric lines and/or equipment.

[USA](#) arranges for participating companies to mark the locations of their underground facilities at the jobsite. There is no charge for this service. The applicant must mark each end of the excavation area with white paint as well as the total length in feet. Applicants should also use arrows to indicate the direction of the trench. For more information, go to www.pge.com/digsafely. Also, learn more about [USA](#) services at the [USA North](#) website (<http://www.usanorth.org>).



USA

1.10.1. Safe Landscaping Near Underground Facilities

When any new vegetation are planted, ensure that a **minimum of 5 feet** is maintained from underground transmission and distribution gas lines as well as distribution electric lines. Please refer to PG&E's [Guide to Safe Landscaping Near Gas Pipelines](#) and the [Guide to Safe Landscaping Near Underground Electric Lines](#) (located in [Appendix B, "Electric Gas and Service Documents,"](#) located on Page B-5) for helpful information about the types of trees and plants that are safe for areas near transmission and gas pipelines.



Dig Safely

1.11. PG&E Safety Training Resources

PG&E wants to ensure that contractors and construction workers avoid electric and natural gas hazards by practicing basic safety rules. Please visit www.pge.com/contractorsafety, "[Contractor Safety Program Contract Requirements](#)," for materials to assist you in providing your employees with safety training.

1.12. SmartMeter™ Program

PG&E's SmartMeter Program is part of a statewide effort driven by the CPUC to upgrade California's energy infrastructure with automated metering technology. The SmartMeter Advanced Meter Reading system includes a programmable, solid-state electric meter and a gas module, installed on a traditional gas meter at each service delivery point to measure and record energy use.

For more information on SmartMeters, including instructions on tracking your energy use online or information on the opt-out program, please visit [Understanding your energy use with SmartMeter](http://www.pge.com/smartmeter) (www.pge.com/smartmeter)



SmartMeter™

1.13. PG&E Online (Website)

The PG&E website at www.pge.com has many tools for building or renovating homes, expanding or renovating business facilities, or opening new locations.

The [PG&E Building and Renovation Services guides](#) are available for residential services at www.pge.com/building/ and include the following information:

- [Visit our Application for service process](#)
- [Choose a guide](#)
- [Manage your project at Customer Connections Online](#)
- [Excess flow valves](#)
- Get estimates
- Pay your project charges online

These tools can help you plan your project and get started. For more information, visit the following web pages.

- Apply online and track your project at [Customer Connections Online](http://www.pge.com/customerconnections) (www.pge.com/customerconnections)
- Residential services at [Discover building and renovation services for homeowners](#) (www.pge.com/building/)
- Business and agricultural services at [Discover building and renovation services for businesses](#) (www.pge.com/newconstruction)



Customer
Connect

1.13.1. **Electric and Gas Service Requirements Manual (aka Greenbook)**

The *Greenbook* is available on the Internet at www.pge.com/greenbook.

NOTE: Communicate and coordinate all gas and electric service arrangements through your assigned PG&E project coordinator. As mentioned earlier in this section, PG&E documents may be updated independently of this manual; however, the project coordinators provide applicants with the latest updated or revised information on request. Applicants **must** contact their assigned project coordinators to ensure that they are correctly interpreting and using the information found in this manual and in other governing documents.

1.13.2. Rates and Tariffs

Rate and tariff information is available on the website [“Electricity rates: Choose the plan that works best for you.”](http://www.pge.com/about/rates/) at <http://www.pge.com/about/rates/>. This information also is available on the [PG&E homepage](http://www.pge.com/) (<http://www.pge.com/>) under the Rate Plans drop down. Also, the online [“Tariffs”](#) provide current gas and electric rate schedules, preliminary statements, rules, forms, advice letters, and more.

1.14. Determining the Electric Service Rating

- A. **PG&E Service Rating:** The rating of the PG&E service to be supplied is the current rating in amperes of the electrical enclosure where PG&E terminates and connects its supply facilities and conductors. This electrical enclosure or equipment also may be known as the service-termination section, pull can, service section, meter panel, or service-termination enclosure. For overhead services, the service rating is the rating of the electrical enclosure or equipment connected to the weatherhead and mast.
- B. **Enclosure Nameplate Labeling and Rating:** Electrical enclosures must list on their manufacturers’ main labels (nameplate) a maximum current rating, in amperes, allowed for the equipment. This maximum rating must be written as a numerical value (e.g., 125, 800, 2,500) and must be acceptable to PG&E. The nameplate label must also describe the voltage, number of phases, and additional electrical information. The nameplate label must be rated for ultraviolet (UV) radiation and exposure of outdoor environments. The label must be easily accessible and permanently attached to the outside front of the equipment enclosure and, when applicable (e.g., switchboard), on each individual section. The label also may be attached to the inside of the enclosure’s outer door.
 1. For pad-mounted (i.e., free-standing) enclosures, this information typically is listed on the main nameplate labels as the “Supply” rating. See Figure 1-1, “Nameplate Rating Label Example: Pad-Mounted Electrical Switchboard or Termination Enclosure,” on Page 1-19.

When multiple sections are physically connected together to form a switchboard or switchgear, the supply rating listed on each section, whether bussed or cabled, should typically be the same. A “Section” rating also should be provided as a numerical value on each individual section label. See Figure 10-35, “Existing Switchboard,” on Page 10-47, as an example of one type of switchboard.
 2. For wall-mounted panelboards and termination enclosures, the maximum ampacity rating is for the entire enclosure and must be listed on the main rating label independently from any individual component (e.g., main bus, meter socket, main disconnect) rating. See Figure 1-2, “Label Example: Wall-Mounted Electrical Meter Panel or Termination Enclosure,” on Page 1-19 for an example. The maximum ampacity rating may be titled on the label in any of the following ways.
 - Maximum Amps
 - Maximum Utility Rating
 - Maximum Equipment Rating

1.14. (continued)

3. If a maximum ampacity rating is not included on the electrical enclosure label, PG&E uses the individual component (e.g., main bus, meter socket, main disconnect, current-transformer mounting bracket) with the greatest rating as the service rating.
4. If there are multiple ratings or conflicting ratings either on a single electrical enclosure or on multiple enclosure sections that are physically connected together (i.e., switchboard, switchgear), PG&E uses the greatest rating as the service rating.

C. Main Service Disconnect: For installations supplying a single main-disconnecting means (i.e., main breaker or main disconnect switch), or for installations without a single disconnecting means (e.g., a service with no main disconnect and only individual disconnects), the rating of the PG&E service to be supplied is the rating of the electrical enclosure where PG&E terminates and connects its service conductors and not the rating of the main service disconnect.

For switchboards, the PG&E service rating is typically listed as the supply rating. For panelboards, the service rating is the maximum ampacity of the panel if listed on the label. If a maximum ampacity is not listed, then the service rating is the greatest rating for any individual component (e.g., main bus, meter socket) in the panelboard. For more information, see Subsection 1.14.A., “PG&E Service Rating,” on Page 1-15.

When a main service disconnect (i.e., switch, fuse, or breaker) is installed, the continuous current (i.e., ampere) rating should not exceed the rating of the electrical enclosure or the rating of the section where it is installed. The main service disconnect may have either the same rating or a lower rating than the electrical enclosure.

D. Overhead Service to Multiple Wall-Mounted Meter Panels or Meter Boxes: When more than one meter panel or meter box is connected to a separate, sealable gutter or other unrated raceway with power supplied from a PG&E overhead service, the PG&E service rating is the aggregate of all meter panel or meter box ratings.

EXAMPLE: Three meter panels rated at 200 amps, 100 amps, and 100 amps would have an aggregated rating of 400 amps (200+100+100).

For illustrations of these types of installations, refer to one of the following two figures:

- [Section 6, “Electric Metering: Residential,” Figure 6-11, “Overhead Service, Grouped-Meter Installation Without a Main Switch \(400 Amps Max. 1Ø or 3Ø\),”](#) on Page 6-16.
- [Section 7, “Electric Metering: Nonresidential, Industrial, and Agricultural,” Figure 7-11, “Overhead Service, Grouped-Meter Installation Without a Main Switch,”](#) on Page 7-15.

1.14. (continued)

NOTE: Applicants can use PG&E approved termination enclosures that are manufactured for overhead or underground services and have a maximum ampacity listed on the nameplate labels. The maximum ampacity will be the PG&E service rating. **If a termination enclosure is installed, then do not add up the ratings of the meter panels.**

- E. **Existing Enclosures:** If an existing electrical enclosure where PG&E terminated and connected its supply facilities and conductors does not have a visible rating, then the service rating is the maximum rating of the single main-disconnecting means (e.g., main circuit breaker) or of the aggregated maximum ratings of all the service breakers or disconnects if a main-disconnecting means is not present.
- F. **Agricultural Services:** For agricultural services with a pump motor as the largest load, PG&E recommends that customers install a Variable Frequency Drive (VFD) or similar controller that uses a soft start (SS) system. These types of pump controllers help compensate for in-rush current.
1. For service termination and metering equipment with a main breaker or individual breakers built into the enclosure, refer to the requirements in Subsection 1.14.C., “Main Service Disconnect,” on Page 13.
 2. For service termination and metering equipment without a main breaker or individual breakers built into the enclosure, PG&E recommends the following types of equipment be installed externally to serve as the main disconnecting means and circuit protection for customer equipment. The following requirements apply.
 - a. **Class R, Dual-Element, Time-Delay Fuses:** These types of fuses also compensate for in-rush current. When Class R fuses are installed, size them to the pump load but **do not** exceed the PG&E service rating by more than 125%.

EXAMPLE: A meter panel rated at 200 amps can have one main service disconnect with Class R fuses rated up to 250 amps ($200 * 1.25$). A meter panel rated at 400 amps can have one main service disconnect with Class R fuses rated up to 500 amps ($400 * 1.25$).
 - b. **Electronic Circuit Breaker:** The electronic breaker rating must not exceed the PG&E service rating. The breaker trip settings can be set to compensate for the in-rush current. See [Section 5, “Electric Metering: General,” Subsection 5.7.4., “Electronic Trip Circuit Breakers,”](#) on Page 5-32.

EXAMPLE: A meter panel rated at 600 amps can have one main electronic circuit breaker rated up to 600 amps ($600 * 1.00$).

1.14. (continued)

- c. **Thermal or Magnetic Circuit Breaker:** When a standard circuit breaker is installed as the main disconnect and protective device for the customer circuit, the breaker's maximum rating must be **125% or less** of PG&E's service termination and metering equipment rating.

EXAMPLE: A meter panel rated at 400 amps can have one main thermal or magnetic circuit breaker rated up to 500 amps (400 * 1.25).

3. When a main disconnect is not installed, and only individual service disconnects are installed on customer equipment, the aggregate total ampacity rating of all the individual service disconnects is allowed to exceed the PG&E service rating by a maximum of 125%.

EXAMPLE: A meter panel rated at 400 amps can have multiple individual service disconnects with an aggregated rating up to 500 amps. If there are three disconnects, the individual ratings could be 200 amps, 200 amps, and 100 amps or a combination that is 500 amps or less. If there are five disconnects, the individual ratings could be 50 amps, 75 amps, 75 amps, 100 amps, and 200 amps or a combination that is 500 amps or less.

1.14. (continued)

Manufacturer	
Switchboard	
Volts	
Phase 3 Wire 4	
Frequency	Section No. 1 of 3
	Date:
Current Ratings—Amperes	
Supply 2000	Neutral 2000
Section 1600	Neutral 2000

Figure 1-1
Nameplate Rating Label Example: Pad-Mounted
Electrical Switchboard or Termination Enclosure

Manufacturer Name	
Catalog/Model Number	
Maximum Utility Rating	125
Main Breaker	125
Meter Socket	125
Bus	200

Figure 1-2
Nameplate Rating Label Example: Wall-Mounted
Electrical Meter Panel or Termination Enclosure

Note in reference to Figure 1-2 on Page 1-19.

1. As described in Subsection 1.14.B.2. on Page 1-15, use the maximum rating listed on the nameplate label for the whole electric meter panel to determine the PG&E service rating. If a maximum panel rating is not listed, then use the greatest rating for any component (e.g., bus) in the panel.

1.15. Changing an Applicant's Approved Project or Existing Service Loads

An applicant **must provide written notice to PG&E** of any changes or plans to make material changes either in the amount or in the character of the gas and/or electrical load, equipment, or other facilities installed to supply gas and/or electricity to the applicant's premises, structure, building, or other facilities. For more information, applicants can review [Electric Rule 2](#) and [Gas Rule 2](#), both called "Description of Service," as well as [Electric Rule 3](#) and [Gas Rule 3](#), both called "Application for Service." PG&E requires this written information to determine the following factors.

- The adequacy of the existing utility service and supply facilities.
- The need to modify those facilities to meet and supply the changed load or equipment requirements. This includes changes in the character or nature of the applicant's previously approved gas and/or electric service.

Applicants must notify PG&E of any planned or intended changes in the load, character, or nature of the service required to supply the premises, structure, building, or other facilities.

If an applicant fails to notify PG&E, and the changes exceed the capabilities of the installed utility service, metering, or other equipment and damage those facilities, the applicant is liable for all damages and resultant costs to PG&E.

Applicants must provide PG&E with written notice **immediately** when they make any material change either in the amount or character of the gas loads and electric amps, appliances, or apparatus installed on the premises to be supplied with gas or electric energy.

1.16. Upgrading, Replacing, and Relocating Electric Facilities, or Adding Power Generation Sources

When PG&E determines that its existing service facilities must be replaced, those facilities are replaced as a new service extension under the provisions of the tariff rules. The following subsections describe the requirements when existing electric service termination and metering equipment are replaced.

NOTE: When replacing existing electric service equipment, refer to [Section 2, "Gas Services," Subsection 2.4.2.E., "Panel Replacements and Conduit Connections to Existing Electric Panels, 400 Amps and Less, Within the Gas Clearance Area,"](#) on Page 2-36, for gas meter set clearance requirements from any type of electrical equipment and materials. Also see Figure 2-22, "Clearance Requirements for an Existing Electric Meter/Panel," also in Section 2.4.2.E.

1.16.1. Upgrading Electric Facilities

An increase in the ampacity rating (e.g., 100 amps to 125 amps; 1,200 amps to 1,600 amps) of the equipment where PG&E terminates its service is typically defined as an upgrade. The ampacity rating also may be known as the service-entrance capacity. For example, when an applicant replaces an existing electric meter panel, switchboard, or termination enclosure with one that has a greater ampacity rating (i.e., upgrade), the applicant must meet all *Greenbook* requirements. Typically, this also includes installing new conduit and service conductors.

When a new meter panel is installed in a new location, the existing meter panel may not be used as a junction box to connect to existing load-side wires. The existing meter panel must be removed and covered by a solid, permanent exterior wall.

See the sections titled “Upgraded Panel” in the numbered documents below for conditions when the conduit or cable may not require upgrading, as determined by PG&E.

- [Numbered Document 063927, “Methods and Requirements for Installing Residential Underground Electric Services 0–600 V to Customer-Owned Facilities”](#)
- [Numbered Document 063928, “Methods and Requirements for Installing Non-Residential Underground Electric Services 0–600 Volts to Customer-Owned Facilities”](#)

1.16.2. Replacing Electric Facilities with Like-for-Like

Replacing service termination and metering equipment with new equipment of the exact same ampacity (e.g., 100 amps to 100 amps; 1,200 amps to 1,200 amps) and in the exact same location is considered a “like-for-like” replacement and typically is **not** considered an upgrade.

NOTE: Replacing a main or load breaker in an existing panel is not considered a panel replacement.

The following requirements apply to like-for-like panel replacements.

- A. All new meter panels and their locations must meet *Greenbook* requirements and be approved by PG&E.
- B. If the existing electric meter panel is fed from an overhead service and has an isolated cable termination compartment, separate from the meter socket compartment, the new meter panel must also have an isolated cable termination compartment. For example, see [Section 6, Figure 6-6, “Typical Service-Termination Enclosure, Combination Meter Socket Panel for a Class 320 Meter \(Residential, 120/240-Volt, 226-Amp Through 320-Amp Service\).”](#) on Page 6-10.

1.16.2. (continued)

- C. If the existing electric meter panel is fed from an overhead service and does not have a cable termination compartment, then the panel may be replaced with a new panel that does not have an isolated cable termination compartment. See [Section 6, Figure 6-5, “Combination Meter Socket Load Center,”](#) on Page 6-9, for specific notes and requirements, and an allowed meter panel that does not have an isolated cable termination compartment. This type of panel may be replaced with one that has an isolated termination compartment.
- D. If the existing electric meter panel is fed from an underground service, the new meter panel must have an isolated cable termination compartment that is separated from the meter socket compartment. For example, see [Section 6, Figure 6-1, “Typical Underground Service Termination Enclosure, Combination Meter-Socket Panel \(Residential, 0 Amps–225 Amps\),”](#) on Page 6-5. New panels without an isolated termination compartment are not allowed.
- E. New multimeter panels must be the same shape, layout, dimensions, and number of meter sockets as the existing multimeter panel to be considered a like-for-like replacement. If any of these items are not met, the panel replacement will be considered an upgrade and must meet the upgrade requirements in Subsection 1.16.1., “Upgrading Electric Facilities,” on Page 1-21.
- F. The new service and metering equipment must be positioned so the existing PG&E service conductors can be terminated into the new panel lugs or studs. Wall-mounted junction boxes, underground splice boxes, or splicing on additional cable is prohibited and not allowed. The new equipment also must be positioned to ensure that clearances are not reduced to gas facilities (as shown in [Section 2, Figure 2-19, “Electric and Gas Meter Set Separation Dimensions and Clearances,”](#) on Page 2-33), water sources, or obstructions. If PG&E needs to install new service conductors or cables to perform the reconnect, the work and material is the applicant’s responsibility.
- G. A like-for-like panel change may not have to meet the current *Greenbook* requirements unless worker safety, existing clearances, working space, or the panel location’s accessibility is reduced or compromised. PG&E will not energize meter panel installations if they do not meet PG&E requirements for safe working conditions. This is at PG&E’s discretion. The following are additional cases where the panel is not allowed to be replaced in the same location.
 - When structures (e.g., decks, remodeled buildings, planters) are built over, under, or around the existing meter panel.

1.16.2. (continued)

- When the existing meter panel is installed directly above or within 12 inches horizontally from the outside edges of the gas meter set. This includes installations where the gas or electric meters are inside cabinets. If one or both of the meters are in cabinets, the 12-inch clearance is from the outer edge of the cabinet. See Figure 1-3, “Panel Replacement Not Allowed when Over a Gas Meter Set,” below. Newly replaced meter panels are prohibited from being installed in the gray area.

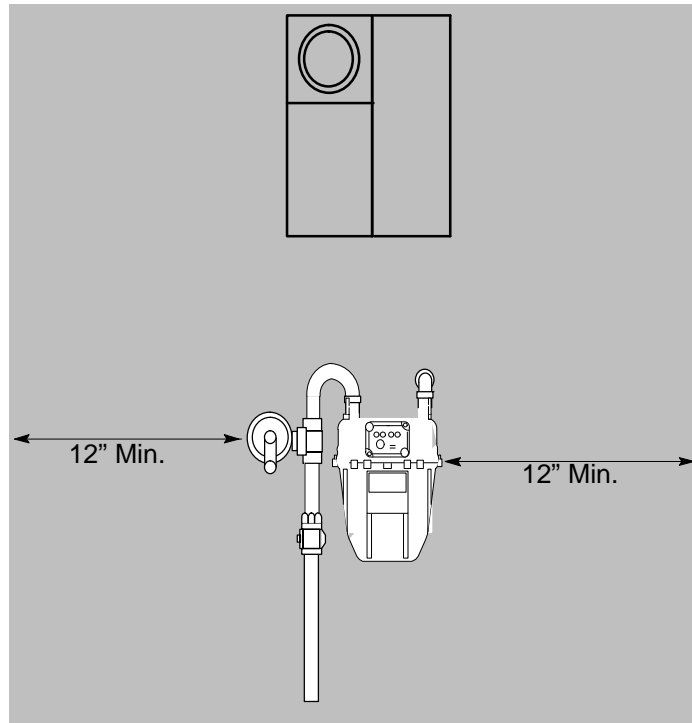


Figure 1-3
Electric Panel Replacement Not Allowed
When Over a PG&E SmartMeter Gas Meter Set

1.16.3. Relocating Electric Facilities

When existing electric facilities are relocated, applicants must meet all of the current *Greenbook* requirements. If PG&E’s existing service conductor can be used, as determined by PG&E, the panel must be positioned so the service conductor can be reconnected properly. The existing service conductor must be able to be reconnected either to the underground electric panel termination lugs or, for overhead services, to the external service-entrance conductors coming out of the weatherhead.

If PG&E needs to install additional service conductors or cables to perform the reconnect, the work and material is the applicant’s responsibility. PG&E **does not accept** cable-termination techniques using pin adaptors, cable ringing, or splicing on additional cable.

1.16.3. (continued)

For additional information, see [Section 5, “Electric Metering: General.” Subsection 5.3., “Electric Meters: General Location Requirements.”](#) on Page 5-5.

1.16.4. Adding Power Generation

All customer-generating equipment connected either to the Company’s equipment or to customer equipment must conform to Company standards. This includes any applicable municipal, local, city, or federal rules and regulations, unless otherwise specified. Any distributed generation (DG) facilities, as well as backup generation installations, must meet the clearance requirements detailed in the *Greenbook*. This includes all clearance requirements from gas facilities.

Examples of DG and backup generation facilities include, but are not limited to, renewable sources such as solar, wind, water power, and farm waste, as well as nonrenewable energy sources such as natural gas or other fossil fuels for conventional engines, turbines, and fuel cells.

1.17. Standard Electric Service Voltage and Load Limitations

This section clarifies PG&E’s voltage requirements when applicants design services for single-family residential homes, duplex homes, town homes, condominiums, apartment buildings, or commercial (nonresidential) buildings.

1.17.1. Single-Phase Service

Unless an applicant qualifies for a three-phase service, the service voltage for a residential building or structure typically is **120/240 V, single phase**, where the size of any single motor does not exceed 7.5 horsepower.

For any single-phase service, the maximum demand as determined by PG&E is limited to the capability of a 100-kVA transformer. If the load requires a transformer installation in excess of 100 kVA, the service will be three phase.

PG&E will **not** supply 120/208 V, single-phase service to residential structures or buildings unless **both** of the following conditions are met.

- A. A 120/208 V secondary system is established near the location where the requested service would be supplied.
- B. The rating of the disconnecting means (i.e., the main switch or main disconnect) or of the service entrance does **not** exceed 225 amperes.

1.17.2. Three-Phase Service

If PG&E determines that a **single** residential or nonresidential building or structure justifies a 75-kVA transformer at 120/208 V, or a 5 horsepower or larger motor at 120/240 V for an overhead service, then installing three-phase service is an **option** for the applicant. This option also is available for underground services with a 75-kVA transformer at 120/208 V, or a 10 horsepower or larger motor at 120/240 V.

1.17.2. (continued)

This applies whether the applicant plans to wire the individual residential units in a single-phase or a three-phase configuration. Applicants requesting the three-phase option must provide space on the property for PG&E to install a dedicated transformer. For more information, see [Electric Rule 2](#).

If, based solely on PG&E's estimation, the electric service demand is greater than that which can be supplied by a single-phase, 100-kVA transformer, then PG&E **must** supply three-phase service.

Other load limitations and requirements used to determine qualification for three-phase service are contained in PG&E's [Electric Rule 2](#).

Three-phase service is available in 208Y/120, 240/120, or 480Y/277 voltages. The appropriate voltage depends on the minimum load requirements and the maximum demand load permitted by PG&E's [Electric Rule 2](#).

1.17.3. **Mixed-Use Projects**

Mixed-use projects include both residential and nonresidential loads. When designing a mixed-use project where the use occurs in separate buildings, ensure that each facility is supplied by a separate transformer. This means that a single-phase transformer could supply the residential unit(s) and three-phase transformer could supply the nonresidential unit(s).

If the mixed use occurs in the same building, a single transformer typically is installed to supply the building. **The size and selection of the transformer is based solely on PG&E's estimated demand load.** The applicant must provide space on the property for PG&E to install a dedicated transformer.

In some cases, PG&E may determine that the residential and nonresidential loads must be supplied by separate transformers and service facilities, including meters and metering facilities. PG&E makes this determination based on the nature or anticipated operation of the nonresidential loads and how they may affect the services. The applicant must provide space for those service facilities on the property.

Again, when developing mixed-use projects, the applicant must communicate and work closely with PG&E early in the design phase.

1.18. **Wholesale Distribution Tariff (WDT) Interconnections**

WDT customers requesting primary service interconnections should refer to [Numbered Document 092816, "Wholesale Distribution Tariff \(WDT\) Interconnection Design Options for Primary Voltage Service."](#) located in and consult with your local service planning office.

1.19. Harmful Wave Form

As described in [Electric Rule 2](#), customers must not operate equipment that either superimposes a current of any frequency or wave form on PG&E's system, or draws current from PG&E's system of a harmful wave form. Harmful wave forms cause interference with PG&E's operations, or with service to other customers, or cause inductive interference to communication facilities.

Also, any customer who operates or plans to operate any equipment that creates intolerable voltage fluctuations, generates waveform harmonic distortion, or otherwise causes intolerable service interference, must limit such interference or restrict the use of such equipment on PG&E's request.

Harmonic distortion is a growing power-quality concern on PG&E's distribution circuits. Therefore, PG&E will adopt the [Institute of Electrical and Electronics Engineers \(IEEE\) Standard 519, "Harmonic Control in Electric Power Systems."](#) PG&E will require that the harmonic current drawn by customer's equipment of any kind be in conformity with the [IEEE Standard 519](#). Customer equipment types include, but are not limited to, Variable Frequency Drive (VFD) motor controllers. These harmonic distortion limits reduce the potential negative effects to customers and PG&E distribution system equipment.

As explained in [Electric Rule 2](#), customers may be required to install protection against the adverse effects of harmonics resulting from their equipment. Customers can reduce harmonic current by installing harmonic filters or upgrading to equipment with a low-harmonic output.

SECTION 2 GAS SERVICE

SECTION 2 GAS SERVICE



Know what's below.
Call before you dig.

Section 2 Gas Service



USA

2.1. Scope

This section of the manual covers general gas service and gas meter-set requirements for residential and nonresidential installations.



WARNING

**TO AVOID POTENTIAL ACCIDENTS, DO *NOT* BEGIN TO
EXCAVATE BEFORE IDENTIFYING UNDERGROUND FACILITIES.**

State law requires applicants to contact [Underground Service Alert \(USA\)](#) by *dialing 811 at least 2 working days before excavation* (weekends and holidays excluded). Ensure that you call USA when planning underground work, before digging begins, to allow adequate time for USA to determine the location of underground gas and electric lines or equipment. *The potential for an accident exists if applicants fail to request USA to identify underground utility facilities before they begin excavating.* For safety, workers must dig by hand when digging within 2 feet of distribution lines and 10 feet of gas transmission lines.

First, the applicant must mark the excavation area with white paint. Then, USA arranges for participating companies to mark the locations of their underground facilities at the jobsite. *This is a free service.* See the USA color-code identifiers in Table 1-1, “USA Color Coding,” on Page 1-1, and on the back of this manual.

Additional information is available at <http://www.pge.com/digsafely>. Find USA services at the USA North website (<http://www.usanorth.org>). USA is a locating service for excavation only. Do not use USA for design purposes.



Dig Safely

2.2. Procedures for Establishing Gas Service

2.2.1. Establishing New Gas Service

Applicants must follow the steps described below to establish new gas service.

A. Applicant’s Planning Stage

When planning to establish new gas service, applicants must:

1. Fill out and submit the appropriate PG&E application. Refer to Subsection 1.3., “Applying for Building and Renovation Services,” on Page 1-5, for more information about the application requirements.
2. Contact their local PG&E project coordinators as early in the planning stage as possible.

NOTE: See [Table FM-1, “Service Planning Office and Inspection Desk Contact Information.”](#) at the front of this manual starting on Page iv, for specific contact numbers listed by area.

2.2.1. (continued)

B. Working With PG&E

After initially contacting PG&E about installing new gas service, applicants must:

1. Provide detailed site improvement plans indicating property lines, roads, sidewalks, and driveways, as well as the locations of other site infrastructure elements such as, but not limited to, water services, sewer line, water drainage, bioswales, and retaining walls. For individual parcels/single buildings, include the proposed locations of gas and electric meters, building elevations, and proposed future improvements. Ensure that the written details for required clearances in meter set assemblies are also included in the drawing. (Meter locations are subject to PG&E approval.)
2. Submit details about the type(s) of gas appliances being installed per meter. Include the connected load breakdown in thousand British Thermal Units (MBTU) per hour for each appliance and its intended use.
3. Applicants requesting above-standard delivery pressure (7 inches of water column) typically are required to submit a written justification for PG&E's review and approval. Standard delivery pressure is approximately 1/4 pounds per square inch gauge (psig). See Subsection 2.4.1., "Gas Pressure," on Page 2-18, for more requirements.
4. Applicants can choose either PG&E or an outside company to design and/or install their services. PG&E provides the applicant with a bid for service design and installation costs. Specific conditions must be met whether the applicant chooses PG&E or an outside company to work on the project.
5. When PG&E utilities are in a trench with other utilities, see [PG&E Standard S5453, "Joint Trench"](#) (located in [Appendix B, "Electric and Gas Service Documents"](#)), Exhibit A, "Joint Trench Drawing," and Form B, "Job Estimate Authorization for Joint Trench Construction." ***Use the information in both exhibits when PG&E facilities are in a trench with other utilities.***

Contact your local project coordinator for copies of these documents. See [Table FM-1](#) in the front of the manual on Page iv.

Information about service design and installation options is available either on [Gas Form 79-716, "General Terms and Conditions for Gas and Electric Extension and Service Construction by Applicant,"](#) or by calling PG&E's Building and Renovation Service Center (BRSC) at 877-743-7782.

2.2.1. (continued)

6. Obtain approval from PG&E's project coordinators for the gas service and meter-set location. If the new gas service request is complex, PG&E may require that estimators and/or engineers become involved *before* approving the gas service and meter-set location.
7. Select a trenching agent to perform the required trenching and paving services. The trenching agent also must obtain all the permits required for installing the gas service pipe from the point of connection at the main to the approved meter location. Applicants can select either PG&E or an outside contractor to perform this work.

If an applicant selects an outside trenching agent for the project, the applicant must obtain a copy of PG&E's approved trench route or construction sketch. PG&E must inspect and approve any trenching and paving work performed by outside agents.

Outside trenching agents are required to be certified to perform work on the gas pipeline systems. For a complete list of tasks requiring certification, see the [Operator Qualification Program Requirements](#) or contact a PG&E project coordinator.

Outside trenching agents can be certified by scheduling a testing session directly with PG&E by calling 1-855-854-6227 (Option 4), or by emailing QualificationCommun@pge.com.

PG&E does not accept or assume ownership of additional facilities installed where the applicant begins construction *before the design is completed and approved by PG&E*. Additional facilities, even if provided at no cost to PG&E, represent increased plant in the rate base. This includes associated, long-term increases in taxes and maintenance expenses.

Applicants are responsible for any additional design changes or reconstruction costs that may be required if PG&E does not accept unapproved facilities. ***PG&E will not pressurize a system that has not received final design approval and passed all inspections.***

8. Pay PG&E for all the installation costs. This includes the costs for facilities and appurtenant fittings, valves, service pipe, service regulators, metering equipment, etc., in excess of the allowances. For more information, see PG&E's [Gas Rule 15, "Gas Main Extensions,"](#) [Section B, "Installation Responsibilities,"](#) and [Gas Rule 16, "Gas Service Extensions,"](#) [Section E, "Allowances and Payments by Applicant."](#)
9. Install, own, and maintain physical protection such as bollards or barrier posts and/or enclosures, as may be required.

2.2.1. (continued)

C. Complying with Local Building Laws and Regulations

Applicants must contact local city and county deputies and inspectors to ensure compliance with all local laws and regulations. Applicants must:

1. Allow only qualified professionals to install applicant-owned facilities. Also, applicants must ensure that equipment required by local building codes are inspected by local building inspectors.
2. Complete the required inspections on applicant-installed gas piping (e.g., houselines) and equipment (e.g., valves, appliances) *before* scheduling meter-set work with PG&E.



Gas App.

2.2.2. Relocating or Adding Load to an *Existing* Service

An applicant should contact PG&E as early as possible when there are plans to remodel that require relocating an existing gas service to a different, acceptable location or when adding gas load. Applicants are required to fill out and submit to PG&E [Gas Form 62-0687, “Application for Service–Existing Service Relocate/Change Service.”](https://www.pge.com/tariffs/assets/pdf/tariffbook/GAS_FORMS_62-0687.pdf) This form is located on [pge.com](https://www.pge.com) at https://www.pge.com/tariffs/assets/pdf/tariffbook/GAS_FORMS_62-0687.pdf

This form, along with additional information about building and renovation services, also is found at <http://www.pge.com/building/>. The form requires applicants to provide the following information.

- **Project Type:** Asks the reason for the relocation/rearrangement.
- **Project Information:** Asks specific information about the project location and applicant.
- **Contract Information:** Asks for the applicant’s legal name, mailing address, etc.
- **Representative Information:** If the applicant has a legal representative to relay project information and updates to the PG&E representative, the legal representative’s name goes here.
- **Construction Information:** Describes the applicant’s choices for trenching and backfill work.
- **Load Information:** Asks for the number of existing meters at each service location. Provide details about the quantity and types of existing gas appliances and details of those being added. Include the connected load breakdown in thousand British Thermal Units (MBTU) per hour for each appliance. Also include a description of each appliance’s intended use.
- **Self-Generation and Net Metering Options:** Describes the requirements to apply for PG&E’s net metering program.
- **Attachments:** Lists the documents required for the application including site improvement plans, drawings, and maps.
- **Agreement to Pay and Signature:** Applicants must sign the agreement and pay any fees associated with the work.

2.2.2. (continued)

NOTE: Adding load may cause the existing service to become inadequate and may require the service to be upgraded and/or replaced at the applicant's expense. (See [Gas Rule 16](#).)

Applicants can choose to provide trenching for gas services relocations. [PG&E Gas Form 62-0687](#) describes these options in greater detail.

2.3. Gas Service

All plastic gas distribution service pipes and stub completions must be a minimum diameter of 1 inch for all new business installations and customer-requested service relocations.

2.3.1. General

A gas service is the section of plastic tubing or steel pipe that connects the service riser and gas meter to PG&E's gas distribution main. The gas distribution main is preferably located in an easement adjacent to the applicant being served. For an example, see Figure 2-1, "Typical Gas Service Installation," on Page 2-6.

Applicants should install the gas distribution mains in joint trenches, when it is feasible to do so. Locate distribution mains 5 feet from the face or foundation of any building as described in [Gas Design Standard A-04, "Cover and Clearance Requirements for Transmission Lines, Distribution Mains, and Service Lines,"](#) located in [Appendix C, "Electric and Gas Engineering Documents."](#) On private property, ensure that easements are at least 10 feet wide for mains. Services that cross third-party property also require a 10-foot-wide easement.

A financial allowance for the installed service cost is based on the applicable, connected gas appliances installed within a specific time period. The allowance is applied toward the cost of a new service, as outlined in PG&E [Gas Rule 16, Section E](#).

A. When installing a gas service, PG&E performs the following actions.

NOTE: While it is PG&E's responsibility to design and install the gas service, the applicant has the *option* to perform both.

1. PG&E installs a service extension and applies the gas rule allowances, based on applicant load, to the applicant under the following conditions:
 - a. PG&E determines that the loads to be served are bona fide.
 - b. The loads are connected and the extension placed into service subject to compliance with [Gas Rule 15](#) and [Gas Rule 16](#).
2. Design the PG&E-approved gas service to the shortest and most practical route, preferably in a straight line at a right angle from the gas main to an approved meter location. Avoid offsets, diagonal runs, bends, and services installed under driveways or customer-paved areas. **Exceptions require PG&E's advance approval.** When the building or structure is on a corner lot, PG&E determines the gas main for connection.

2.3.1. (continued)

3. Install and connect the gas service to the gas main in the adjoining street, highway, alley, lane, road, or easement.

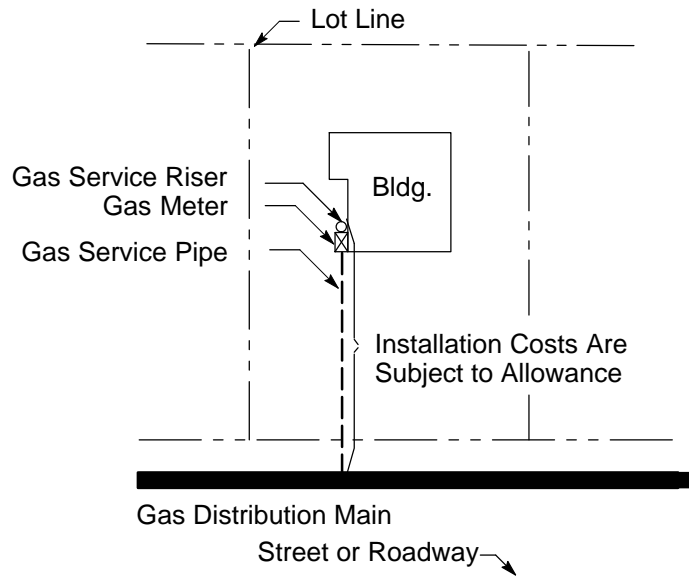


Figure 2-1
Typical Gas Service Installation

4. Refer to [Gas Design Standard A-93.3, “Excess Flow Valves,”](#) located in [Appendix C](#).
5. Refer to Subsection 2.3.3., “Curb Values,” on Page 2-10, if a curb valve is required.
6. Do not install gas services under or through retaining structures (e.g., retaining walls) greater than 3 feet above ground.

NOTE: A **retaining wall** is a structure that retains (i.e., holds back) material (usually earth) and prevents it from sliding or eroding away. Retaining walls are designed to resist the pressure of the material being held back.

B. PG&E does **not** permit the following types of installations.

1. Installing gas service under or through structures, buildings, foundations, or decks. On an exception basis, PG&E may approve a gas service riser in a gas meter room that meets the requirements in [Gas Design Standard J-16, “Gas Meter Room,”](#) located in [Appendix C](#).

NOTE: If PG&E determines that an applicant’s uninspected trench excavation requires repair, or if the uninspected trench is backfilled and/or paved over, the applicant must provide and pay for all of the paving services and permits that are required to get an inspection and repair the trench excavation completely. This includes trenches dug on both public and private property.

2.3.1. (continued)

2. Installing gas service and gas service risers directly into concrete or asphalt pavement materials.
 3. Installing gas service risers that are not approved by PG&E.
- C. When installing a gas service, the applicant is responsible for ensuring the following conditions are met.

NOTE: Applicants must refer to PG&E [Gas Form 79-716](#) when they propose installing new gas services for new business utility services. This form is located on the [Tariffs](#) website on [pge.com](#) at <https://www.pge.com/tariffs/index.page>.

1. Provide and maintain a clear route, free of any obstructions, for installing the gas service facilities.
2. Trench, backfill, and perform any other digging as described in PG&E's specification and inspection instructions, as required.
3. Pay any required permit fees.
4. Install and maintain all of the gas piping downstream of the service delivery point. See Subsection 2.5., "Applicant-Owned and Installed Gas-Service Piping (e.g., Houseline), Valves, and Automatic Shut-Off Devices," on Page 2-49, for more information.
5. Ensure that all requirements are met in the following PG&E gas design standards, located in [Appendix C](#).
6. Notify PG&E as soon as any paving activity is planned and provide PG&E with the scheduled completion date. Applicants should remember that PG&E can meet their schedules when the Company is notified early in the process.
7. PG&E must approve all requests for gas service in a casing before installation. Provide and install an approved casing (i.e., sleeve) under the paving material when the paving will extend over the gas service. Applicants must ensure that:
 - a. The casing is made of a PG&E-approved material. Refer to [Gas Design Standard A-75](#), located in [Appendix C](#).
 - b. PG&E employees and equipment have sufficient, safe, and unobstructed access to the casing location with sufficient space to perform any required work when installing in a joint trench.
 - c. Before installing any type of pavement or concrete, place a minimum 3-inch sleeve around the gas service riser.

2.3.1. (continued)

8. [PG&E Procedure TD-4632P-01, “Gas and Electric Operations – Cross Bore Prevention and Mitigation,”](#) provides the steps that must be taken to prevent, inspect, identify, report, and address cross bores that are created when PG&E, its contractors, and contracting agencies perform trenchless construction. All construction work performed by or for PG&E is subject to this procedure.

NOTE: Find additional information about cross bores at the [Sewer Cleaning](#) website:
https://www.pge.com/en_US/safety/gas-safety/sewer-cleaning-safety.page

- D. For more information and illustrations, see [Company Standard S5453, Exhibit B, Joint Trench Configurations & Occupancy Guide](#), located in [Appendix B](#).
- E. Underground warning tape is required for all gas service and main pipeline installations as described in [Gas Design Standard L-16, “Gas Pipeline Underground Warning Tape,”](#) located in [Appendix C](#).
- F. Figure 2-2, “Gas-Only Service Trench;” Figure 2-3, “Typical Gas Bell Hole–Plan View;” and Figure 2-4, “Typical Bell Hole Depth–Profile View,” show the typical, PG&E-required excavation for a gas-only service trench and gas bell hole. All three figures are located on Page 2-9. See [Gas Design Standard A-03, “Gas Trench Design and Construction,”](#) located in [Appendix C](#), for gas-only service trenching requirements.

2.3.1. (continued)

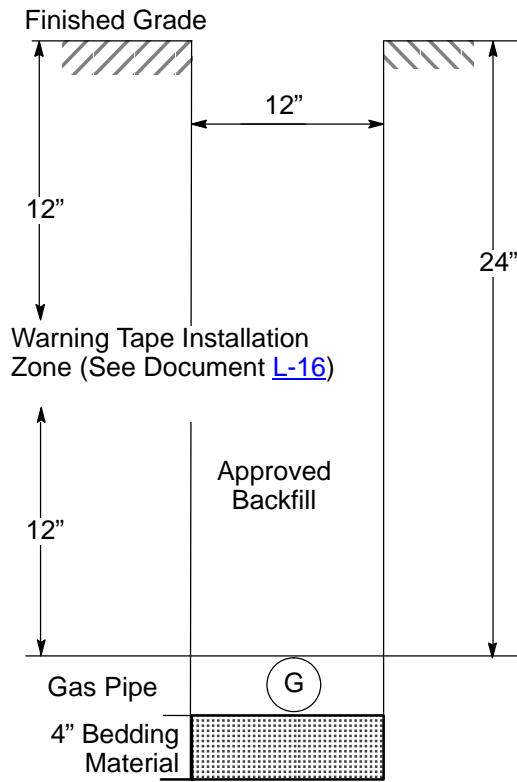


Figure 2-2
Gas-Only Service Trench

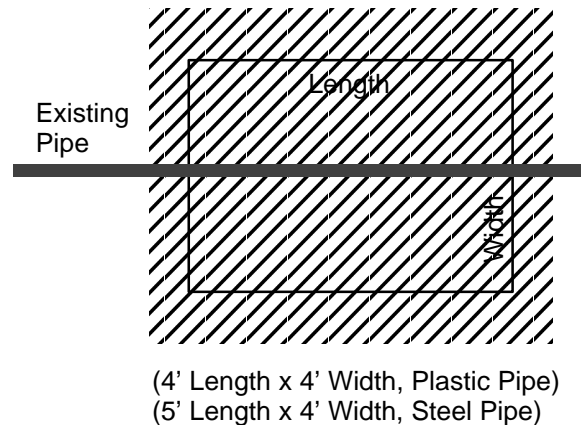


Figure 2-3
Typical Gas Bell Hole-Plan View

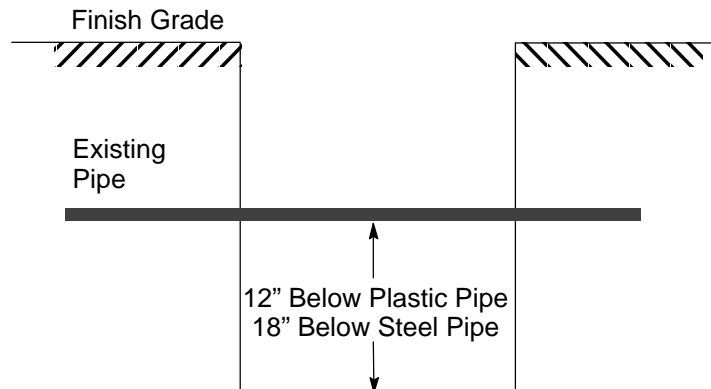


Figure 2-4
Typical Bell Hole Depth-Profile View

Notes in reference to Figure 2-2, Figure 2-3, and Figure 2-4.

1. All dimensions are the minimum required amounts.
2. For Figure 2-2, "Gas-Only Service Trench," soil compaction must meet PG&E's and any applicable federal, state, county, and local requirements.
3. Some jobs may require bell holes with larger dimensions and trench shoring.

2.3.2. Branch Service Pipe

Branching may be used to provide service to no more than two buildings.

The meter installations must be located on adjacent sides of the two buildings being served. Where a branch-service installation is justified, a separate location for the gas meter and electric meter is permissible, if necessary.

Design and install all branch services as described in [Gas Design Standard A-42, “Standard Branch Service Installation,”](#) and [Gas Design Standard A-90,](#) both located in [Appendix C.](#)

2.3.3. Curb Valves

A. A curb shutoff valve is required to be installed when any of the following conditions exist:

1. The meter capacity exceeds 5,000 standard cubic feet per hour, and an EFV is not required and not installed. Refer to [Gas Design Standard A-93.3,](#) located in [Appendix C,](#) for EFV requirements.
2. The shutoff valve is not readily accessible or is inside a building and the service shutoff valve is enclosed (e.g., basement, garage, or similar obstructed location).
3. An EFV is not required and not installed, and the service line cannot be quickly squeezed off because of wall-to-wall paving, concrete, depth of cover, or other surface conditions. This includes known, planned depth of cover or other surface conditions. Typically, a service line that is installed in a lawn area with normal soil conditions (i.e., no wall-to-wall paving, concrete, or other obstruction over the service line) may be quickly squeezed off.

B. PG&E ***requires*** curb valves when the service line supplies a building where approximately 100 or more people gather and where the occupancy may be transient (see [Gas Design Standard A-43.2, “Curb Valves”](#)). Examples include, but are not limited to:

- Schools
- Hospitals
- Churches
- Places of incarceration
- Theaters
- Auditoriums
- Arenas
- Transit centers

2.3.3. (continued)

C. PG&E **may require** valves on small, gas-distribution systems. These systems include, but are not limited to:

- Mobile home parks (**not** individual mobile homes)
- Condominiums and apartments
- Multiple buildings
- Shopping centers
- Commercial/industrial parks

2.3.4. **Joint Utility Service Trenches**

When installing underground electric service, PG&E's gas service usually is installed in a common joint trench with the electric service. The joint trench typically includes telephone and cable television facilities. No other utilities or wiring are allowed in a joint trench (e.g., water, sewer, private wires, or facilities not a member of Underground Service Alert). See the definition for "Non-Utility" in [Appendix A, "Acronyms and Glossary."](#)

When planning to install joint-trench, allow for additional lead time to design and engineer the joint trench. Applicants must be aware of the following requirements.

1. Both a Joint Trench Composite Drawing and [Form B, "Job Estimate Authorization for Joint Trench Construction,"](#) are required when PG&E facilities are located in a trench with other utilities.
2. Applicants either must submit joint trench drawings to PG&E for review, or PG&E can prepare joint trench drawings for applicants at their expense.
3. PG&E must approve the trench's design details **before** trenching begins and facilities are installed.
4. Figure 2-5, on Page 2-12, shows the layout of a "Typical Joint-Service Trench."

Separation and clearance details for joint utility service trenches are located in Table 2-1, "Minimum Separation and Clearance Requirements for Trenches," on Page 2-13.

2.3.4. (continued)

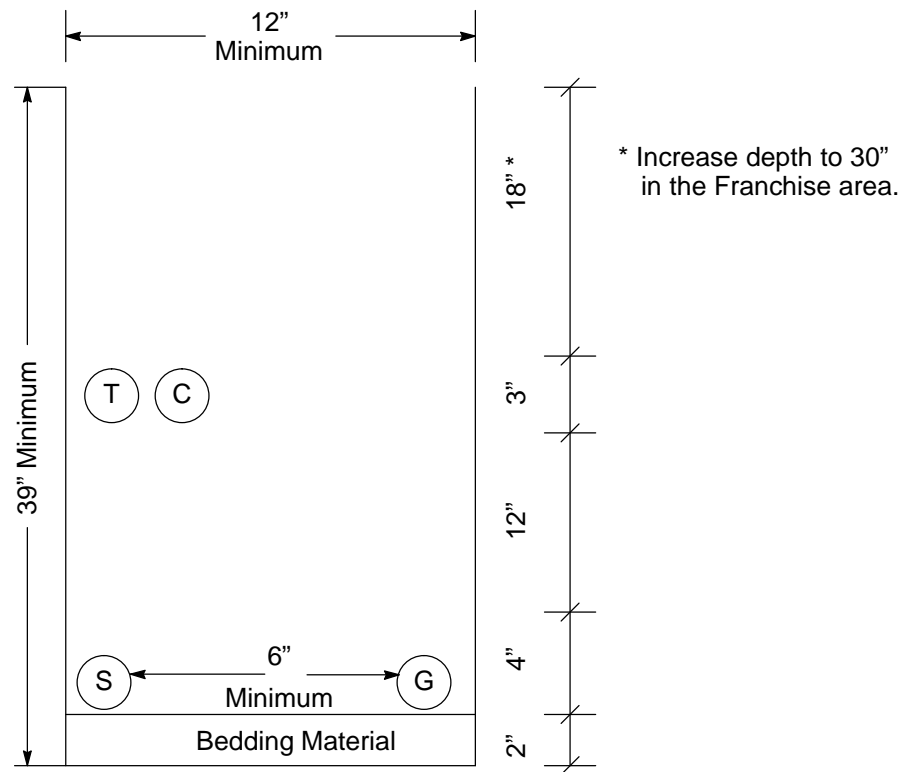


Figure 2-5
Typical Joint-Service Trench

Notes in reference to Figure 2-5.

1. Trench depth varies depending on the occupant's facility allotment.
2. Soil compaction must meet PG&E's, and any applicable federal, state, county, and local requirements.
3. A joint service trench must meet all separation and clearance dimensions shown in Table 2-1, "Minimum Separation and Clearance Requirements for Trenches," on Page 2-13.
4. For more information on Figure 2-5, see PG&E's [Joint Trench Configurations & Occupancy Guide](#), located in [Appendix B](#).

2.3.4. (continued)

Table 2-1 Minimum Separation and Clearance Requirements for Trenches¹

		G	Duct T	DB T	C	S	P	SL
(In Inches)								
G	Gas ²	–	12	12	12	6	12	6
T	Telephone (Duct)	12	–	1	1	12	12	12
T	Telephone (Direct Bury)	12	1	–	1	12	12	12
C	CATV	12	1	1	–	12	12	12
S	Electric Secondary	6	12	12	12	1.5	3	1.5
P	Electric Primary	12	12	12	12	3	3	3
SL	Streetlight ³	6	12	12	12	1.5	3	1.5
NE	Foreign Electric Sources, Non-PG&E ⁴	12	12	12	12	12	12	12

¹ All separation clearance distances are in inches.

² For more information about this table, see [Company Bulletin TD-5453B-002, "Updated Separation Requirements For Conduit in Joint Trench."](#) located in [Appendix B](#).

³ Streetlight circuits **not owned** by PG&E must be installed to meet the requirements in PG&E's [Joint Trench Configurations & Occupancy Guide](#). Specifically, applicants must review the requirements for working with a second utility company.

⁴ Considered a "utility" as defined in [Utility Standard S5453, "Joint Trench."](#)

PG&E does **not** differentiate between the clearances for casing/conduit and pipe. The clearances and installation requirements are the same.

For more information on backfill-sand requirements, see [Engineering Material Specification EMS-4123, "Backfill Sand,"](#) located in [Appendix B](#).

For more information on the minimum separation and clearance requirements for service trenches, see the [Joint Trench Configurations & Occupancy Guide](#).

When different service facilities (e.g., gas, electric, telecommunications) are installed in close proximity (e.g., in a joint trench), applicants must ensure that the facilities maintain a minimum horizontal separation of 36 inches from the gas riser where they transition from below ground to above ground. See Figure 2-19, "Electric and Gas Meter Set Separation Dimensions and Clearances," on Page 2-33.

Clearances between other facilities can be reduced **only** when the parties supplying those services or facilities reach a mutual agreement.

NOTE: Applicants must ensure that sufficient space is provided between facilities at all times to allow for safe maintenance and operation.

A. Applicants must **not** install any electrical devices or equipment including wires, cables, metering and telecommunication enclosures, bond wires, clamps, or ground rods within 36 inches of the gas service riser.

2.3.4. (continued)

This distance can be reduced to 18 inches for electrical devices or equipment certified for National Electric Code (NEC) Class I, Division 2 locations. See Figure 2-19, “Electric and Gas Meter Set Separation Dimensions and Clearances,” on Page 2-33, and Figure 2-21, “Gas Regulator Set Clearance Requirement from Air-Intake and Exhaust Fans,” on Page 2-36.

- B. Applicants must keep the area immediately behind gas meters, service facilities, and risers free and clear of all other facilities or equipment (i.e., pipes, building vents, or conduits). This requirement also applies to the area between those facilities and the premises or structure being served.

Before installing utility conduits or gas service piping, applicants must discuss the service arrangements and coordinate the final PG&E-approved meter locations and joint trench requirements with a PG&E project coordinator.

The joint trench composite drawing must include details of the sizes and quantities of all the equipment sharing the trench. ***PG&E inspectors must approve the trench after installation is complete.***

Applicants must ensure that the gas and electric meters are installed according to Figure 2-19 on Page 2-33, providing the minimum separation clearances. Refer to the following sections of this manual for acceptable electric meter utility locations.

- [Section 2, “Gas Service,” Subsection 2.4., “Set Requirements for Gas Meters”](#) (on Page 2-18)
- [Section 5, “Electric Metering: General”](#)
- [Section 6, “Electric Metering: Residential”](#)
- [Section 7, “Electric Metering: Nonresidential, Industrial, and Agricultural”](#)

Wet-utility piping or facilities are ***not*** permitted in a joint trench. Examples of wet utilities that are not allowed in a joint trench include the following:

- Propane lines
- Pressurized water lines
- Sewer, sanitary, or storm drains

Both [PG&E Standard S5453, Form B, “Job Estimate Authorization for Joint Trench Construction,”](#) and the [Joint Trench Configurations & Occupancy Guide](#), located in [Appendix B](#), describe the requirements for separating a wet utility from a joint trench.

When applicants want to install facilities in a joint trench other than those listed in this section, PG&E requires a ***written*** request that includes a justification for the exception. Applicants must submit their requests to PG&E for review and approval ***before*** beginning work on a joint trench.

See Figure 2-19 on Page 2-33 for above-grade clearance requirements from the gas service riser where joint trench occupants terminate.

2.3.5. Multiple Buildings Located on One Lot

A. Two Buildings Located on One Lot

1. PG&E may furnish a separate gas service to each building if it does **not** require an additional gas distribution main extension. Figure 2-6, “Separate Gas Services for Two Buildings on a Single Lot,” on Page 2-13, and Figure 2-7, “Separate Gas Services for Two Buildings on a Corner Lot,” on Page 2-16, show examples of two premises on one lot with separate gas services.

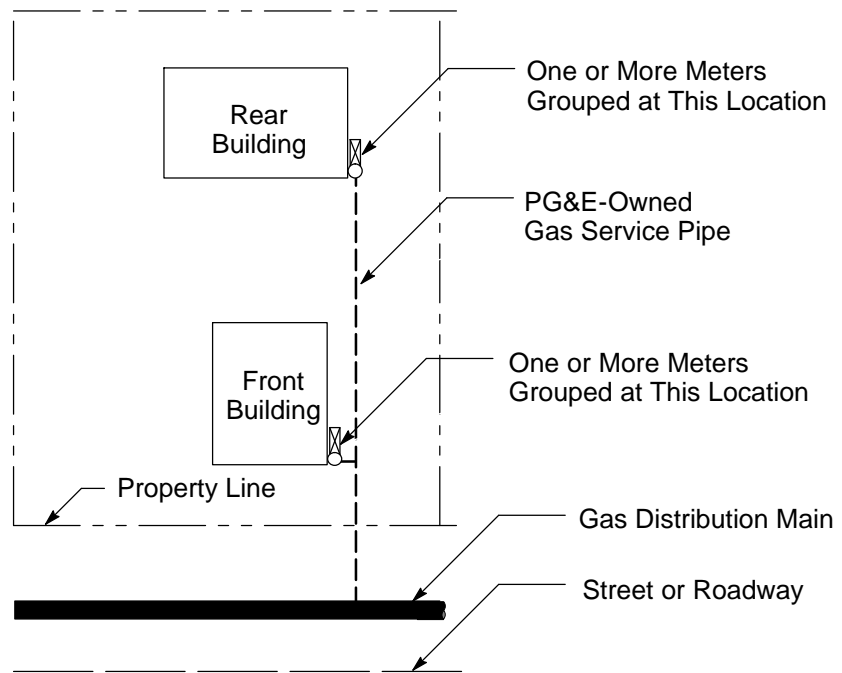


Figure 2-6
Separate Gas Services for Two Buildings on a Single Lot

2.3.5. (continued)

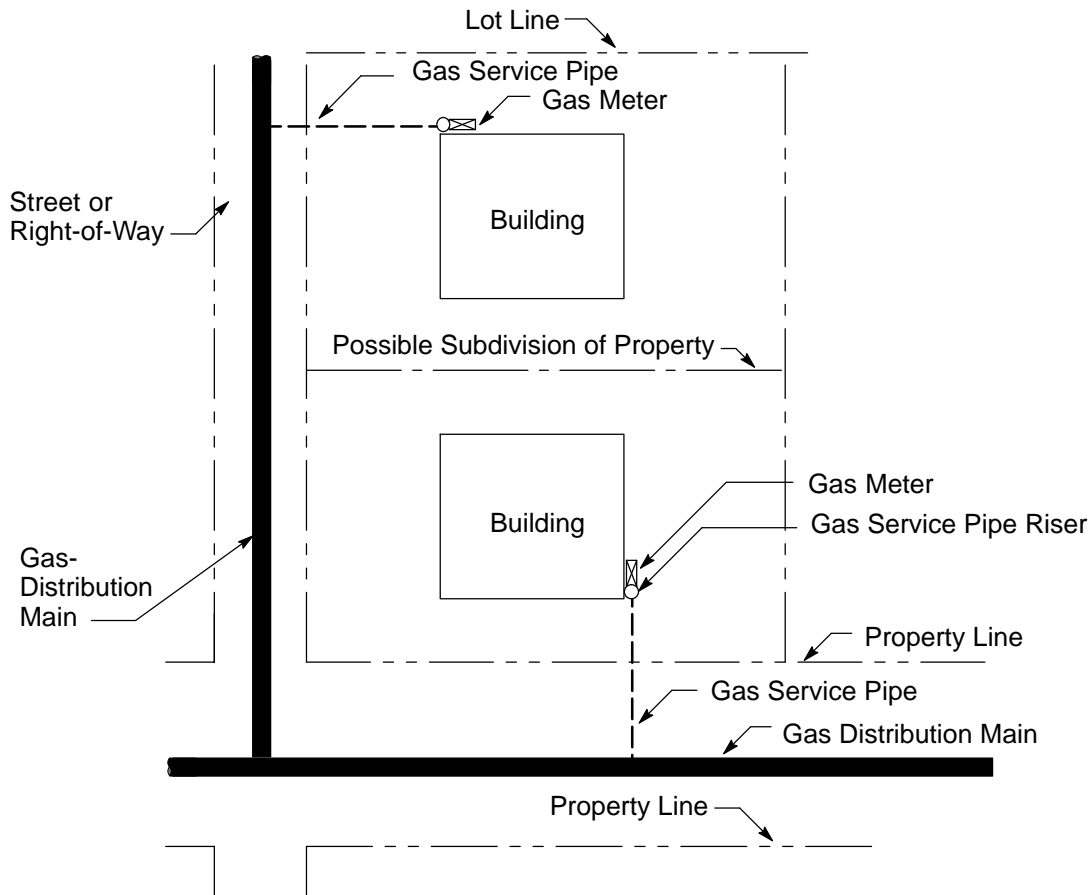


Figure 2-7
Separate Gas Services for Two Buildings on a Corner Lot

2. When more than one gas meter is required to serve a single building, the meters for that building must be grouped at a common location that has been approved by PG&E. See Subsection 2.4.2.F., “Multiple Gas Meter Connection Requirements for Single and Double (Banked) Manifold Connections,” on Page 2-39, for grouping requirements when locations have multiple meters.

B. Three or More Buildings Located on One Lot

When two or more buildings, either single family or multifamily, are on the same lot and located in close proximity to each other, PG&E may install a gas distribution main on the applicants’ properties. For specific requirements, see PG&E’s main-extension rule, [Gas Rule 15](#), and service-pipe extension rule, [Gas Rule 16](#). Before a gas distribution main can be installed, applicants must ensure that the following conditions are met.

1. There must be a protected and accessible location on the property.
2. A satisfactory right-of-way, easement, or permit must be available at no cost to PG&E.

Typically, PG&E installs a single, gas-service pipe to each building, as described in [Gas Rule 16](#).

2.3.5. (continued)

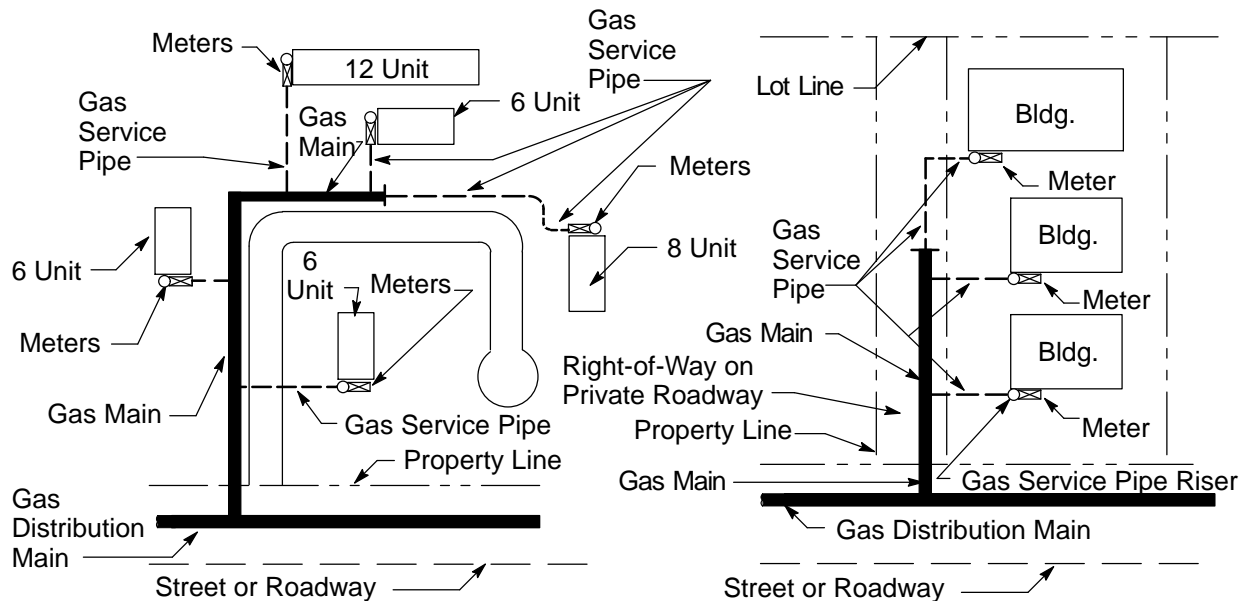


Figure 2-8
Apartments With Grouped Meter Locations

Figure 2-9
Individually Metered Buildings

**Typical Gas Distribution Main and Service Pipe Installation
for Property With Three or More Buildings**

Multifamily residential complexes are subject to a California Public Utilities Commission (CPUC) mandate specifying that each unit is metered individually. Specifically, see [Public Utilities Code Division 1, "Regulation of Public Utilities," Part 1, "Public Utilities Act," Chapter 4, "Regulation of Public Utilities," Article 3, "Equipment, Practices, and Facilities," Section 780.5](http://leginfo.ca.gov/faces/codes_displaySection.xhtml?sectionNum=780.5&lawCode=PUC) (on the Internet at http://leginfo.ca.gov/faces/codes_displaySection.xhtml?sectionNum=780.5&lawCode=PUC).

EXCEPTION: A single gas meter may serve an entire complex when the gas is used only for central heating systems (i.e., space, water) that supply all tenants in common, and when each individual unit does *not* use gas appliances that require combustion venting. Refer to [Gas Rule 18, "Supply to Separate Premises and Submetering of Gas."](#)

When each dwelling unit includes ground-floor space, each unit may have an individual service pipe and separate meter location *if*:

1. Sufficient meter space is provided.
2. Local ordinances do *not* prohibit such arrangements.

When it is practical, install the gas service pipe in a joint trench with the electric service.

See Subsection 2.4.2.F. on Page 2-39 for specific requirements when locations have multiple meters.

2.3.6. Mobile Home Parks

Gas mains and services in mobile home parks must meet the same standards for gas installations that are required for residential and nonresidential applications.

In addition, applicants must **not** install gas mains, services, and meters under existing or proposed structures including mobile homes, sheds, porches, carports, and stairs.

Applicants should install the gas distribution mains in the roadway, when it is practical to do so, and in joint trenches, when it is feasible. Locate distribution mains 5 feet from the face or foundation of any building as described in [Gas Design Standard A-04](#) located in [Appendix C](#). On private property, ensure that rights-of-way are at least 10 feet wide for mains and at least 5 feet wide for service piping. Only use easements for utility installations. Table 2-1 on Page 2-13 shows the minimum separation and clearance requirements for service trenches.

NOTE: Curb valves are **not** recommended for individual mobile home services; however, a curb valve may be installed on the service to a park's community building.

NOTE: Refer to [Gas Design Standard J-12.4, "Mobile Home/Manufactured Home Meter Set Installation."](#) Contact your local project coordinator for this document.

Also see the gas meter set requirements in Subsection 2.4.2.A.4., "Mobile Home Parks," on Page 2-23.

2.4. Set Requirements for Gas Meters

The following information describes the meter set requirements for gas services.

2.4.1. Gas Pressure

The following information describes the types of delivery pressures available with gas service.

A. Standard Delivery Pressure

PG&E typically will provide gas service pressure to the service delivery point at 7 inches of water column (WC). This is approximately 1/4 psig, as measured at the gas meter outlet.

B. Elevated Delivery Pressure

PG&E may be able to provide gas service at higher gas-delivery pressures, depending on the location of the applicant's facility and on the requirements of the gas system serving that location. PG&E maintains sole authority to determine if the elevated delivery-pressure service is available at a specified location.

2.4.1. (continued)

In all elevated delivery-pressure service situations, PG&E reserves the right to reduce the gas service pressure to standard delivery pressure, as outlined in [Gas Rule 2](#), “Description of Service,” when:

- PG&E determines that the elevated gas pressure is no longer available.
- The current delivery pressure is detrimental to PG&E’s gas distribution system.

NOTE: When providing elevated gas-pressure service, PG&E can incur additional costs. In these cases, special facilities charges will apply as described in [Gas Rule 2](#). Applicants must pay these charges *before* PG&E can provide the services.

The following two numbered items describe cases where special facilities charges can apply.

1. **For 2-psig Services:** In many PG&E service territories with sufficient distribution operating pressure, 2-psig delivery pressure may be available. When completing PG&E’s [Application for service process](#) online form, applicants must request 2-psig gas-service delivery pressure in the “Load Information” section. Generally, there are no special facilities charges at or below 2 psig for meters equal to or less than 1,000 standard cubic feet per hour (scfh) nominal capacity. As mentioned previously, PG&E determines if special facilities charges apply.
2. **For Services Higher Than 2 psig:** Elevated gas-metering pressures higher than 2 psig may be available from the local gas distribution system. PG&E must ensure that tapping into this existing service will *not* be detrimental to the operation of that gas system.

When requesting elevated gas-service delivery pressure higher than 2 psig, applicants must follow these steps.

- a. Contact the local PG&E project coordinator as soon as possible (preferably in the *planning* stage for a new or remodeled building).
- b. Fill out the appropriate PG&E [Application for service process](#) online form and note the gas-service delivery pressure being requested in the “Load Information” portion of the form.
- c. Submit a formal, written request and justification for elevated gas-service delivery pressure (e.g., the hypothetical houseline diameter size at standard delivery pressure, the appliances’ specification requirements).
- d. Submit a houseline piping schematic.
- e. Submit the manufacturer’s appliance specifications to ensure that the appliances will operate as designed.
- f. Provide detailed load information for all appliances and their intended use.

2.4.1. (continued)

C. Back-Pressure Protection

PG&E may require the applicant to install a check valve after the PG&E gas meter's set point of connection. This check valve prevents backflow. PG&E determines the need for check valves on a case-by-case basis. The applicant is required to have a maintenance plan and to maintain the check valve.

For all higher-than-standard delivery pressure, PG&E recommends that applicants hire a qualified person, such as plumber or contractor, to review the applicant-owned gas piping, venting, and appliance installations for the gas pressure service being requested. The qualified person can ensure that the installations comply with all local, state, and federal codes, standards, and regulations. Specifically, the qualified person helps to ensure that the [Uniform Plumbing Code](#) is enforced based on the installation requirements of the local governing agency in the applicant's location.

2.4.2. Gas Meter-Set Locations

Typically, PG&E provides only one meter set (in an outside location) for each dwelling unit and one service to each building. PG&E may require that the meter be set at the property line if *either* of the following two conditions are met:

1. The building is back more than 200 feet from the property line.
2. A potential hazard or unusual site condition threatens the service between the property line and the building. Some examples of unusual site condition are plowed land, ditches, bridges, ponds, waterways, leach fields, bioswales, inaccessible security areas, or other deterrent, obstacle, or hazard.

PG&E prefers that rotary meter sets be located outside of and away from the building.

PG&E must have unrestricted, drive-up access for service trucks and adequate space to install and maintain the meter.

Any deviations require advanced approval from PG&E.

For specific information, see [Gas Rule 16](#), Section C, Number 5, "Unusual Site Conditions." Figure 2-10, "Property Line Installation," below, shows a property-line meter set installation.

2.4.2. (continued)

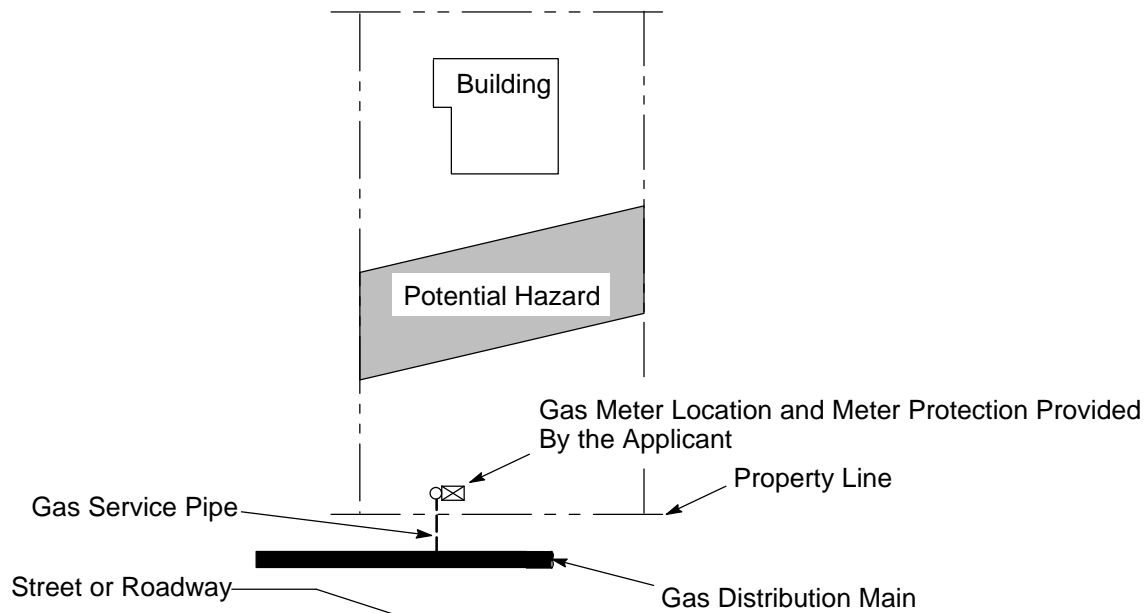


Figure 2-10
Property Line Installation

A. Descriptions of Acceptable Meter Locations

For descriptions of, and specific requirements for, acceptable gas meter locations, see [Gas Design Standard J-15, “Gas Meter Locations,”](#) located in [Appendix C](#).

Figure 2-11, “Acceptable Locations for Gas Meter Installations,” on Page 2-23, and Figure 2-12, “Acceptable Meter Locations for Mobile Home Parks,” on Page 2-24, illustrate locations that are acceptable for installing typical meter sets.

1. Required Access

PG&E employees require access to gas meter sets to perform inspection and maintenance activities. When gas meter locations are approved by PG&E and are installed in areas that are locked or can potentially be inaccessible, the applicant must allow PG&E employees access to the meters.

- a. Use a lock box, provided by PG&E and installed by the applicant, to hold the applicant’s key. The lock box with key must be installed in a PG&E-approved location near the gas meter access point.
- b. For gates, a double-lock device (e.g., hasp) may be required with one lock for the applicant and one lock for PG&E.

2.4.2. (continued)

2. Approved Meter Set Locations (In Order of Preference)

NOTE: For specific requirements and definitions, see [Gas Design Standard J-15](#), located in [Appendix C](#).

- a. Meter set located outside a building including property-line meter sets.
- b. Meter set located outside in an alcove as described in Subsection 2.4.2.G.1., “Alcoves,” on Page 2-41.
- c. Enclosures as described in Subsection 2.4.2.G.2., “Enclosures,” on Page 2-42.
- d. Meter set located in a cabinet or closet as described in Subsection 2.4.2.G.3., “General Requirements for Meter Cabinets,” on Page 2-43, and Subsection 2.4.2.G.4., “Gas Meter Closets,” on Page 2-45.
- e. Meter set located in a breezeway. An acceptable breezeway is permanently open at both ends with no sources of ignition and no openings into the building.

NOTE: PG&E will consider approving Number f. and Number g., below, on an exception basis only after Number a. through Number e., above, are ruled out as options. Number f. and Number g., below, typically are limited to structures built up to the property line with space restrictions.

- f. Meter set located inside a building in a gas meter room (see [Gas Design Standard J-16](#) located in [Appendix C](#)).
- g. Meter set located in a buried vault, pit, or box.

2.4.2. (continued)

3. Single Residential, Apartment, or Nonresidential Building

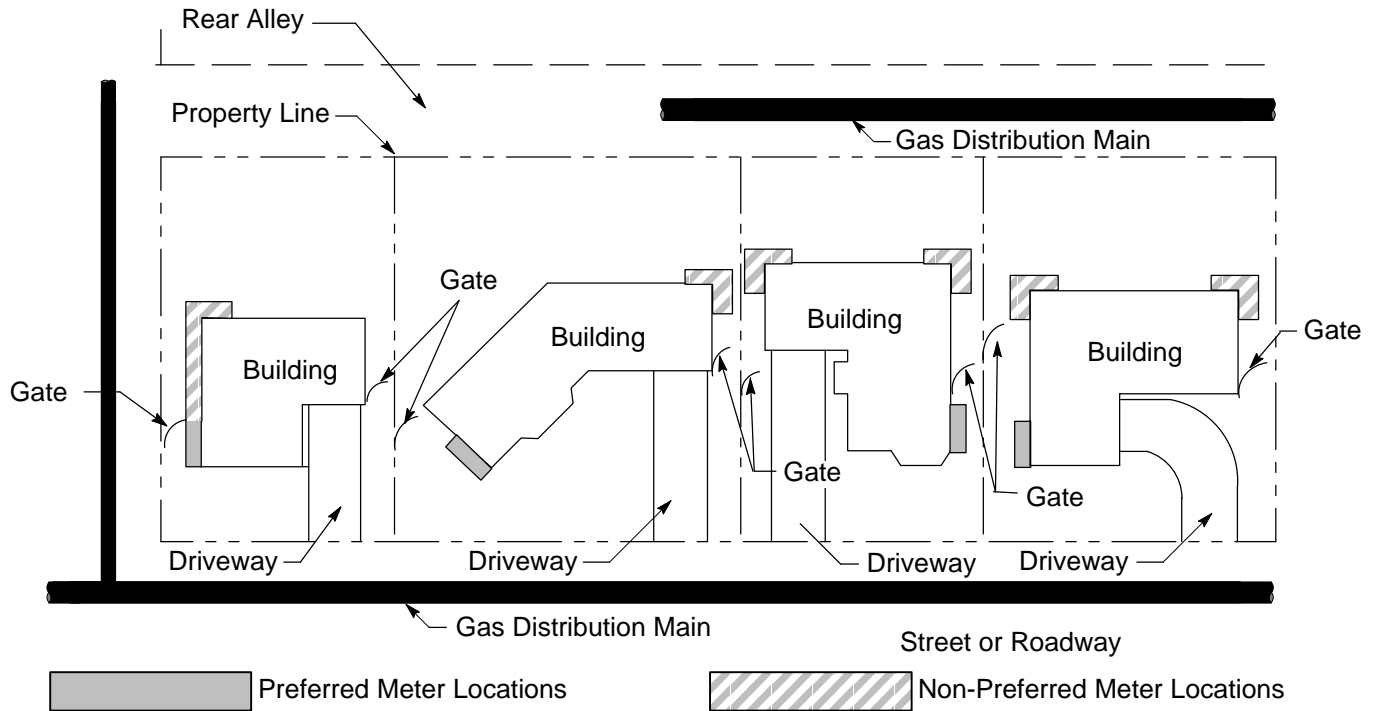


Figure 2-11
Acceptable Locations for Gas Meter Installations

NOTE: When the meter set from the gas distribution line is located in a rear alley, applicants should locate the meter set outside of any gated or fenced area. This allows access for PG&E employees when maintenance is required.

4. Mobile Home Parks

For new mobile home parks, the mobile home park owner or operator must provide a separate and independent meter location for each lot. New mobile home parks are not allowed to have submetering facilities.

Typically, meters are located on flat surfaces that are not obstructed by landscaping. Meter locations cannot be obstructed by porches and stairs leading to porches. Figure 2-12, on Page 2-24, represents several acceptable meter locations within a typical mobile home park.

2.4.2. (continued)

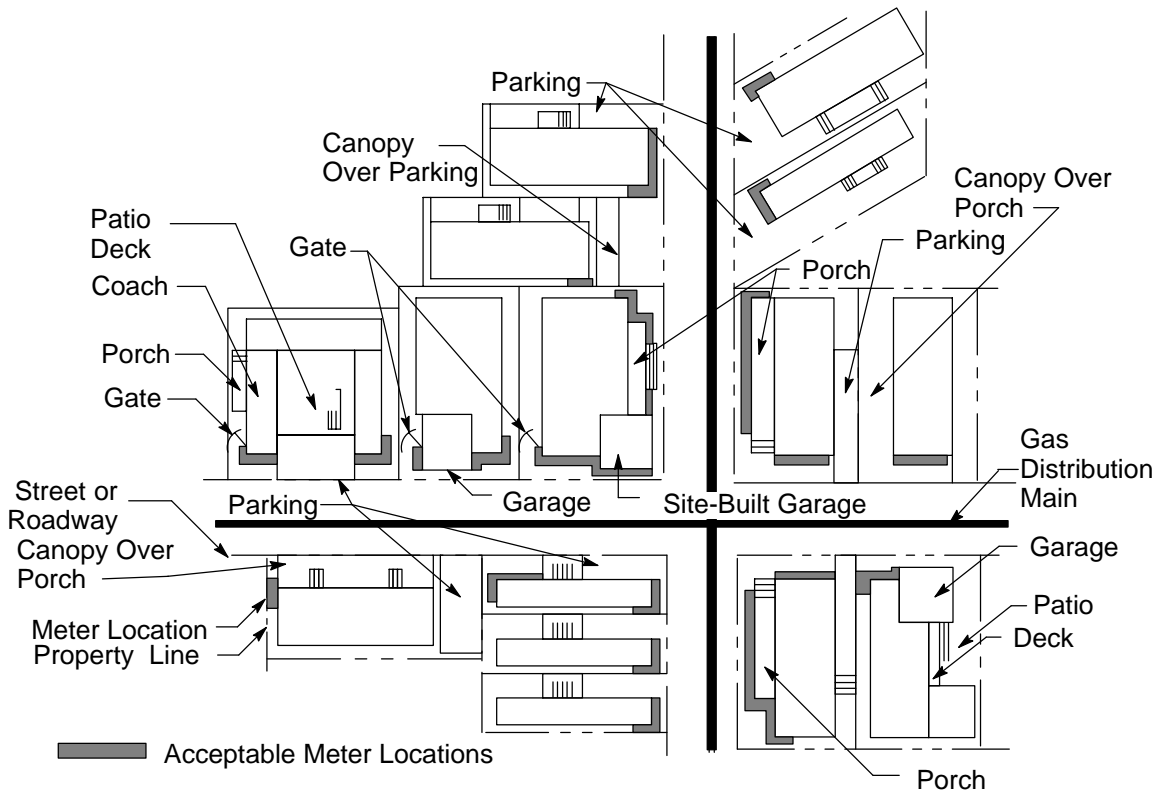


Figure 2-12
Acceptable Meter Locations for Mobile Home Parks

PG&E does *not* provide metering facilities if they will be attached directly to a “movable” mobile home unit that is installed or set up in any location, including a mobile home park. Before PG&E provides metering facilities, the mobile home must meet *both* of the following conditions.

- a. **Fixed in Place:** The mobile home typically does not have either running gear or wheels and is not capable of being moved to another location.
- b. **Installed on a Foundation System:** The mobile home must have a foundation system as described on the [California Department of Housing and Community Development](#) website. From the [Home](#) page, click [Manufactured & Mobilehomes](#). Then from the drop down, click [Mobilehome Parks](#). Finally, click [Laws and Regulations](#).)

This section says that if a mobile home park contains lots or site spaces that are set up to accommodate “movable” mobile home units, PG&E will install and supply the park using utility-approved service and metering facilities at a fixed location other than the mobile home. In these cases, applicants are responsible for connecting their mobile home units to those fixed metering facilities.

2.4.2. (continued)

5. Subsidence Areas

In subsidence areas, the acceptable location requirements are the same as the requirements outlined in Subsection 2.4.2.A., “Descriptions of Acceptable Meter Locations,” on Page 2-21. PG&E may require a flexible connector to be installed between the gas meter outlet and the houseline. These connectors may require additional clearance space. See Figure 2-13, “Flex-Hose Meter Set–Residential and Small Commercial,” located below, for a sample installation. Contact your local project coordinator for [Gas Design Standard J-58, “Flex Hose Meter Set Installation,”](#) which provides information about diaphragm and rotary meters in subsidence areas.

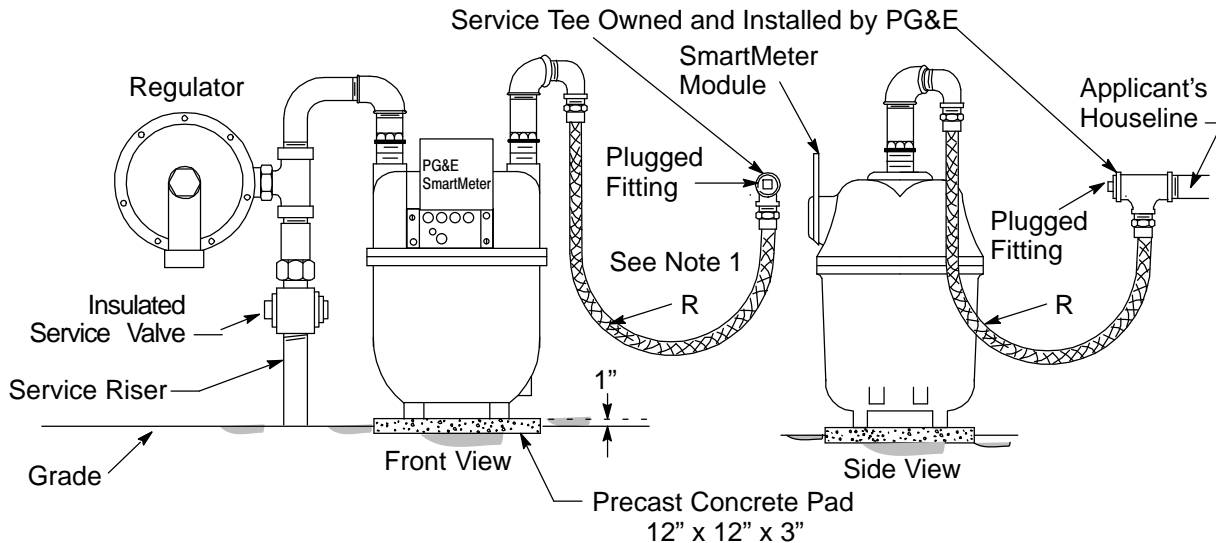


Figure 2-13
Flex-Hose Meter Set–Residential and Small Commercial

Notes in reference to Figure 2-13.

1. Hoses have a minimum bending radius (R) based on the projected settlement of the ground and on the size of the hose.

B. Unacceptable Meter Locations

For new or remodeled buildings, ***do not locate*** gas meter sets in the following areas.

1. In curb meter boxes or vaults. (Only allowed as an option of last resort.)
2. In living quarters, closets, toilet rooms, or bathrooms.
3. Under stairs inside or outside.
4. In garages without properly vented meter cabinets.

2.4.2. (continued)

5. Behind fences. (This is not preferred, but on an exception basis may be allowed.) See Subsection 2.4.2.A.1., “Required Access,” on Page 2-21.
6. On steep slopes.
7. In areas where landscaping restricts access.
8. Within engine, boiler, heater, or electrical-equipment rooms.
9. Under display platforms or show windows in commercial buildings. (This includes any permanent, elevated display floors or platforms associated with the window where the purpose of the window is to present a display to the public.)
10. In contact with the soil, in a depression below general ground level, or where potentially corrosive materials are likely to contact the meter set.
11. In tradesman alleys (i.e., passageway in a building with a door at one end). Meters may be in a tradesman alley when in a vapor-proof cabinet that is vented to the outside and clear of sources of ignition.
12. In crawl spaces under buildings or decks.
13. Near a driveway, drive-thru, or other-traveled area.
14. In a metallic cabinet, room, or location that blocks or interferes with the radio frequency signal transmissions that are necessary for PG&E to operate its SmartMeter™ Advanced Meter Reading system.
15. In any location that does not provide the required clear and level work space. The height dimension is 6 feet, 6 inches of clearance above ground, 1 foot on each side of the meter facilities, and the depth dimension is 3 feet of clearance in front of the gas meter. See the figures in Subsection 2.4.2.C., “Single Gas Meter Connection Requirements,” below, for the different width dimensions.

NOTE: All meter locations are subject to PG&E approval.

2.4.2. (continued)

C. Single Gas Meter Connection Requirements

The figures beginning on Page 2-28 illustrate typical meter-set dimensions and working clearance requirements based on the total diversified loads and stated delivery pressure.

NOTE: The actual meter-set configuration, including the dimensions, may be different depending on field conditions and restrictions.

Consult with your local project coordinator for the exact meter location and houseline placement and orientation. Customer-installed equipment (e.g., earthquake valves) must be installed on customer houseline and cannot reduce the minimum riser-to-houseline dimension.

A commercial meter set may require the riser to be located farther away from the face of the building to accommodate the meter's installation. Your local project coordinator can verify that risers and houselines are installed and meet all minimum clearance requirements before scheduling the meter set installation.

2.4.2. (continued)

1. Figure 2-14 represents a typical gas meter kit with 0 through 350 scfh at 7 inches WC or 0 through 600 scfh at 2 psig. Reverse sets are not allowed. The houseline must be to the right of the gas service riser.

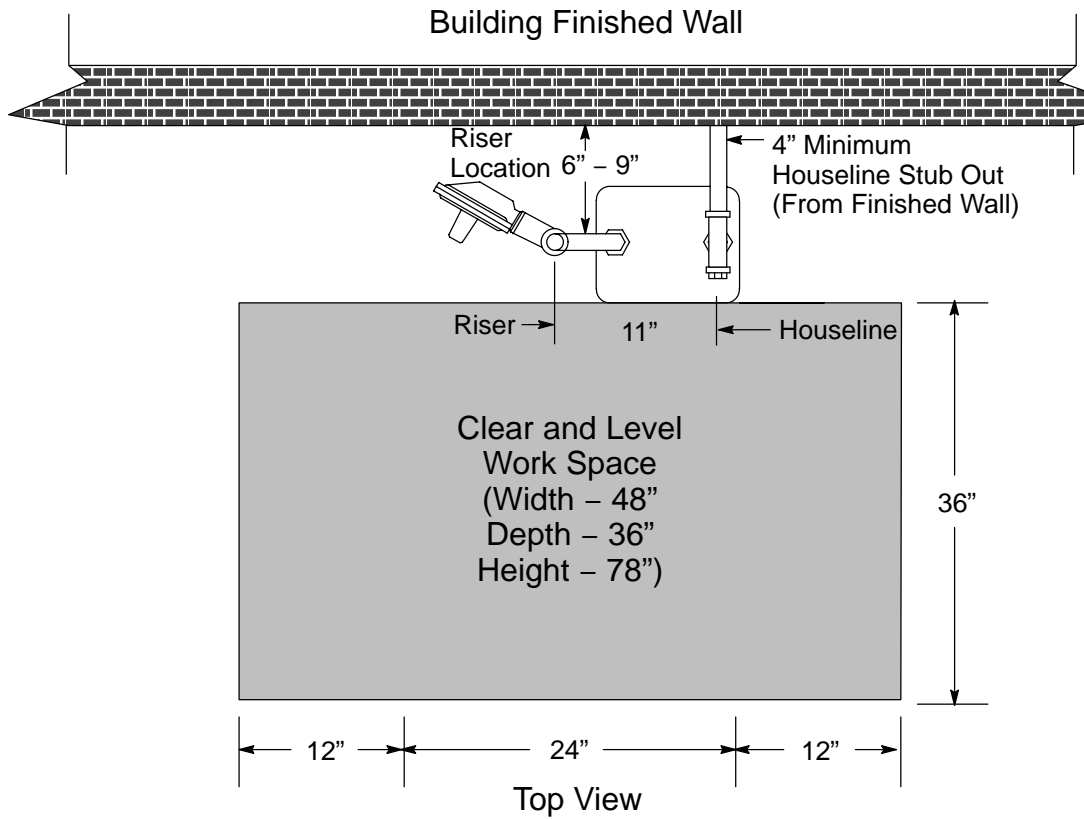


Figure 2-14
Typical Residential Gas Meter Connection

2.4.2. (continued)

2. Figure 2-15 represents a typical gas meter kit with 351 through 1,400 scfh at 7 inches WC or 601 through 2,400 scfh at 2 psig. Reverse sets are not allowed for 400 through 600 class meters (i.e., 400, 425, 630). The houseline must be to the right of the gas service riser.

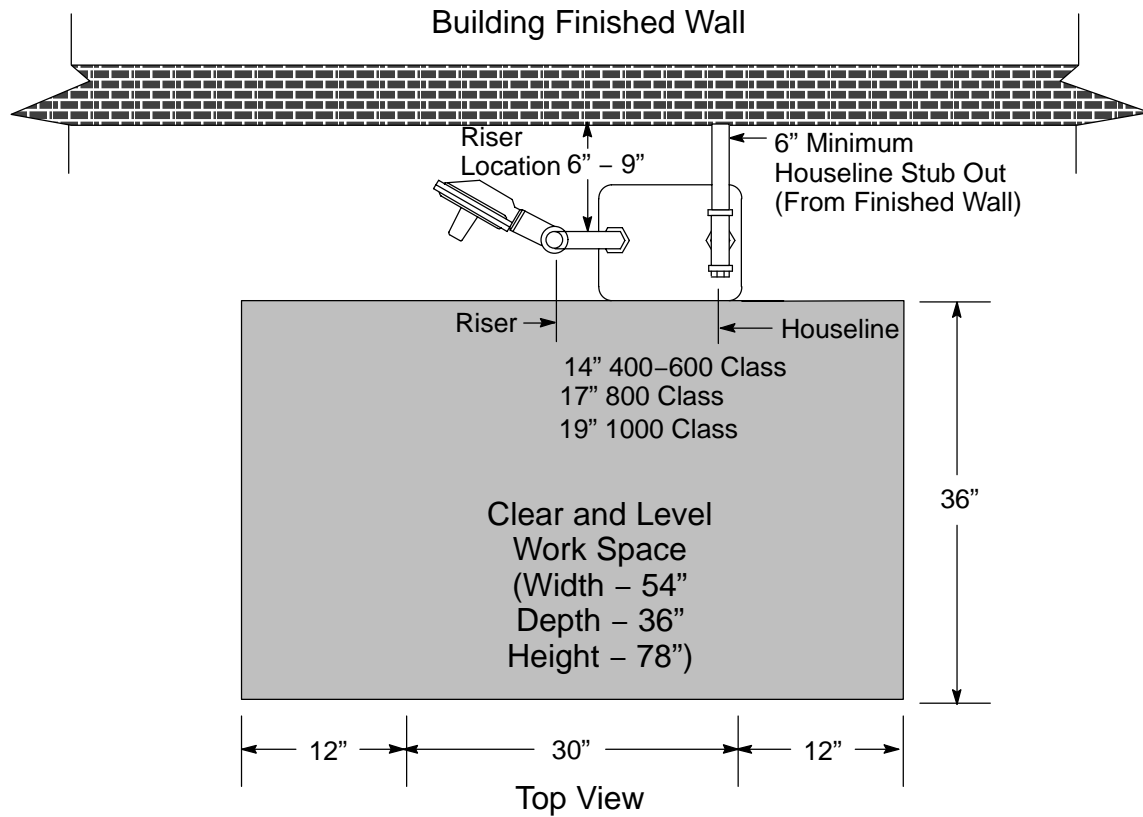


Figure 2-15
Typical Gas Meter Connection for 400 to 1,000 Class Meters

2.4.2. (continued)

3. Figure 2-16 represents a rotary gas meter with 1,401 through 3,000 scfh at an approved delivery pressure.

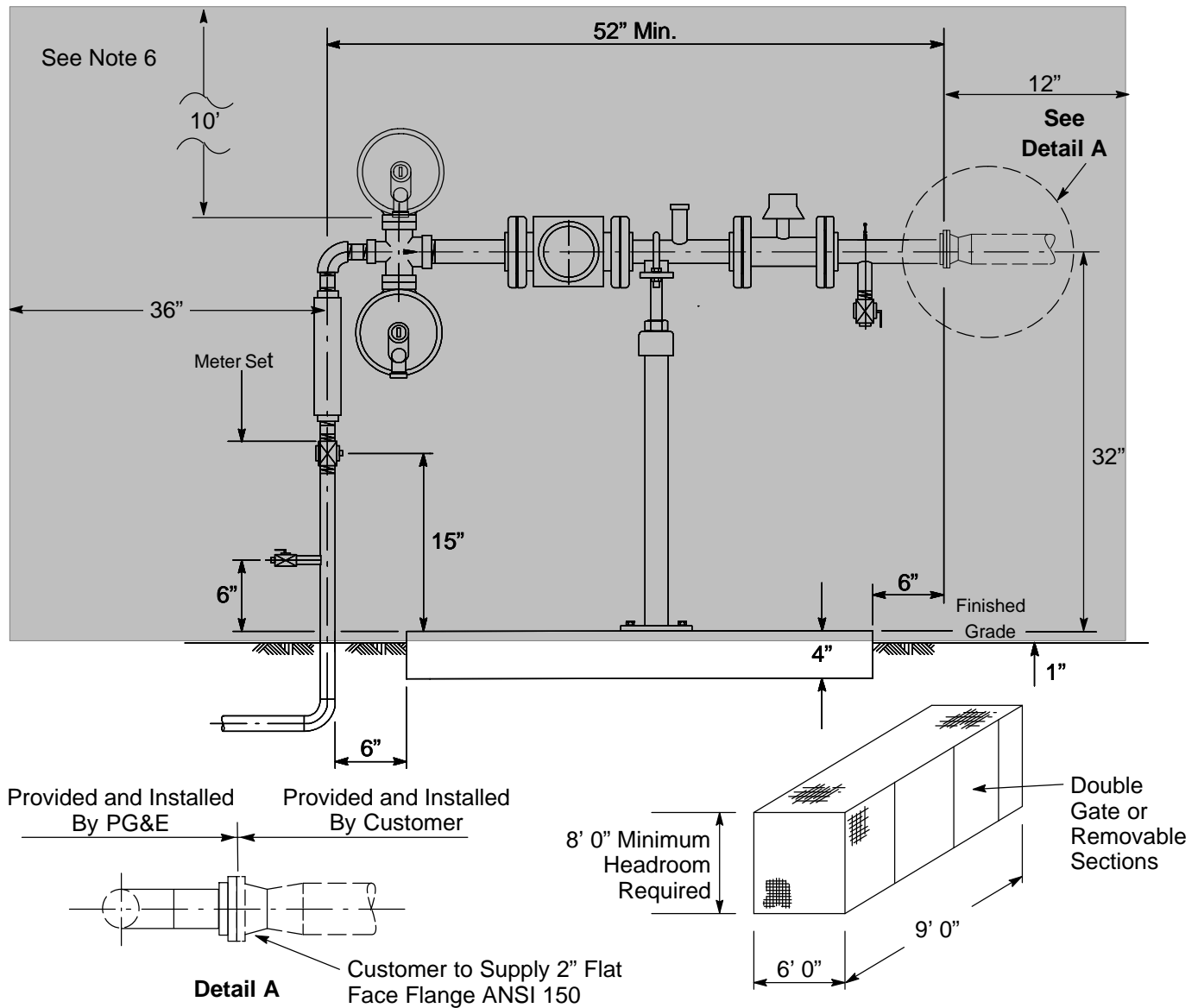


Figure 2-16
Gas Meter Connection Using a 1.5M or 3M Rotary Gas Meter

Notes in reference to Figure 2-16.

1. Customers must provide a 40 inches x 36 inches x 4 inches concrete pad with minimum #4 rebar.
2. Customers must provide a 2-inch ANSI 150 flat face flange to connect to PG&E facilities.
3. If the meter set is built next to a building wall, place the vertical leg of the riser and the houseline 20 inches from the wall. This ensures that the meter set components are built in a straight line.
4. The finished grade must be below the bury-line marking on the service riser.
5. PG&E's weld elbow is optional.
6. The regulator vent must not terminate near any sources of ignition or openings into the building. The riser must be a minimum of 36 inches from sources of ignition, from any openings into the building, or any wet facility. This clearance area extends 10 feet above the highest regulator vent, 36 inches below the lowest regulator vent, and 12 inches beyond the farthest PG&E meter-set equipment.

2.4.2. (continued)

5. Figure 2-18 represents a rotary gas meter with 7,001 through 16,000 scfh at an approved delivery pressure.

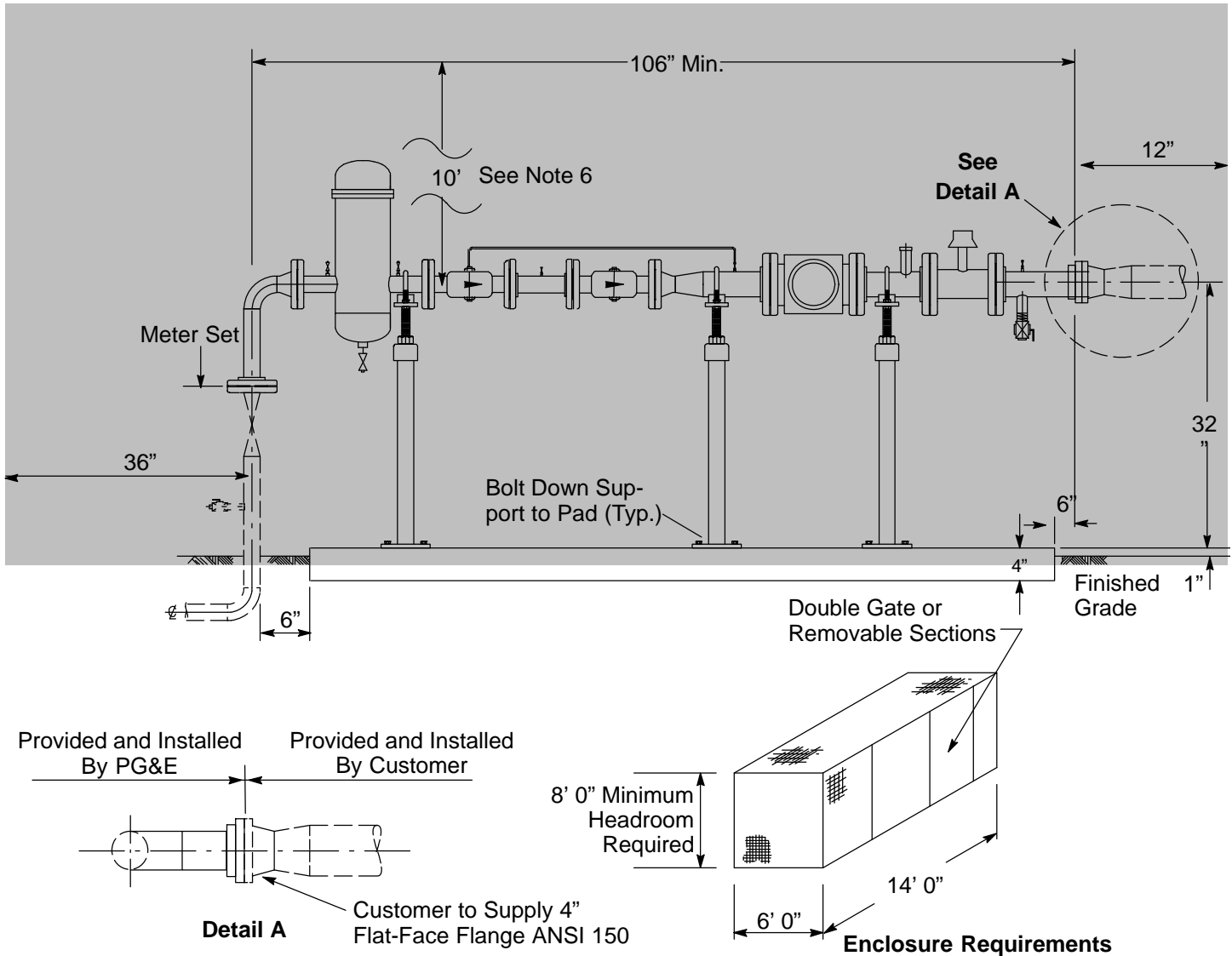


Figure 2-18
Gas Meter Connection Using an 11M or 16M Rotary Gas Meter

Notes in reference to Figure 2-18.

1. Customers must provide a 96-inch x 36-inch x 4-inch concrete pad with minimum #4 rebar.
2. Customers must provide a 4-inch ANSI 150 flat-face flange to connect to PG&E facilities.
3. If the meter set is built next to a building wall, place the vertical leg of the riser and the houseline 20-inches minimum away from the wall. This ensures the meter set components are built in a straight line.
4. The finished grade must be below the bury-line marking on the service riser.
5. PG&E's weld elbow is optional.
6. The regulator vent must not terminate near any sources of ignition or openings into the building. The riser must be a minimum distance of 36 inches from sources of ignition, openings into the building, or any wet facility. This clearance area extends 10 feet above the highest regulator vent, 36 inches below the lowest regulator vent, and 12 inches beyond the farthest PG&E meter-set equipment.

2.4.2. (continued)

Contact your local project coordinator about possible locations for regulator vents.
(The regulations for large, industrial meter sets can vary.)

D. Minimum Meter Set Clearance Requirements

Figure 2-19, “Electric and Gas Meter Set Separation Dimensions and Clearances,” below; Figure 2-20, “Gas Meter Set Clearance from Building Openings,” on Page 2-35; and Figure 2-21, “Gas Regulator Set Clearance Requirement from Sources of Ignition,” on Page 2-36, all represent various metering facilities’ clearance requirements. If applicants install enclosures on their premises, the enclosures must meet the clearances provided in these illustrations.

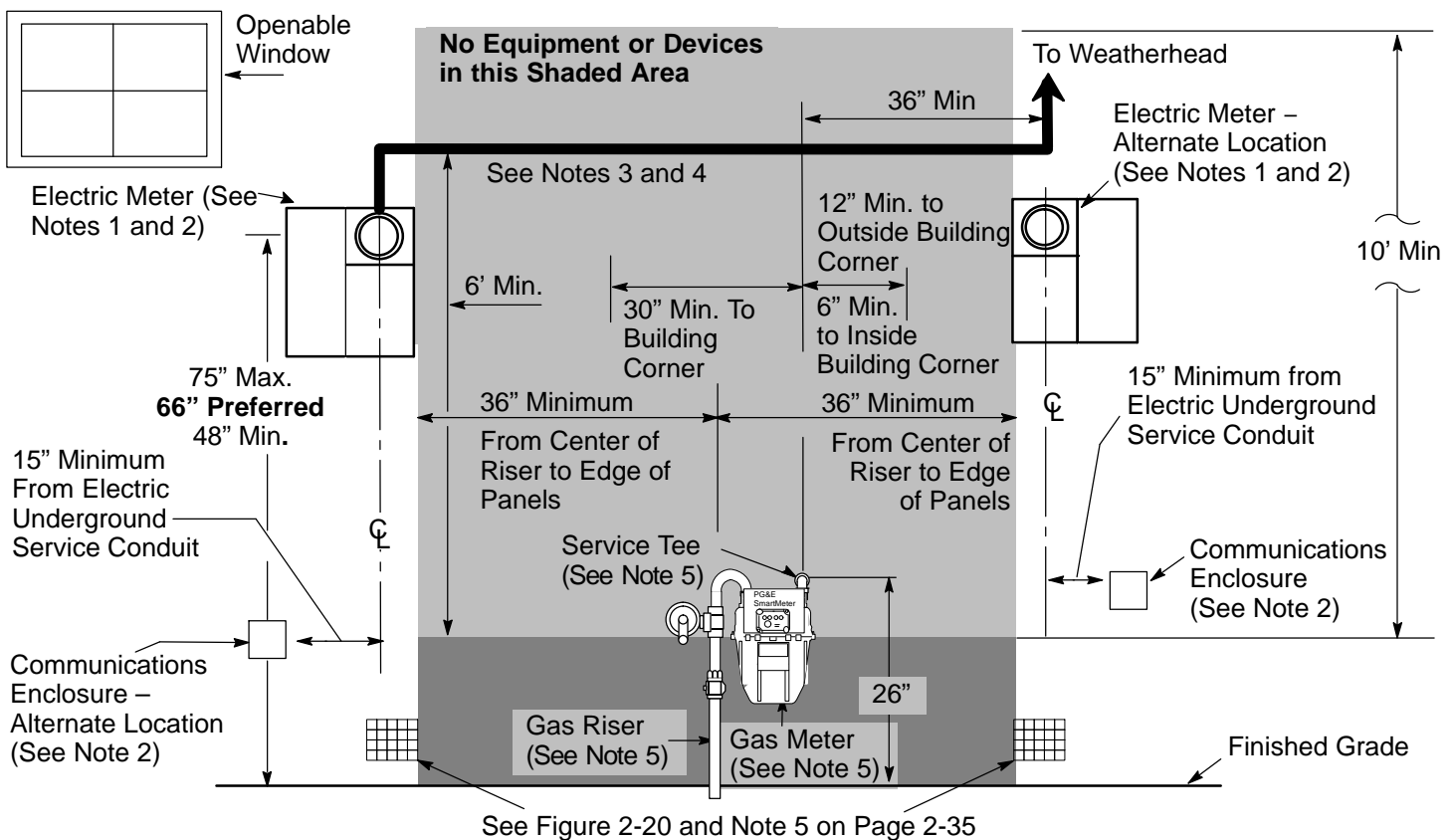


Figure 2-19
Electric and Gas Meter Set Separation Dimensions and Clearances

Notes in reference to Figure 2-19.

1. Electric meter panel locations are subject to utility approval and must comply with the applicable code requirements. PG&E does *not* have specific requirements for the distance from the electric panel to the outside building corner. See [Section 5, “Electric Metering: General.”](#) for properly locating the electric meters. See [Subsection 5.4.4., “Working Space.”](#) on Page 5-17, for electric meter working space.

Notes continued on the next page

2.4.2. (continued)

Notes in Reference to Notes in reference to Figure 2-19 (continued).

2. Applicants must **not** install any electrical devices or equipment, including wires, cables, metering enclosures, telecommunication enclosures, bond wires, clamps, or ground rods within the shaded area around the gas meter. The 36-inch distance can be reduced to 18 inches for electrical devices or equipment certified for NEC Class I, Division 2 locations.
3. A solid and continuous conduit without couplings, joints, or connections is allowed to run completely through the shaded area at 6 feet or higher above the gas meter regulator vent.
4. Place the gas service riser 6 inches to 9 inches from the finished wall. The completed customer houseline at the service delivery point must extend a minimum of 4 to 6 inches from the finished wall where the meter is to be set and must be 26 inches above the finished grade. See Figure 2-14 on Page 2-28, Figure 2-15 on Page 2-29, and Subsection 2.5. on Page 2-49.
5. The minimum dimensions and clearances in Figure 2-19 are good for gas meters up to the 1,000 class. See Figure 2-14 and Figure 2-15 on Pages 2-28 and 2-29 for illustrations of clear and level work space in front of the gas meter.

2.4.2. (continued)

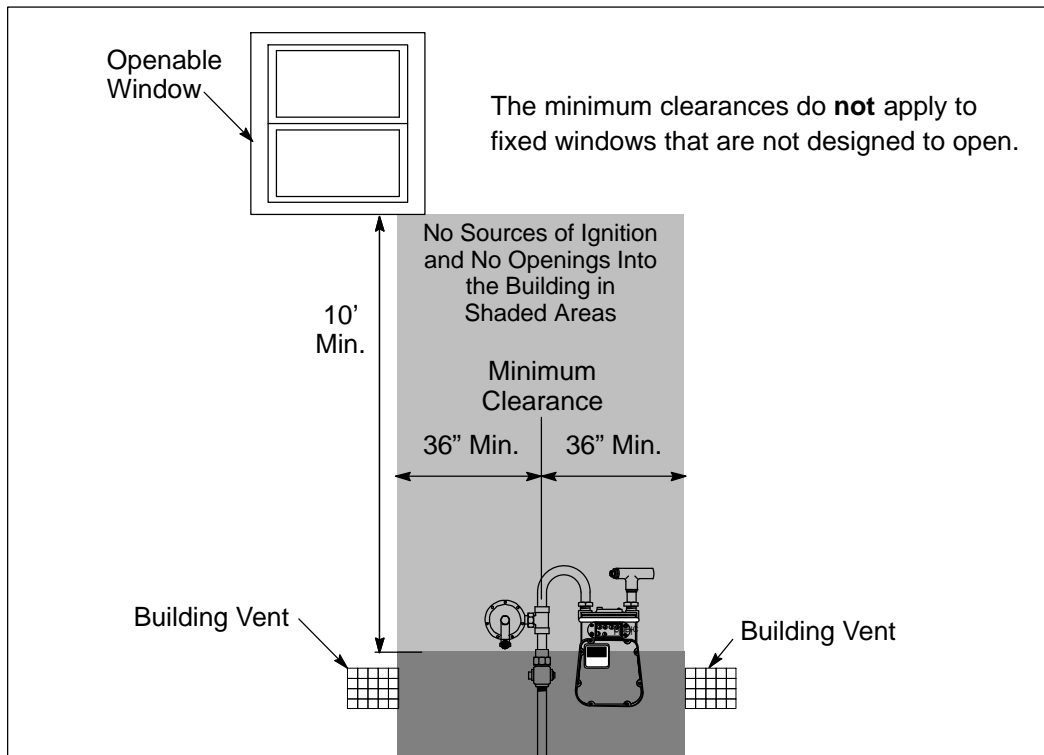


Figure 2-20
Gas Meter Set Clearance From Building Openings

Notes in reference to Figure 2-20.

1. Do **not** place gas regulator vents under display platforms or show windows in commercial buildings. This includes any permanent, elevated display floors or platforms associated with the window, where the purpose of the window is to present a display to the public.
2. Do **not** place gas regulator vents under building overhangs where the overhang is likely to direct venting gas to a building opening.
3. The building vent openings, sources of ignition, and above-ground water sources must be a minimum of 36 inches away from the riser.
4. Applicants must not install water spigots, lines, gutter systems, or other water sources within 36 inches of the gas riser or electric facilities.
5. For a large meter set or multimeter manifold, the minimum separation requirement for sources of ignition, opening to buildings or sources of above-ground water, extend 12 inches beyond the farthest PG&E metering facilities and 10 feet above the highest regulator vent.

2.4.2. (continued)

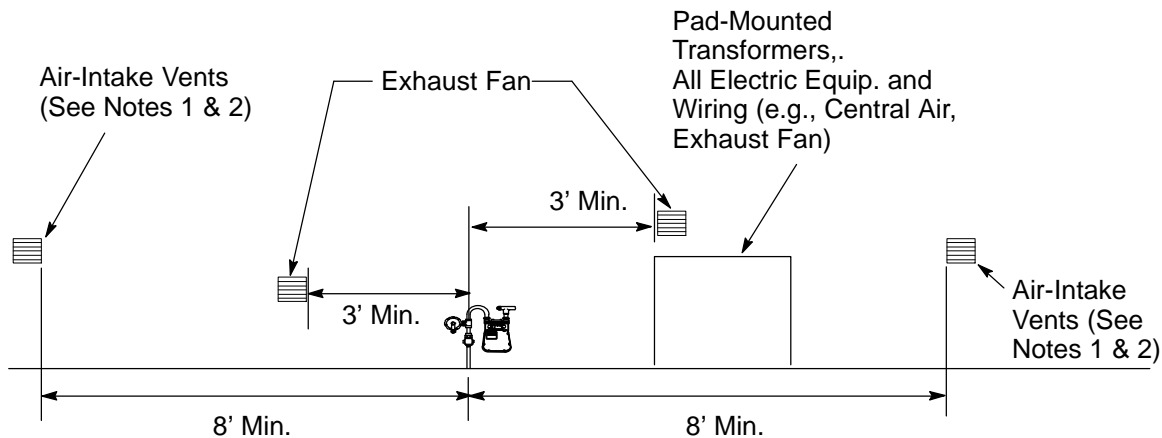


Figure 2-21
Gas Regulator Set Clearance Requirement from Air-Intake and Exhaust Fans

Notes in reference to Figure 2-21.

1. An 8-foot minimum horizontal and 10-foot minimum vertical clearance is required from the gas service riser to air-intake vents.
2. For a large meter set or multimeter manifold, this clearance requirement will extend 8 feet beyond the farthest PG&E meter equipment.

E. Panel Replacements and Conduit Connections to Existing Electric Panels, 400 Amps and Less, within the Gas Clearance Area

Electric panel upgrades, “like-for-like” panel replacements, and new electric conduit connections to existing electric meter panels may be allowed for an existing electric meter panel that resides within the gas clearance area as shown in Figure 2-19, “Electric and Gas Meter Set Separation Dimensions and Clearances, on Page 2-33, **if all the following requirements are met:**

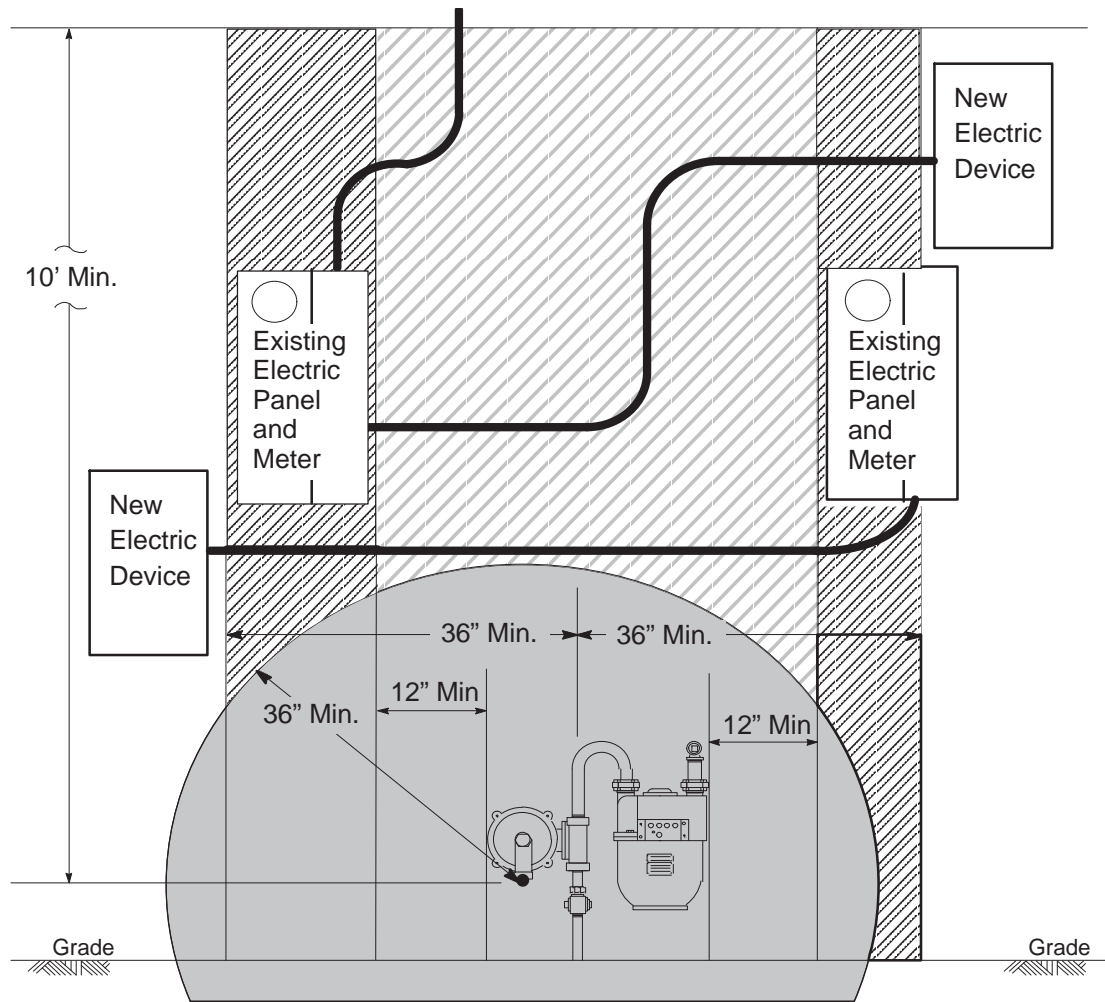
1. The electric panel and electric conduit and equipment must not reside within the 36-inch radius from the gas regulator vent opening.
2. The electric panel must not reside within 12 inches on either side of PG&E gas facilities and 10 feet above the regulator vent opening as shown in Figure 2-22, “Clearance Requirements for an Existing Electric Meter/Panel,” on Page 2-38. If any portion of the existing electric panel resides within this area, the electric panel must be relocated outside all clearance areas shown in Figure 2-22 before the panel is replaced and any conduit connection is made.
3. Additional electric equipment/devices must not be installed within the clearance areas shown in Figure 2-22.

2.4.2. (continued)

Exception: A continuous metallic conduit with no couplings or joints can run completely through and terminate/connect outside of the 36-inch radial clearance from the gas regulator vent opening.

4. All minimum clear and level working space requirements for the electric meter panel and gas meter set must be met.

2.4.2. (continued)



LEGEND

● Regulator Vent Opening

— New Conduit Without Fittings, Couplings, or Joints Except Connection to Panel



No Existing Electric Meter/Panel and No New Electric Devices (See Notes 1 and 2)



No Electrical, No Conduit, No Source of Ignition, No Meter/Panel, and No New Grounding Wires or Clamps



No New Electric Devices. Only Electric Panel Upgrades and Like-for-Like Panel Replacements are Allowed.

Figure 2-22
Clearance Requirements for an Existing Electric Meter/Panel

Notes in Reference to Figure 2-22:

1. This includes electric meters and panels in cabinets.
2. Junction boxes or other electrical enclosures **must not** be installed to replace the existing electric meter panel.

2.4.2. (continued)

F. Multimeter Manifolds

Specific requirements in this subsection apply to particular types of premises (e.g., multifamily, apartment, and commercial buildings) where multiple meters are installed at a single location using the manifold configuration. These manifold connection requirements are additions to the meter-set requirements for single gas meter sets.

PG&E limits gas meter manifold configurations to one-tier or two-tier meter manifolds not exceeding 60 inches high. These manifolds are measured from the final, level, standing surface to the top of the manifold.

NOTE: Applicants must provide their PG&E project coordinator with a written justification for approval when requesting a three-tiered manifold or a manifold greater than 60 inches high.

PG&E will assess the applicant's site and conditions for gas service and metering installations before approving an installation site. For manifolds requiring support brackets, the applicant must provide a wall surface with adequate structural support to use 1/4-inch x 1 1/2-inch lag screws to secure all brackets.

Refer to [Gas Design Standard J-15](#), located in [Appendix C](#), for additional information.

2.4.2. (continued)

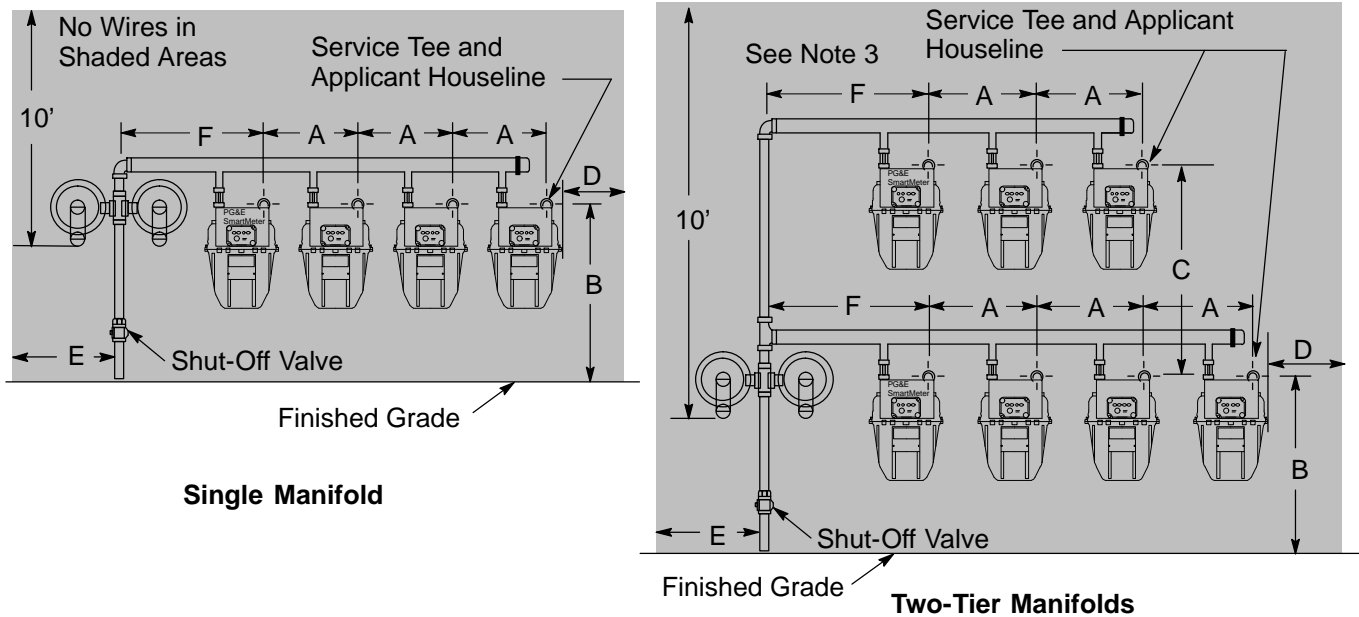


Figure 2-23
Dimensions for Typical, Residential, Multimeter Installations

Notes in reference to Figure 2-23

1. The applicant's houselines must be stubbed out 4 inches to 6 inches from the finished wall at the locations shown.
2. The applicant must clearly mark each houseline. See Subsection 2.4.2.G.I., "Meter-Set Requirements for Marking Houselines," on Page 2-47.
3. Gas meter manifolds may be built in a right-to-left configuration (reverse) when approved in advance.
4. Applicants must **not** install any electrical devices or equipment, including wires, cables, metering enclosures, telecommunication enclosures, **bond wires, clamps, or ground rods** within 36 inches horizontally from the riser and 12 inches from the farthest edge of PG&E facilities and 10 feet above the regulator vent.
5. Applicants may need to install the riser farther away from the building to accommodate the manifold installation. Consult your local project coordinator for site-specific details.

2.4.2. (continued)

Table 2-2 Dimensions to Figure 2-23

Dimension	Installation	Comments
A	12" for residential only, 15" for cabinet installations only, 20" for all commercial up to 1,000 class meters	PG&E provides custom-design dimensions for mixed meter sizes and for meters larger than 1,000 class meters.
B	26" (typical) for unenclosed, 32" minimum for cabinet installations	–
C	24" residential (unenclosed and cabinet), 36" commercial	Contact your local project coordinator for two-tier commercial manifolds.
D	6" minimum to inside building corner, 12" minimum to outside building corner, 12" minimum to openings into the building and sources of ignition (see Note 4)	From farthest edge of PG&E equipment.
E	30" minimum to inside or outside corner of building, 36" minimum to openings into the building and sources of ignition (see Note 4)	PG&E may approve Dimension E to be reduced on a case-by-case basis. For example, in nonpedestrian traffic areas and on select PG&E equipment.
F	24" (typically) for residential, 36" (typically) for 400 to 1,000 class meter, commercial	PG&E provides custom-design dimensions for mixed meter sizes and for meters larger than 1,000 class meters.

G. Requirements for Alcoves, Enclosures, Gas-Meter Cabinets, Closets, and Gas-Meter Rooms

1. Alcoves

An alcove is an exterior space that is recessed into a building or wall. The alcove's width can vary depending on the meter set. PG&E provides final dimensions after confirming the meter size. Please consult your local project coordinator for guidance.

For single-diaphragm meters, applicants must use the area dimensions shaded in Figure 2-14 on Page 2-27 and Figure 2-15 on Page 2-28 (depth not to exceed 36 inches).

For single-rotary meters, use the area dimensions shaded in Figure 2-16 on Page 2-29, Figure 2-17 on Page 2-30, and Figure 2-18 on Page 2-31 (do not exceed 36 inches deep and 8 feet high).

A manifold located in an alcove may require a custom design depending on the configuration.

Gates are not a preferred option and will be approved only on a case-by-case basis. If a gate is proposed in front of the alcove, it must have a minimum 50% open area.

The alcove must not have openings into the building, sources of ignition, or other facilities (e.g., wiring, water downspouts, or foreign pipes).

Contact your local PG&E project coordinator for more information.

2.4.2. (continued)

2. Enclosures

Gas-Meter Set Enclosures

a. Typical Enclosure Details

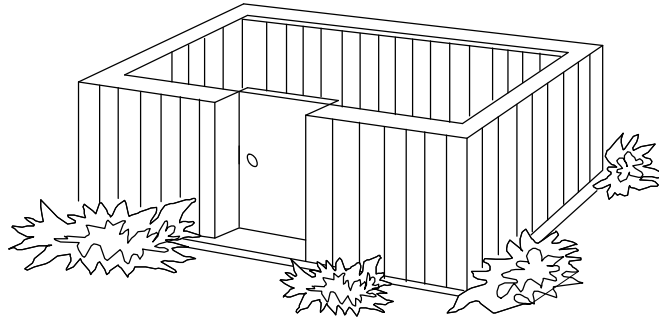


Figure 2-24
Typical Detached Enclosure

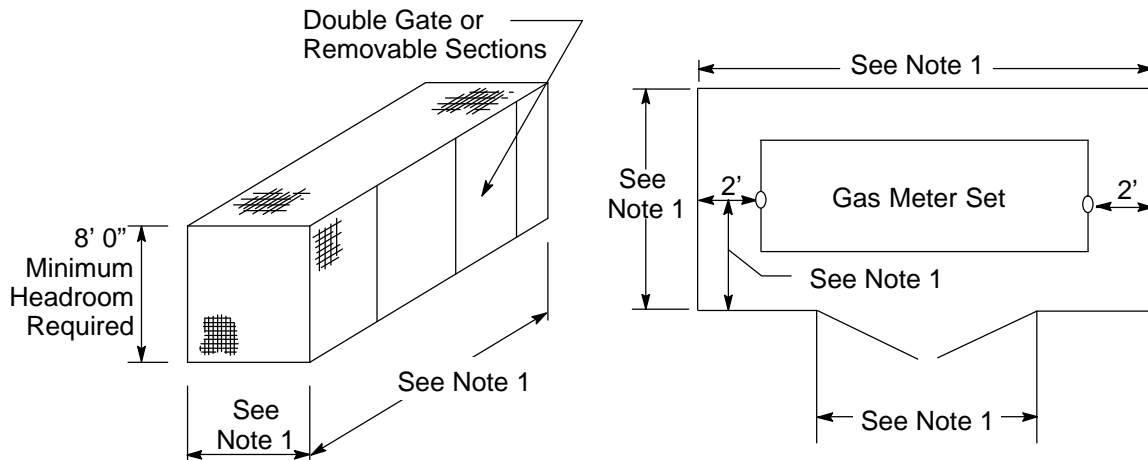


Figure 2-25
Typical Enclosure Dimensions

Notes in reference to Figure 2-24 and Figure 2-25.

1. The enclosure's length and width will vary depending on the meter set. Contact your local PG&E project coordinators for more information.
2. Approved enclosure wall materials include, but are not limited to, concrete block, wood, perforated or expanded metal, or metal chain-link fencing.
3. PG&E determines if the enclosure requires a wire mesh cover. If a mesh cover is required, it must have a minimum 50% open area.
4. All distances provided in Figure 2-25 are minimums. After PG&E confirms the meter size, final dimensions will be provided.
5. Trucks must be able to access large meter installations. Please contact your local PG&E project coordinator before designing locations for gas meters.
6. Additional meter protection may be required. Protection posts can be incorporated into an enclosure design.

2.4.2. (continued)

b. Special Requirements for Gas Meters Serving Schools or Other Buildings Where Children Congregate

The following requirements apply to schools or other buildings where children congregate.

- Locate the gas meter enclosure adjacent to the property line or away from buildings in a wire cage enclosure or other suitable protective enclosure.
- PG&E requires an overhead wire cover to prevent any debris or other material from falling inside the enclosure. The applicant must ensure that PG&E is able to secure the enclosure with a PG&E lock.
- It is the applicant's responsibility to provide the enclosure and concrete pad for the gas meter set. PG&E must approve the final design and size of the enclosure.

3. General Requirements for Meter Cabinets

Gas cabinets are not preferred and require PG&E's approval in advance of construction. Applicants must ensure that all vent openings, louvers, and/or viewing windows are installed correctly. Also, applicants must ensure that the cabinets open to the outside and are readily accessible to PG&E at all times.

When approved by PG&E, the gas meter size represented in Figure 2-14, "Typical Residential Gas Meter Connection," located on Page 2-28, can be installed in a cabinet.

On a case-by-case basis, PG&E may allow an applicant to install a gas meter the size of the one illustrated in Figure 2-15, "Typical Gas Meter Connection for 400 to 1,000 Class Meter," located on Page 2-29, in a cabinet.

A gas estimator must provide the cabinet spacing and size requirements, which then must be approved by a Field Service Manager.

a. Specific Requirements for a Single Gas Meter Cabinet

PG&E determines the minimum cabinet size allowed for an applicant's specific type of meter and provide the applicant with those dimensions. PG&E bases cabinet requirements not only on the size of the meter currently required, but also on the location and accessibility of the meter. See [Gas Design Standard K-51](#), located in [Appendix C](#), when determining the specifications for single gas meter cabinets.

2.4.2. (continued)

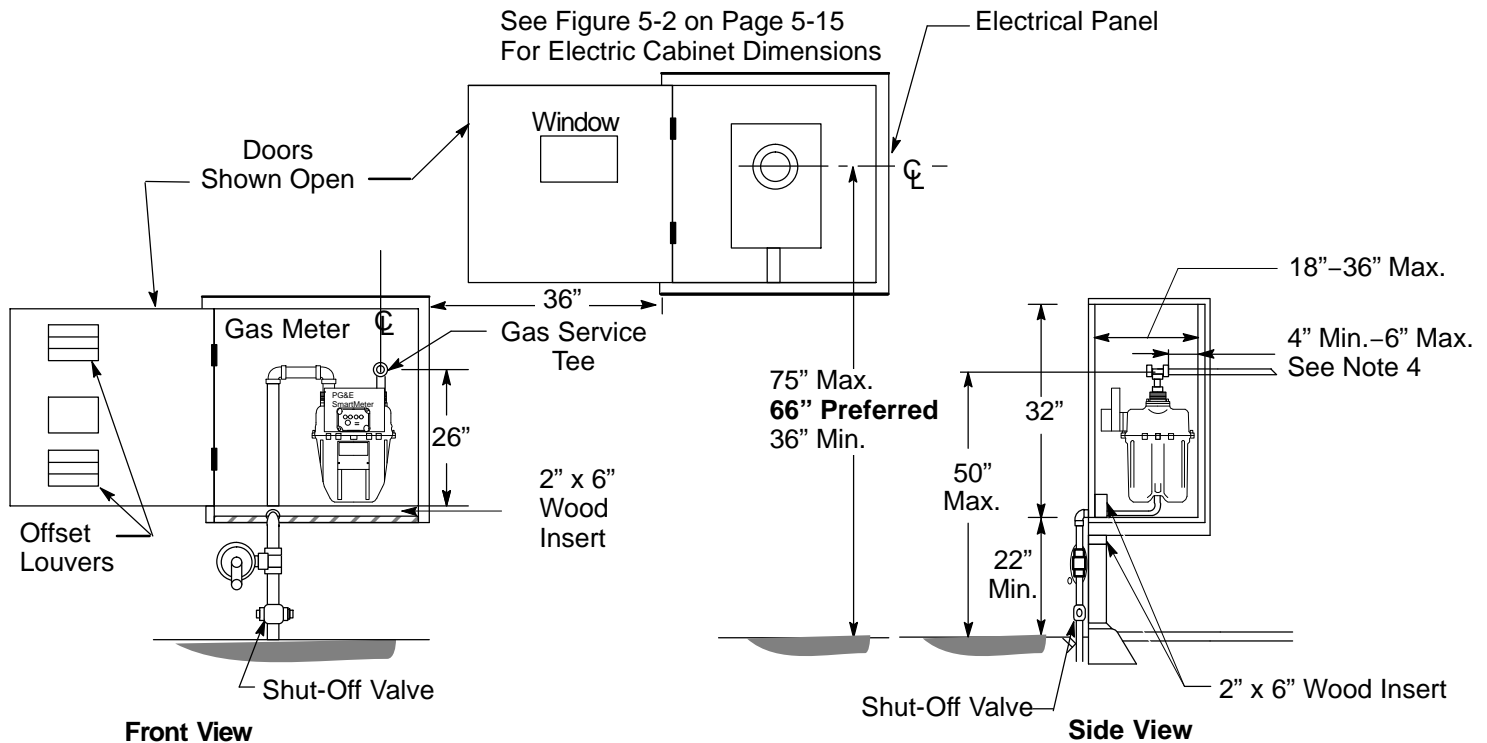
b. Specifications for a Recessed, Individual Meter Cabinet

Figure 2-26
Recessed, Individual Meter Cabinet for Gas and Electric Meter Installations

Notes in reference to Figure 2-26.

1. Meter cabinets are not a preferred method of installation. Meter cabinets, with the exception of Class 250 meter installations, require approval from the local Field Services Manager before construction begins. When approved, they must comply with the requirements in this section.
2. Regulators will be installed on the outside of the cabinet. Additional space is required for larger regulators and dual-head regulators. The local Field Services Manager may approve the regulators to be installed in a cabinet. Regulators installed in a cabinet require the vents to be piped out as described in [Gas Design Standard H-93, "Piping—Details: Regulator Vent Lines—Above Ground."](#)
3. See Subsection 2.5.1., "Service Delivery Point for the Gas Supply," on Page 2-50. The houseline at the service delivery point also must be reinforced so that it can provide support for the meter set piping. The pipe must be rigid, a minimum of 3/4 inch, and have male National Pipe Thread (NPT) threads.
4. The houseline must extend a minimum of 4 inches and a maximum of 6 inches into the gas meter cabinet measured from the finished wall. The houseline must be 26 inches above the bottom of the meter cabinet.
5. Applicants must provide louvered, non-metallic doors. Each door must open at least 90°.
6. The gas meter cabinet must have a gas-tight seal and be vapor proof from the building. Construction material and sealing requirements for the cabinet are described in [Gas Design Standard K-51](#), located in [Appendix C](#), and also apply to Figure 2-26.

Notes continued on the next page

2.4.2. (continued)

Notes in reference to Figure 2-26 (continued).

7. Applicants must ensure that gas meters installed in cabinets comply with the requirements of the inspection authority having jurisdiction.
8. Do **not** place electric meter panels, equipment or devices, conduit or wiring, enclosures or electrical connections; **water services, faucets, downspouts, or other wet utilities** within 36 inches of the gas riser including for services such as cable television or telecommunications.

Requirements for multiple, residential, gas meter cabinets are shown in Figure 2-27, “Cabinet Dimensions for Multiple, Residential Gas Meters,” and include dimensions and details.

Gas meter manifolds may be built in a right-to-left (i.e., reverse) configuration when approved in advance.

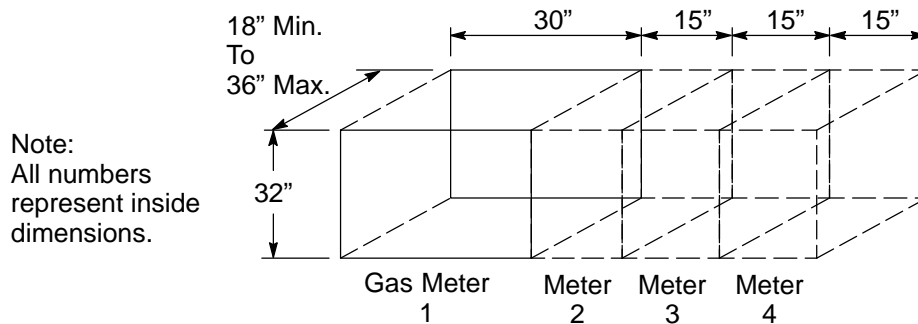


Figure 2-27
Cabinet Dimensions for Multiple, Residential Gas Meters

4. Gas-Meter Closets

Gas meter closets will be furnished and installed by the applicant and have a depth of 18 inches minimum and 36 inches maximum without exception. Doors must be non-metallic and fully louvered. Doors must open at least 90° and have a clear opening height of 6 feet, 8 inches tall.

The inside of the closet must be made of nonflammable material and have a minimum 1-hour fire rating. All joints and penetrations must be sealed to prevent gas from migrating into the structure.

Foreign pipes are not allowed inside the closet with the exception of fire sprinkler heads. Lighting, wiring, conduits, junction boxes, or inspection panels of any kind are not allowed inside the closet. Bonding or grounding wires on the customer's houselines are not allowed inside the closet.

The ceiling must have a 1:12 slope. The ceiling must slope up toward the door frame with a maximum 6 inches measured from the door opening to the finished ceiling. The inside width of the closet cannot exceed 8 inches beyond either side of the door frame.

2.4.2. (continued)

Refer to Figure 2-23 on Page 2-40 for manifold spacing to determine the size of closet required for the desired number of meters. The meters and manifold must fit within the opening of the closet doors with the exception of the tie-in piece from the outside riser. The riser and regulator will be installed outside of the closet.

The applicant provides a penetration through the wall into the closet. The pipe penetration from outside to inside must not conceal the pipe. It must be clearly visible for inspection. Contact your local project coordinator for the exact size and location of the required penetration.

The doors must have signs identifying “Gas Meters.” If the doors have locks, the applicant must install a lock box, provided by PG&E, near the closet in a location that is acceptable to PG&E and contains the access key provided by the applicant.

The closet cannot be used for storage of any kind. Only PG&E gas meters and metering appurtenances are allowed inside the closet.

5. Specific Requirements for Gas Meter Rooms

Refer to [Gas Design Standard J-16](#), located in [Appendix C](#), for specific requirements about gas meter rooms.

H. Meter Protection Requirements

Applicants must protect meter sets in locations that are subject to damage from vehicular traffic. PG&E determines when such protection is required. Refer to [Gas Design Standard J-95](#), located in [Appendix C](#).

Applicants must protect all gas meter sets located in the following areas.

1. Within 3 feet of:
 - Single-family, residential driveways or parking areas (including garage areas)
 - Commercial refuse container locations
 - Thoroughfares
 - Paved areas with curbs
2. Within 8 feet of:
 - Multifamily, commercial, or industrial driveways or parking areas (see the “Exception” below)
 - Loading docks
 - Freight-handling areas
 - Thoroughfares
 - Paved areas without curbs

2.4.2. (continued)

EXCEPTION: Physical protection is *not* required for meter sets located within 8 feet of multifamily, commercial, or industrial driveways or parking areas if the meter set is located 3 feet behind a barrier that is adjacent to the area and if PG&E finds the barrier to be acceptable.

3. Within an area that has, in PG&E's judgement, an unusually high risk of vehicular damage, the applicant must install a system of barrier posts that meet PG&E's specifications. Consult your local project coordinator for specific requirements.

I. Meter-Set Requirements for Marking Houselines

Applicants must ensure that the following rules for marking houselines are followed.

1. Establish service at one Service Delivery Point, through one meter, and at one voltage class or pressure.
2. PG&E requires that lines are marked by attaching an embossed, durable, metal or plastic tag to each houseline. PG&E must approve of the tag.
3. Markings *must* be legible and specific.
4. Marking information must include an authorized apartment or street number and a use or location designation.
5. The houseline must be permanently, clearly, and prominently marked *at the point of the service connection* (i.e., service delivery point).

NOTE: PG&E will *not* install meters unless the permanent address, the location, or, when applicable, the area being served is marked at each meter location.

6. When gas meters are installed in interior locations or rooms, the words "Gas Meters" must be placed on the room or location access doors to allow PG&E employees to find the meters easily.

J. Meter Sets Requiring Electric Circuits for Communication

PG&E prefers to install, own, and maintain cellular equipment with a customer-provided, dedicated, electrical circuit for gas meter sets with electronic equipment that require communication. When applicants have an estimated average use of 10,000 therms per month or more, certain rate schedules, Automated Meter Reading (AMR), noncore accounts, or other nonstandard gas metering conditions, then the customer must provide an electrical circuit.

2.4.2. (continued)

When installing customer-provided, dedicated electrical circuits with no less than 15 amp and 120 volt alternating current (Vac) to a lockable disconnect switch within 3 feet of a gas meter that meets or exceeds National Electric Code (NEC) Class I, Division 2, Group D hazardous area requirements, all above-ground wiring must be placed in threaded, rigid-steel or intermediate-steel conduit with an above-ground riser conduit seal to prevent gas from migrating to areas classified as nonhazardous.

PG&E will inform the customer that if conditions change in the future, a phone line may be required. If cell service is not available or acceptable to PG&E, the applicant may be required to install, own, and maintain a nominal, 1-inch diameter conduit and a telephone cable to within 3 feet of the meter.

K. Gas Pulse Metering

Refer to [Gas Standard J-65.1, “Volume Pulse Output Connection for Gas Meters.”](#) located in [Appendix C](#), for specific requirements about gas pulse metering.

L. Additional Meter-Set Requirements–SmartMeter™ Module Location Requirements

PG&E’s SmartMeter Advanced Meter Reading system uses radio frequency (RF) technology to transmit gas meter reads automatically. This allows PG&E’s customers to monitor their daily energy use.

SmartMeter customers have additional location requirements specific to the meters necessary for PG&E to operate its SmartMeter Advanced Meter Reading system. Applicants must be aware of the following requirements to ensure that the SmartMeter Advanced Meter Reading system can operate properly.

1. ***Do not*** locate the meters in any room, cabinet, enclosure, or configuration that blocks or interferes with the radio frequency signal transmissions. An example of such a prohibited enclosure is a metallic cabinet.
2. ***Do not*** locate the meters in close proximity to (i.e., 6 inches or less) any metallic object that could block or interfere with the radio frequency signal transmission.
3. ***Do not*** install gas meters within 5 feet of building walls and ceilings if they are made from a significant amount of metal or metal reinforcements.

2.4.2. (continued)

4. Most SmartMeter gas modules are installed directly on a gas meter. If a gas meter is installed in a cabinet, meter room, below grade, basement garage, or other location where communication problems may exist, PG&E may install a module in a remote location away from the gas meter to ensure proper radio frequency transmissions. The equipment may be installed on nearby gas piping, a customer-owned building wall/ceiling, or an outside location. The equipment may need to be attached to the structure or wall to route the wiring.

M. SmartMeter Gas Network Utility Closet Requirements for Indoor Meter Rooms

This section provides SmartMeter infrastructure installation and construction requirements for customers designing indoor gas meter rooms. It addresses below-grade and multiple above-grade meter room installations such as those that may exist in urban, high-rise environments to ensure PG&E's SmartMeter RF network is established for these customers. These provisions are required for commercial and/or residential, with single or multiple indoor meter rooms to ensure SmartMeter gas network communication access and performance.

A separate SmartMeter gas network utility closet must be constructed for each indoor meter room directly adjacent (with a common or shared wall) to the natural gas meter room. In addition, two 1-1/2 inch conduits would be required; one from the SmartMeter gas network utility closet to the outside of the building and one from the SmartMeter gas network utility closet to the indoor gas meter room. See the requirements listed in [Gas Design Standard J-16](#), located in [Appendix C](#),

2.5. Applicant-Owned and Installed Gas Service Piping (e.g., Houseline), Valves, and Automatic Shut-Off Devices

The applicant is responsible for maintaining the applicant-installed and owned gas service piping, valves, automatic shut-off devices (e.g., earthquake valves), or other piping components on any premises or in any building. These applicant-owned components must be installed downstream of (i.e., after) the gas supply service delivery point. PG&E reserves the right to suspend service until applicant-owned equipment is removed from PG&E meter-set assemblies.

Applicants must ensure that after their equipment is installed, the equipment *does not* obstruct the operation or serviceability of PG&E's piping, metering, and pressure-regulating equipment.

The houseline at the service delivery point typically is located after the PG&E service tee for residential services. Reinforce the houseline so that it provides support for the meter-set piping. For residential service, the houseline stub-out must be a minimum of 3/4-inch steel rigid pipe with male NPT threads. Larger gas loads or commercial meter sets may require a flanged connection.

2.5.1. Service Delivery Point for the Gas Supply

The service delivery point for the gas supply is the point where PG&E's facilities connect to the applicant's house pipe (i.e., houseline). Figure 2-1 on Page 2-6 illustrates a typical service delivery point.

For *residential* and *small commercial* meter sets, the service delivery point is the point where the male threads of the applicant's houseline connect to the female threads of PG&E's gas service tee fitting.

Some *commercial* installations and *industrial* installations **do not** have service tees installed. For these installations, the gas supply service delivery point is located after the gas meter, gas pressure regulator, or regulation equipment. Specifically, it is the point where the gas service bypass reconnects with the gas service outlet piping.

Typically, the gas supply service delivery point is either the first weld or fitting after the PG&E-installed bypass valve downstream of (i.e., after) the gas meter. See Subsection A in Figure 2-16 through Figure 2-18 on Page 2-30 through Page 2-32.

PG&E **does not** allow applicants to access the pipe fitting's plug. Only PG&E employees are authorized to access the plug when they perform service and maintenance.

Applicants **must not** connect or install non-PG&E components to any portion of the PG&E gas meter set upstream of (i.e., before) the service delivery point.

Applicants must provide a securely supported gas houseline connection to PG&E piping either by bracing or by reinforcing the houselines that extend from finished walls. Do **not** connect flexible houseline directly to PG&E piping. (Exceptions include subsidence areas, mobile home parks, and manufactured homes as described in [Gas Design Standard J-12.4, "Mobile Home/Manufactured Home Meter Set Installation,"](#) and [Gas Design Standard J-58.](#))

When applicants require a gas supply for multiple gas meter installations that are supplied by a manifold, PG&E will install gas service tees downstream of (i.e., after) each gas meter. PG&E will install these service tees to each location where the utility gas service pipe connects to the applicant's houseline at the service tee.

2.5.1. (continued)

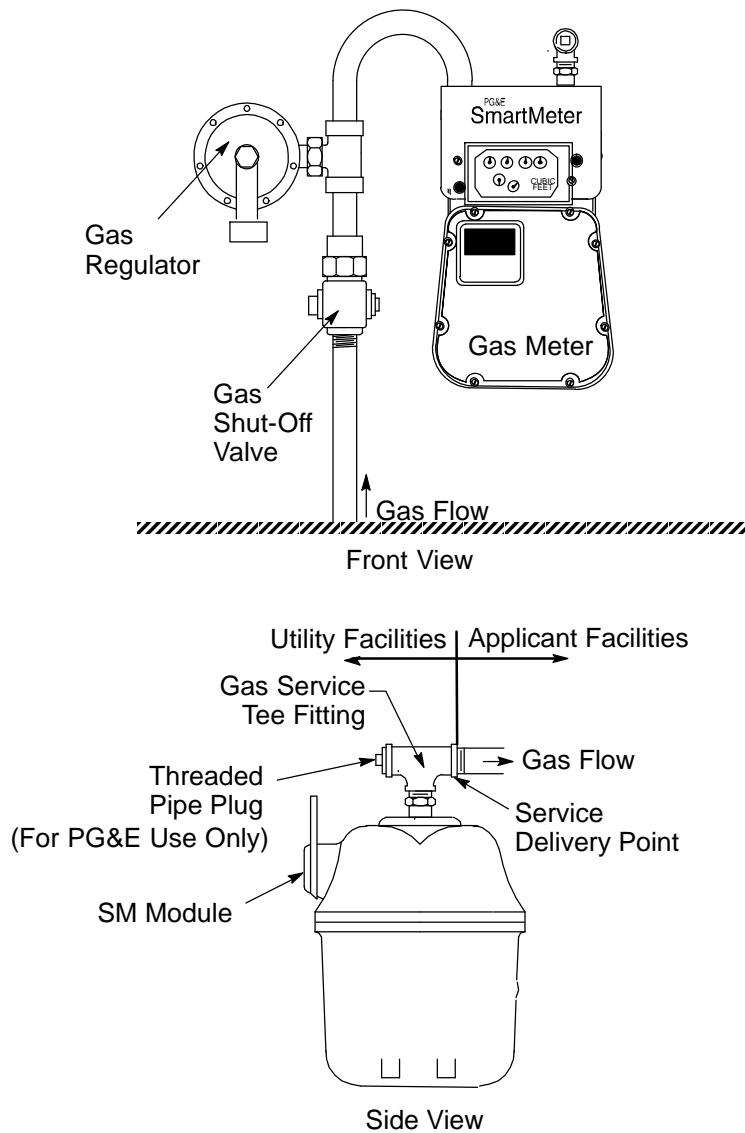


Figure 2-28
Typical Residential Installations

2.5.2. Applicant-Owned Riser and Pipe

PG&E recommends that applicants use the gas-riser configuration shown in Figure 2-29, “Recommended, Applicant-Owned Riser and Pipe,” on Page 2-52, when they install above-ground gas pipe that transitions to underground gas pipe. The preferred riser for most applications is a noncorrodable, prefabricated riser.

Also, PG&E recommends that applicants contact the local authority having jurisdiction before installing ferrous gas pipe and ask for the requirements to protect the underground pipe from corrosion.

2.5.2. (continued)

- A. Applicants are encouraged to have all buried gas houseline pipe inspected on a regular schedule. Applicants should contact locally licensed plumbing contractors if they need assistance in locating, inspecting, or repairing their buried gas service pipe or other piping equipment.
- B. Applicants must ensure that all required cathodic protection is in place and documented as illustrated in Figure 2-29 below.
- C. Applicants must ensure that their facilities are designed and installed to the requirements of the governmental authorities having jurisdiction. PG&E recommends using the [*Uniform Plumbing Code*](#), which requires the following protective measures.
 1. Apply a coating and cathodic protection to steel pipelines.
 2. Repair any coating that is damaged during installation.
 3. Install copper tracer wire with nonmetallic gas pipe.
 4. Provide a minimum 18-inch cover for plastic yard pipe used to carry gas.

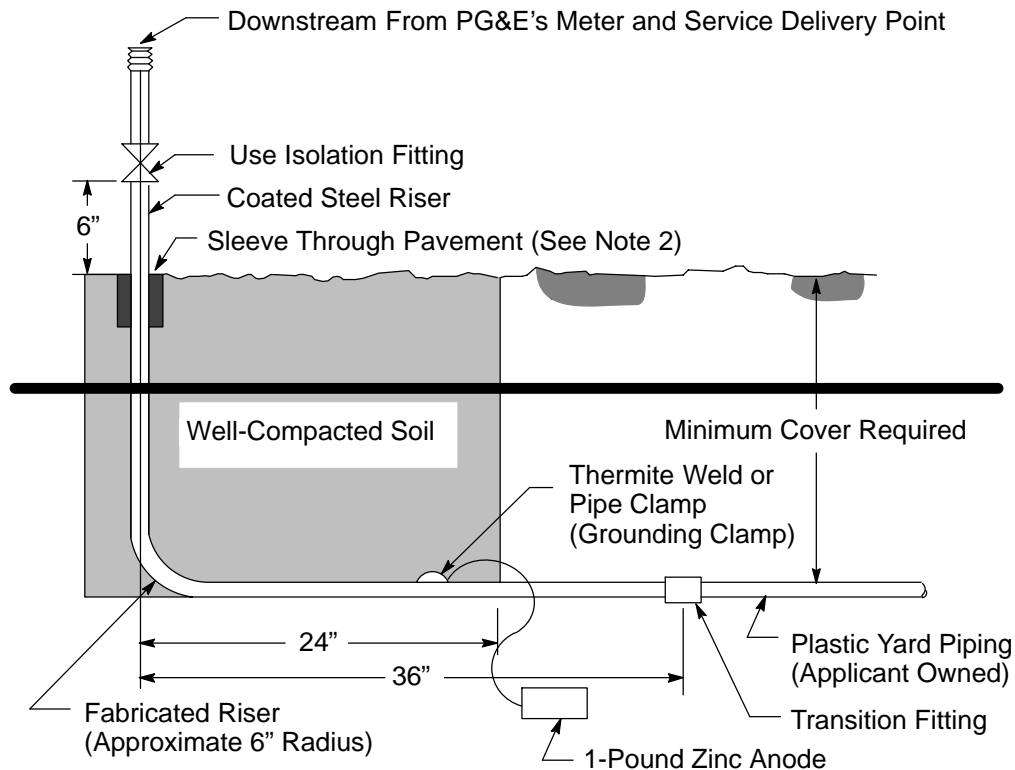


Figure 2-29
Recommended, Applicant-Owned Houseline Riser and Pipe

Notes in reference to Figure 2-29.

1. Always maintain a minimum distance of 36 inches between the vertical centerline of the riser and the transition fitting.
2. If the area around the gas riser is going to be paved, install a minimum 3-inch sleeve around the riser.
3. Comply with city regulations when installing a plastic-to-steel riser (as shown) or a noncorrodable, prefabricated riser on the applicant's houseline.

2.5.3. Electrically Bonding and Grounding Gas Pipe

- A. Do **not** install electrical devices or equipment, wires, cables, bonding or grounding wires, clamps, or ground rods around the gas meter set as shown in Figure 2-19 on Page 2-33 and Figure 2-23 on Page 2-40.
- B. Do **not** use PG&E's gas service piping, gas risers, or meter facilities for electric bonding or grounding that allows the gas meter, piping, or other gas facilities to become current-carrying conductors.
- C. Do **not** allow customer houseline to be electrically bonded within meter enclosures, cabinets, or meter rooms.

2.5.4. Applicant-Owned Protective Equipment

PG&E's gas metering equipment can be affected adversely when an applicant's equipment causes:

- Pulsations in the gas flow
- Sudden changes in flow rate
- A backflow condition

Applicants must install, at their expense, any equipment necessary to mitigate or eliminate these detrimental effects. PG&E must review and approve these installations before initiating gas service.

Applicants must add any necessary protective equipment when their operations change and those changes could create any of the three adverse conditions described in the bulleted list above.

PG&E may terminate service and refuse to restore that service to any applicant who continues to operate without the proper protective equipment after receiving notification from PG&E.

Applicants are responsible for damages made to PG&E equipment because they did not install the proper protective equipment.

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**SECTION 3
ELECTRIC SERVICE:
UNDERGROUND**

SECTION 3 ELECTRIC SERVICE: UNDERGROUND



Know what's below.
Call before you dig.

Section 3

Electric Service: Underground

3.1. Scope

This section of the manual provides information to help applicants, as well as their engineers and contractors, select acceptable locations and types of terminations for underground services when connecting to Pacific Gas and Electric Company's (PG&E's/Company's) overhead or underground electric distribution system.

NOTE: For technical information on primary services, refer to [Numbered Document 094676, "Primary Electric Service Requirements,"](#) and for temporary or permanent service to a post or pedestal, refer to the applicable documents in [Appendix C, "Electric and Gas Engineering Documents."](#)

3.2. General Information

PG&E has the right to access Company facilities located on an applicant's premises at any time, for any purpose connected with furnishing gas and/or electric service. Applicants must **not** access PG&E facilities or enclosures. Only qualified PG&E employees will connect service lateral conductors to (or disconnect them from) PG&E's energized distribution system. This includes installing or removing metering facilities or any other work related to PG&E's facilities or systems.

3.2.1. Safety Reminder



WARNING

TO AVOID POTENTIAL ACCIDENTS, DO NOT BEGIN TO EXCAVATE BEFORE IDENTIFYING UNDERGROUND FACILITIES.



CAUTION

Flame resistant (FR) clothing is required while working on, working near, or observing others working on any PG&E facility.

State law requires applicants to contact [Underground Service Alert \(USA\)](#) by dialing **811 at least 2 working days before excavation** (weekends and holidays excluded). Ensure that you call USA when planning underground work, before digging begins, to allow adequate time for USA to determine the location of underground gas and electric lines or equipment. ***The potential for an accident exists if applicants fail to request USA to identify underground utility facilities before they begin excavating.***



USA

3.2.1. (continued)

**Dig Safely**

First, the applicant must mark the excavation area with white paint. Then, USA arranges for participating companies to mark the locations of their underground facilities at the jobsite. **This is a free service.** See the USA color-code identifiers in [Section 1, “General,” Table 1-1, “USA Color Coding,”](#) on Page 1-1, and also on the back of this manual.

Additional information is available at www.pge.com/digsafely and about USA services at the USA North website <http://www.usanorth.org>. USA is a locating service for excavation only. Do not use USA for design purposes.

3.2.2. Establishing Underground Electric Service Responsibilities

Applicants are responsible for constructing, maintaining, and protecting specific portions of underground electric services during construction of their project. The following subsections describe those responsibilities and explain PG&E’s responsibilities during the construction process.

- A. Applicants are responsible for obtaining all required **permits and easements**. This includes local building permits, environmental permits, encroachment permits, public utility easements, and any other permits and land rights that may be required based on the specific location of the trenching/excavation activities.
- B. Applicants must ensure that the following construction activities, which may be required to establish underground service, are performed according to PG&E’s standards and specifications, PG&E-approved construction drawings and inspection requirements, and any other permit-specified requirements. This includes construction activities conducted on private property, in the franchise area, or in other rights-of-way areas. Construction activities include:
 - Trenching
 - Excavation
 - Backfill
 - Compaction
 - Underground conduit (conduit, bends, couplings, end bells, cable protectors)
 - Service riser conduit and connector (connects underground conduit to meter panel or termination enclosure)
 - Substructures (boxes and pads)
 - Paving (cut, patch, and final repair)
- C. Applicants must provide satisfactory termination facilities on or within the structures being served. (In this manual, see Sections [5](#), [6](#), [7](#), [8](#), [9](#), [10](#), and [11](#), as applicable, based on your project type, amperage, and voltage.) The locations for all transformers and meters, as well as the sizes, types, and quantities of conduit, are subject to PG&E’s specifications and approval.

3.2.2. (continued)

- D. Applicants must not install service conduit, meter, and service equipment in prohibited locations. These include, but are not limited to, outdoor areas less than 300 feet away from biowaste, toxic, corrosive, or similar type of unsafe substances that could be released into the air, are in the ground soil, located in open air wet ponds, or stored in a dry location. See [Section 5, “Electric Metering: General,” Subsection 5.3.2., “Prohibited Meter and Service Equipment Locations,”](#) on Page 5-7.
- E. Applicants are responsible for owning and maintaining conduit and substructures on private property; however, they must convey ownership of any portion in a public (i.e., franchise) area or right-of-way, if applicable, to PG&E.
- F. Applicants are responsible for providing, installing, and maintaining any structures that are required to protect service facilities from damage.
- G. If projects require Horizontal Direction Drilling (HDD), applicants or their contractors must contact PG&E before work begins. [PG&E Manual TD-4135M, Horizontal Directional Drilling Manual](#), as well as [PG&E Procedure TD-4632P-01, “Gas and Electric Operations–Cross Bore Prevention and Mitigation,”](#) both outline the construction processes that applicants must follow to be in compliance.

If an applicant does not contact PG&E **in advance** of construction and does not follow the HDD processes identified in the Company documents described above, the applicant will fail the HDD installation inspection. It is then the applicant’s responsibility to correct issues noted during the inspection before PG&E accepts ownership of the HDD project.

When applicants are responsible for this trenchless construction, they must take steps to prevent, inspect, identify, report, and address any cross bores that are created during the HDD process.

All electric and gas construction work performed either by or for PG&E is subject to these rules, including PG&E gas-for-electric work and other types of applicant-installed work. Find additional information about cross bores at the [Sewer Cleaning](#) website. See <http://www.pge.com/en/safety/gaselectricsafety/sewercleaningsafety/index.page>.

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- H. **PG&E is responsible for and required to perform any and all tie-in work to existing distribution and/or energized facilities.**

3.2.2. (continued)

I. PG&E is responsible for furnishing, installing, owning, and maintaining the following service facilities, as applicable.

- Cable/conductors to supply power
- Transformer
- Meter(s) and metering transformers, if required
- Other equipment (e.g., switches)
- Riser materials (to connect underground service to overhead facilities)

For additional details and options for performing this work, refer to [*Electric Rule 15, “Distribution Line Extensions,”*](#) and [*Electric Rule 16, “Service Extensions,”*](#) found online at <https://www.pge.com/tariffs/index.page>.

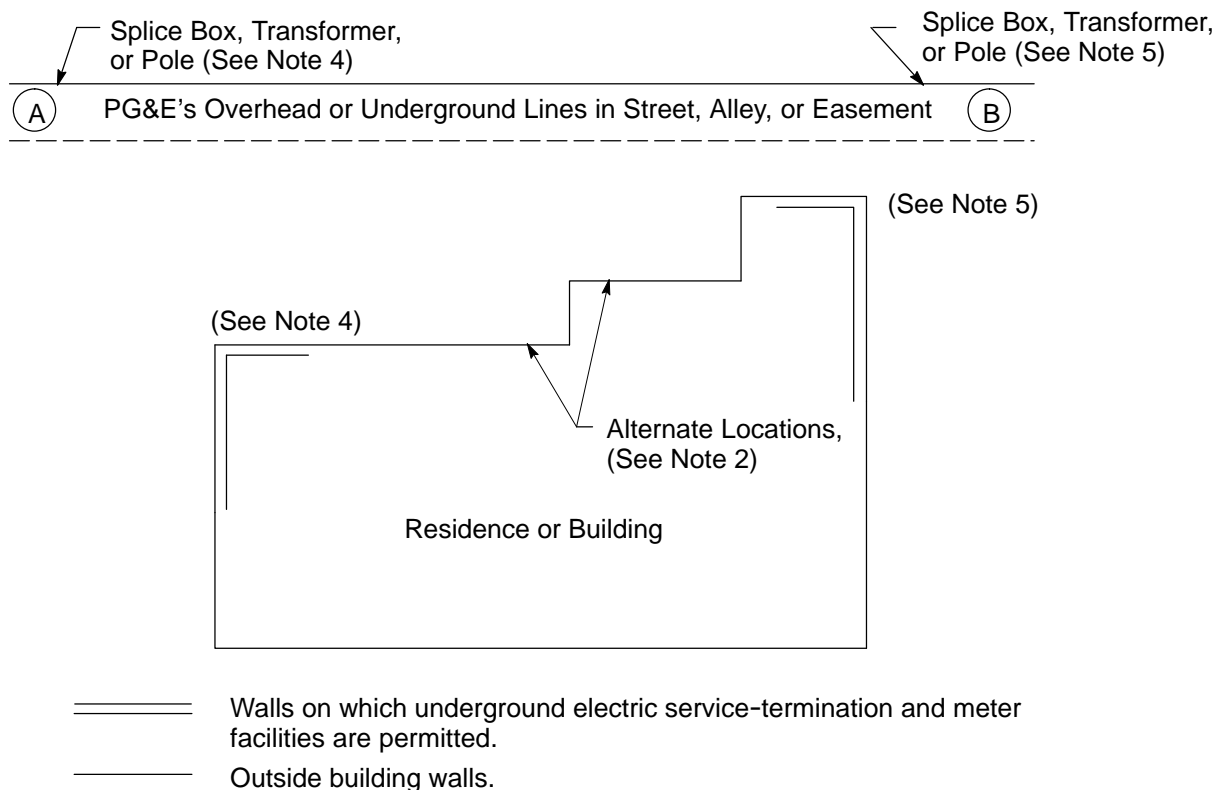


Figure 3-1
Locations of Underground Electric Service-Termination and Meter Facilities

Notes in reference to Figure 3-1.

1. If practical, attach the underground electric service-termination facility and the meter to the wall at a preferred location. Locate the facilities as close to PG&E's service facilities as possible to avoid future operation and maintenance restrictions.
2. **PG&E must approve all service locations *before* they are constructed.**
3. Applicants must locate the service so that the meter can be read and serviced **without** entering a fenced or enclosed location, when possible.
4. Permitted locations for electric service-termination and meter facilities are from Point A.
5. Permitted locations for electric service-termination and meter facilities are from Point B.

3.2.3. Installing Ground Rods

Applicants or their contractors are required to install ground rods when PG&E specifically requires them as part of a substructure installation (e.g., when constructing a transformer pad). Find PG&E-approved ground rods and clamps in [Numbered Document 013109, “Corrosion Resistant Ground Rods and Ground Rod Clamps.”](#) included in [Appendix C](#).

3.2.4. Installing Equipment Pads

Applicants or their contractors must construct and install equipment pads, as required, for underground electric equipment. When constructing a concrete pad for a transformer, use [Numbered Document 045292, “Concrete Pad for Three-Phase, Loop-Style Pad-Mounted Transformers.”](#) If installing a box pad for a transformer, use [Numbered Document 064309, “Box-Pad for Pad-Mounted Transformers.”](#) Both engineering documents are listed [Appendix C](#).

For projects that require equipment pads other than for transformers (e.g., PMH switches), the project coordinator or PG&E inspector provide these drawings at the pre-construction meeting **if** the installation is included in the PG&E-approved design.

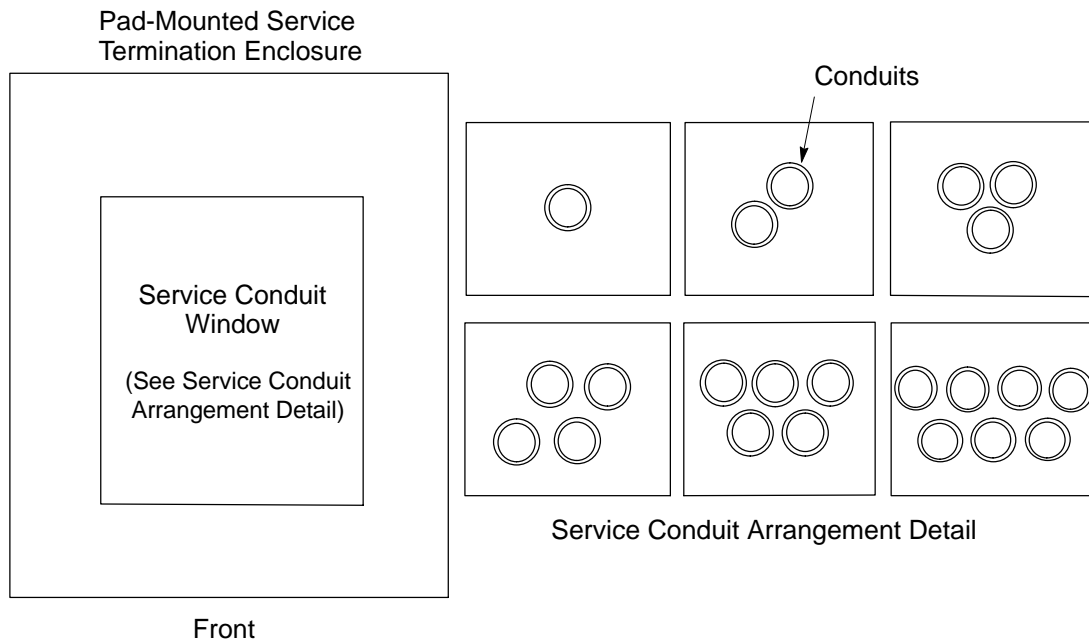
Underground electric equipment has required working space clearances in front of and all around the equipment. Applicants must ensure the minimum clearances are met. See [Numbered Document 051122, “Clearances and Location Requirements for Enclosures, Pads, and Underground Equipment.”](#) located in [Appendix C](#).

Construct customer-owned, floor-standing switchboard pads (0–600 volts) according to their applications. Figure 3-2, “Service Conduit Layout–Top View,” on Page 3-6, and the associated “Notes,” provide the placement and arrangement for service conduits inside the utility termination section or pull section.

For primary switchboards, refer to the ground rod and conduit requirements in [Section 11, “Electric Switchboards: 601 Volts Through 25,000 Volts and Primary Services,” Subsection 11.3.S.](#), on Page 11-4, and [Figure 11-1, “Primary Switchboard Termination Section Pad Detail.”](#) on Page 11-6.

For additional references to the underground electric documents provided in [Appendix C](#), see Table 3-2, “Electric Underground Documents,” on Page 3-23.

3.2.4. (continued)



**Figure 3-2
Service Conduit Layout–Top View**

Notes in reference to Figure 3-2.

1. Group the conduits at the service termination (i.e., pull section) enclosure as shown in the “Service Conduit Arrangement Detail.”
2. Center the conduits under the cable termination bus or bus stubs.
3. Conduits should be separated from each other by approximately 1 inch.
4. Ensure the top of each conduit is 2 inches above the concrete pad or floor of the switchboard.
5. Permanently install end bell fittings on all conduits.
6. Temporarily plug or cap all conduits.
7. Grout conduit windows with nonshrink grout. **Do not use asphalt or blacktop to grout windows.**
8. For primary service conduit installations, see [Section 11, Figure 11-1, “Primary Switchboard Termination Section Pad Detail.”](#)

3.2.5. Installing Overhead and Underground Service for Two or More Buildings on One Lot

If more than two dwellings or buildings are located on the same lot, applicants must consult their local PG&E project coordinators to determine the acceptable service-termination locations and meter locations **before** wiring the buildings.

NOTE: See [Table FM-1, “Service Planning Office and Inspection Desk Contact Information.”](#) at the front of this manual starting on Page iv, for specific contact numbers listed by area.

3.2.5. (continued)

Typically, PG&E only installs one service lateral to a single building on one premise, or to a single enterprise (with either one or multiple buildings) on one premise. However, PG&E may provide more than one service lateral under the following circumstances:

- Where it is allowed or required by PG&E's tariff schedules
- For PG&E's convenience
- Where it is required by ordinance
- When it is installed as special facilities

3.2.6. **Inspecting and Approving Overhead and Underground Services**

An applicant must contact the local PG&E project coordinator to arrange for a field representative to inspect and approve the applicant-furnished and installed service equipment, as well as any other mandatory components required for an underground service installation.

3.2.7. **Easements for PG&E Facilities**

New underground distribution facilities must be designed for installation in a Public Utility Easement (PUE) outside of public streets and roads. PUEs typically only provide the minimum-required land space for the safe and proper installation, operation, and maintenance of the distribution facilities. In some cases, PG&E may require an easement be granted instead of a PUE.

Ensure that PUEs are at least 10 feet wide for primary, secondary, and service cables. Cables should be installed around the centerline of the PUE. If other allowed non-PG&E utilities (e.g., phone, cable) and PG&E facilities (i.e., gas) are installed in the PUE, ensure the minimum clearances between facilities are met. Also, ensure clearances to below- and above-grade foreign structures, buildings, and obstructions outside of the PUE are met.

Services that cross third-party property also require a 10-foot-wide easement. In some instances, the PUE may need to be wider than 10 feet. See Figure 3-3, PG&E Trench and Equipment in PUE – Example,” on Page 3-8.

In locations along the path of the PUE where subsurface enclosures and pad-mounted equipment will be installed, the PUE must be wider to encompass the equipment being installed and to meet the minimum required working space clearances that surround the equipment. See [Numbered Document 051122](#). If the PUE does not provide adequate space for equipment and minimum clearances, an easement granted to PG&E will be required.

Contact your local project coordinator for questions on PUE requirements, determining the best locations for distribution facilities, and high-density housing projects with short setbacks from the property line.

3.2.7. (continued)

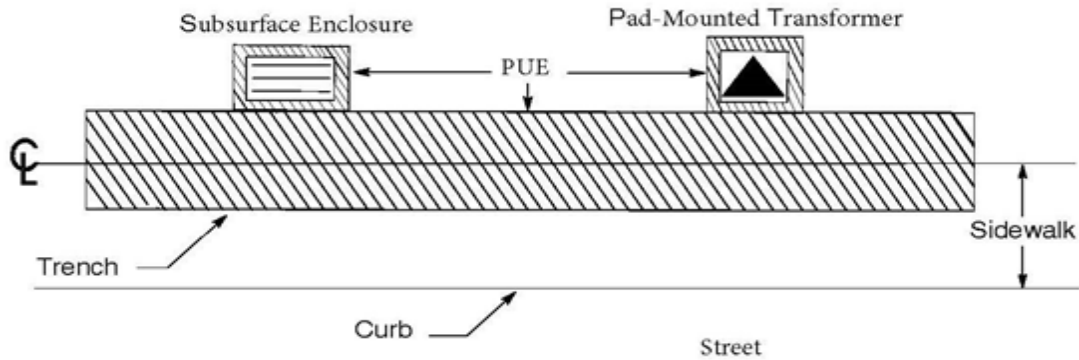


Figure 3-3
PG&E Trench and Equipment in PUE – Example

3.2.8. Clearances Around PG&E Facilities

Applicants must not construct structures or install equipment, including, but not limited to, buildings, homes, customer generation equipment, agricultural wells, or expansions of existing structures over, under, to the sides, or between PG&E overhead or underground facilities, either in the public right-of-way or on private property, without maintaining the proper clearances. PG&E facilities are typically covered by an easement, right-of-way, or land-right agreement, and require minimum clearances be maintained around the facilities. When in doubt, contact the PG&E Land Department and your local project coordinator for help in determining the land rights and clearances required for existing PG&E facilities.

3.3. Underground Service Installation Requirements

3.3.1. Installing Services from Underground Distribution Systems

PG&E serves applicants from an underground service if the site or lot is located in an area that is supplied from an **existing** underground distribution system. PG&E owns, maintains, and installs the underground service lateral conductors. PG&E provides underground-to-underground service **along the shortest, most practical, and most available route** to the applicant's service-termination facility.

Typically, the termination facility is on or within the building or structure, as shown in Figure 3-4, "Underground-to-Underground Service Connection," on Page 3-9. PG&E installs the conductors in conduit.

Substructures include conduit, boxes, and transformer pads. Applicants must follow PG&E's guidelines and specifications, including those specified in [Electric Rule 16](#).

PG&E installs the transformer, if required, and connects the service lateral conductors to the applicant's termination facilities.

3.3.1. (continued)

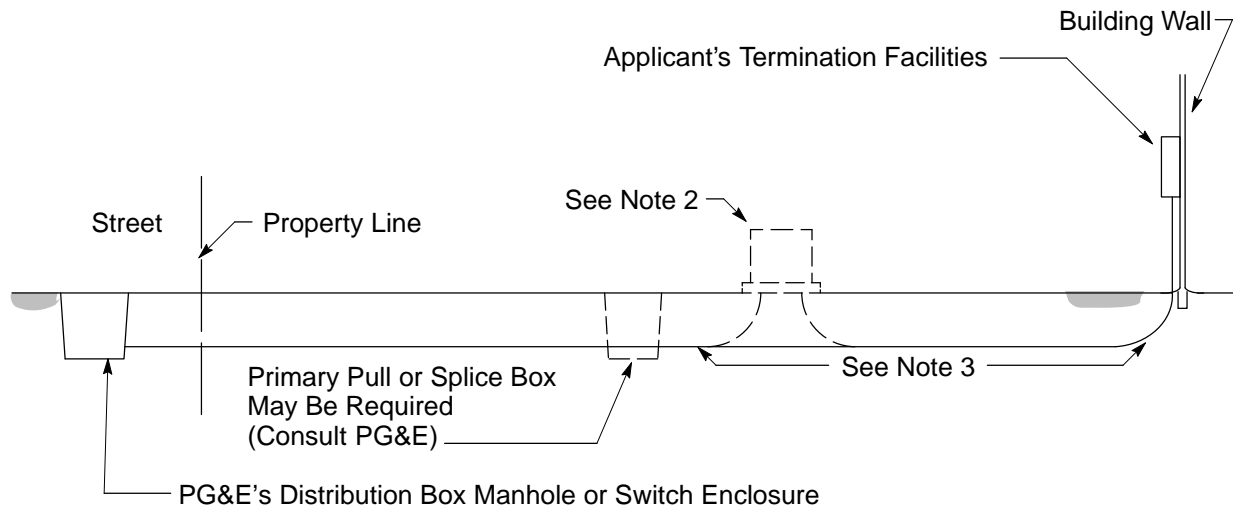


Figure 3-4
Underground-to-Underground Service Connection

Notes in reference to Figure 3-4.

1. When the service delivery voltage is the same as the available, primary distribution voltage (i.e., over 2,000 volts), typically the applicant provides a primary splice box according to PG&E's requirements.
2. PG&E supplies a transformer, if required. (The applicant must provide the trench, backfill, and required conduit, pad, and substructures.)
3. PG&E-owned primary and/or secondary conductors. (The applicant must furnish the substructures.)

3.3.2. Installing Services from Overhead Distribution Systems

PG&E provides service from an underground riser that is installed on an **existing** pole, as shown in Figure 3-5, "Overhead-to-Underground Service Connection," on Page 3-10, if **any** of the following requirements are met.

- A. The applicant is located in an area served from an overhead system and the applicant prefers to have the service installed underground.
- B. The applicant's load requires a transformer that is 75 kilovolt amperes (kVA) or larger.
- C. A local city or county ordinance requires underground service.

In these cases, in addition to the requirements described in Subsection 3.3.1., "Installing Services From Underground Distribution Systems," on Page 3-8, the applicant must pay the material costs of both the pole riser facility and any conduit required in the public right-of-way.

3.3.2. (continued)

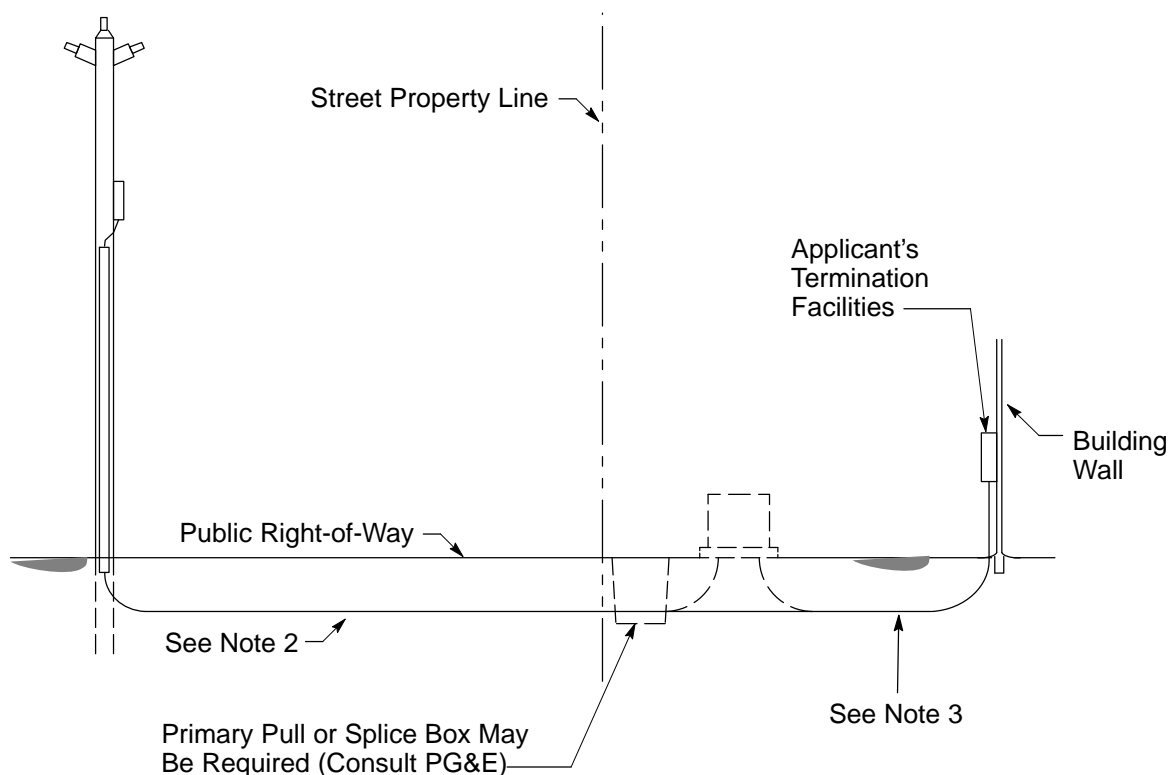


Figure 3-5
Overhead-to-Underground Service Connection

Notes in reference to Figure 3-5.

1. When the service delivery voltage is the same as the available, primary distribution voltage (i.e., over 2,000 volts), typically the applicant provides a primary splice box according to PG&E's requirements.
2. PG&E's pole and secondary riser. (The applicant must pay the installed cost of the pole riser and conduit within the right-of-way.)
3. PG&E-owned service lateral conductors. (The applicant must furnish the conduit, as required.)

3.3.3. Installing Conduit for Underground Service

NOTE: PG&E will **not** install its supply cables in conduits that run beneath any building or structure when those conduits **do not terminate** on or within that building or structure, but are intended to supply **another** building or structure on the same or another premise.

PG&E requires applicants to install a conduit system for underground service laterals. It is the applicant's responsibility to provide service conduit as described in the following PG&E documents. Refer to the following numbered documents, located in [Appendix C](#).

- [Numbered Document 038193, "Minimum Requirements for the Design and Installation of Conduit and Insulated Cable"](#)
- [Numbered Document 062288, "Underground Conduits"](#)
- [Numbered Document 063927, "Methods and Requirements for Installing Residential Underground Electric Services 0–600 V to Customer-Owned Facilities"](#)
- [Numbered Document 063928, "Methods and Requirements for Installing Non-Residential Underground Electric Services 0–600 Volts to Customer-Owned Facilities"](#)

Applicants must ensure that conduit is not installed in a trench at a depth greater than 60 inches. If large utility pipes or drains are obstructing the service path, the trench may be as deep as 10 feet to traverse under the obstructions and then transition back to the proper trench depth.

Conduit runs must have a polyester pull-tape (Code 560154) to initiate the cable pulling. The pull-tape must be attached securely either to conduit plugs or caps. For spare conduits that will be vacant for 30 days or longer, install detectable pull-tape (Code 602679) so the spare conduit can be identified during mark and locate field work.

Applicants must prove that the entire conduit system is free of dirt, rocks, or other obstructions that could prevent, hinder, or harm installing the electric conductors. Applicants must use a PG&E-approved mandrel to prove the conduit system. See Subsection 3.5., "Mandrels," on Page 3-20, for details. A PG&E inspector must approve the equipment and the method, and observe the work being performed to prove the service conduit system's readiness.

Applicants can either choose to perform the underground electric service conduit installation or request PG&E to do the work. Either way, applicants must provide the service riser conduit that extends from the conduit bend out of the ground and into the electric meter panel or service termination enclosure. The service riser conduit must be vertically straight and cannot contain any couplings, offsets, or bends.

3.3.3. (continued)

Applicants must furnish and install either conduit caps or plugs on the ends of all conduits. In addition, at locations where the cable insulation may be damaged (e.g., transformer pads or switchboard pull sections), applicants are required to install cable protection at all of the conduit ends. Applicants should contact their local PG&E project coordinator for specific requirements. Also see [Numbered Document 038193, “Minimum Requirements for the Design and Installation of Conduit and Insulated Cable,”](#) located in [Appendix C](#).

Applicants must be aware that underground conduits, enclosures, and substructures must not be installed in the ground or in buildings foundations before PG&E issues an approved design for the installation. Unapproved installations are considered “at risk” and the applicant assumes the risk for any work performed without requesting PG&E’s advanced approval. PG&E can charge the applicant if it is necessary to make changes to unapproved work.

PG&E inspectors, at their discretion, can deny or allow at-risk installations. Inspectors also can require pot holing in the foundation and ground or require other inspection methods needed to determine if installation meet requirements.

When an applicant designs and constructs a PG&E-approved electric room inside of a building, an outside wall must be used as one of the walls of the electric room. The conduits passing through or under the applicant’s building foundation or slab must not extend past the outside wall into the room by more than 20 feet and must terminate inside the electrical room.

Refer to [Section 5, “Electric Metering: General,” Subsection 5.3.4., “Electric Meter and Service Termination Equipment Rooms,”](#) on Page 5-16, and [Figure 5-1, “Allowable Locations for Electric Service and Meter Rooms,”](#) on Page 5-11.

3.3.3.1. Galvanized Rigid Steel Conduit and Couplings

When new galvanized rigid steel (GRS) conduit is used as riser conduit transitioning from the underground service conduit up to the electric meter panel, the following requirements apply.

- The top end of the riser (the end that is inside the meter panel) must be threaded and requires a screw-on lock nut.
- A cable protector is required.
- Do not use set screw couplings or lock nuts on new installations.

The following exceptions apply for existing, rigid-steel conduit risers that will be reused during an electric meter panel change, if applicable.

- If the riser is not threaded, then a conduit lock nut with a set screw is allowed.
- If a coupling with set screws already exists in the riser conduit, then it does not need to be replaced.

3.3.3. (continued)

New and existing rigid steel conduit does not need to be bonded to the electric panel.

All polyvinyl chloride (PVC) and steel couplings, including plastic-to-steel transition couplings, must be installed below grade and must not be exposed above grade. When a coupling is installed inside of a foundation, the top edge of the coupling may be flush with the top of foundation concrete.

3.3.4. Installing PG&E-Only Service Trenches

Applicants must ensure that trenches containing only PG&E electric service facilities or PG&E electric and gas service facilities are covered, as required, when those trenches are located on:

- Private property
- Designated sidewalks
- Parkways
- Driveways

The electric service conduit and gas pipe must be covered on private property or in the franchise as described in the following text. The required minimum clearances must be maintained as listed in Table 3-1, “Minimum Separation and Clearance Requirements for Service Trenches,” on Page 3-19.

- A. Provide a 24-inch minimum cover for secondary (i.e., 0–750 volts) electric service conduit and gas pipe.
- B. Provide a 36-inch minimum cover for primary (i.e., over 750 volts) electric service conduit.

The term “cover” refers to the standard distance between the outer surface of an underground facility and the final grade level. **The actual trench depth must be greater than the cover depth.**

All electric service and secondary conduit must enter PG&E splice boxes or enclosures from the bottom for new construction and not through the boxes’ conduit knockouts. **If** the top of the conduit is not at or below the required minimum conduit depths, the applicant needs to increase the installed depth of the conduit at those locations. See notes in [Numbered Document 028028, “Secondary Electric Underground Enclosures,”](#) located in [Appendix C](#).

PG&E may require the applicant to provide other means of protecting the service conduit in the following circumstances.

- Increased traffic loading
- Soil erosion
- Open ditches
- Where digging machinery or equipment may be used

This increased protection also may be required in areas where similar situations either are anticipated or exist already.

3.3.4. (continued)

Applicants must ensure that the trench depth is sufficient to meet the minimum depth requirements when taking into consideration the following conditions.

- The required depth of cover (as described previously)
- The size of the conduit that is being installed (e.g., 3 inch, 4 inch)
- The necessary bedding materials
- The size of the electric conduit bends (e.g., 24-inch or 36-inch bends)

When installing 4-inch and 5-inch diameter conduit that requires a 36-inch vertical bend at the pole, transition the trench to a greater depth before reaching the pole to accommodate for the larger radial bend. At the pole, the conduit must extend vertically above grade a minimum of 2 inches to a maximum of 6 inches.

For service trenches (e.g., secondary voltage and 3-inch conduit) on private property or in the franchise, the required minimum depth of trenches below grade is 30 inches. For primary services, the minimum trench depth is 42 inches for 4-inch conduit and 44 inches for 6-inch conduit.

Applicants must receive pre-approval from the PG&E inspector when requesting an exception to the minimum-depth requirements. Applicants should contact their local PG&E project coordinator with questions about trench depth.

Applicants should be aware that wet utilities must always be separated from the electric and gas service trench, meters, and risers. Wet utility piping or facilities include, but are not limited to, water, bioswales, storm sewer, sanitary sewer, steam, liquid fuels, oil, diesel, sprinkler, irrigation, spigots, downspouts, drain or leach lines, propane, or lines for other liquids or volatile, heavier-than-air gases. For more information, see [PG&E Standard S5453, "Joint Trench," Exhibit B, Joint Trench Configurations & Occupancy Guide](#), located in [Appendix B, "Electric and Gas Service Documents."](#)

Also, when applicants plan to install electric service facilities with other services, such as telephone or cable television, they must refer to:

- Subsection 3.3.8., "Installing Joint Utility Service Trenches," on Page 3-17.
- Figure 3-6, "Typical Joint Service Trench," on Page 3-18.
- Table 3-1, "Minimum Separation and Clearance Requirements for Service Trenches," on Page 3-19.

Applicants should contact their local PG&E project coordinator in the development stages of their projects for additional details and requirements about using joint trenches.

3.3.5. Installing Offsets

In situations where more than two 90° bends are needed, applicants should consult their local PG&E project coordinators to determine whether additional raceway pull-boxes will be required to avoid excessive pulling tension on the service cables.

- A. PG&E does **not** approve short-radius conduit fittings, commonly known as LBs or service elbows, for use in underground service conduits that are intended to hold PG&E service conductors. Applicants must ensure that offsets are **not** installed in the following situations.
 - 1. Do not make an offset in the service lateral conduit entering the electric service panel or enclosure.
 - 2. Avoid making an offset in the conduit system because it may prohibit the use of a mandrel to prove the acceptability of the conduit system.
 - 3. Avoid making an offset in the service conduit because it will increase the pull tension required to install the service conductors.
- B. In some situations, applicants may be required to perform both of the following numbered actions.
 - 1. Install larger conduits and/or additional splice boxes or pull boxes to accommodate the installation of the conductors.
 - 2. Transition to cables appropriately sized for the service capacity.
- C. The following scenarios represent situations where B.1. and B.2., on Page 3-15, could be required.
 - 1. Construction sites where PG&E determines that larger-than-standard cables or conductors are required to maintain voltage and flicker drop.
 - 2. Construction sites where normal pulling tensions may be exceeded.

NOTE: Applicants must be aware that pin adaptors, cable ringing, or splicing on additional cable **will not be used** to terminate cables. PG&E **does not** accept these termination techniques.

3.3.6. Selecting Backfill

Applicants must use backfill (i.e., sand or native soil) to provide a smooth bedding area when installing utility facilities. The backfill must fill all of the voids around the facilities and provide at least 12 inches of cover for the conduit or pipe. PG&E considers soil that contains occasional, rounded rocks that are 1/2 inch in diameter or less to be acceptable backfill.

Crushed rock or sharp-edged materials of any kind, or backfill containing easily breakable dirt clods larger than 6 inches in diameter, are not acceptable.

Additionally, PG&E **prohibits** applicants to use backfill with rocks greater than 3 inches in any dimension within 6 inches of the top of the pipe or conduit or less than 12 inches below the pavement subgrade.

3.3.6. (continued)

In sections where a shallow trench is needed and allowed, place a cement-slurry cap above the conduit. The cap must be a minimum of 3 inches thick and made from a cement-slurry mix. The mix must consist of a two-sack sand slurry, with red dye mixed in. The cap must rest on rock-free sand and not the conduit. Position the cap at least 6 inches above the conduit. The top of the cap must be a minimum of 8 inches below grade level. The width of the cap must be the same width as the trench.

When backfilling trenches on slopes or grades, bags of concrete and red dye may be required on top of the conduit to prevent the backfill from moving down the slope or running out of the trench.

Soil compaction density must be 90% to 95% and meet PG&E's and any applicable Federal, State, County and local requirements. PG&E-specific soil compaction requirements are as follows:

- A. Trenches that run across or along public roads and streets in the franchise areas must have soil compacted to a minimum of 95% density.
- B. Trenches that run across private roads and streets in non-franchise areas must have soil compacted to a minimum of 90% density.
- C. When PG&E requires a compaction test report for trenches or equipment pads, the testing must be performed by a qualified testing company and the report must include the testing company's information (i.e., Name, Address, Contact Information).

All of these requirements are at the discretion of the PG&E inspector.

See PG&E's [Joint Trench Configurations & Occupancy Guide](#) for additional backfill and trenching requirements. For PG&E-approved import material, see [Engineering Material Specification \(EMS\) 4123, "Backfill Sand."](#) Both are located in [Appendix B](#).

3.3.7. Providing Drainage from the Conduit System

In some conditions, water can enter the wire and conduit system and migrate into the meter panel and/or building. The applicant or applicant's contractor must provide a means to discharge any excess water or water pressure from the conduit system.

The most common method required for discharging water from the conduit is installing a box outside near the base of the riser to the meter panel. Alternate locations may be required by the PG&E inspector or PG&E project coordinator. Any other methods of discharging water will require PG&E's approval **before** construction begins. For indoor electric meter rooms below grade or at grade level, additional methods of water drainage should be incorporated into the design of the meter room(s) to prevent the accumulation of water.

3.3.8. Installing Joint Utility Service Trenches

When installing electric services underground, the PG&E gas service pipe and the electric service lateral typically are installed in a common, joint trench. A joint trench also may include telephone and cable television facilities.

Applicants should be aware that wet utilities must always be separated from the electric and gas service trench, meters, and risers. Wet utility facilities are **not** permitted in a joint trench. Wet utility piping or facilities include, but are not limited to, water, bioswales, storm sewer, sanitary sewer, steam, liquid fuels, oil, diesel, sprinkler, irrigation, spigots, downspouts, drain or leach lines, propane, or lines for other liquids or volatile, heavier-than-air gases.

There are additional requirements for separating a wet utility from a joint trench along with the electric and gas meters and service risers.

Applicants must submit a written request to PG&E when they want to include other facilities in a joint trench. The request must include a justification and be submitted to PG&E for review and approval **before** excavation or work begins.

PG&E must coordinate joint trench installations with telephone, cable television, or other facilities. This coordination requires lead time, so applicants should submit their requests and justifications as early in the planning process as possible. Applicants must ensure that PG&E has reviewed and approved their trenching plans before digging begins.

Figure 3-6 on Page 3-18 illustrates a “Typical Joint Service Trench.” Separation and clearance details for the trenches are found in Table 3-1 on Page 3-19. Also, see PG&E’s [Joint Trench Configurations & Occupancy Guide](#) located in [Appendix B](#) of this manual. This guide contains additional information and joint trench requirements. For PG&E-approved import material, see [Appendix B](#) for [Engineering Material Specification EMS-4123, "Backfill Sand."](#)

When applicants plan to use joint service trenches, they must ensure that the gas and electric meters are installed either adjacent to, or in close proximity to, each other. [Section 5, “Electric Metering: General;”](#) [Section 6, “Electric Metering: Residential;”](#) and [Section 7, “Electric Metering: Nonresidential, Industrial, and Agricultural,”](#) provide information about determining acceptable locations for utility electric meters. [Section 2, “Gas Service,” Subsection 2.4.2, “Gas Meter-Set Locations,”](#) on Page 2-20, provides information about determining acceptable locations for utility gas meters.

Applicants must discuss the service arrangements and coordinate the meter locations and joint trench requirements with a PG&E project coordinator **before** installing utility conduits or gas service piping.

Applicants must ensure that when multiple service facilities (i.e., gas, electric, and telecommunications) are installed in close proximity (e.g., in a joint trench), a 12-inch minimum, radial separation is maintained where those facilities transition from below ground to above ground.

3.3.8. (continued)

PG&E allows an exception to that rule when the separation is between PG&E secondary, electric-service conduit and gas-service piping. In this instance, the minimum separation distance may be reduced to 6 inches. Clearances between other facilities can be reduced **only** when the facility owners reach a mutual agreement.

When electric underground facilities cross under or over gas facilities, the minimum vertical separation between these facilities is 6 inches. The electric and gas facilities should cross at an angle between 45 degrees to 90 degrees. Crossings less than 45 degrees are considered to be parallel and require the minimum horizontal clearance between the two facilities.

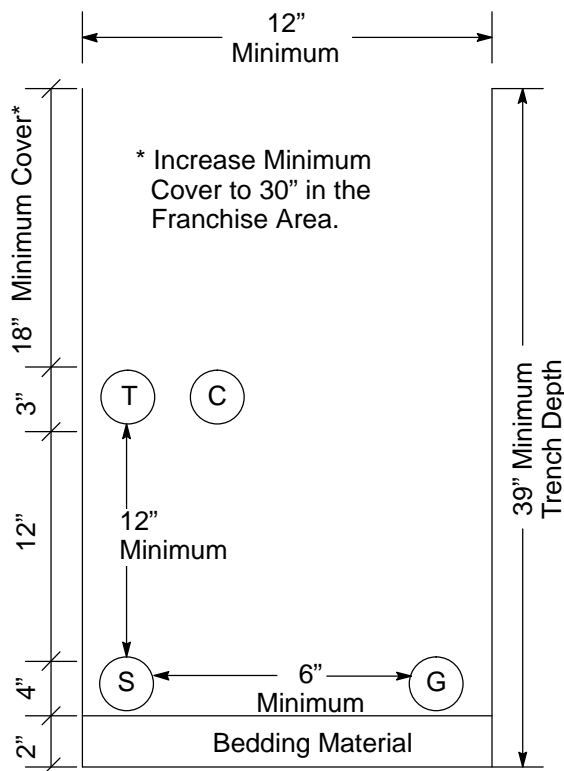


Figure 3-6
Typical Joint Service Trench

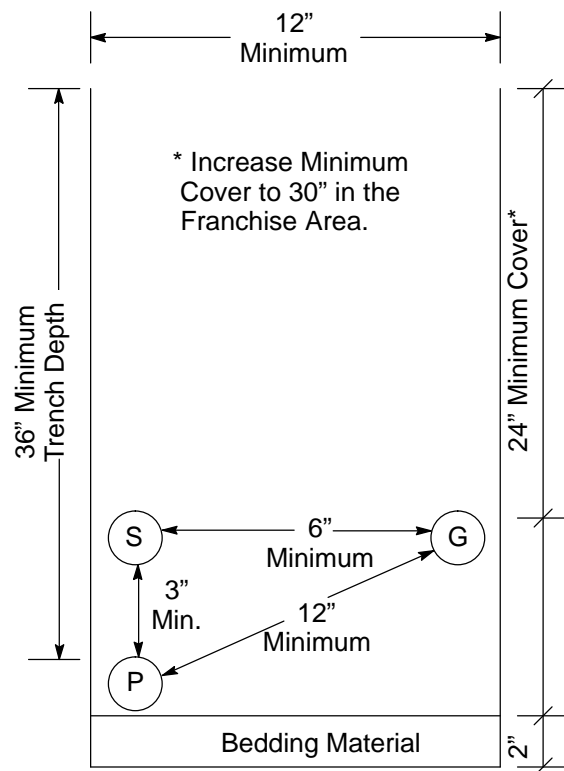


Figure 3-7
PG&E Electric and Gas Service Trench

Notes in reference to Figure 3-6 and Figure 3-7.

1. Trench depth will vary depending on conduit size.
2. Soil compaction must meet PG&E's and any applicable federal, state, county, and local requirements.
3. All separation and clearance dimensions must be met in Table 3-1 on Page 3-19.
4. For more information on Figure 3-6, see PG&E's [Joint Trench Configurations & Occupancy Guide](#), located in [Appendix B](#).

3.3.8. (continued)

Table 3-1 Minimum Separation and Clearance Requirements for Trenches¹

		G	Duct T	DB T	C	S	P	SL
G	Gas ²	-	12	12	12	6	12	6
T	Telephone (Duct)	12	-	1	1	12	12	12
T	Telephone (Direct Bury)	12	1	-	1	12	12	12
C	CATV	12	1	1	-	12	12	12
S	Electric Secondary	6	12	12	12	1.5	3	1.5
P	Electric Primary	12	12	12	12	3	3	3
SL	Streetlight ³	6	12	12	12	1.5	3	1.5
FE	Foreign Electric Sources (Non-PG&E) ⁴	12	12	12	12	12	12	12

¹ All separation clearance distances are in inches.

² For more information about this table, see [PG&E Bulletin TD-5453B-002, "Updated Separation Requirements for Conduit in Joint Trench,"](#) in [Appendix B](#) of this manual.

³ Streetlight circuits **not owned** by PG&E must be installed to meet the requirements in PG&E's [Joint Trench Configurations & Occupancy Guide](#). Specifically, applicants must review the requirements for working with a second utility company.

⁴ Must be considered a "utility" as defined in PG&E's [Joint Trench Configurations & Occupancy Guide](#).

Applicants must ensure that adequate amounts of space exist to maintain and operate the facilities. Applicants must ensure that the area immediately **behind** the gas meter, service facilities, and risers and **between** those facilities and the premises or structures being served is kept free and clear of all other facilities or equipment such as pipes, wires, cables, or conduits. See [Section 2, Figure 2-19, "Electric and Gas Meter Set Separation Dimensions and Clearances,"](#) on Page 2-33.

NOTE: Applicants should consider installing conduit one size larger than the required minimum in case larger cable is required or needed for future upgrades. Refer to Subsection 1.14., "Determining the Service Rating," on Page 1-15, for a description of the methods PG&E uses to determine the ampacity (capacity) rating of customer equipment.

3.3.9. Providing a Service-Termination Facility

In addition to the requirements in Table 3-1, above, applicants must provide and maintain a satisfactory termination facility on or within the building or structure to be served.

PG&E will **not** install services supplied from different electrical sources in the same termination facility unless the services are separated using suitable barriers. When two or more services are in one termination facility, the minimum dimensions of each compartment created by the barriers must be the same as if each compartment were a separate termination facility.

NOTE: See new service and current transformer (CT) installation requirements in [Section 5, Subsection 5.2.4., "Requirements for Installing Secondary Terminations \(0–600 Volts\) in Metering Equipment Requiring CTs,"](#) on Page 5-4.

3.3.10. Bioswales and Large, Wet Locations

A bioswale is a long, channeled depression or trench that receives rainwater runoff and uses vegetation and organic matter to slow water infiltration and filter-out pollutants. A bioswale is considered a wet location and applicants must **not** install PG&E facilities that go through or close to a bioswale. Bioswale areas should be avoided and PG&E facilities should be designed to go around them. If applicants cannot avoid a bioswale area, they must apply additionally protective methods when designing PG&E facilities. Also see [Numbered Document 038193](#), located in [Appendix C](#).

3.3.11. Replacing Non-Standard Underground Services

When applicants are relocating or upgrading their electric meter panels and they have existing, non-standard Cable in Conduit (CIC) or Direct Buried (DB) cable, it must be replaced with new PG&E service cable installed in approved service conduit. The new service and conduit run must extend from the new electric panel or termination enclosure location back to the distribution splice box or transformer.

Do not install a splice box along the path of the existing, non-standard DB or CIC cable, between the PG&E secondary distribution system and the panel or termination location, to shorten the length of the new service and conduit. This excludes installing boxes along the new service run near the meter panel to prevent the accumulation of excess water in the service conduit system.

3.4. Electric Underground Documents

Applicants that are performing underground construction should refer to the electric underground numbered documents that are provided at the back of this manual in [Appendix C](#). See PG&E's Internet website at www.pge.com/greenbook to access the most recent versions of these documents **or** contact your local PG&E project coordinator. Most of these documents also are available in [PG&E Manual TD-2502M, Electric Underground Construction Manual, Book 1](#).

3.5. Mandrels

The following section includes both an overview of, and a procedure for using, PG&E-approved, flexible-steel mandrels to prove conduit systems.

A. Using Mandrels to Prove Conduit Systems

Applicants must ensure that the conduit systems required for PG&E cables and/or conductors are installed in a trench that meets all of PG&E's requirements and specifications for the particular job or project. The conduit systems must meet PG&E's requirements for each specific installations, as well.

NOTE: The term "conduit system" includes conduits, conduit bends, conduit fittings, and all related components (e.g., bell ends and cable protectors) that are needed to install PG&E cables and conductors.

3.5. (continued)

Applicants must ensure that conduit systems are **not** covered or hidden from view before the facilities are inspected visually by a PG&E field inspector. The inspector must determine if the conduit system and its installation comply with all of PG&E's specifications (e.g., type, size, schedule, radius of bends) and installation requirements before the customer backfills the trench.

After the conduit system passes PG&E's visual inspection, including visual verification of the conduit system's materials and the radius of the bends, the applicant must backfill the trench and compact the soil. Then, the applicant must provide PG&E with proof that the conduit system is in compliance by successfully inserting and pulling an approved, flexible-steel mandrel through the **entire** conduit system.

The PG&E inspector remains onsite to ensure that the appropriately sized and approved, flexible-steel mandrel is inserted and pulled through the length of the conduit system without encountering blockages or obstructions.

The applicant must provide the mandrel and follow the procedures for using the mandrel provided in Subsection 3.5.B. on Page 3-21.

The applicant must provide polyester pull-tape (Code 560154) to initiate the cable pulling. For spare conduits that will be vacant for 30 days or longer, install detectable pull-tape (Code 602679) so the spare conduit can be identified during mark and locate field work.

NOTE: For HDD projects, applicants or their contractors must contact PG&E **before** construction begins. See Subsection 3.2.2.G. on Page 3-3 for information about drilling projects.

B. Procedure for Using Mandrels

Applicants must follow the procedural steps below when using a mandrel to prove a conduit system.

Step 1. Select the mandrel that is sized properly for the type of conduit that will be proven. See Figure 3-8, "Flexible Steel Mandrel," on Page 3-22, and Table 3-2, "Mandrel Dimensions, Part Numbers, and Order Codes," on Page 3-23, for mandrel specifications.

NOTE: For high-density polyethylene (HDPE) continuous conduit only (i.e., 3-inch, 4-inch, 5-inch, and 6-inch HDPE), use the next smaller-size mandrel shown in Table 3-2 on Page 3-23.

Step 2. To pull the mandrel through the conduit, securely tie one end of the 2,500-pound pulling tape to the pulling eye of the mandrel. (The pulling tape was installed in the conduit previously.)

Step 3. Securely tie a second section of 2,500-pound pulling tape to the pulling eye located on the other end of the mandrel. This section of tape must be long enough to replace the pre-installed pulling tape completely.

3.5. (continued)

Step 3. ensures that a run of pulling tape remains in the conduit after the mandrelling process is completed. Also, if the mandrel becomes blocked or stuck in the conduit, the second run of pulling tape allows the mandrel to be pulled back out of conduit **and** provides a means of measuring the distance to the point of blockage.

Step 4. After both pulling tapes are attached securely to the mandrel, insert the mandrel into one end of the conduit. Slowly start to pull the pulling tape at the opposite end of the conduit. This removes any slack in the pulling tape.

Step 5. Slowly pull the mandrel through the conduit by hand or non-mechanically. The rate of the pull should not exceed 100 feet per minute. Both the person pulling the tape and the PG&E inspector must check the pulling tape for signs of stress (i.e., molten plastic) as the tape comes out of the conduit.

NOTE: The PG&E inspector may **not** approve a section of the conduit if any portion of the pulling tape shows damage in the form of molten plastic. If the inspector decides to reject the conduit section, he or she will secure the melted section of pulling tape as evidence.

If the mandrel passes through the conduit without encountering any blockage or obstructions, the PG&E inspector approves the conduit section for use.

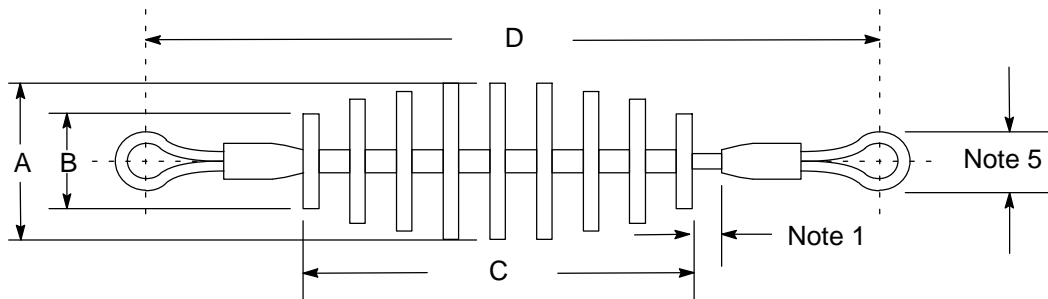


Figure 3-8
Flexible Steel Mandrel

Notes in reference to Figure 3-8.

1. The length must be adequate for the mandrel to pass through a 24-inch radius bend (all sizes).
2. The disks must be fabricated from 1/2-inch, flat, steel plate (average weight: 490 pounds per cubic foot) with a 7/16-inch hole for the 3/8-inch cable.
3. The spacers must be fabricated from 1/2-inch iron pipe size (IPS) pipe with a minimum inside diameter of 0.6 inches.
4. Cable size: 3/8-inch, 6 x 19 mild, plow-steel hoisting rope.
5. The outside diameter of the eye must not exceed Dimension A.
6. The size must be stamped permanently into one end of the plates.

3.5. (continued)

Table 3-2 Mandrel Dimensions, Part Numbers, and Order Codes¹

Size (In Inches)	PG&E Code	Manufacturer Part Numbers ³	Dimensions (In Inches)				
			A	B	C	D ²	Spacer Length
2	202567	08400-200	1.69	1.69	6.5	15	0.25
3	202570	08400-300	2.65	1.65	10.5	23	0.75
4	202571	08400-400	3.57	2.57			
5	200911	08400-500	4.56	3.56			
6	202572	08400-600	5.51	4.51			

¹ For HDPE continuous conduit only (3-inch, 4-inch, 5-inch, and 6-inch HDPE), use the next-smaller-size mandrel.

² "D" dimensions are approximate.

³ PG&E's approved mandrel manufacturer is DCD Design & Manufacturing.

Table 3-3 Businesses That Sell or Rent Mandrels^{1, 2}

Company	Street Address	City	Zip	Phone Number
Utility Division Locations (UDL)	5275 Central Ave.	Fremont	94536	(510) 656-9680
WESCO	1544 N. Maple Ave.	Fresno	93703	(559) 255-4423
WESCO/Herning	4925 E. Annadale Ave.	Fresno	93725	(559) 443-5600
WESCO/Herning	567 Exchange Ct.	Livermore	94550	(925) 449-2550
Pacific Utilities Supply Co.	2475 Estand Way	Pleasant Hill	94523	(925) 674-1600
WESCO	1045 W. National Dr., Suite 19	Sacramento	95834	(916) 928-1001
Independent Electric Supply (IES)	1370 Bayport Ave.	San Carlos	94070	(650) 594-9440
WESCO	2800 Mead Ave.	Santa Clara	95051	(408) 562-0400
Independent Electric Supply (IES)	2801 Research Park Dr.	Soquel	95073	(831) 464-3232
Utility Division Locations (UDL)	200 East Larch Rd.	Tracy	95304	(209) 832-2038
Utility Division Locations (UDL)	4076 Channel Dr.	West Sacramento	95691	(916) 376-8400

¹ Mandrels must be from the approved manufacturer listed in Table 3-2 on Page 3-23 (DCD Design & Manufacturing).

² This table is provided as a general reference to companies that may sell or rent PG&E-approved mandrels to customers. These companies may be located in cities other than those listed in this table.

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**SECTION 4
ELECTRIC SERVICE:
OVERHEAD**

SECTION 4 ELECTRIC SERVICE: OVERHEAD

Section 4

Electric Service: Overhead

4.1. Scope

This section of the manual provides instructions and minimum clearance requirements for attaching permanent, overhead services to residential and nonresidential properties. The term “residential” includes mobile homes installed on foundations in locations other than mobile home parks.

NOTE: Requirements for installing and attaching PG&E overhead services may be different than local city or county ordinances, as well as national or California electric codes. Contact your local PG&E project coordinator if you have questions. See [Table FM-1, “Service Planning Office and Inspection Desk Contact Information.”](#) at the front of this manual starting on Page iv, for specific contact numbers listed by area.

4.2. General

Pacific Gas and Electric Company (PG&E) will **not** supply new overhead services to applicants when either of the following conditions exist:

- A. When buildings or premises are located in areas designated either by local jurisdictions or by PG&E as underground districts.
- B. When buildings or premises are located in areas zoned for nonresidential or residential use and the installed service equipment and/or load requires PG&E to use a 75-kilovolt ampere (kVA) or larger transformer.

4.2.1. Safety Reminder



CAUTION

FLAME RESISTANT (FR) CLOTHING IS REQUIRED WHILE WORKING ON, WORKING NEAR, OR OBSERVING OTHERS WORKING ON ANY PG&E FACILITY.

4.3. Locating Overhead Services

4.3.1. Point of Attachment

In areas served from overhead lines, PG&E installs an overhead service drop from the Company’s distribution line to a point of attachment on the applicant’s residence, building, or structure. PG&E follows the guidelines listed below to ensure the service is installed safely and efficiently.

- A. The point of attachment must be located so it can be reached with a single span from PG&E’s facilities.
- B. The span should **not** cross over adjacent property, if possible.
- C. The span must maintain the required, vertical, clearance-to-ground.

4.3.1. (continued)

The point of attachment may be either on the building wall near the PG&E line or on a periscope fixed to the building's roof, usually not more than 18 inches in back of that wall. Figure 4-1 below provides more information about the point of attachment.

Applicants must consult PG&E **before** installing the building's wiring. PG&E must approve of the location selected for the utility service attachment.

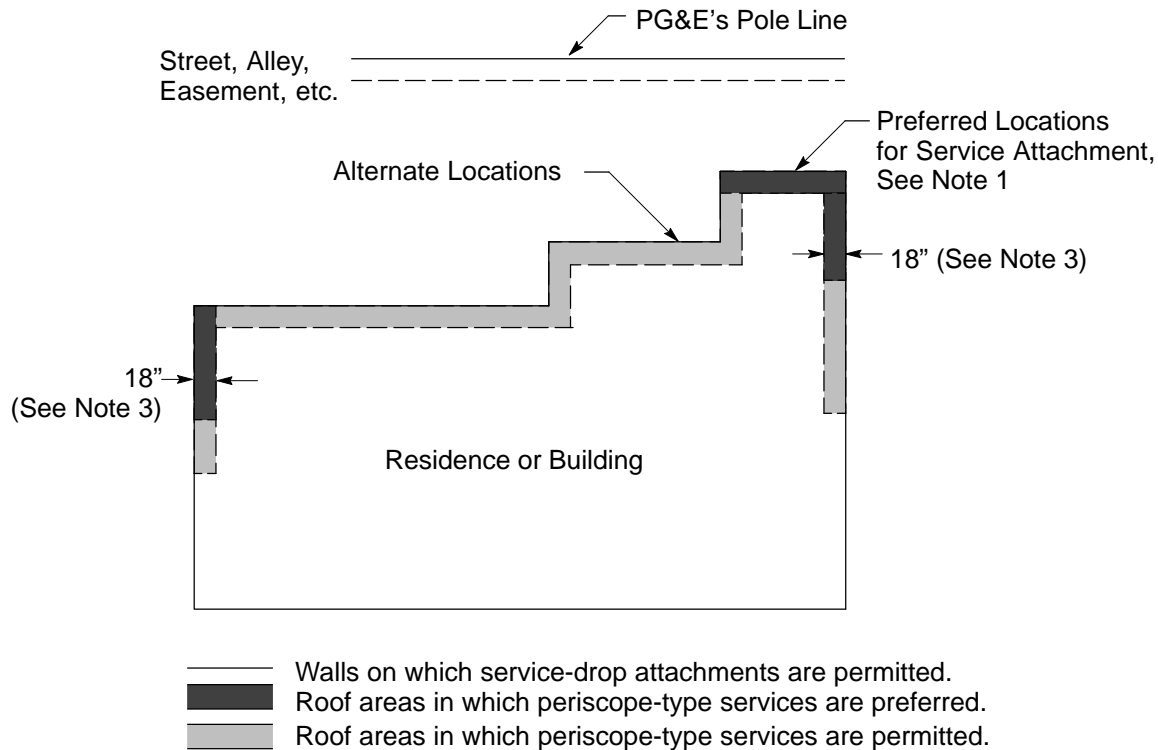


Figure 4-1
Preferred and Alternate Locations for the Overhead Service Drop Attachment (see Note 2)

Notes in reference to Figure 4-1.

1. Applicants can attach service drops to sidewalls if the service-drop conductors do **not** exceed 75 feet. Service-drop conductors must **not** cross over an adjacent property. Finally, applicants must ensure that the required conductor clearances and accesses to the electric meters are maintained.
2. For more information on meter location requirements, see [Section 5, "Electric Metering: General;"](#) [Section 6, "Electric Metering: Residential;"](#) and [Section 7, "Electric Metering: Nonresidential, Industrial, and Agricultural"](#) (as applicable). For available short-circuit current information and requirements, see [Subsection 5.7.2., "Main Service Disconnect Switch Rated for Amperes Interrupting Capacity \(AIC\)."](#) on Page 5-31.
3. The **required** maximum setback affects nonresidential customers only. The preferred maximum setback is for residential installations, but is not required.

4.3.2. Two or More Buildings on One Lot

If more than two dwellings or buildings are located on the same lot, applicants must consult PG&E to determine acceptable service attachments and meter locations **before** wiring the buildings.

Typically, PG&E installs only one service lateral to a single building on one premise, or to one enterprise (with either one building or multiple buildings) on a single premise. However, PG&E may provide more than one service lateral under the following circumstances:

- Where it is allowed or required by PG&E's tariff schedules
- For PG&E's convenience
- Where it is required by ordinance
- When it is installed as a special facility

4.4. Service Drop Clearances

NOTE: See [Table FM-1](#) starting on Page iv, for specific contact numbers listed by area.

Applicants can request a PG&E project coordinator to specify a location for service drop attachments. When PG&E selects the location, applicants are assured that the service conductors will maintain the required clearances above thoroughfares and structures, as well as the required clearances away from windows, doors, and building exits.

The minimum clearances from the ground, structures, and other objects for overhead service drops are specified in the California Public Utilities Commission's (CPUC's) [General Order \(G.O.\) 95, Rules for Overhead Electric Line Construction](#). Figure 4-2 through Figure 4-20 list and illustrate these minimum clearances.

Applicants must ensure that the elevation at the point of attachment is high enough to maintain all of the required vertical clearances. Applicants should allow for normal conductor sag when determining these vertical clearances.

[G.O. 95](#) allows the vertical clearance restrictions for service drops to be reduced in certain instances. PG&E's review and approval is required before any reductions in vertical clearances are allowed. **Applicants should contact PG&E as soon as possible in the planning phases of their projects to ensure that any potential problems or exceptions are addressed before construction begins.**

Requirements for installing and attaching PG&E overhead services may be different than local electrical codes.

4.4. (continued)

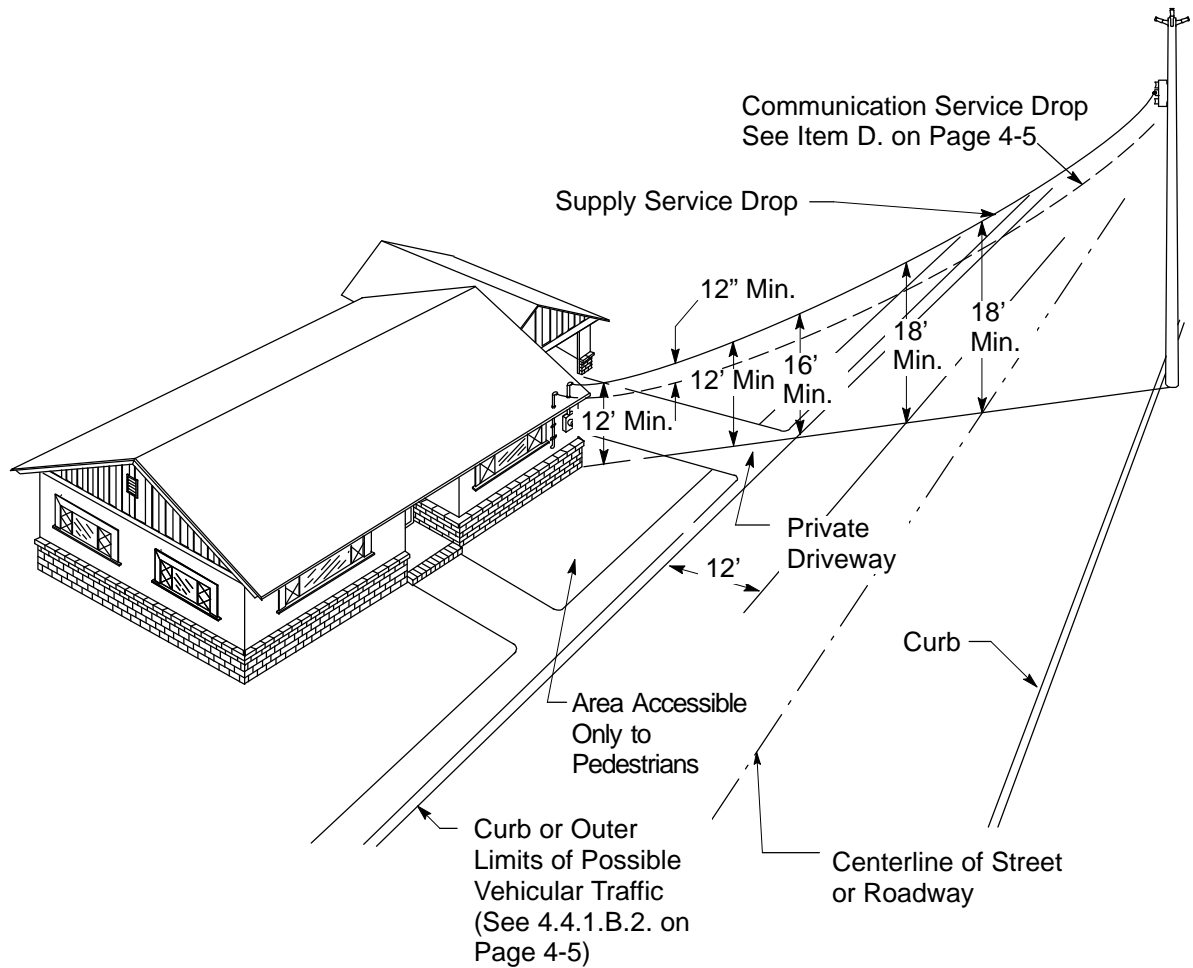


Figure 4-2
Ground Clearances for Supply Service Drops, 0 Volts Through 750 Volts, Residential Installations
(Required by the CPUC)

4.4.1. Vertical Clearance for Residential, Overhead Service

A. Clearance Above Rails

Applicants must ensure that the following clearances are maintained when requesting electric service be placed over train or trolley tracks.

1. Crossing above railroad tracks **without** overhead trolley wire: 25 feet
2. Crossing above railroad tracks **with** overhead trolley wire:
 - Above rails where freight cars are transported: 26 feet
 - Above rails where freight cars are not transported: 23 feet

4.4.1. (continued)

B. Clearance Above Thoroughfares in Public Areas and in Private Communities of 10 or More Residences

Applicants must ensure that the following clearances are maintained when requesting electric service be placed above thoroughfares in public and private communities with more than 10 residences.

1. Crossing above the center portion between points 12 feet horizontal from curbs: 18 feet
2. Crossing at the curb line (from the level of the street, not the sidewalk): 16 feet
3. Crossing where there are no curbs: applicants must consider the curb line as the outer limit of possible vehicular traffic: 16 feet

C. Clearance Over Residential Property

Applicants must ensure that the following clearances are maintained when requesting electric service be placed over residential property.

1. Crossing over private roads and other areas accessible to agricultural equipment: 15 feet
2. Crossing over agricultural equipment: maintain 16 feet, if possible
3. Crossing over private driveways or other areas accessible to vehicles: 12 feet
4. Crossing over areas accessible to pedestrians only: 12 feet

D. Clearance from Communication Service Drops

Applicants must ensure that the following clearances are maintained when requesting electric service be placed over communication service drops.

1. Normal radial clearance: a minimum of 24 inches.
2. Within 15 feet of the point of attachment on a building or structure: the normal radial clearance may be reduced to a minimum of 12 inches.

E. Clearance from Swimming Pools

Avoid installing utility service drops above public and private swimming pools, when practical.

The CPUC, not local agencies or codes, regulates, by its adoption of [G.O. 95](#), the installation and clearances of utility-owned, operated, and maintained supply lines and service drops. [G.O. 95](#) contains specific requirements for installing and maintaining utility supply-line and service-drop clearances above swimming pools. Figure 4-3, “Minimum Clearance for All Drops Above or Adjacent To Swimming Pools,” on Page 4-6, illustrates the minimum-permitted clearances mandated by [G.O. 95](#) where utility service drops are installed above swimming pools.

NOTE: Table 4-1, “Minimum Clearances Over Swimming Pools,” on Page 4-6, also provides clearance information for drops located either above or adjacent to swimming pools.

4.4.1. (continued)

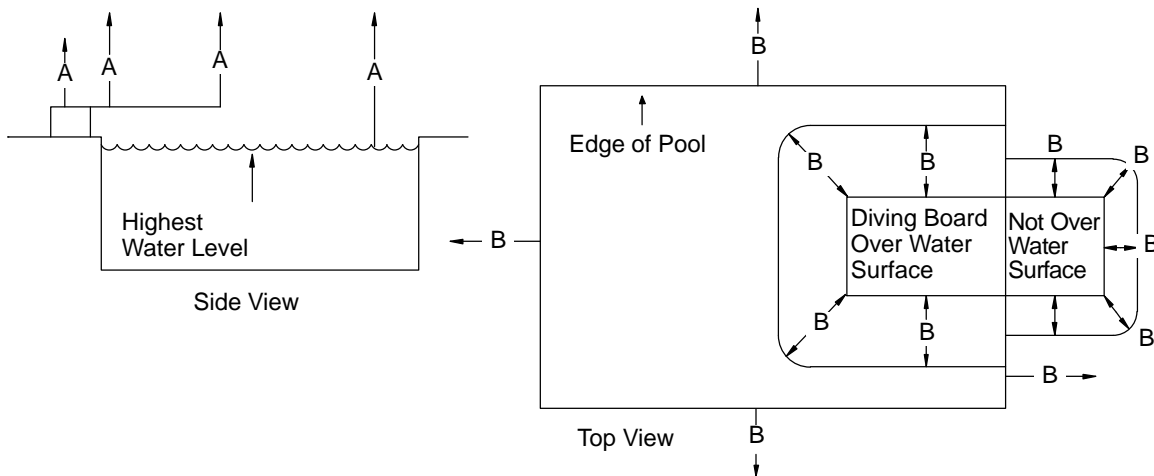


Figure 4-3
Minimum Clearance for All Drops Above or Adjacent To Swimming Pools

Table 4-1 Minimum Clearances Over Swimming Pools¹

Minimum Vertical and Radial Clearances	A Vertical	B Radial
	(In Feet)	
Unprotected Line Conductors-Vertical Over the Highest Water Level and Radial from the Top Edge of the Pool Walls:		
1. 0 through 750 volts	20	20
2. Above 750 volts through 22,500 volts	25	25
3. Above 22,500 volts through 300 kilovolts (kV)	30	30
Service Drops-Vertical Over the Highest Water Level and Radial from the Top Edge of the Pool Walls:		
4. Pools: public and nonresidential	16	16
5. Pools: residential	12	12
Service Drops (Over Diving Boards or Platforms):		
6. Portion of the board or platform that is over the water's surface	16	8
7. Portion of the board or platform that is not over the water's surface	12	3
Guys-Ungrounded Portions:		
8. Over the highest water level and from the top edge of the pool walls	18	18
9. Over the diving board or platform (the portion that is over the water's surface)	18	8
10. Over the diving board or platform (the portion that is not over the water's surface)	12	6
Guys-Grounded Portions:		
11. Over the highest water level	16	—
12. Over the diving board or platform (the portion that is over the water's surface)	16	8
13. Over the diving board or platform (the portion that is not over the water's surface)	8	3

¹ Clearance requirements may be different than local electrical codes.

4.4.2. Clearance Above Buildings

Table 4-2, “Minimum Allowable Clearance of Service Drops from Buildings–0 Volts Through 750 Volts,” below, lists the required clearances for buildings that are receiving electric service.

Table 4-2 Minimum Allowable Clearance of Insulated Service Drops from Buildings–0 Volts Through 750 Volts

	Minimum Clearance from Buildings Insulated Conductors (See Note 1) 0 Volts Through 750 Volts
Vertical Clearances Above:	
1. All portions of buildings including metallic or nonmetallic cornices, decorative appendages, eaves, roofs, or parapet walls of the building being served.	See Notes 2, 3, and 4
2. Metallic or nonmetallic, “nonwalkable” overhang, patio cover, or other structure.	See Notes 2 and 3
3. Other buildings on the same premises.	2 Feet
4. Buildings on other premises.	8 Feet (See Note 5)
Horizontal and Radial Clearances:	
1. From fire escapes, exits, windows, and doors.	3 Feet

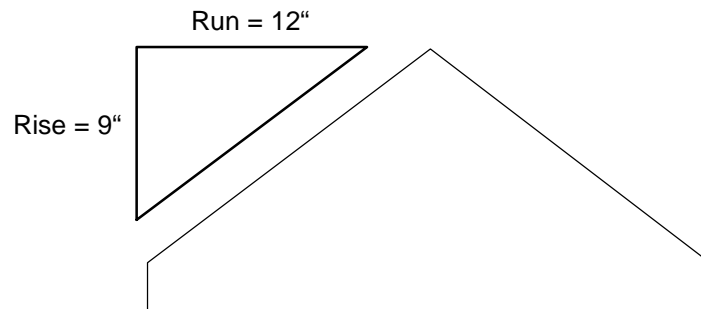
¹ Weather-resistant, covered conductors are **not** used in new installations. See [G.O. 95, Section V, “Detailed Construction Requirements for Supply Lines,” Rule 54.8, “Service Drops, 0–750 Volts,” Table 10, “Minimum Allowable Clearance of Service Drops of 0–750 Volts from Buildings,”](#) for insulated conductor clearances.

² Not less than 1/2 inch for residential services. Not less than 12 inches for nonresidential services as shown in Figure 4-13 through Figure 4-20 on Page 4-13.

³ An applicant must ensure that the service drop’s point of attachment for industrial and nonresidential premises is no more than 18 inches. Take this measurement from **behind** the front face of the building wall facing the pole line from which the service drop originates.

⁴ Clearance requirements may be different than local electrical codes.

⁵ Reduce to 2 feet for nonmetallic roofs when the roof slope exceeds 9 inches of rise per 12 inches of run. (See Figure 4-4, “Nonmetallic Roof,” below.)



**Figure 4-4
Nonmetallic Roof**

4.4.3. Clearance at the Residential Point of Attachment

PG&E recommends that applicants do **not** locate electric supply and communication services in the same vertical plane. Figure 4-11, one of the “Clearance at the Residential Point of Attachment” illustrations on Page 4-9, shows the recommended arrangement for the communication service drop.

- A. Typically, applicants the service drop is attached **below** the level of the service weatherhead; however, it may be attached **above** the service weatherhead, as shown in Figure 4-7 and Figure 4-9, both located on Page 4-9, if the two following situations exist.
 - 1. It is impractical to attach the service drop below the level of the service weatherhead.
 - 2. The service-drop conductor’s attachment point is located 24 inches or less from the service weatherhead.
- B. Applicants must ensure that the line length of the open wiring (i.e., drip loop) between the point of service attachment and service weatherhead does **not** exceed 3 feet.
- C. Applicants must ensure that the clearance requirements for the PG&E overhead service are met. These clearances may be greater than local electrical codes.
- D. PG&E will **not** attach services to periscope structures made of plastic.

Figure 4-5 through Figure 4-11, all representing “Clearance at the Residential Point of Attachment,” provide examples of clearances for overhead service-drop installations and terminations. These seven figures are located on Page 4-9.

NOTE: For overhead, temporary services, see [Numbered Document 025055, “Requirements for Customer-Owned Poles,”](#) in [Appendix C, “Electric and Gas Engineering Documents.”](#)

NOTE: Refer to [Numbered Document 094676, “Primary Electric Service Equipment,”](#) in [Appendix C,](#) for technical information on primary services.

4.4.3. (continued)

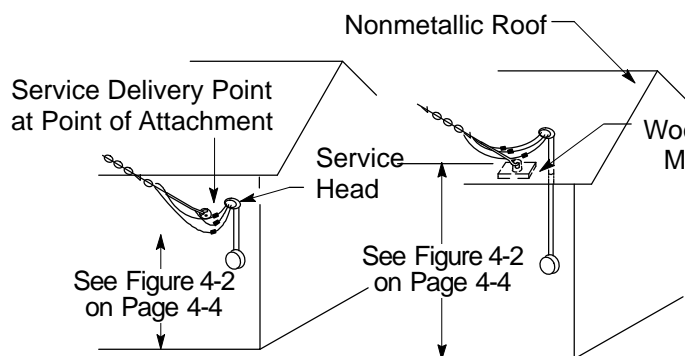


Figure 4-5

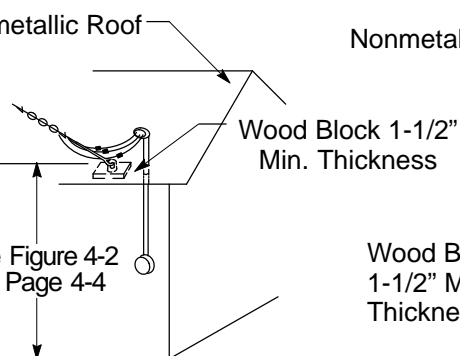


Figure 4-6

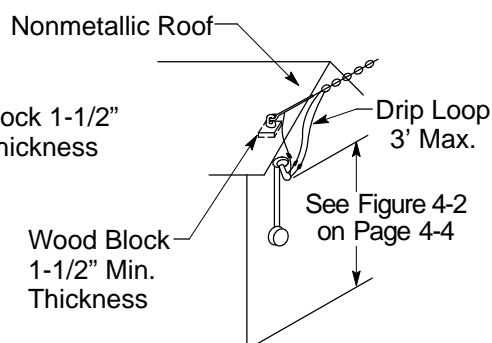


Figure 4-7

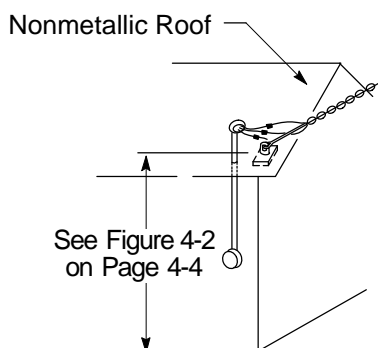


Figure 4-8

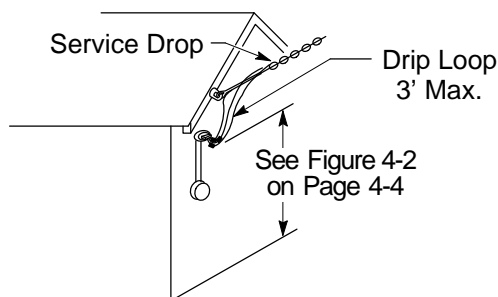


Figure 4-9

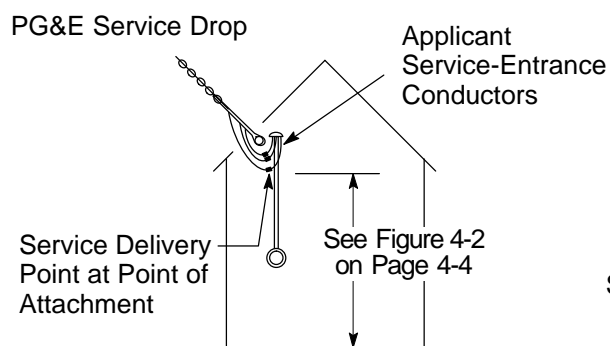


Figure 4-10

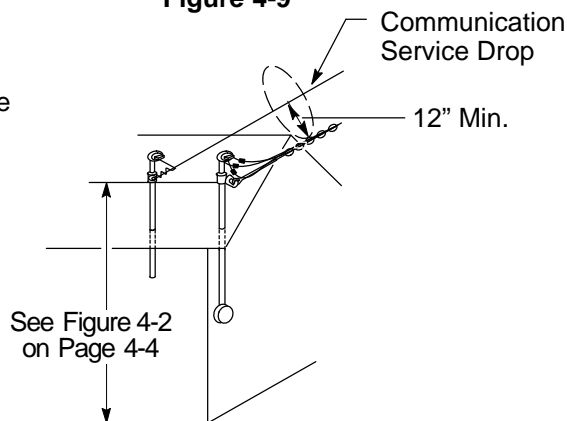


Figure 4-11

Clearance at the Residential Point of Attachment

4.4.4. Vertical Clearance on Nonresidential Property

Table 4-3, “Vertical Clearance from the Ground on Nonresidential Property,” located below, provides the minimum vertical distance (in feet) from the ground on nonresidential property.

Applicants must ensure that periscope attachment structures are constructed with one of the following, approved materials.

- 1-1/4-inch minimum, galvanized rigid steel (GRS) or intermediate metal conduit (IMC) rigid steel
- 2-inch minimum rigid aluminum conduit measured in iron pipe size (IPS) dimensions

PG&E will **not** attach a span to plastic periscope structures.

Periscope extensions projecting above the roof may require bracing against the pull of the service-drop conductors, as shown in Figure 4-39, “Unbraced Periscope Structure (Residential and Nonresidential),” on Page 4-23.

Typically, the service drop is attached **below** the level of the service weatherhead; however, it may be attached **above** the service weatherhead if **both** of the following situations exist.

- It is impractical to attach the service drop below the level of the service weatherhead.
- The attachment point on the service-drop conductors is located less than 24 inches from the service weatherhead.

Ensure the length of the open-wire drip loop does **not** exceed 3 feet.

PG&E connects the Company’s service conductor and an applicant’s service-entrance conductor **below** the service weatherhead.

Table 4-3 Vertical Clearance from the Ground on Nonresidential Property¹

Description	Minimum Vertical Distance (In Feet)
Over private driveways, lanes, and other areas (e.g., alleys and parking lots) accessible to vehicles.	16
Over areas accessible to pedestrians only.	12
Over buildings and bridges, or over structures (attached or unattached) that do not ordinarily support conductors and on which people can walk.	8

¹ Clearance requirements may be different than local electrical codes.

A. Clearance from Communication Service Drops

Applicants must ensure that the following clearances are maintained when requesting electric service to be placed over communication service drops.

1. Normal radial clearance: a minimum of 24 inches.
2. Within 15 feet of the point of attachment on a building or structure: the normal radial clearances may be reduced to a minimum of 12 inches.

4.4.4. (continued)

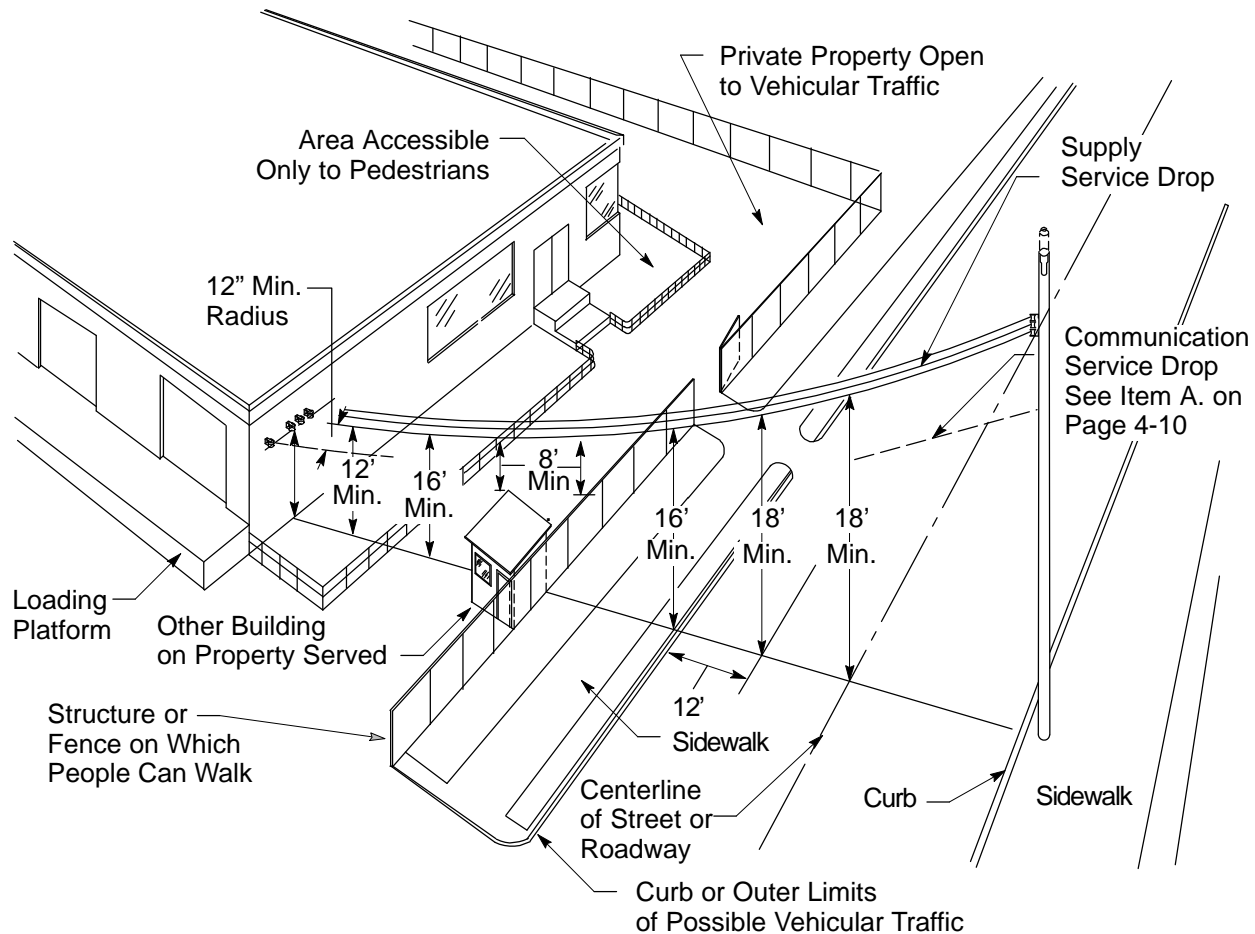


Figure 4-12
Ground Clearances for Supply Service Drops, 0 Volts Through 750 Volts,
Industrial and Nonresidential Installations (Required by the CPUC)

Figure 4-13 through Figure 4-20, all representing “Clearances for Nonresidential Buildings Using Insulated Conductors” and all located on Page 4-13, show overhead service drops and vertical-clearances, as measured from the ground, for nonresidential and industrial installations and large residential buildings.

4.4.5. Clearances for a Nonresidential Building Service Drop Using Cable or Equally Insulated, Open-Wire Service Conductors

Applicants can use the clearances shown in Figure 4-13 through Figure 4-20 only when they use Type N-SD service-drop cable, or equally insulated cable, open-wire service conductors. Applicants must **not** use weatherproof-rated conductors.

Figure 4-12, “Ground Clearances for Supply Service Drops, 0 Volts Through 750 Volts, Industrial and Nonresidential Installations (Required by the CPUC),” located above, provides the required clearances from a service drop to the ground.

4.4.5. (continued)

Figure 4-21, “Clearance Around Windows,” and Figure 4-22, “Clearance Around Doors,” both located on Page 4-14, provide applicants with the required clearances from fire escapes, exits, windows, doors, and other locations where people could be present.

Applicants must use a 1-1/4-inch minimum GRS or IMC rigid steel, or 2-inch minimum rigid aluminum conduit (IPS dimensions) for all periscope attachment structures. See Figure 4-13, Figure 4-14, Figure 4-15, Figure 4-19, and Figure 4-20, all representing “Clearances for Nonresidential Buildings Using Insulated Conductors,” on Page 4-13, for examples.

The clearances shown in Figure 4-13 through Figure 4-20 only apply to insulated services, up to a 750-volt maximum, over nonmetallic roofs or decorative appendages. Applicants also should refer to the service-entrance, conductor-clearance requirements found in the *State Building Standards Electrical Code*.

The special 24-inch minimum clearance, illustrated in Figure 4-20, is applicable only to service-drop cable.

Either brace the periscope attachment structures as shown, or ensure that the structures are supported using similar, acceptable methods. For more information on bracing periscope attachment structures, see Figure 4-34 and Figure 4-35, both representing “Service to Nonresidential Premises,” and both on Page 4-18. Also, see Figure 4-38, “Braced Periscope Attachment Structure,” on Page 4-20, and Table 4-5, “Maximum Mast Height Above the Roof *Without* Bracing,” on Page 4-23.

4.4.5. (continued)

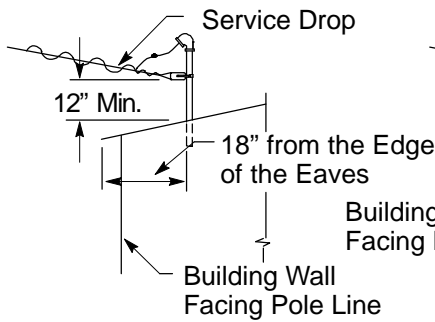


Figure 4-13

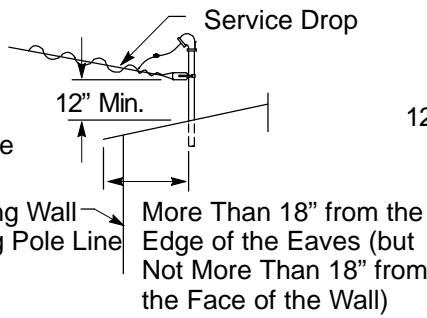


Figure 4-14

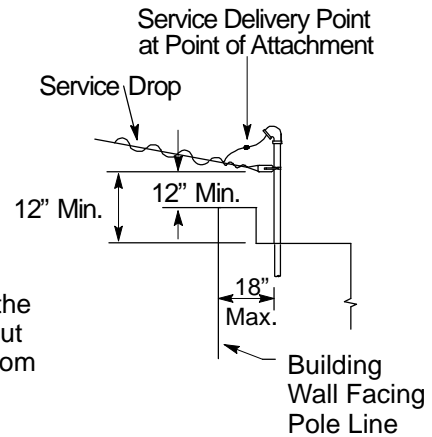


Figure 4-15

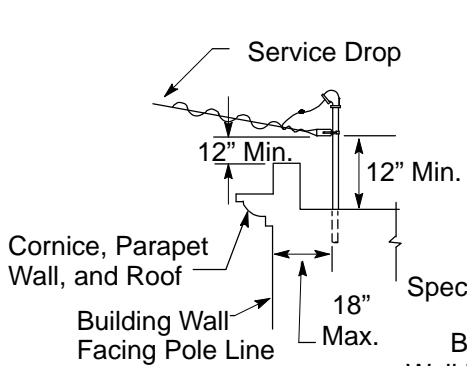


Figure 4-16

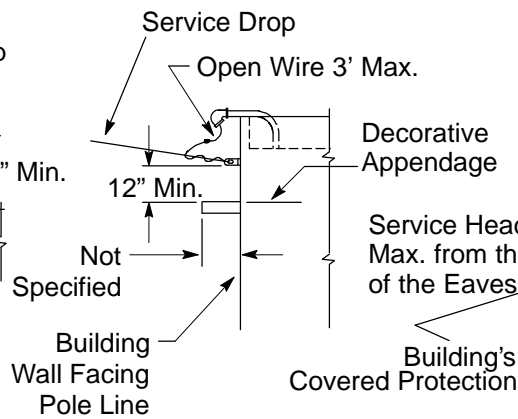


Figure 4-17

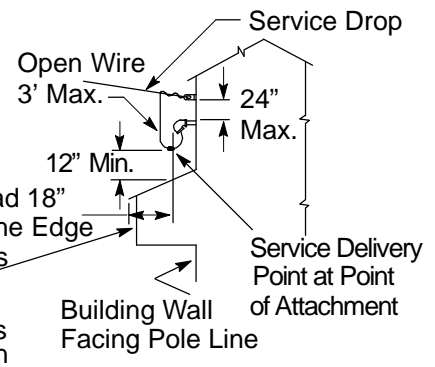


Figure 4-18

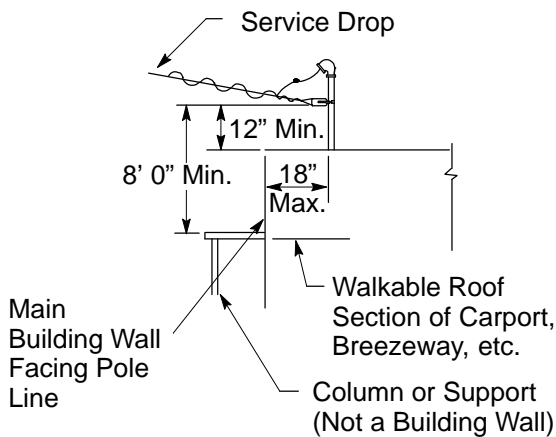


Figure 4-19

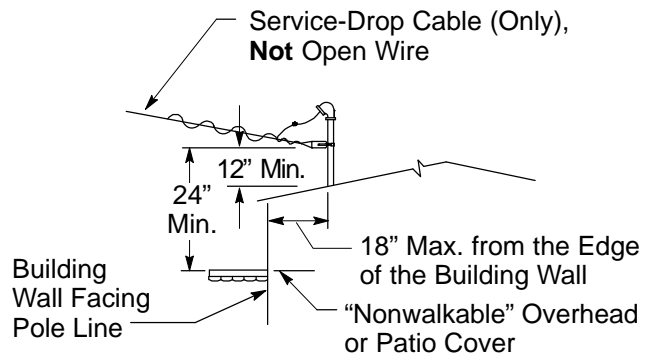


Figure 4-20

Clearances for Nonresidential Buildings Using Insulated Conductors (0 Volts–750 Volts)

4.4.6. Clearances Around Doors and Windows

Service drops are not required to clear **buildings** by any specified horizontal distance; however, applicants must ensure that the service weatherhead, the service drop, and the open wires between the service weatherhead and the service drop maintain the following clearances from fire escapes, balconies, stairways, exits, doors, windows, and other locations where people could be present.

- A. Wires that are either at or below the level of the top of exits, doors, windows, and other openings **must** have a radial clearance from the boundaries of such openings of not less than 3 feet, as shown in Figure 4-21 below.
- B. Wires less than 8 feet above, or 3 feet below, the surface levels of fire escapes, balconies, porches, stairways, and walkways **must** have a minimum horizontal clearance of at least 3 feet from such surfaces, as shown in Figure 4-22 below.

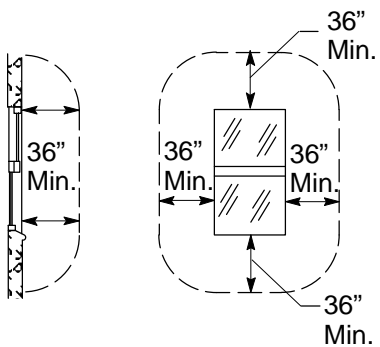


Figure 4-21
Clearance Around Windows

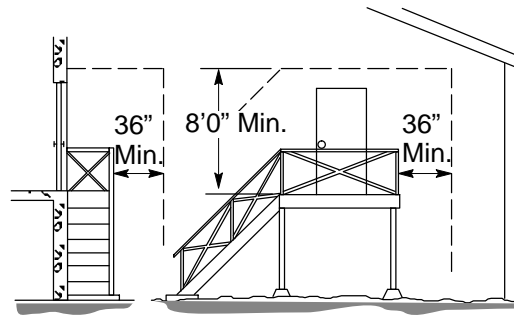


Figure 4-22
Clearance Around Doors

4.4.7. Clearance Between Service Drop Wires

The minimum-allowable radial clearance between service drop sites (i.e., 0 volts through 750 volts) in the span from the pole to the building, and a point of attachment to the building, is 3 inches. Applicants must ensure that wire supports at the building are spaced 8 inches apart, where practical.

4.4.8. Clearance from Applicant-Owned Service Poles

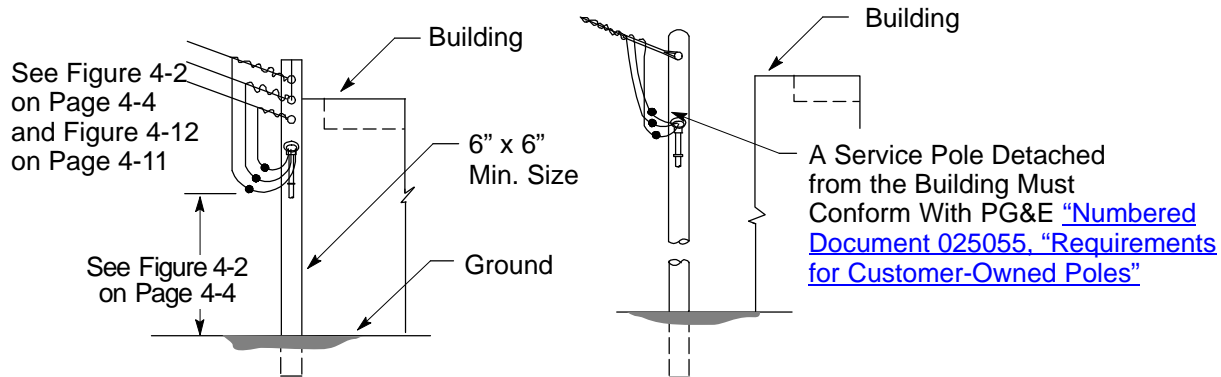


Figure 4-23
Service Attachment Structure or
Service Pole Secured to a Building

Figure 4-24
Service Pole Detached
from a Building

4.5. Service Attachments

Applicants must ensure that utility service drops (i.e., 0 volts through 750 volts) are **not** attached directly to metal roofs.

4.5.1. Attaching Low-Voltage, Residential, Overhead Service Drops

Applicants must ensure that the service drop's point of attachment to the building is high enough to provide the minimum legal clearances shown in Figure 4-2 on Page 4-4.

Subsection 4.6., "Attachment Structures (Periscopes)," on Page 4-21, provides information on installing and using periscopes as attachment structures.

Whenever practical, attach the service drops below the level of the service weatherhead, as shown in Figure 4-29, "Cable (Single Spool)," and Figure 4-30, "Open Wire or Cable (Cable Shown)," both of which are on Page 4-16, and Figure 4-39, "Unbraced Periscope Structure (Residential and Nonresidential)," on Page 4-23.

In all installations, PG&E connects to the applicant's service-entrance conductor **below** the level of the service weatherhead. Drip loops are included at the entrance of each conductor to the service weatherhead. These drip loops prevent moisture from penetrating the installations.

The standard service attachments shown in Figure 4-25 through Figure 4-30, all representing "0-Volt Through 300-Volt Service at Residential Premises," on Page 4-16, are designed according to the CPUC's *State Building Standards Electrical Regulations* to California electrical code and to PG&E requirements. Local authorities may have additional requirements.

4.5.1. (continued)

NOTE: PG&E will attach a service knob to a stud (e.g., 2 inch x 4 inch) or rafter, if possible. PG&E will **not** mount the service knob directly to the roof or attach it to corner trim or roof trim without a 2-inch x 4-inch stud or larger. Figure 4-36, “Building Attachment–Service Knob,” Detail A, on Page 4-20, provides the requirements for attaching service knobs.

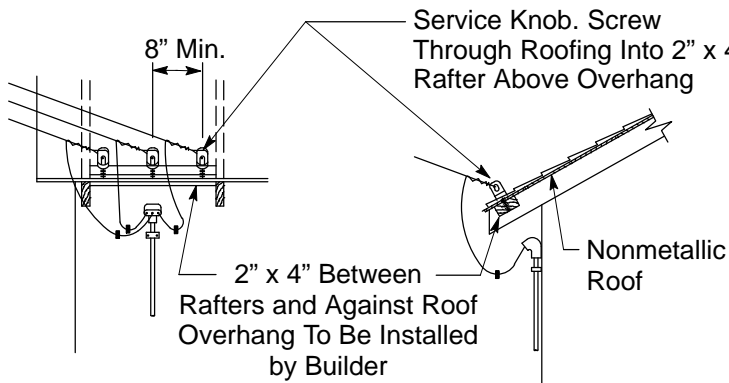


Figure 4-25
Open Wire

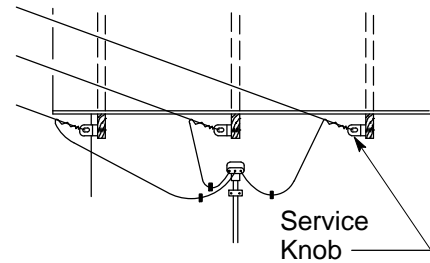


Figure 4-26
Open Wire or Cable
(Open Wire Shown)

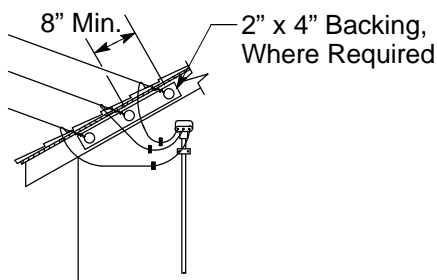


Figure 4-27
Open Wire or Cable (Open Wire Shown)

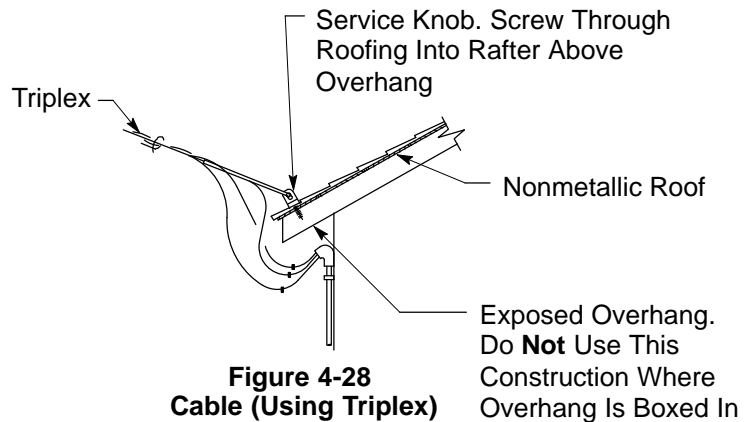


Figure 4-28
Cable (Using Triplex)

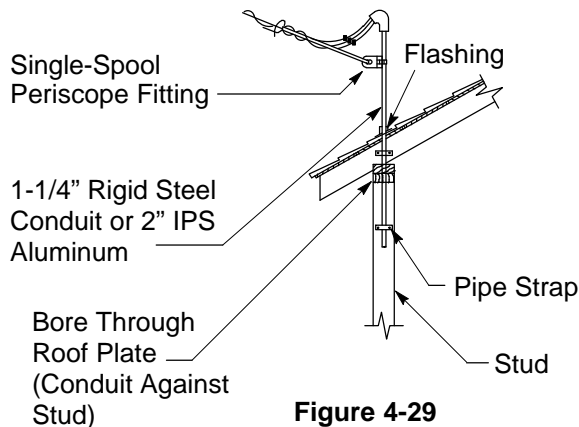


Figure 4-29
Cable (Single Spool)

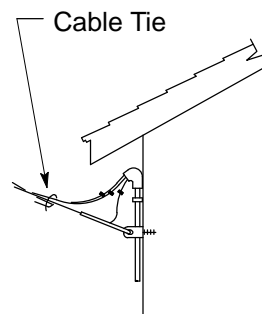


Figure 4-30
Open Wire or Cable
(Cable Shown)

0-Volt Through 300-Volt Service at Residential Premises

4.5.2. Attaching Low-Voltage, Nonresidential, Overhead Service Drops

When applicants plan to install service-entrance wiring larger than that shown in Figure 4-31 through Figure 4-34, all representing “Service to Nonresidential Premises” and on Page 4-18, they must consult PG&E **before** they begin construction to obtain instructions on attaching the wiring properly.

Figure 4-31, “Service Drop Cable, 4/0 and Smaller, Triplex or Quadruplex,” shows applicants how to attach the wiring using service knobs in either concrete or masonry walls. Service knobs must be screwed into wood-frame walls.

Figure 4-32, “New Wall, 1/0 kcmil to 397.5 kcmil Aluminum,” shows applicants how to attach the wires using insulated clevises on concrete walls. For wood-frame walls or masonry walls (e.g., brick, hollow tile, cinder block), applicants must bolt the attachments through the wall. Where service is attached to masonry walls, applicants must install bracing or attachment structures.

When it is practical to do so, applicants must attach service drops **below** the level of the service weatherhead.

PG&E furnishes the bolts and insulators needed to secure the service drop to the building or attachment structures. Applicants can attach the service drop to the walls or to periscope structures either horizontally or vertically.

The wire sizes shown in Figure 4-31 through Figure 4-35 refer to service drops, not to service-entrance wires.

Open wiring, or drip loop, installed between the service drop attachment and the service weatherhead, must **not** exceed 3 feet.

Applicants must install periscope structures as illustrated in Figure 4-39 on Page 4-23. See Subsection 4.6. on Page 4-21 for additional information on installing periscopes and using periscopes as attachment structures.

4.5.2. (continued)

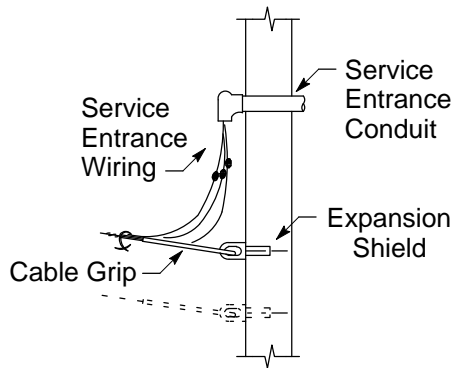


Figure 4-31
Service Drop Cable, 4/0 and Smaller,
Triplex or Quadruplex

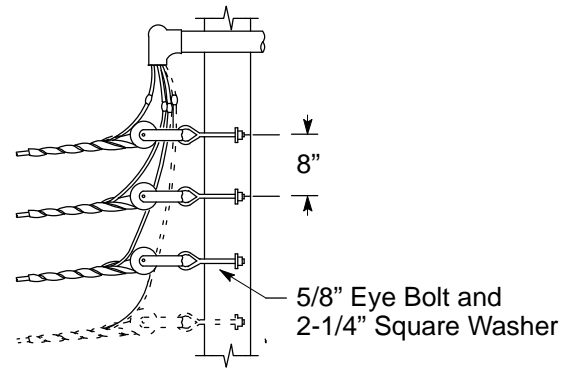


Figure 4-32
New Wall, 1/0 kcmil¹ to 397.5 kcmil Aluminum

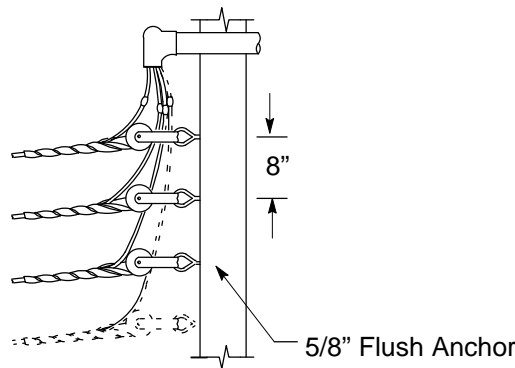


Figure 4-33
New or Existing Wall, 1/0 kcmil¹ to 397.5 kcmil Aluminum

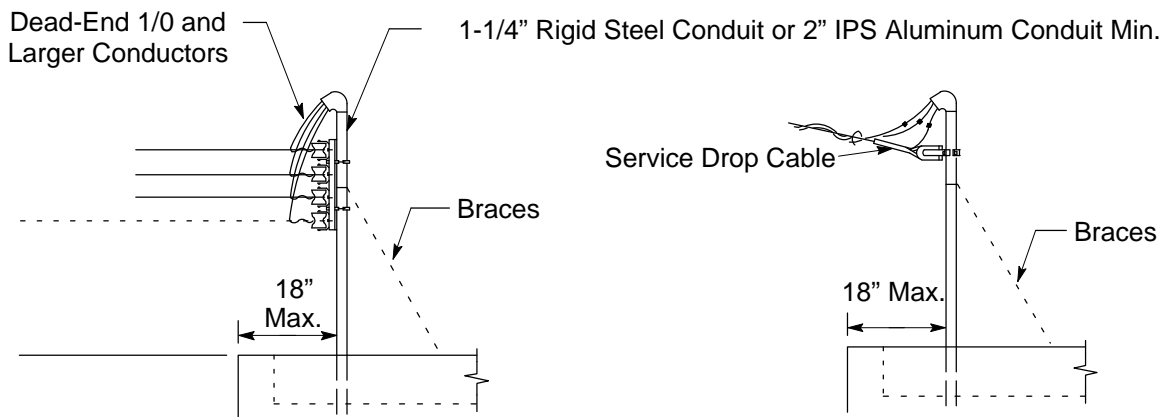


Figure 4-34
Open Wire Service, #4 to 397.5 kcmil¹ Aluminum

Figure 4-35
Service Drop Cable

Service to Nonresidential Premises

Note in reference to Figure 4-32, Figure 4-33, and Figure 4-34.

1. kcmil: a thousand circular mils

4.5.3. Special Service Attachment Requirements: Areas Subject to Heavy Snow Loading

The following special requirements apply to service drops installed in snow-loading areas. PG&E has designed these requirements to minimize storm damage.

- A. Applicants must ensure that the span length of triplex or quadruplex service drop cable used in snow-loading areas is 125 feet or less.
- B. Applicants should locate the service weatherhead as high as practical to keep the weatherhead clear of deep snow.
- C. Applicants should try to attach service drops to house gables, where practical. This type of attachment protects the service and meter equipment from being impacted by snow and ice as it slides off the roof.
- D. PG&E will attach a service knob to a stud, if possible. PG&E will **not** mount the service knob directly to the roof or attach it to corner trim or roof trim. Figure 4-36, “Building Attachment – Service Knob,” Detail A, on Page 4-20, provides the requirements for attaching service knobs.
- E. Applicants should install a self-supported, periscope attachment structure according to the requirements specified in Subsection 4.6. on Page 4-21 and Table 4-4, “Maximum Distance ‘L’ (Inches from the Service Attachment to the Top Periscope Support),” on Page 4-20.

Typically, periscope attachment structures that are installed as specified in Subsection 4.6. and Table 4-5, “Maximum Mast Height Above the Roof *Without* Bracing,” on Page 4-23, provide a sufficiently rigid service-drop support to withstand the expected snow loading. In areas above 3,000 feet, use the construction methods shown in Figure 4-36, where practical.

4.5.3. (continued)

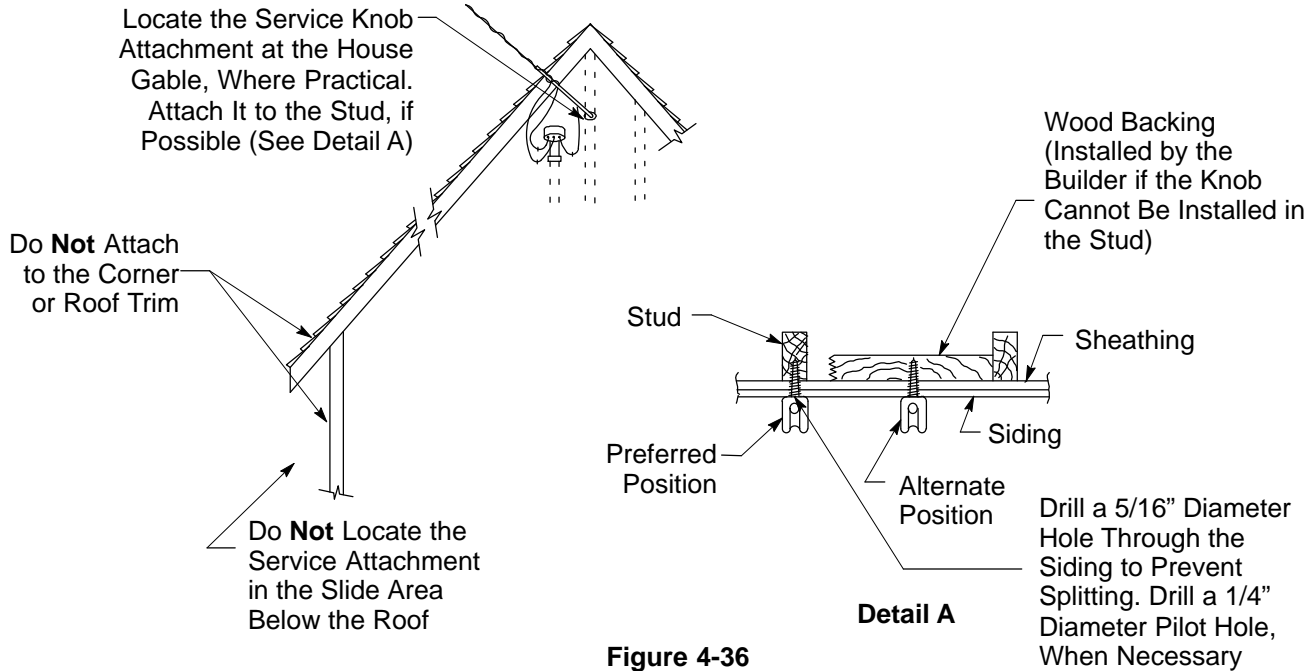


Figure 4-36
Building Attachment–Service Knob

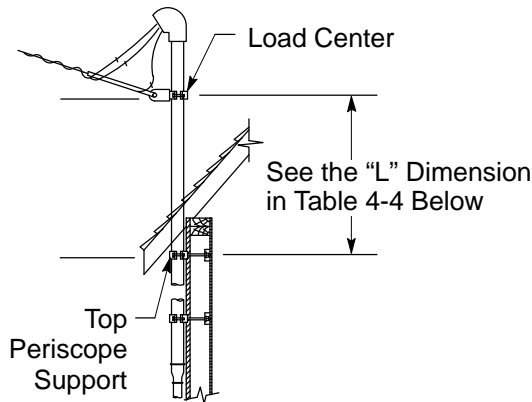


Figure 4-37
Self-Supported Periscope Attachment Structure

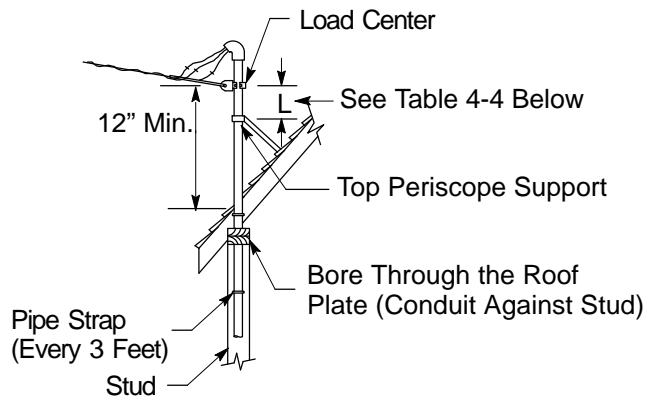


Figure 4-38
Braced Periscope Attachment Structure

Table 4-4 Maximum Distance “L” (Inches from the Service Attachment to the Top Periscope Support)

Type of Service Periscope	IPS Size of Service Periscope (In Inches)					
	1-1/4 ³	1-1/2 ³	2 ³	2-1/2	3	4
GRS ¹ or IMC ²	5	7	11	22	36	57
Aluminum	Not Permitted		4	9 ³	14	26

¹ GRS: galvanized rigid steel

² IMC: intermediate metal conduit

³ Brace the periscope as shown in Figure 4-38 to maintain a sufficient clearance over the roof.

4.6. Attachment Structures (Periscopes)

An attachment structure is a support that connects the service drop to the structure while maintaining the clearances required for the service drop. Applicants must ensure that the service drop maintains the required clearance at its point of attachment to the periscope, mast, or other attachment structure. These clearances are mandated by the CPUC's [G.O. 95](#).

PG&E will connect service drops to attachment structures in either one of two ways.

- A. Connect by using either spools or insulators that are installed on a building.
- B. Connect by using a single mast constructed of one of the following galvanized rigid pipe or conduit materials.
 - Steel
 - Intermediate metal
 - Aluminum

Applicants using Method A must only install a single (one) mast and weatherhead from the electric service termination and metering equipment to the service drop location. Applicants using Method B must only install a single (one) mast, periscope, and weatherhead from the electric service termination and metering equipment to the service drop location. Installing more than one attachment structure is prohibited.

To provide structural support for periscopes, applicants should use a heavy-duty, 2-hole pipe strap every 3 feet, secured by 3/8-inch x 3-inch lag screws (minimum size). Structural support is required at the location shown in Figure 4-39, “Unbraced Periscope Structure (Residential and Nonresidential),” on Page 4-23.

When applicants must install attachment structures to maintain the required clearances, they must contact PG&E for approval **before** constructing the structures. PG&E must ensure that attachment structures meet all of the applicable legal requirements.

Applicants must install and maintain these attachment structures at their expense.

The attachment structures must be strong enough to support the service drop wires and service attachments. Applicants may use a single (one) service-entrance conduit as the attachment structure. In this case, the periscope must be a minimum 1-1/4-inch GRS conduit or IMC, or 2-inch IPS rigid aluminum conduit.

Applicants may **not** use plastic conduit as an attachment structure.

Subsection 4.5.3., “Special Service Attachment Requirements: Areas Subject to Heavy Snow Loading,” on Page 4-19, provides applicants with additional requirements when using attachment structures in snow-loading areas.

When applicants use attachment structures, either on exterior walls or on roof structures, they must ensure the attachment structures provide the required clearances. Additionally, applicants must ensure that buildings are constructed or reinforced to support the weight of the attachment structure and fitting. Buildings must be able to withstand the pull of the service wires. Applicants must furnish all of the materials required to install the attachment structures **except** the racks, bolts, and insulators needed to secure the service wires. PG&E supplies those parts.

4.6. (continued)

Attachment structures typically must be installed directly above the service termination and metering equipment, vertically upward to the weatherhead location. The service entrance mast (conduit) should not be installed in either a diagonal or horizontal position unless approved by PG&E. For existing installations where the meter panel is being replaced and relocated away from the gas facilities, or to achieve the minimum-required working space, the mast may be installed horizontally to be able to run back to the existing weatherhead location if it is not changing. Refer to [Section 2, “Gas Service,” Figure 2-19, “Electric and Gas Meter Set Separation Dimensions and Clearances,”](#) on Page 2-33, for gas clearance requirements. Any horizontal run of mast (conduit) should not exceed 10 feet and must not be installed on top of the roof. If a new attachment structure is installed, it should be directly above the new service termination and metering equipment.

Applicants may **not** attach communications conductors, such as those used for telephone or cable television service, to the electric supply’s power-service mast or attachment structure. Applicants can attach **only** electric-utility, power-supply, service-drop conductors to the electric-supply, power-service masts or attachment structures.

If a new meter panel is planned to be installed next to an existing meter panel and connected to the same overhead service, applicants may not install additional masts and weatherhead and are required to install a sealable gutter in conjunction with a single mast.

4.6.1. Periscope Clearances and Bracing Requirements

Applicants must ensure that periscopes and raceway-type service masts extend a maximum of 78 inches and at least 12 inches above any roof or eave they may penetrate. Applicants may be required to raise periscopes and raceway-type service masts when using them as attachment structures and/or to obtain the appropriate clearances for service drop conductors. For more information, see Figure 4-13 through Figure 4-16, all on Page 4-13. Also, see Figure 4-34, “Open Wire Service, #4 to 397.5 kcmil Aluminum,” and Figure 4-35, “Service Drop Cable,” on Page 4-18. Finally, see Figure 4-36 through Figure 4-38 on Page 4-20.

Applicants may have to brace periscopes that project above the roof lines, as shown in Figure 4-39 and Table 4-5. An acceptable method of bracing is illustrated in Figure 4-34 and Figure 4-35. Table 4-5 lists the maximum periscope heights that applicants can install **without bracing** for different types of conduit.

The periscope (i.e., mast) height without bracing is limited to 30 inches above the roof in either of the following two locations.

- **Where the service drop is installed through trees**
- **Where trees or tree branches may strike or cause unplanned loading on the service drop.**

Applicants must ensure that unbraced periscopes projecting above roofs or eaves are continuous **without couplings** from the point where the utility service drop is attached to the periscope to 30 inches below the roof or eave.

4.6.1. (continued)

When the periscope structure requires support above the roof, applicants must ensure that it is braced, **not guyed**, as shown in Figure 4-38. The brace must be located as described in Table 4-4. When applicants need to brace periscope structures, the bracing must consist of two galvanized steel members installed at an approximate 90° spread. Braces must consist of a minimum 3/4-inch galvanized steel pipe or 1-1/4-inch x 1-1/4-inch x 1/8-inch galvanized steel angles.

Table 4-5 Maximum Mast Height Above the Roof *Without* Bracing¹

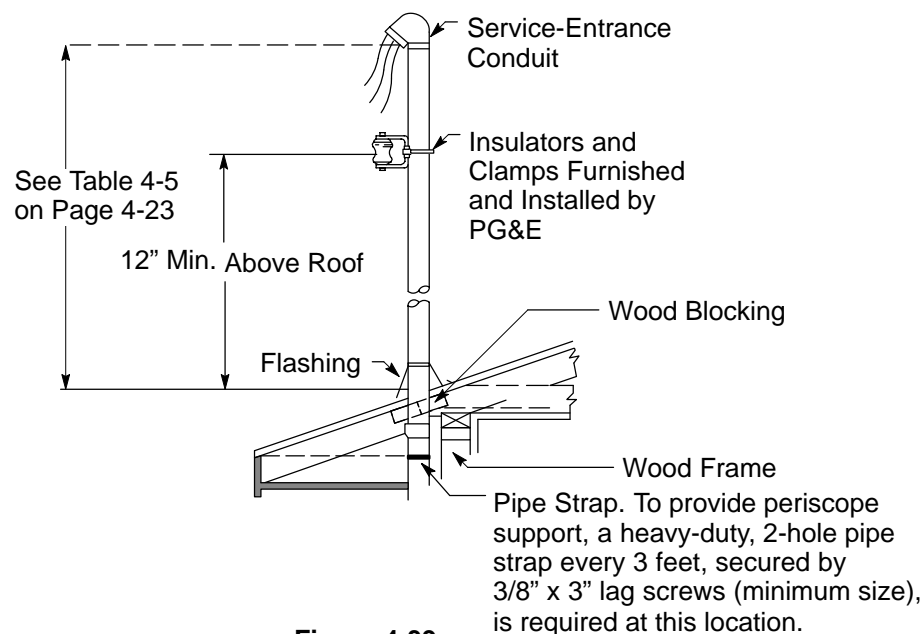
(IPS) Conduit Size		Maximum Height <i>Without</i> Bracing ⁴
GRS ² or IMC ³	Aluminum	
All Measurements in Inches		
1-1/4	2	42
1-1/2	2-1/2	42
2	3	54
Larger	Larger	78

¹ See Subsection 4.5.3. on Page 4-19 for snow-loading area requirements.

² GRS: galvanized rigid steel

³ IMC: intermediate metal conduit

⁴ Periscope height, without bracing, is limited to 30 inches above the roof if the service drop is installed through trees or if tree branches may strike or cause loading on the service drop.



**Figure 4-39
Unbraced Periscope Structure (Residential and Nonresidential)**

4.7. Service Weatherheads

Typically, applicants should **not** locate the service weatherhead on exterior walls that are less than 2 feet from a common property line. The service weatherhead should be higher than the point of service attachment.

Applicable California state laws require applicants to locate the service weatherhead so that they maintain the minimum clearances specified in Subsection 4.4., “Service Drop Clearances,” on Page 4-3, through Subsection 4.5., “Service Attachments,” on Page 4-15. These minimum clearances also apply to the service drop and the open sites between the service weatherhead and the service drop’s point of attachment.

In some instances, applicants may need to install the service weatherhead and related open wires at an elevation greater than the minimum required clearances. Adding the extra height ensures that the installed service drops maintain the required clearances above the ground and any affected structures. Also, the required clearances may be greater than local electrical codes.

A **service weatherhead** must be located **above** the service-drop conductor’s point of attachment; however, the **service-drop attachment** may be located **above** the service weatherhead if **both** of the following conditions are met.

- A. If it is impractical to attach the service drop below the level of the service weatherhead.
- B. If the attachment point on the service-drop conductor is located less than 24 inches from the service weatherhead.

Ensure that the length of the open-wire drip loop does **not** exceed 3 feet.

4.8. Service-Entrance Conductors

Applicants must furnish, install, and maintain the service-entrance wiring and service equipment beyond the point where it attaches to PG&E’s overhead service drop.

PG&E will only connect to one set (run) of service-entrance conductors exiting the mast and weatherhead. Therefore, applicants must only install one set of conductors in the service conduit. One set or run is a maximum of three conductors for single-phase and four conductors for three-phase services.

The type and size of service-entrance wires must conform to applicable legal requirements and must be approved service-entrance cable. If applicants use an approved service-entrance cable, they must ensure that the service-entrance wires are enclosed either in a single (one) continuous metallic tubing or in rigid conduit of a type and size to conform to applicable requirements, but preferably 1-1/4 inches or more.

NOTE: On periscope-type installations, use a minimum 1-1/4-inch GRS or IMC, or 2-inch IPS, rigid aluminum conduit. It is prohibited to install more than one conduit (mast), periscope, and weatherhead for service-entrance conductors.

4.8. (continued)

If applicants use SE-type service-entrance cables between the service weatherhead and meters, they must ensure that the SE-type cables are **not** concealed. Also, applicants must ensure that service entrances are rain tight by using approved fittings.

In residential and small nonresidential installations, applicants may install short-radius conduit fittings (i.e., LBs, service elbows) in the overhead, service-entrance conduit system.

Because this conduit system penetrates the outer building wall, applicants must install the short-radius conduit fittings with covers that prevent water from penetrating the fittings. The covers also must be sealable by PG&E personnel.

NOTE: Short-radius conduit fittings should **not** contain splices or taps.

The drip loop is the length of exposed wire between the service weatherhead and the service drop. Applicants must **not** use more than 3 feet of exposed, open wiring to form the drip loop.

To create drip loops, an applicant should install a minimum 18 inches of service-entrance wiring that extends out from the service weatherhead. In cases where the service-entrance open conductors pass over a roof or firewall with a minimum clearance of 12 inches, applicants must provide enough wire for PG&E to connect to the service drop and to obtain the required 12-inch minimum clearance above the building.

PG&E connects the Company's service conductors and the applicants' service-entrance conductors below the weatherhead.

PG&E furnishes and installs connectors for joining the service-entrance conductors to the service drop. Drip loops must **not** extend around the corner of a building; however, the service weatherhead may be located on the same face of the building as the service-drop attachment. The service-entrance conduit or cable may be extended around the corner of the building to the meter and service switch.

Do **not** install conductors other than service-entrance conductors in the conduit leading to the meter.

4.9. Applicant-Owned, Installed, or Furnished Wood Poles

PG&E project coordinators will explain the requirements to ensure that applicants are familiar with the inspection process and requirements for installing and using the wood poles.

For poles that have a final height greater than 20 feet above ground level, the Federal Aviation Administration (FAA) may require the applicant to file a notice a minimum of 45 days before installing the pole. The FAA may issue a determination of hazard to air navigation and recommend actions to mitigate or eliminate the hazard. Please contact your PG&E project coordinator for additional information.

4.9. (continued)

After discussing or meeting with project coordinators and finalizing their installation plans, applicants must notify their local PG&E project coordinators **before setting** wood poles. It is critical that applicants who own, install, or furnish approved wood poles to which PG&E can attach equipment or facilities, or to which PG&E can furnish or supply permanent electric service, meet the requirements of [Numbered Document 025055](#), found in [Appendix C](#). After the applicant installs the pole(s) in the ground, PG&E field inspectors will approve the installation of poles that meet Company requirements.

PG&E field inspectors verify the following, specific requirements for applicant-furnished poles before approving their installation.

- A. The poles must be supplied and treated by a PG&E-approved supplier.
- B. The applicant must obtain and provide PG&E with a copy of a “Certificate of Treatment” from the pole supplier. That certificate must indicate that the pole was treated according to the requirements of both the American Wood Preserver’s Association and the American National Standards Institute (ANSI).
- C. Applicants must ensure that new poles are branded or tagged. This identification must be either 10 feet from the pole butt for poles less than 55 feet long or 14 feet from the pole butt for poles more than 55 feet long. The brand must include the following four identifiers.
 - The manufacturer’s name
 - The month and year the pole was treated
 - The wood species
 - The preservative used to treat the pole
- D. Poles greater than 40 feet long that will support PG&E primary facilities must be through-bored at the ground line.
- E. PG&E must inspect and approve used poles **before** they are reused (i.e., PG&E facilities are reinstalled on the poles). PG&E-owned poles that have been removed from service and will no longer be used by PG&E cannot be reused as customer-owned poles.

The PG&E field inspector must verify that the poles meet the dimensional and test requirements for reused poles. These requirements are described in [PG&E Procedure TD-2325P-01, “Inspecting, Reinforcing, and Reusing Wood Poles.”](#)

If installing **overhead temporary services**, refer to [Numbered Document 025055](#), found in [Appendix C](#).

4.10. Required Vegetation Clearances

The state of California requires electric utilities to keep electric lines (i.e., high-voltage lines) cleared of vegetation. All newly constructed distribution lines and existing lines must meet these requirements.

NOTE: PG&E may determine that the distribution line should be installed underground, or that trees should be removed, if the planned line extension does **not** meet or exceed the clearance requirements between existing trees and overhead electric lines. See new options for commercial agricultural orchards in Subsection 4.10.5. on Page 4-31.

4.10.1. General Requirements

When establishing new overhead services, and/or when building or remodeling structures near high-voltage lines, poles, or towers, applicants must research planting regulations and follow the rules established here.

NOTE: Applicants must consider safety and access for repairs when planting near an overhead electric service.

- A. Where required, applicants must establish clearances as described in [California Public Resource Code \(PRC\) Division 4, “Forests, Forestry and Range and Forage Lands,” Part 2, Chapter 3, Section 4292](#). PG&E can exempt applicants if the vegetation around power poles at the completed construction site will be well irrigated, low growing, and not highly flammable in perpetuity. In general, do **not** plant trees near power poles or towers.
- B. For electric **distribution**, low-voltage and high-voltage lines rated up to 60,000 volts, applicants must establish a 15-foot “low-growth” zone on both sides of all new lines. Applicants also must ensure that all branches with potential overhang within 4 feet of the conductors are trimmed.

Applicants must **not** plant trees under or within 15 feet of **distribution** power poles. Applicants should landscape with low-growth, fire-resistant plants, shrubs, and flowers in the zone under electric power lines. PG&E recommends planting shrubs and flowers in low-growth zones to ensure compliance. Figure 4-40, “Illustration of 15-Foot Clearance, Low-Growth Zone,” on Page 4-28, and Figure 4-41, “Grass and Shrubs Recommended Under Service Wires,” on Page 4-29, illustrate low-growth zones and show how the 15-foot clearance is measured from the center of the pole.

- C. For all electric **transmission**, high-voltage lines rated greater than 60,000 volts, applicants must **not** plant trees within the right-of-way easement of the **transmission** poles or towers. Applicants must follow a “no-growth” zone inside rights-of-way areas, including under the electric power lines. The zone outside the rights-of-way areas is a “low-growth” zone, tree-planting zone, and/or a shrub-and-flower planting zone. Figure 4-41, “Grass and Shrubs Recommended Under Transmission Wires,” on Page 4-29, illustrates a no-growth zone.

4.10.1. (continued)

- D. Applicants must ensure that a thorough inspection is made of proposed construction areas. Dead, dying, diseased, or hazard trees tall enough to fall into the proposed power lines must be removed. Hazard trees are defined as any tree having a structural defect that may cause the tree, or a portion of the tree, to fall either on someone or on something of value.

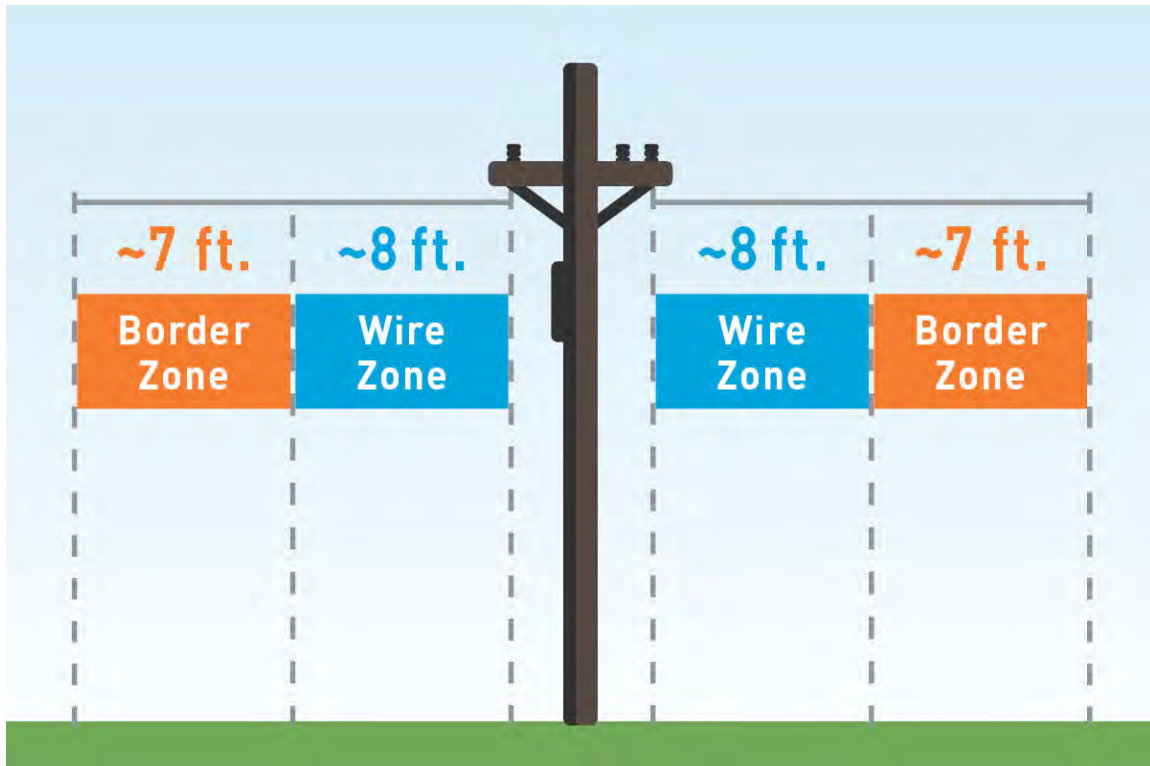


Figure 4-40
Illustration of a 15-Foot Clearance, Low-Growth Zone

4.10.1. (continued)

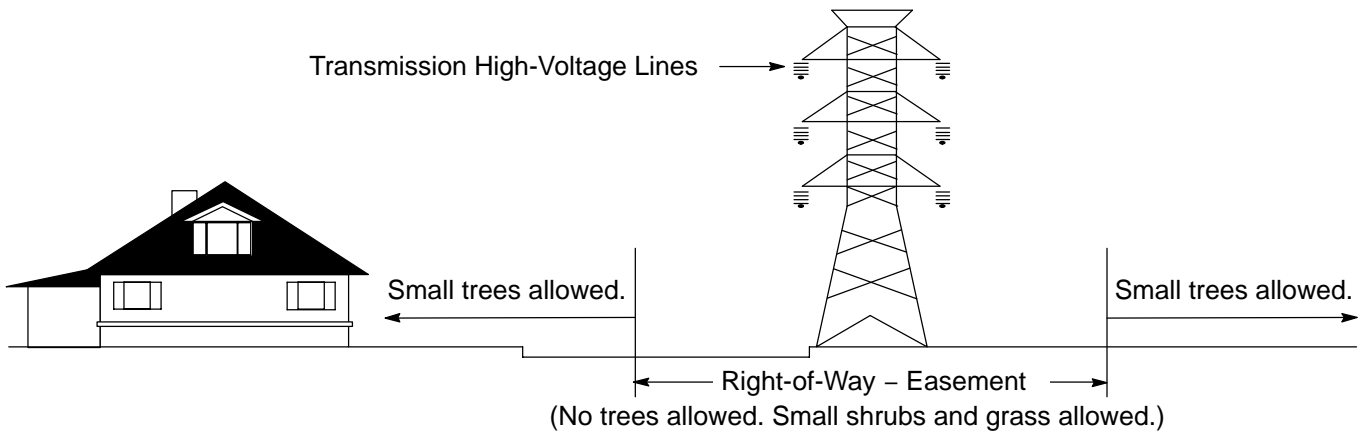


Figure 4-41
Grass and Shrubs Recommended Under Transmission Wires

- E. Applicants can contact PG&E’s vegetation management personnel to obtain more information about codes or regulations and to schedule field inspections for construction sites. Vegetation management personnel perform field inspections to identify clearance requirements or hazard trees.

4.10.2. Planning Requirements

When planning and routing, high-voltage, overhead electric lines, applicants must avoid areas with heavy tree growth. See the tree-planting matrix tables (Tables B-1 through B-7 starting on Page B-2) in [Appendix B, “Electric and Gas Service Documents.”](#) Building plans should indicate where overhead lines pass within the boundaries of the construction and landscape areas, as shown in Figure 4-40, “Illustration of a 15-Foot Clearance, Low-Growth Zone,” on Page 4-28, and Figure 4-42, “Alternative Routes to a House Showing High-Voltage Lines and Tree-Clearance Zones,” on Page 4-30.

4.10.2. (continued)

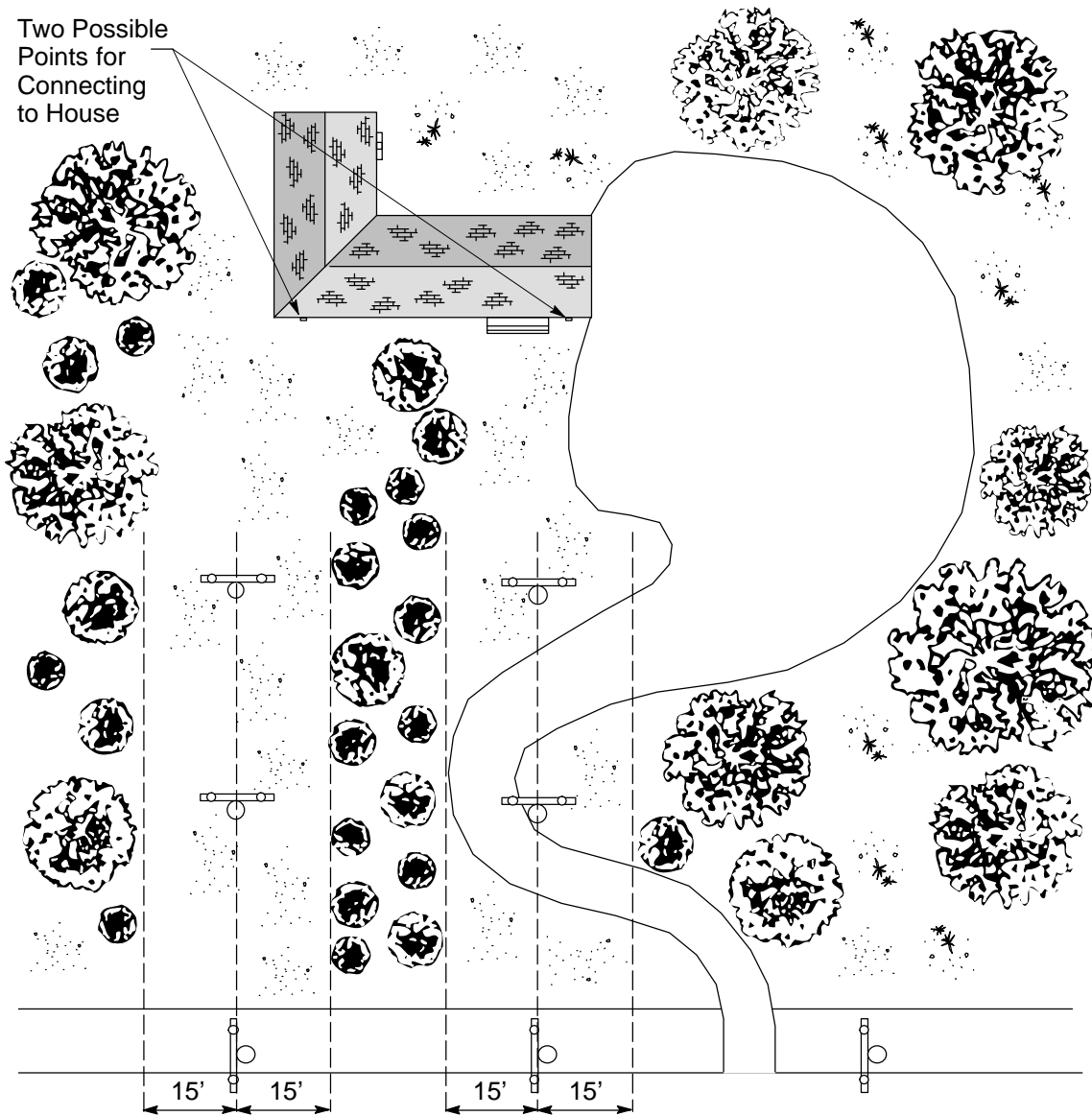


Figure 4-42
Alternative Routes to a House Showing High-Voltage Lines and Tree-Clearance Zones

4.10.3. Existing Overhead Lines Adjacent to Developments

Most new developments are designed to ensure that power lines are built underground. However, one or more sides of the construction area may be bordered by existing power lines. When planning landscape improvements, applicants must use only lower-growing, fire-resistant plant species under and near overhead electric lines.

4.10.4. Line Extensions

Line extensions must be constructed with a 15-foot clearance on either side of high-voltage power poles. This includes removing any overhanging branches. Applicants must clear the area from one end of the line extension to the final connection point before construction on the line extension begins.

Figure 4-42 on Page 4-30 illustrates an approved method for clearing affected areas. Also, any hazard trees identified during the PG&E inspection that are located outside of the 15-foot clearance zone on either side of the power poles should be removed before construction begins on the line extension. PG&E will **not** connect new lines to the existing distribution system until the applicant provides adequate clearance from the trees.

4.10.5. Primary Overhead Distribution Poles in Commercial Orchard Installations

Applicants must not plant trees under or adjacent to primary overhead distribution lines. When discovering any new tree plantings, PG&E reserves the right to remove those trees in order to protect its facilities.

Applicants must work with the PG&E project coordinator to choose a route for the overhead distribution facilities that does not conflict with the orchard trees and eliminates the need for future vegetation pruning.

When planting near overhead electrical service drops, applicants must consider both safety and access to the electric facilities when irrigation pumps and other electrical loads require repair.

4.10.6. Removing Vegetation Near Existing, High-Voltage, Energized Lines



CAUTION

Because safety is the Company's highest priority, the [California Occupational Safety and Health Administration \(Cal/OSHA\)](#) requires that all vehicles, equipment, tools, and people maintain a minimum 10-foot distance from all high-voltage power lines. Refer to [Section 1, "General," Table 1-2, "Minimum Safe Working Distances \(Scaffolds, Equipment, Tools, Structures, and People\),"](#) on Page 1-11, and [Table 1-3, "Minimum Safe Working Distances \(Boom-Type Lifting or Hoisting Equipment\),"](#) on Page 1-12, for the minimum safe working distances.

Applicants or unqualified tree-trimming contractors should **never** attempt to trim or remove trees that are within 10 feet of high-voltage power lines (i.e., conductors).

If it is necessary to trim or remove trees located within 10 feet of a high-voltage power line, applicants **must** notify PG&E at **1-800-743-5000**.

Generally, high-voltage power lines are any overhead lines that connect from pole to pole. These lines typically are 600 volts and greater. Post a "HIGH VOLTAGE" sign on the poles or crossarms, as shown in Figure 4-43, "High-Voltage Marker on Poles and Crossarms," on Page 4-32.

4.10.6. (continued)

However, applicants should contact PG&E for assistance if a line's voltage is unknown, and should **always assume that lines are high voltage**.

During PG&E's normal tree-trimming schedule, contractors qualified to perform high-voltage line clearances will prune or remove trees at no cost to applicants to create a safe distance between the vegetation and high-voltage power lines.

If it is necessary to trim a tree that is closer than 10 feet from an overhead power line **before** PG&E's normal tree-trimming schedule, applicants may hire a qualified tree company to perform high-voltage line clearances (i.e., prune trees to a safe distance away from the electric lines). **Again, unqualified companies/employees must never perform high-voltage line clearances.** Applicants can contact PG&E to obtain the tree-trimming schedules for their areas.

There are regulations and statutes that dictate the requirements for working around high-voltage power lines. The [California Occupational Safety and Health Administration \(Cal/OSHA\)](#) requires that persons working within certain distances of overhead power lines be qualified and trained properly. For details, see the *California Code of Regulations*, Title 8, Division 1, Chapter 4, Subchapter 5, Group 2, "High-Voltage Electrical Safety Orders," [Article 37, Provisions for Preventing Accidents Due to Proximity to Overhead Lines,](#) and [Article 38, "Line Clearance Tree Trimming Operations."](#)

In addition, the [California Penal Code](#) makes it a **crime for any person to work within 6 feet of a high-voltage power line**. For details and additional information about this misdemeanor, see the [California Penal Code, Part 1, "Of Crimes and Punishments," Title 10, "Of Crimes Against the Public Health and Safety," Section 385\(b\).](#)

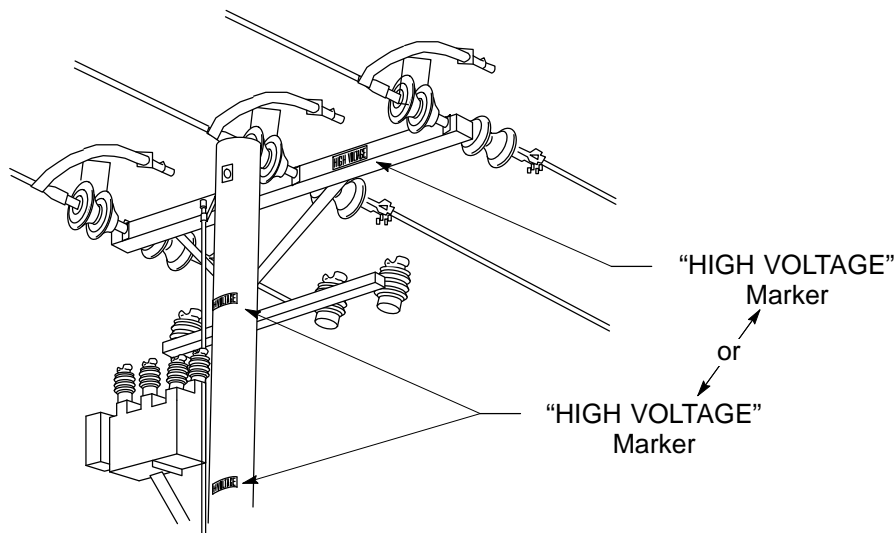


Figure 4-43
High-Voltage Marker on Poles and Crossarms

4.10.6. (continued)

See [Appendix B](#) for PG&E's Community Wildfire Safety Program brochure, *Guide to Landscaping in High Fire-Threat Areas* (on Pages B-2 and B-3). This brochure suggests the best low-growing, fire-resistant native vegetation to use when planting near power lines. In general, select plants with a reduced risk for starting and fueling wildfires.

- Low-growing native vegetation
- Plants with high-moisture and low-resin content
- Well-watered vegetation
- Plants that do not create or accumulate dry, dead material

Many people now consider non-vegetative landscaping, including the following ignition-resistant options.

- Sand
- Decorative gravel
- Tumbled glass
- Drainage rock
- Beach pebbles
- Mulch, wood chips, bark

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**SECTION 5
ELECTRIC METERING:
GENERAL**

SECTION 5 ELECTRIC METERING: GENERAL

Section 5

Electric Metering: General

5.1. Scope

This section of the manual is designed to help applicants, engineers, and contractors plan acceptable electric metering installations for the electric service supplied by Pacific Gas and Electric Company (PG&E/Company). The information and requirements described are applicable to [Section 6, “Electric Metering: Residential,”](#) through [Section 11, “Electric Switchboards: 601 Volts Through 25,000 Volts, and Primary Services.”](#)

For help with determining the service rating of customer equipment, see Subsection 1.14. located on Page 1-15.

NOTE: See new service and current transformer (CT) installation requirements in Subsection 5.2.4., “Requirements for the Installation of Secondary Terminations (0–600 Volt) in Metering Equipment Requiring CTs,” on Page 5-4.

5.2. General Conditions and Responsibilities

5.2.1. Approved Metering and Service-Termination Equipment

All service termination and metering equipment must conform to nationally recognized standards, meet all applicable certification requirements, and bear the certification marking of a nationally recognized testing laboratory. Nationally recognized standard organizations include, but are not limited to, the following: [National Fire Protection Association \(NFPA\)](#), [National Electrical Manufacturers Association \(NEMA\)](#), [Underwriters Laboratories \(UL\)](#), and the [Occupational Safety & Health Administration’s \(OSHA’s\) Nationally Recognized Testing Laboratory \(NRTL\) Program](#). The equipment also must meet the requirements specified in the [Electric Utility Service Equipment Requirements Committee \(EUSERC\)](#) manual and be approved by PG&E for use in construction projects.

NOTE: Employees perform an onsite field inspection of the equipment and installation and provide final approval only after ensuring that all of the specified requirements have been met.

5.2.2. Drawing Submittal Requirements for Metering and Service Termination Equipment

Applicants must meet the requirements in Item A., through Item E., both on Page 5-2, when installing electric metering and service termination equipment. This applies to residential and nonresidential applications and includes meter panels, pedestals, panelboards, and switchboards that are wall-mounted, pad-mounted, pole-mounted, or on panelboard construction.

5.2.2. (continued)

- A. Submit drawings for metering equipment to PG&E using either hard-copy paper drawings (**in triplicate**) or electronic files. Drawings must be reviewed and pre-approved either by local meter shop employees or by a meter specialist.
- B. Submit drawings for metering equipment to PG&E with the following current ratings. Do not submit drawings for metering equipment rated less than described below unless PG&E requests them.
 1. **Single-Family Residential**
 - Wall-mounted and pad-mounted (floor standing): Current ratings of 320 amps or above.
 2. **Multifamily Residential**
 - Wall-mounted and pad-mounted (floor standing): Current ratings of 320 amps or above.
 - Pedestals (pad-mounted): Current ratings of 200 amps or above.
 3. **Nonresidential Commercial and Industrial**
 - Wall-mounted and pad-mounted (floor standing): Current ratings of 400 amps or above.
 - Pedestals (pad-mounted): Current ratings of 100 amps or above.
 4. **Nonresidential Agricultural**
 - Pole-mounted, panelboard construction, and wall-mounted: Current ratings of 200 amps or above. A single-line drawing also must be submitted showing the fuse size, circuit breaker, and main disconnecting device ratings for all of the equipment being installed.
 - Pad-mounted (floor standing): Current ratings of 400 amps or above.
- C. Also, submit drawings for newly designed metering equipment or for equipment that has been modified from existing designs as shown in the *Greenbook* or [EUSERC](#) manuals. This applies to metering equipment of any current rating. This includes, but is not limited to, new electric equipment containing electrical devices or components for customer generation interconnections. Drawings must be sent to the Meter Engineering Department for review. The review process could take 6 months or longer.
- D. Ensure that submittals contain specific references from either the [EUSERC](#) manual, this *Electric and Gas Service Requirements (Greenbook)* manual, or both. When using *Greenbook* references, include the applicable subsection(s), figure(s), and page number(s). For [EUSERC](#) references, use the drawing and sheet numbers.
- E. Ensure that submittals contain specific references for each component or section included with the equipment. Provide a detailed summary of the specification information in the beginning of the submittal, as well as on all equipment figure drawings in the submittal.

5.2.3. Applicant Responsibilities

The applicant must provide, install, own, and maintain the following equipment and structures listed in Item 5.2.3.A. through Item 5.2.3.L., starting below.

- A. All meter sockets and enclosures, metering transformer cabinets, and switchboard service sections intended for utility use, unless PG&E permits a specific exception.
- B. Use only ring-type meter sockets, enclosures, switchboards, and other metering equipment approved both by PG&E and [EUSERC](#).
- C. For Overhead Service: Overhead meter panel, service entrance conductors, conduit, and a weatherhead to the point of attachment to PG&E's overhead service conductors.
- D. For Current-Transformer Panels and Switchboards: Lugs, an underground service-termination pull box, and a separate current-transformer cabinet and meter box.
- E. **All Indoor Meter Panels:** Individual, residential, or nonresidential applicants with a meter-panel rating of **any size**, installed inside a meter room or inside a building or other type of structure, must follow all of the requirements described below.
 - 1. Install, own, and maintain a separate, nominal, **2-inch** diameter conduit with pull tape inside. The conduit and pull tape must extend from the meter panel or switchboard and terminate in a [NEMA 3R](#), 6-inch x 6-inch x 6-inch enclosure located 8 feet to 10 feet above grade on the outside surface of the building.
 - 2. Follow the applicable requirements in [Numbered Document 094683, "Smart Meter Electric Network Requirements for Indoor Meter Rooms and High-Rise Buildings."](#) located in [Appendix C, "Electric and Gas Engineering Documents."](#)
 - 3. Do not use the conduit. The conduit is for PG&E's metering equipment only. See additional requirements in Item 5.2.3.G. on Page 5-4.
- F. **All Indoor or Outdoor Meter Panels:** Individual, nonresidential applicants with a meter-panel rating of **500 kW or greater** must install, own, and maintain a separate, nominal, **1/2-inch** diameter conduit with pull tape inside. The conduit and pull tape must extend from the telephone service location and terminate in a horizontal position on top of the meter panel section, 6 inches to 12 inches from the front of the meter panel. The conduit must not enter or pass through the switchboard or switchgear. **Do not** cut or penetrate the top of the electric panel or switchboard.

5.2.3. (continued)

EXCEPTION: Approved meter–panel locations that have adequate wireless radio frequency (RF) signal capabilities may be exempted from installing the 1/2-inch phone line conduit. To request a variance, customers must submit switchboard and meter-panel drawings with the jobsite address to their local project coordinator early in the service application process. The project coordinator submits this information to the PG&E local meter shop, enabling PG&E employees to make a field determination as to whether or not the conduit should be required. Without an exemption from the meter shop, the 1/2-inch conduit is required and must be installed.

NOTE: A 500 kW minimum, 3-phase (Ø) meter panel is defined as one of the following:

- 277/480 volts, 4-wire wye, and minimum 800 amps
- 120/208 volts, 4-wire wye, and minimum 1,600 amps
- 120/240 volts, 3-wire delta, and minimum 1,600 amps
- 120/240 volts, 4-wire delta, and minimum 1,600 amps
- 2,400–21,000 volts, primary service, any size

G. Conduit installed in the ground, floors, ceilings, walls, or concrete must be made of rigid steel. In any other installation location, the conduit type can be electrical metallic tubing (EMT) or better. For underground installations, the conduit must exit the pad on the outside of the switchgear...not inside the switchgear. See Figure 5-6, “Preferred Location of Conduits for Indoor and Outdoor Meter Panels and Switchboards,” on Page 5-20.

H. For recommendations on the best locations for equipment, ask your project coordinator to **contact PG&E’s electric metering department**. Questions may include the prime location for a phone interface box, the required point for conduit to exit the meter room or building, or your options in a remote location when a telephone line is unavailable.

I. Transformers rated at 120/240 volts, three-phase, 4-wire, with delta-connected service installed, must have the “high leg” (e.g., power leg, stinger leg) conductor located either in the center phase or on the right phase position. This conductor usually is designated as the “C” phase for metering purposes. Mark (i.e., identify) the conductor (e.g., high leg, power leg, stinger leg) properly. The color orange is typically used for this purpose.

On all self-contained services, the power leg must be located in the far-right phase position, usually designated as the “C” phase. Mark (i.e., identify) the conductor (e.g., high leg, power leg, stinger leg) properly. The color orange is typically used for this purpose.

J. Applicant wiring that extends from the distribution section (i.e., branch circuits) must **not** pass through any PG&E-sealed section.

5.2.3. (continued)

- K. Single-metered applicants with single-phase services above 400 amps should consider installing a switchboard as described in [Section 10, “Electric Switchboards: 0 Volts Through 600 Volts.”](#)
- L. For Underground Service: Conduit and electric meter panel manufactured for PG&E’s underground service conductors.

5.2.4. Requirements for Installing Secondary Terminations (0–600 Volts) in Metering Equipment Requiring CTs

All non-PG&E personnel (e.g., applicant installers) who install, inspect, or supervise the installation of PG&E services, and all PG&E personnel who schedule, install, inspect, or supervise the installation of services and metering work, must follow the new construction requirements for installing secondary terminations at customer switchboards or meter panels when 600 V metering CTs have **not** been installed.

Non-PG&E personnel installing approved PG&E service-entrance conductors must contact the local PG&E project coordinator and request that the CTs be installed **before** the service-entrance conductors are installed (usually 1–2 weeks before).

To ensure the safety of field metering personnel, CTs must be installed on new services before the service conductors are terminated in the utility pull section. To prevent the secondary voltage from being energized inadvertently before the CTs are installed, all personnel should know and follow the safety requirements for installing secondary terminations.

Refer to the following PG&E documents for detailed instructions about installing secondary terminations (0–600 volt) in metering equipment requiring CTs:

- [TD-2424P-01, “Distribution Transformer Operations”](#)
- [TD-6301P-01, “Electric Metering—Safe Work Procedures,” Attachment 1, “Installing 600 Volt Current Transformers”](#)

5.2.4.1. PG&E’s Responsibilities

PG&E provides, installs, owns, and maintains all meters and metering transformers for full-service applicants. For direct access applicants, refer to [Direct Access Standards for Metering and Meter Data \(DASMMD\) in California](#) (March 1999).

5.3. Electric Meters: General Location Requirements

To determine the most satisfactory meter location and to ensure that adequate space is provided for the meter, consult a PG&E project coordinator in the project’s preliminary planning stage. All equipment clearance and working space requirements must be met.

5.3. (continued)

When an electric panel is being relocated or replaced, and PG&E's existing service conductor will be used, as determined by PG&E, the panel must be positioned so the service conductor can be reconnected properly. The existing service conductor must be able to be reconnected to the underground electric panel termination lugs or the external service-entrance conductors coming out of the weatherhead for overhead services. If PG&E needs to install additional service conductors or cables to perform the reconnect, the work and material would be at the applicant's expense. PG&E **does not accept** cable-termination techniques using pin adaptors, cable ringing, or splicing on additional cable.

The local PG&E meter shop must approve remote meter locations before applicants locate meters away from (i.e., remote from) termination enclosures. Applicants must submit a drawing that shows the distance (in feet) and the accessible path to the remote meter location. Also, describe the size and type of conduit used to attach to the remote meter.

See [Section 6, Figure 6-4, "Typical Underground, Separate-Bused, Current-Transformer Cabinet and Safety-Socket Meter Box Assembly, 201 Amps–400 Amps, 3Ø and 201 Amps–800 Amps, 1Ø,"](#) on Page 6-8, as an example of remote metering.

Applicants can avoid the time and expense of installing additional facilities or relocating existing facilities by consulting with PG&E early in the process.

5.3.1. Basic Meter Location Requirements

The following five lettered items explain PG&E's basic meter location requirements and are subject to PG&E's review and approval to ensure compliance. Applicants must ensure that:

- A. Locations have at least one clear and unobstructed path or entrance providing access to the working space.
- B. Nonportable illumination is provided for the working spaces around meters, metering-related equipment, and associated facilities when meters are located indoors. Also, applicants must provide a hallway or aisle leading to the meter(s) and metering equipment.
- C. Locations in elevated areas (e.g., balconies or mezzanines) or in depressed areas (e.g., basements, cellars, or underground rooms) must be accessible by either a ramp or clear stairway that conforms to building-code requirements.
- D. PG&E has provided advanced approval when potential locations are not in conflict with prohibited meter locations and are on walkways, alleys, or driveways that provide access to commercial or industrial property. PG&E may grant exceptions if other suitable locations are not available.

5.3.1. (continued)

- E. PG&E personnel have full access to inspect, read, or test metering facilities, whether the facilities are located indoors or outdoors. Applicants must ensure that all metering and service facilities are accessible and free of obstacles at all times when the metering equipment is energized. Applicants must maintain these accesses both **during** and **after** landscaping activities, fence installations, building construction, building renovation, remodeling activities, etc.

5.3.2. Prohibited Meter and Service Equipment Locations

The following locations are **not** acceptable for electric meters and service termination equipment.

- A. Locations deemed hazardous to either personnel or equipment, or locations found to be unsuitable for entry. These locations include:
 - 1. Inside any residence.
 - 2. Directly over any stairway, ramp, or steps.
 - 3. Any area where personnel may contact either exposed, high-voltage conductors or equipment in motion.
 - 4. Any area that is accessible only through a trapdoor.
 - 5. Any elevator shaft.
 - 6. Any doorway, hatchway, or drive-through pathway designed for picking up goods through a window, where opening the meter panel blocks the through-area.
 - 7. Areas where entry may be restricted or controlled because of medical, health, environmental, or other safety-related issues.
 - 8. Any area in close proximity to a lake or water area. These locations are unsuitable when the meter faces the water.
 - 9. In traffic medians or areas where there is traffic on both sides of the meter.
 - 10. Any indoor or outdoor area where personal protection equipment is needed, as determined by PG&E, including eye and hearing protection.
 - 11. Outdoor areas less than 300 feet away from biowaste, toxic, corrosive, or a similar-type of unsafe substances that could be released into the air, are found in the ground soil, are located in open-air wet ponds, or are stored in dry locations.
- B. Underground vaults or enclosures.
- C. Areas where vibration, moisture, excessive temperature, fumes, or dust may damage the meter or interfere with its operation.
- D. Areas within or requiring access through any restroom, bathroom, shower, powder room, toilet, or private-type room.
- E. Portions of buildings where landscaping, fencing, or other construction activities will make the meter inaccessible.

5.3.2. (continued)

- F. Inside any single-family residence, multi-residential, or nonresidential building, garage, or structure that does not meet all of the requirements described in Subsection 5.3.4., “Electric Meter and Service Termination Equipment Rooms,” on Page 5-8.
- G. In a metallic cabinet (including doors), room, enclosure, or location that blocks or interferes with the radio frequency signal transmissions that are necessary for PG&E to operate its SmartMeter™ Advanced Meter Reading system. This applies only to meter panels that meet all of the following criteria.
 - Single metered
 - Less than 400 amps continuous rating
 - Wall mounted
- H. In a room, utility closet, or area where metering facilities or termination enclosures are less than 3 feet away from any water source such as pipes, valves, fire sprinklers or equipment, or other wet facility.

5.3.3. Locating and Grouping Multiple Meters

When it is practical, PG&E will supply two or more meters from one service and will group the meters at one location. Also, see [Section 2, “Gas Service,” Subsection 2.3.5, “Multiple Buildings Located on One Lot,”](#) on Page 2-15, and [Section 3, “Electric Service: Underground,” Subsection 3.2.5, “Installing Overhead and Underground Service for Two or More Buildings on One Lot,”](#) on Page 3-6.

5.3.4. Electric Meter and Service Termination Equipment Rooms

PG&E prefers to install electric service and metering equipment outdoors. When outdoor locations are not feasible, PG&E allows applicants to design and build electric rooms indoors for the meter and service termination equipment.

Applicants must ensure that meter and service equipment rooms (electric rooms) meet the following requirements. Also, see Figure 5-1, “Allowable Locations for Electric Service and Meter Rooms,” on Page 5-11, for acceptable and unacceptable room locations. If electric rooms cannot be designed and built to meet these requirements, then the service termination and metering equipment must be installed outdoors in a location acceptable to PG&E.

If meters are located in a closet, applicants must meet the requirements described in Item A through Item K., starting below.

- A. Electric room locations and specifications must be approved during the initial stages of construction. **Submit the following sets of drawings listed below. Drawings should be labeled and marked to help with the review. Drawings must be submitted to your local project coordinator for review by the local meter shop.**

5.3.4. (continued)

1. Building site plans – Shows where the electric room is located, including driving and walking paths to the room.
 2. Elevation plans (all sides) – Shows where the room is located, including access and walking paths to the room, and any ramps and driveways leading to the room.
 3. Floor plan – Shows the dimensions of the room, all service and metering equipment to be installed (including fire pumps), and the working space and clearances surrounding all of the equipment.
 4. Single-line drawings – Shows the service termination and metering equipment, fire pump switchboard or panel, transfer switches, customer generation interconnections, disconnect switches, as well as the electrical capacities and voltages of the equipment.
- B. Designs must include a designated room for electric service, meters, and metering equipment.
- C. Electric rooms must be clear of obstructions and located inside of buildings on the ground floor or no more than one story below the ground floor. The exception is a qualified high-rise building where the walking surface of the highest tenant-occupied floor is over 75 feet high. PG&E may, at its option, approve grouped meter locations on one or more upper floors.

For high-rise buildings, typically 16 stories or greater, PG&E at its discretion might allow subtractive billing for locations that qualify and meet the requirements. Contact your local service planning representative for more information.

- D. **Electric rooms must have a doorway that opens 90 degrees or more directly to the outside of the building or into an area that is available to the general public. DO NOT design and build meter and service-termination rooms with multiple separate doorways leading up to the room or which must be accessed by walking down a corridor.**

NOTE: The term “available to the public” means any person(s) who does or does not live or work at the location can walk into the business, building, or structure and up to the meter room without being restricted by locked doors, gates, security personnel, or other forms of restriction.

- E. Electric rooms must have a clear and safe working space as described in Subsection 5.4.4., “Working Space,” on Page 5-17, and Subsection 5.4.5., “Barricades,” on Page 5-21.
- F. Rooms must **not** include gas meters but can be used for communication equipment.

5.3.4. (continued)

- G. Rooms may be locked if the applicant provides PG&E with independent access to the room. Ensure the meter room is locked using one of the following methods.
1. **Preferred:** Use an acceptably located key lock box, provided by PG&E and installed by the applicant, to hold the applicant's key to the electric meter room door. The key's lock box must be installed near the meter room door. PG&E personnel can use the following meter codes to order a key lock box for an applicant:
 - M170164
 - M170171
 - M231097
 2. **Nonpreferred:** Use a double-lock device (e.g., hasp), provided by the applicant, with one lock for the applicant and one lock for PG&E. This type of double-lock arrangement is typically used on gates.
- H. Rooms must be identified by appropriately marking the doors or doorways as described in Subsection 5.5.1., "Properly Identifying and Marking Meters," on Page 5-24.
- I. Rooms must have conduit(s) and pull tape installed as described in Subsection 5.2.1, "Applicant Responsibilities," on Page 5-1 through Page 5-3.
- J. The applicant must install lighting for the electric meter room. **The minimum-acceptable illumination is two lights with a combined brightness of 30 foot-candles.**
- K. Rooms must be designed and constructed with a means to adequately discharge any excess water that may enter the room from the conduit system. Below-grade electrical rooms must be designed and constructed to eliminate any and all water intrusion into the room, including through the service entrance conduit system.
- L. The meter and service-termination (electric) room must be designed and constructed to include an outer wall of the buildings to meet the following requirements.
1. The PG&E service must be installed from the outside directly into an electric room and may not run under other rooms or spaces in the building before reaching the meter and service termination room.
 2. The PG&E service must not extend more than 20 feet past the building's outer foundation into an electric room.
 3. The room must have a doorway that opens 90 degrees or more and leads directly to the outside of the building.

5.3.4. (continued)

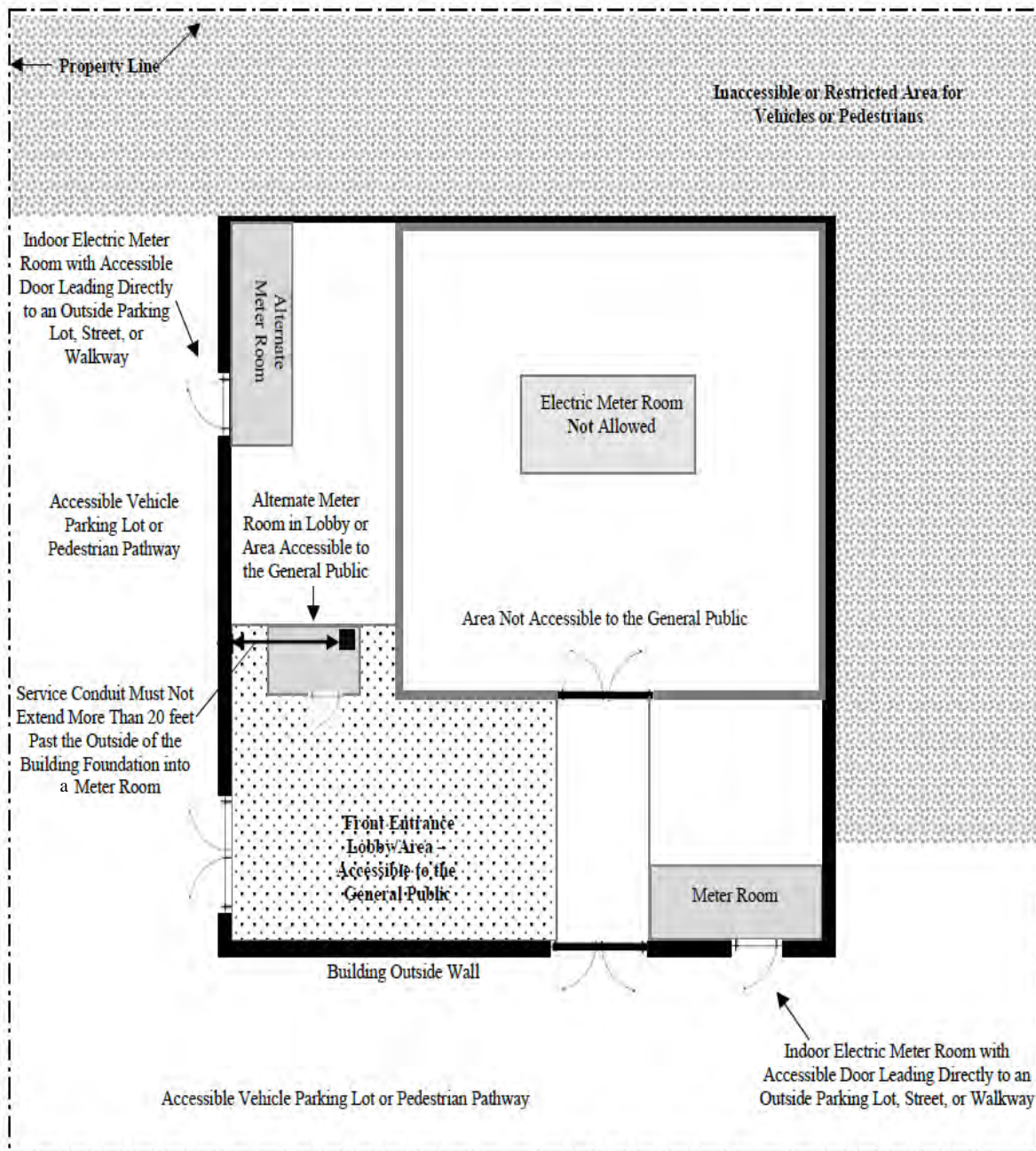


Figure 5-1
Allowable Locations for Electric Service and Meter Rooms

5.3.4. (continued)

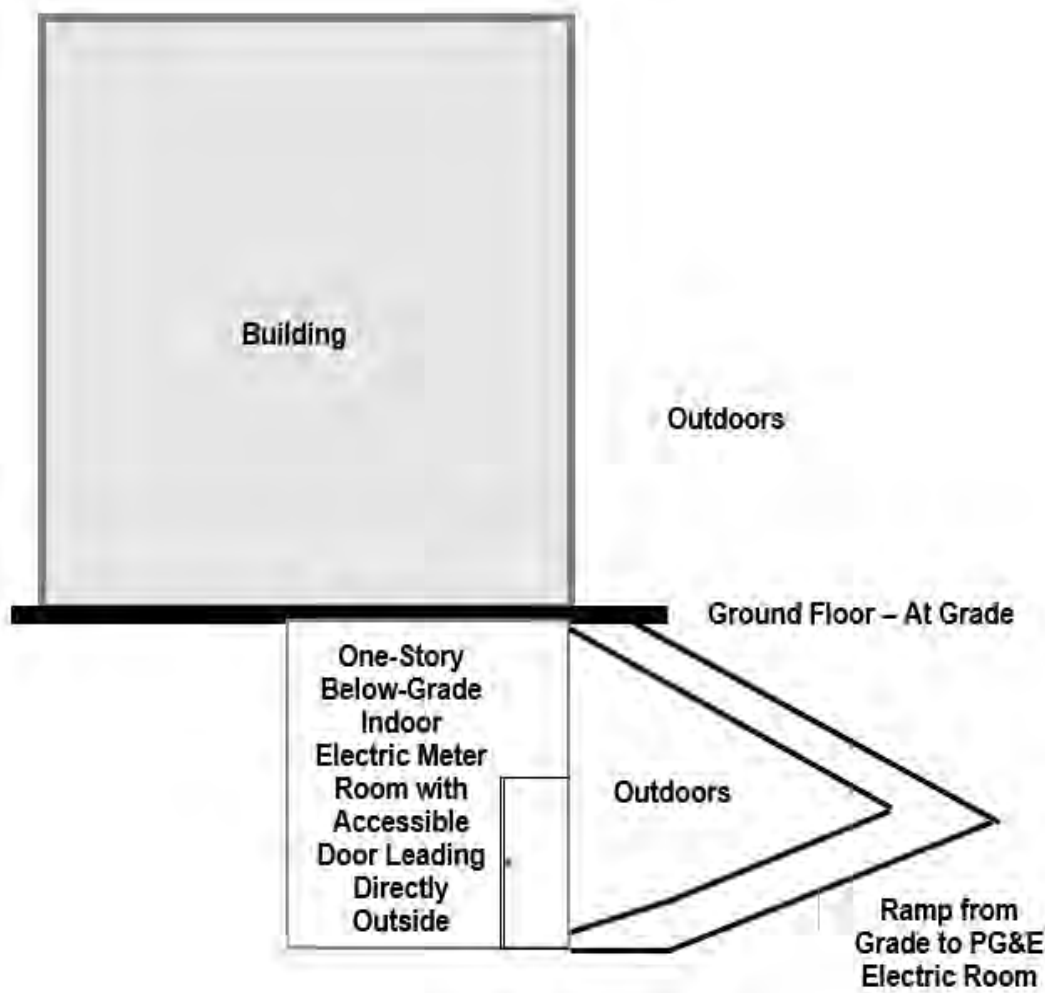


Figure 5-1 – Detail A
Outdoor Ramp to Electric Service and Meter Room Below Grade

Notes in Reference to Figure 5-1 and Detail A.

1. If the electric rooms are located below grade, then the applicant must ensure that an accessible, permanent, and unrestricted walking ramp is provided starting at grade outside of the building and continuing directly to the meter-room door. Additional doors or gates are not allowed along the walking ramp between the outside and the meter room door. PG&E personnel may need to roll heavy equipment into and out of the meter room, so stairs are prohibited.
2. If the electric meter room(s) is located inside a vehicle garage area, either at grade or below grade, and has building entrance gates or locked doors, then the applicant must ensure that the building is accessible to PG&E through a driveway entrance into the garage that is shared with the building occupants, and PG&E is granted access to any locked entrance gates and doors. A shared garage driveway is secondary access and does not eliminate the requirements for a meter room door directly to the outside of the building or a walking ramp (see Note 1 above) to a below-grade electric room.
3. Applicants must ensure that electric rooms **are not located** in the interior of a building connected by hallways, corridors, or other internal passages. This is **not** considered direct access from the electric room to the outside.

5.4. Meter Heights, Clearances, Enclosures, and Protection

5.4.1. Meter Heights

A. Pole-, Pad-, and Wall-Mounted Meters

When installing meter enclosures on a pole, on a wall, or on a pad-mounted structure, applicants must ensure that the meters meet the following requirements, except when installing metering equipment on poles for communication services. In that situation, follow the requirements in 5.4.1.B. on Page 5-14. All metering and service-termination facility installations are subject to PG&E review and approval. The meter height must be measured to the horizontal centerline of the meter axis.

1. **PG&E's preferred meter height is 66 inches** for all individual service-termination and meter-panel installations. All electric meters must be located 75 inches maximum above the ground or standing surface. The minimum meter heights are listed below.
 - Meters installed in self-contained panels rated up to 320 amps must be a minimum of 48 inches.
 - Meters installed in outdoor transformer-rated panels 400 amps and above must be a minimum of 60 inches. This applies to wall-mounted and panel board construction.
2. When meters either are enclosed in a cabinet or installed indoors in a meter room, the **maximum** meter height is the same as for outdoor installations, or 75 inches. The **minimum** meter height must be 36 inches as measured from the ground or standing surface to the centerline of the meter.
3. For switchboard service with a current transformer (CT) compartment, the maximum meter height is 72-1/2 inches, as illustrated in [Section 10, Figure 10-27, "Standard Switchboard Service Section with CT Compartment and Filler Panel, 0 Volts–600 Volts,"](#) on Page 10-40. This applies both to indoor and outdoor installations.
4. In locations where snow accumulates, PG&E may require the minimum installed meter height to be increased. Specific meter-height requirements depend on the meter's location. Ask your local PG&E project coordinator to consult the electric meter department for specific meter-height requirements in snow-accumulation areas.

5.4.1. (continued)

B. Communication Service and Meter Equipment

Applicants must ensure that meter panels installed for communication equipment meet all of the applicable *Greenbook* requirements. For metering equipment installed on poles with communication equipment, refer to the requirements specified on Page 5-14.

1. **Wood Pole Mounted Communication Equipment:** Applicants must ensure that communication service and meter equipment installed on PG&E or joint poles is placed so the bottom of the enclosure is a minimum of 7 feet to a maximum of 8 feet from the finished grade. **If it is not possible to meet the height requirements**, install an electric meter pedestal. For installation requirements, ask your PG&E project coordinator for [Numbered Document 027911, “Installation Details for Service to Pole-Mounted Communication Equipment,”](#) for specific requirements.
2. **Pad-Mounted Communication Equipment:** When meter panels are attached to communication equipment, they must meet the minimum 48-inch meter height requirements described in Subsection 5.4.1.A., “Pole-, Pad-, and Wall-Mounted Meters,” on Page 5-13. The upper and lower areas on the back of the meter panel must be securely attached to the equipment using all of the manufactured mounting holes. **Panels that are not fully attached and secured will not be approved.**
3. **Steel, Pole-Mounted Communication Equipment:** Before attaching communication equipment to PG&E-owned steel poles, review [Numbered Document 094677, “PG&E Metered Electric Service to Antenna and Communication Equipment on Company Owned Steel Streetlight Poles.”](#) For service to municipality owned steel streetlight poles that are on a LS-2 rate schedule, review [Numbered Document 094678, “PG&E Electric service to Antenna and Communication Equipment on Municipality Owned Steel Streetlight Poles.”](#)

5.4.2. Meter Cabinet Enclosure Clearances

Applicants must ensure that meter cabinet enclosures are large enough to provide easy access to the meter and have an adequate working space for maintaining the meter. The cabinet requires a side-hinged door that can be latched open at 90° or more. Also, the enclosure and service equipment must comply with local code requirements. Detailed dimensional requirements are shown in Figure 5-2, “Meter Cabinet Enclosure Clearances,” and Table 5-1, “Meter Cabinet Enclosure Clearance Dimensions,” both on Page 5-15.

Applicants also must ensure that meter cabinet enclosures are maintained and work properly. In corrosive areas a fiberglass enclosure is recommended to help prevent deterioration of the metallic equipment.

5.4.2. (continued)

Finally, applicants must ensure that when a cabinet enclosure is pad-mounted, a 3-foot clearance is maintained between the edge of the pad and the base of the pole.

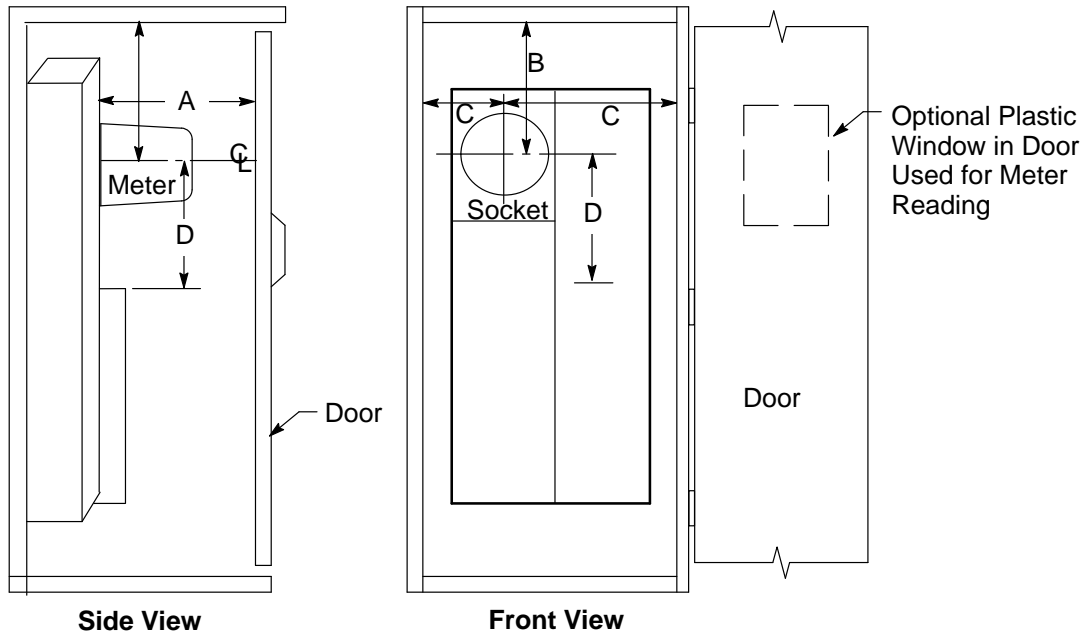


Figure 5-2
Meter Cabinet Enclosure Clearances

Table 5-1 Meter Cabinet Enclosure Clearance Dimensions

Dimension A	11-inch minimum / 15-inch maximum. See Note 1 below.
Dimension B	9-inch minimum to the edge of the access opening.
Dimension C	10-inch minimum to the edge of the access opening.
Dimension D	8-inch minimum from the meter centerline to the top of any protrusion below the meter or to the bottom of the enclosing cabinet.

¹ The 11-inch minimum for Dimension A may be reduced to 8 inches only for residential, wall-mounted, meter cabinet enclosures.

5.4.3. (continued)

Notes in reference to Figure 5-3 (continued).

4. Electric wiring for new photo voltaic or electric meter upgrades may pass through the clearance area shown in Figure 5-3 if the wires are in a metallic, continuous sleeve (conduit) with no joints, couplings, or fittings. The sleeve must extend a minimum of 3 feet on either side of the meter set and must be a minimum of 6 feet above the regulator opening.
5. See [Section 2, “Gas Service,” Figure 2-19, “Electric and Gas Meter Set Separation Dimensions and Clearances,”](#) Note 5 and Note 6, on Page 2-33, for information about gas facilities.
6. Applicants must not install water spigots, water lines, cleanout drain lines, gutter systems, or other sources of above-ground or below-ground water to within 36 inches as measured in a straight, horizontal line of any gas facilities or underground electric meter panels and facilities.
7. For overhead service-meter panels and equipment, applicants must ensure that the clearance from above-ground downspouts and other nonpressurized (i.e., gravity fed) wet facility sources is a minimum of 12 inches radially from the meter panel.
8. Above-ground water lines, sprinkler systems, and other objects mounted on the wall or above grade are not allowed in any part of the working space in front of the electric meter panel.

5.4.4. Working Space

Working space is defined as the whole area in front of the meter panel, the meter enclosure, the CT section, the service-conductor pulling or termination enclosure, or associated equipment. A working space permits access to the equipment and provides a safe working environment for personnel.

A working space must be located entirely on the applicant’s property or only located in the public right-of-way for municipality or state-owned land. Ask your local project coordinator to contact the PG&E electric meter department to review and approve of any exceptions to the Company’s requirements for metering work spaces and locations.

The working space must be clear, level, and unobstructed at all times. See the minimum required dimensions in Table 5-2, “Working Space Dimensional Requirements,” on Page 5-18.

In flood plains or other areas where elevated platforms are required in front of the meter, install permanent safety rails. The platform must be approved by the local metering department and meet specific PG&E requirements.

Wall-Mounted Equipment: Includes, but is not limited to, service and metering equipment mounted on building or structure walls, panelboard structures, poles, posts, and communication pedestals.

For meter panels and service equipment, the working space is **30 wide x 36 deep x 75 inches tall**. See Figure 5-4, “Semi-Flush Meter Installation,” and Figure 5-5, “Enclosed Meter Installation,” both on Page 5-19.

Improved Surface: Applicants must ensure that the entire working space for multi-residential and nonresidential locations with wall-mounted meter panels or pad-mounted, single-metered pedestals up to 200 amps has an improved surface that is constructed from the same material. The improved surface material can be concrete, stone pavers, asphalt, or compacted gravel. The selected improved surface must extend a maximum of 1 inch above grade. All improved surfaces must be completely level. Native soil (dirt) is not an improved surface for the working spaces in these locations.

5.4.4. (continued)

The following requirements apply for each improved surface:

- **Concrete:** Minimum 3,000 pounds per square inch (psi), precast pad allowed. Poured concrete must be a minimum of 3 inches thick and have wire mesh or rebar.
- **Stone pavers:** Minimum 3 inches thick, spaced not more than 1/4-inch apart.
- **Asphalt:** 2 inches thick on top of 2 inches of angular gravel.
- **Gravel:** Aggregate sized at 1/4 inch to 1/2 inch diameter without sharp edges, compacted to 90% density, surrounded either by a galvanized metal or pressure-treated wood border on each side and connected together.

Floor-Standing (Pad-Mounted): Includes, but not limited to, switchboards, switchgear, pedestals metering enclosures, and service termination equipment rated over 225 amps. **Use concrete to construct the working space surface area.** The working space width is the same dimensional width as the equipment section.

Concrete floors, housekeeping pads, and elevated platforms must extend out in front of the whole area to the minimum working space depth. Measure the depth from the outside of the equipment's outer door. See Figure 5-6, "Preferred Location of Conduits for Indoor and Outdoor Meter Panels and Switchboards," on Page 5-20, for additional requirements.

Table 5-2 Working Space Dimensional Requirements ^{2, 3}

Voltage (Volts)	Meter/Service Equipment Type	Dimensions (Inches)			Figure(s)
		Width ¹	Depth	Height ⁴	
0–600	Wall-Mounted	30	36	75	5-4 & 5-5
	Wall-Mounted Inside Closet	See Note 2	48	75	NA
	Pad-Mounted Pedestals (0–200 Amps)	30	36	75	NA
	Pad-Mounted Switchboards, Pedestals (> 200 Amps), Termination Enclosures	Same as enclosure section	48	See Note 4	5–6
601–25,000	Pad-Mounted	Same as enclosure section	96	See Note 4	5–6

¹ The width of the working space is the width of all service-termination and metering equipment (connected or stacked).

² Closet doors must open a minimum 90 degrees and not reduce the working space in front of the meters and metering equipment. The concrete (or improved surface) working space may extend to the outside past the closet doors.

³ Ensure all clearances from any obstructions are met.

⁴ The minimum working space height is 12 inches above the top of the pad-mounted equipment, but not less than 75 inches.

5.4.4. (continued)

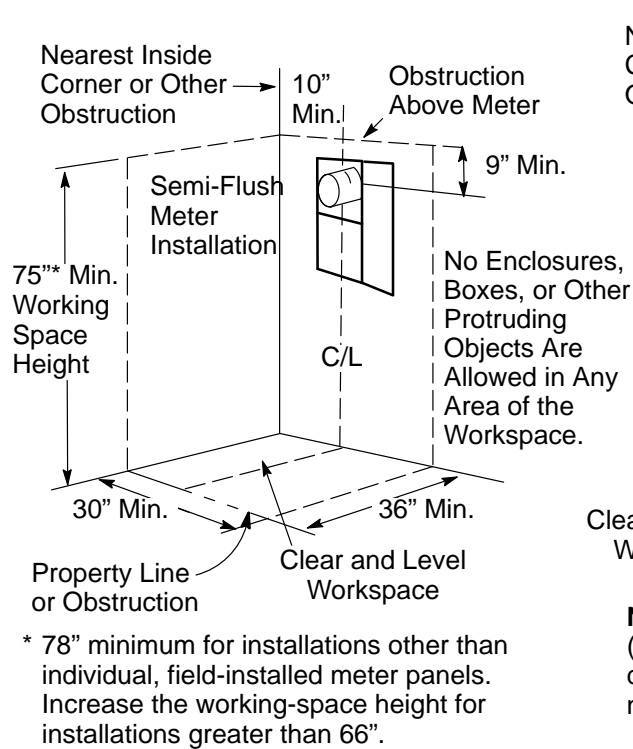
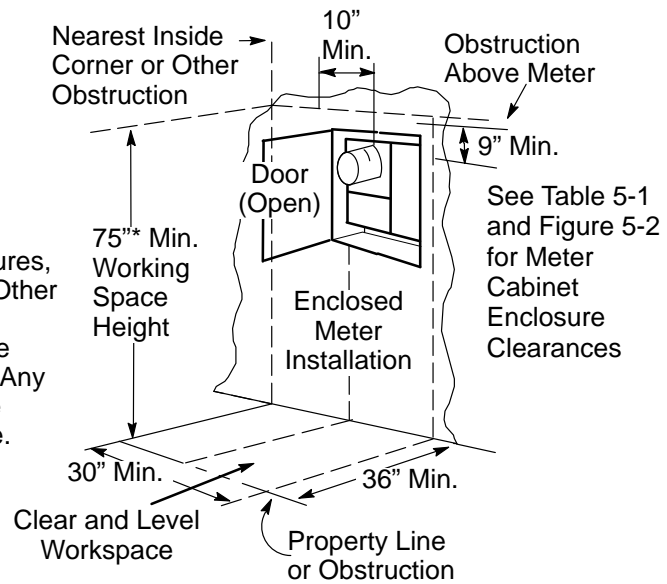


Figure 5-4
Semi-Flush Meter Installation



Note: To allow the cabinet door to open fully (90° or more), increase the 30" minimum-width dimension of the meter working space, as necessary.

Figure 5-5
Enclosed Meter Installation

5.4.4. (continued)

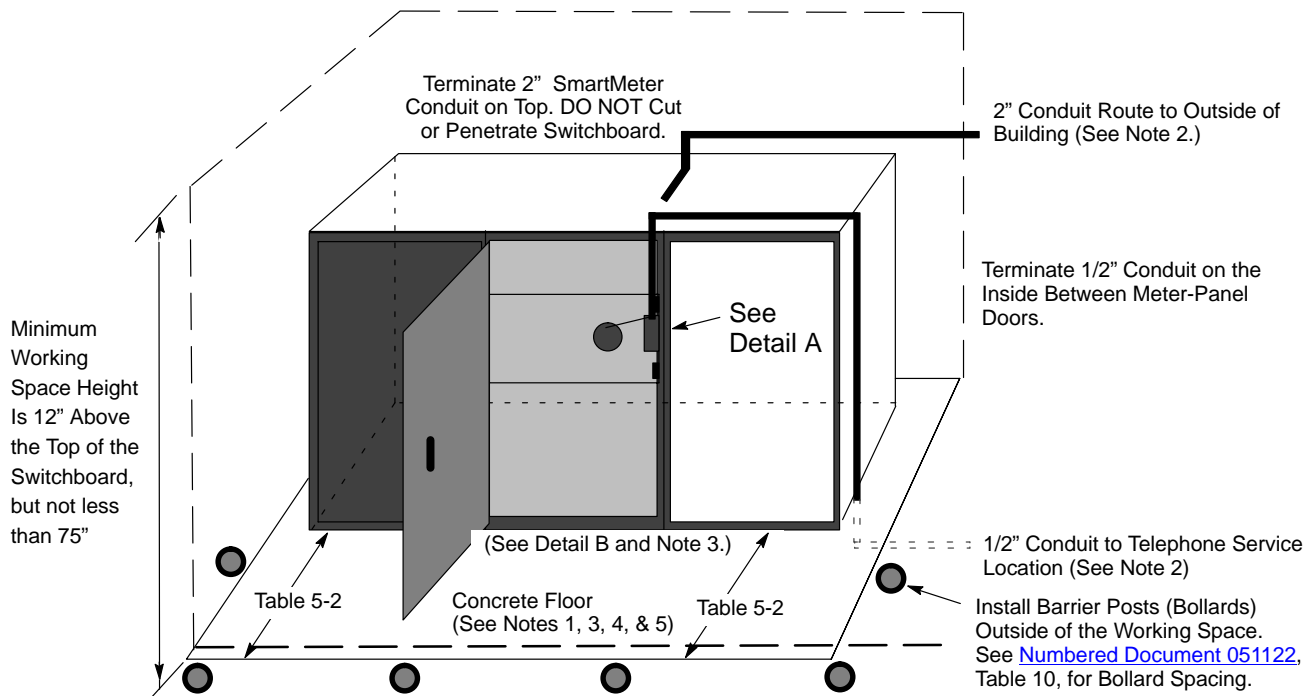
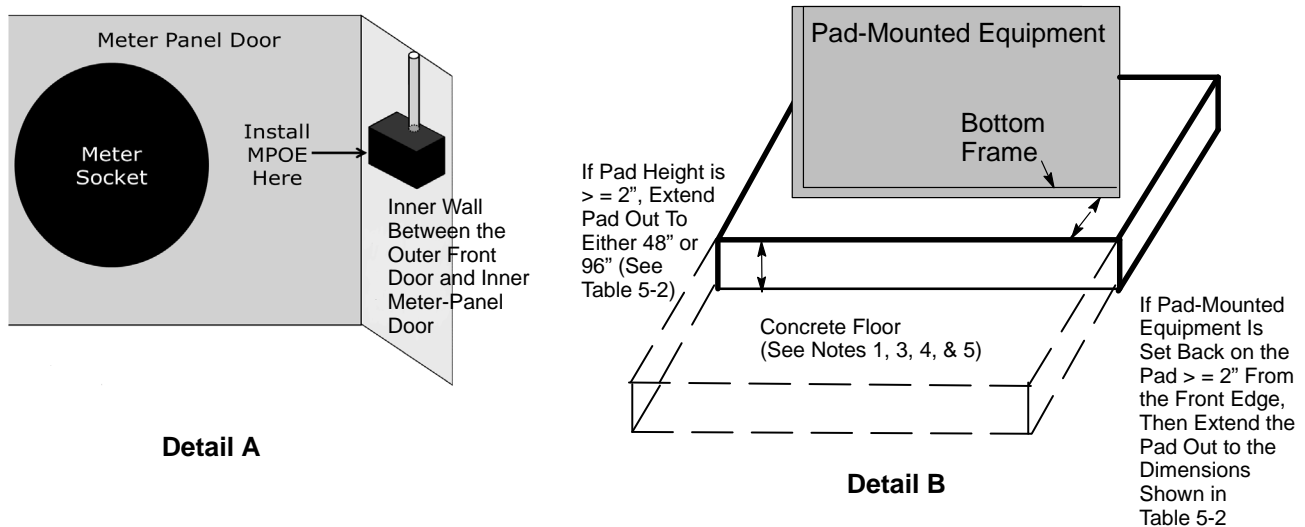


Figure 5-6

Preferred Location of Conduits for Indoor and Outdoor Meter Panels and Switchboards



Notes in reference to Figure 5-6.

1. A level, concrete structure (e.g., floor, pad) must extend out the minimum-required distance in front of all sections to which PG&E requires access. This structure is used for floor-standing equipment (e.g., switchboard, pedestals greater than 200 amps, termination enclosure).
2. A 1/2-inch phone-line conduit may be required for all indoor and outdoor meter panels rated 500 kW or greater. See Item E. and Item F. in Subsection 5.2.3., "Applicant Responsibilities," on Page 5-3. A 2-inch SmartMeter conduit is required only for indoor, wall-mounted or pad-mounted meter-panel enclosures of any size.

Notes continued on the next page

5.4.4. (continued)

Notes in reference to Figure 5-6 (continued).

3. The switchboard's bottom horizontal support frame must not protrude more than 3 inches above the floor or pad. This is in front of all PG&E sections (see Detail B).
4. The pad-mounted equipment must be set back less than 2 inches from the front edge of a raised pad. And the concrete pad must be less than 2 inches above the ground or floor. This is true for all PG&E sections. Otherwise extend the pad outward.
5. For the finished surface type, see Subsection 5.4.4., "Working Space," on Page 5-17.

5.4.5. Barricades

In areas where either the meters and service termination equipment or the working spaces are exposed to vehicles or hazardous conditions, a permanent barricade outside of the working space is required. PG&E determines when this type of protection is required.

Physical protection from vehicular traffic is provided based on the level of vehicular exposure. Applicants must protect all electric metering and service termination equipment located in the following areas:

A. Within 3 feet of the following areas:

- Single-family residential driveways or parking areas (including garage areas)
- Thoroughfares
- Multifamily or nonresidential (i.e., commercial or industrial) driveways or parking areas
- Commercial refuse container locations
- Loading docks and freight-handling areas
- Paved areas without curbs

B. Within an area that has, in PG&E's judgement, an unusually high risk of vehicular damage, the applicant must install a system of barrier posts (bollards) that meet PG&E's specifications.

A suitable barricade for vehicular traffic is concrete-filled steel pipes, either 3 inches or 4 inches in diameter, securely set in an adequate concrete footing for support. **Permanently installed posts are required.** Do not use removable barrier posts or bolt-down-type barrier posts for metering and service-termination equipment.

See Figure 5-7, "Meter Panel Clearance and Protection From Residential Vehicle Driveway or Parking Space," on Page 5-22, and Figure 5-8, "Nonresidential or Multifamily Metering and Service Equipment Clearance and Protection From Nonresidential or Multifamily Vehicle Areas," on Page 5-23.

For information on ordering and installing bollards, see [Numbered Document 051122, "Clearances and Location Requirements for Enclosures, Pads, and Underground Equipment,"](#) Page 25 through Page 27. This document is included in [Appendix C](#).

5.4.5. (continued)

Contact your local PG&E inspector and project coordinator to determine if a barricade is required.

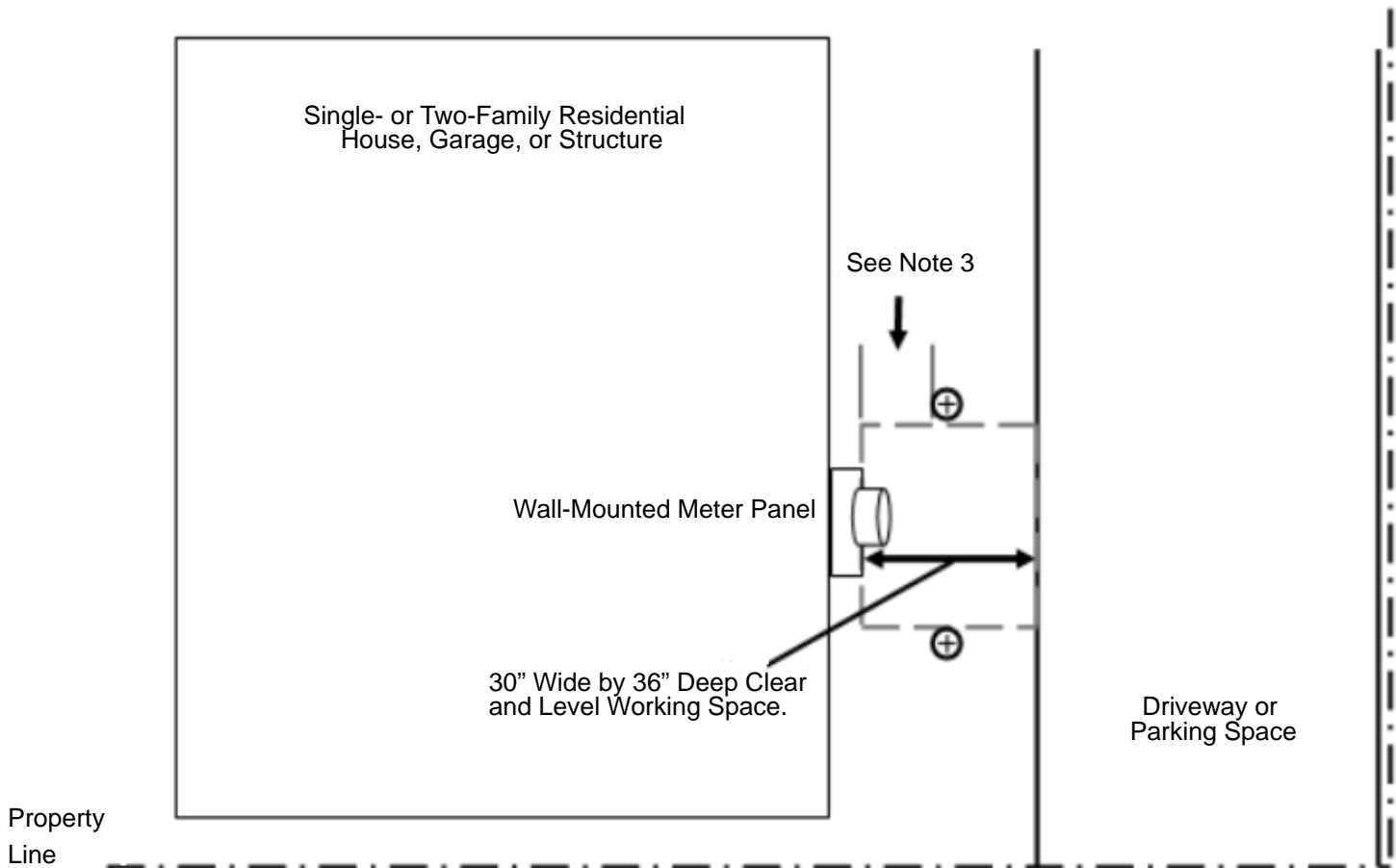


Figure 5-7
Meter Panel Clearance and Protection from Residential Driveways or Parking Spaces

Notes in reference to Figure 5-7:

1. If a permanent barrier or obstruction (e.g., fireplace, wall, curb) exists less than 3 feet to the side of the meter panel and protrudes outward a minimum of 12 inches from the building farther than the meter panel, then the meter panel may be considered sufficiently protected. A PG&E inspector or meter technician will make this determination. Obstructions are not allowed in the working space.
2. For single-lane driveways or parking spaces a minimum of 12 feet wide with meters installed at a height of 66 inches to 75 inches as measured from the ground to the centerline of the meter, or with a meter panel installed in a permanent cabinet with a meter height of 48 inches to 75 inches, the meter panel may be sufficiently protected. A PG&E inspector or metering technician make this determination. For cabinet specifications see Figure 5-2, "Meter Cabinet Enclosure Clearances," and Table 5-1, "Meter Cabinet Enclosure Clearance Dimensions," both on Page 5-15.
3. If the descriptions for protected meters provided in Note 1 or Note 2 do not apply, then install permanent (fixed) bollards (barrier posts) 30" to 36" apart and outside of the 30-inch-wide meter(s) working space(s). The client must ensure that the bollards are installed a minimum of 6 inches to a maximum of 48 inches from the front of the meter panel. Refer to [Numbered Document 051122](#) for the bollard spacing and installation requirements. Note that 2-inch bollards are allowed only for single-family or two-family residential applications. Refer to [Numbered Document J-95, "Meter Guard Design and Installation Arrangement,"](#) (located in [Appendix C](#)) for the 2" bollard requirements. Bollard material specifications and material codes are listed in Table 5-3, "Bollard Post Materials," on Page 5-23.

5.4.5. (continued)

Table 5-3 Bollard Post Materials

Description	Length	Code	Document
Yellow, 2" diameter, Schedule 40 galvanized pipe with reflective tape (2" wide) and a steel cap	56"	150117	J-95
Gray, 2" diameter, Schedule 40 galvanized pipe with reflective tape (2" wide) and a steel cap	56"	234188	J-95
Fixed post: 3" diameter, 1-3/4" fiberglass core with 5/8" polyethylene cover (Manufactured by Allwire FGP674)	67"	150553	051122
Yellow, 4" diameter, Schedule 40 galvanized pipe with reflective tape (2" wide)	78"	150122	051122

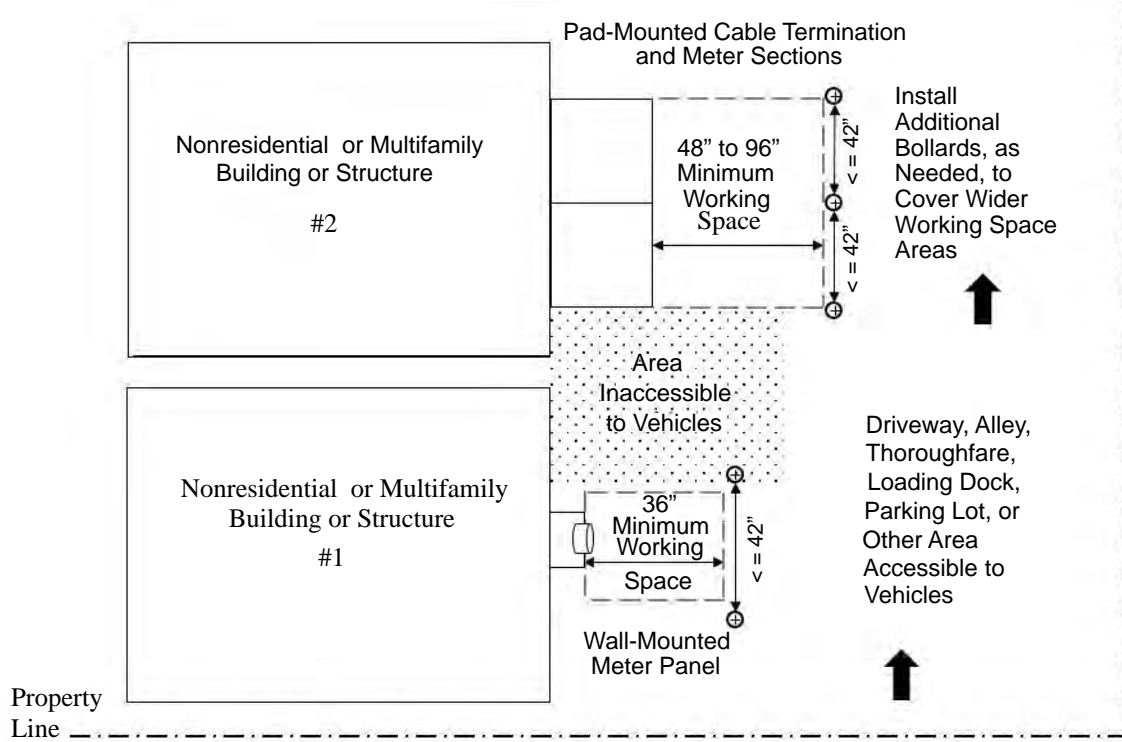


Figure 5-8
Nonresidential or Multifamily Metering and Service Equipment
Clearance and Protection from Vehicle Areas

Notes in reference to Figure 5-8:

1. Install permanent (fixed) bollards outside the working space, as required. See the exceptions below in Note 2 and Note 3.
2. If a minimum 6-inch high, permanent curb or equivalent barrier is present and outside the working space, bollards may not be required for low-traffic and light-duty vehicle areas. A PG&E inspector or metering personnel make this determination.
3. If a minimum 6-inch high, permanent, vehicle parking stop or other equivalent barrier is at least 24 inches away from the front of the working space, then bollards may not be required in light-duty vehicle areas only. A PG&E inspector or metering personnel make this determination.
4. See [Numbered Document 051122](#) for bollard spacing, material specifications, and installation requirements.

5.4.6. Meter Protection

Applicants must ensure that meters and metering equipment are enclosed in a protective cabinet in the following situations. Meter heights less than 36 inches are **not** allowed.

- A. For **all** installations, when the meter is less than 48 inches high, as measured from the horizontal centerline of the meter to the standing surface. Meter heights less than 36 inches are **not** allowed.
- B. When the meter is mounted on, or recessed in, any wall at a school or similar establishment and public safety is an issue.
- C. When environmental problems are anticipated.
- D. When corrosion problems are anticipated or present.
- E. When anticipating vandalism.

Any protective structure surrounding meters and metering equipment must be pre-approved by the local meter shop and provide safe working conditions as determined by PG&E. Approval from the local authority having jurisdiction also may be required.

When a fence or surrounding structure is approved to be built around service termination and metering equipment (e.g., switchboard, switchgear), the doors or gates leading into the structure must open outward away from the equipment being installed and are preferred to be located on the front of the structure.

If the door(s) or gate(s) into the structure are on the sides or the back of the service termination and metering equipment, the working space depth in front of the equipment is required to be increased to twice (e.g., 4 feet times 2 = 8 feet) the distance. If there are doors on the back of the switchboard or switchgear with PG&E equipment inside, or if there are multiple switchboards inside the enclosed structure, the same requirements apply.

5.5. Meter Identification and Seals

5.5.1. Properly Identifying and Marking Meters

Applicants must ensure that each individual meter position, its service disconnecting means, and the unit or dwelling being served is marked clearly and permanently. PG&E will not install meters unless the permanent address, the location, or, when applicable, the area being served is marked at each meter location. Three of the following examples describe acceptable permanent markings. One example describes unacceptable markings.

- A. **Preferred:** An identification plate attached by screws, rivets, or weatherproof adhesive.
- B. **Non-preferred but acceptable:** Paint that cannot be removed using common solvents. Apply the paint using a stencil.

5.5.1. (continued)

- C. **Non-preferred but acceptable indoors:** Manufactured decals that are not installed outdoors and will not peel or fade.
- D. **Unacceptable:** Tape-type and label-maker stick-on labels; hand-written lettering (sharpie, paint stick, etc.).
- E. **Temporary:** Temporary meter panels rated up to 200 amps that will be installed less than one year and will not be used as a temporary-to-permanent installation may use hand-written lettering that is legible to PG&E as well as any marking methods described in Item A. through Item C (above).

NOTE: For outdoor meters, the marking material must have an ultra violet (UV) protection rating.

The identification must be legible. It must include a specific apartment number, a street number, use, or location. Ensure that the information is verified. A store name or other generic description may be included, but does **not** constitute acceptable identification when used alone.

Where individual meters serve a remote location, or where meters are grouped at a common location (both residential and nonresidential), applicants must ensure that they mark the sites or buildings and identify meters properly.

For meters serving agricultural pumps or other large equipment, mark the ampacity rating of the main service disconnecting means (i.e., breakers, fuses) along with the type of equipment and the nameplate rating. For multiple individual disconnects with a main disconnect, mark the aggregate rating for all of the disconnects installed.

PG&E **will not** install meters without a permanent address or location mark at each meter location.

When it is appropriate, applicants should include the area being served by the meter when permanently marking the site.

PG&E may make an **exception** to the rules for permanent marking when the Company is requested to set a meter for a single-family home that is under construction. In this case, PG&E will set the meter if the home's address is noted clearly and legibly either on the street side of the dwelling or on the lot in front of the dwelling. PG&E understands that during construction, the "permanent" address sometimes is not available when the dwelling is ready for the meter to be set.

Customers who install distributed generation (e.g., solar, wind, battery storage) that is connected to the electric meter panel are required to install permanent signage affixed to the panel indicating an alternative source of generation is interconnected. Signage and maps also are required at the meter panel for the alternating current (ac) disconnect switch location when it is more than 10 feet away and out of the line of sight from the meter panel.

5.5.2. Sealing Meters and Metering Equipment

PG&E seals all meters and enclosures for **utility** meters, metering equipment, and service-entrance equipment using PG&E's seals.

Applicants cannot locate or install equipment within meter sections, meter panels, switchboard sections, or equipment enclosures with existing PG&E seals unless they receive authorization from the PG&E electric meter group.

EXCEPTION: Equipment that provides access for replacing over-current protection fuses is exempted.

Only an authorized PG&E representative can break the PG&E seal.

Certified meter service providers (MSPs) also will seal all meters and enclosures for meters, metering equipment, and test-bypass switches owned by their respective companies with their companies' seals, as described in the [*DASMMD in California*](#) (March 1999) document.

5.5.3. Locking Provisions

All transformer-rated and all three-phase installations must have provisions for sealing or locking all of the main service switches or breakers in a permanent (off) position. When installing service equipment of any phase or ampacity that contains multiple service (disconnect) switches, the applicant must ensure that provisions for locking each individual service (disconnect) switch are provided.

If the main breaker or service disconnects are installed in an enclosure, the door(s) for the enclosure also must have locking provisions that accept a PG&E lock or other locking mechanism and can accommodate more than one lock. Do not use a keyed lock handle (e.g., T-handle) to secure enclosures.

The applicant must ensure that the locking mechanism is a permanent installation and that the clip, with a hole for the lock shaft, is made of a rigid metal. The breaker or switch covers can be nonmetallic. Finally, the applicant must ensure that these provisions are sealable and lockable with a padlock having a 5/16-inch lock shaft.

5.6. Meter Types and Connections

The following requirements refer specifically to meter types and connections. Applicants must follow the guidelines listed below.

- A. When installing a new service, ensure that the panel enclosures rated at 125 amps are Class 100 ampere services. Services and enclosures rated at 225 amps are Class 200 ampere services.
- B. Ensure that transformer-rated meters have a current rating of less than 100 amps (e.g., CL5, CL10, or CL20).
- C. Do **not** use K-based (i.e., bolt-in) meters when designing new installations. Services that need 400 amps (continuous) require current-transformer facilities.

5.6. (continued)

- D. Ensure that sockets meet the requirements of [UL Standard UL-414, “Standard for Meter Sockets.”](#)
- E. Locate potential taps, including the neutral connection, behind a sealed panel.
- F. Ensure that the meter manufacturer designs and fabricates transformer-rated meter sockets that are installed on hinged panels for back connection.

Applicants should use Table 5-4, “Meter Socket Requirements (Number of Jaws),” on Page 5-27, to find specific meter-socket requirements and to ensure they provide the proper equipment.

Table 5-4 Meter Socket Requirements (Number of Jaws)

Service			0–225 Amperes	226–320 Amperes ¹	400 Amperes and Above
Voltage	Phase	No. of Wires	Self-Contained	Self-Contained	Transformer Rated
120/240	1	3	4	4 ²	6
120/208 ³	1	3	5	—	—
120/208Y	3	4	7	—	13 or 15 ⁴
240 ⁵	3	3	5	5	8
120/240	3	4	7	—	13 or 15 ⁴
277/480Y	3	4	7	—	13 or 15 ⁴

¹ A socket-based, Class 320-ampere (continuous) meter will be installed on a Class 400 meter panel, rated at 80% continuous (i.e., 320 amps). Do **not** use Class 400, bolt-in meters on new installations. Service rated at 400 amps continuous requires current transformers to be installed.

² Only use a 4-jaw meter socket for a Class 320-ampere meter for single-phase residential applications.

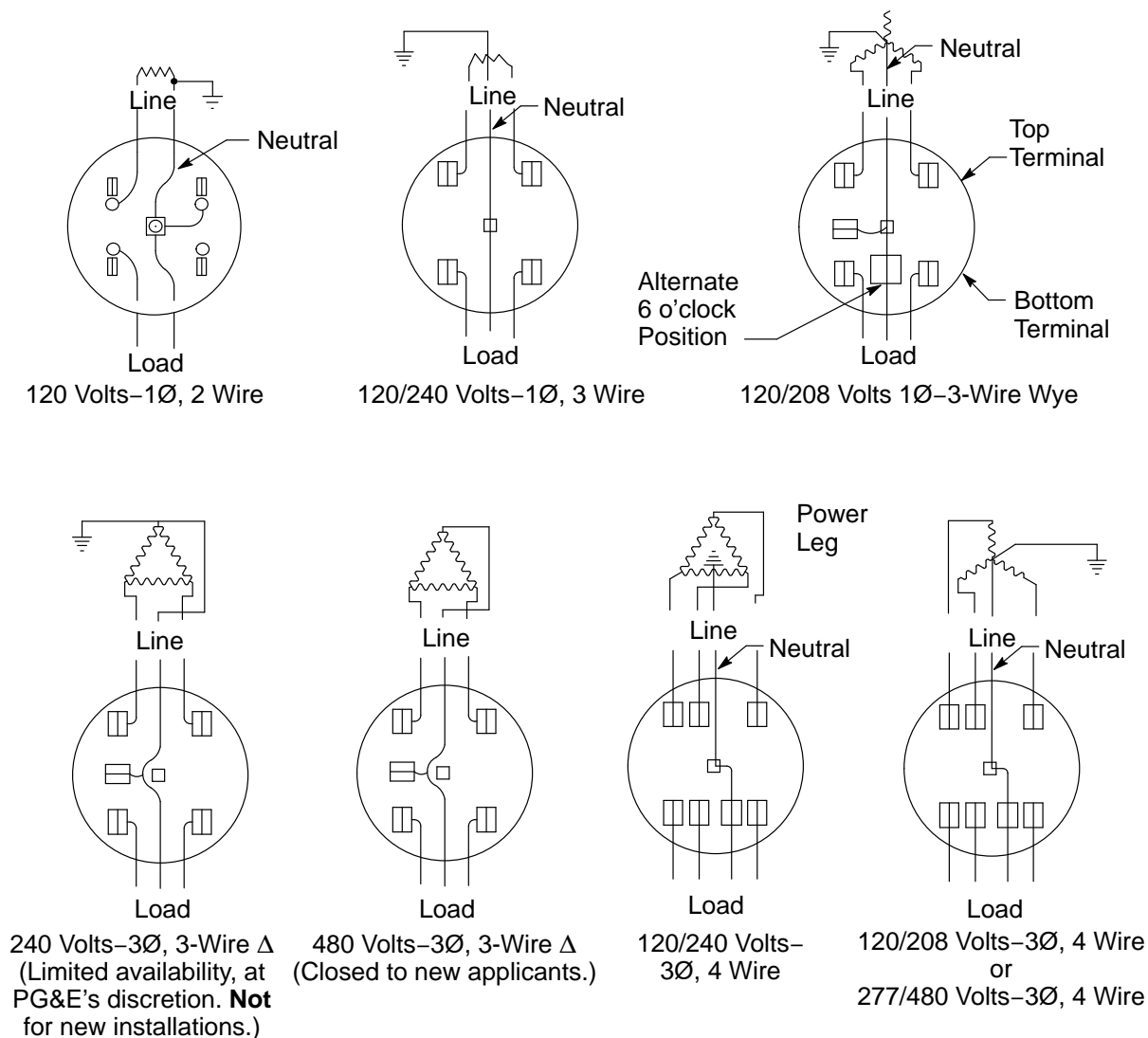
³ In locations where PG&E maintains a 120/208-volt secondary system, 3-wire, single-phase service, typically the service is limited to what can be supplied by a main switch or service entrance rating of 225 amps. Single-phase loads that exceed the capacity of a 225-ampere main switch or service-entrance rating usually are supplied with a 120/208Y-volt, three-phase, 4-wire service.

⁴ The 15-jaw socket is acceptable, but not required.

⁵ Limited availability, at PG&E’s discretion. **Not** for new installations.

Figure 5-9, “Connection Diagrams for Self-Contained Meter Sockets,” and Figure 5-10, “Connection Diagrams for Transformer-Rated Meter Sockets,” on Page 5-28, show the required connections for self-contained and transformer-rated meters.

5.6. (continued)



Front Views Shown

Figure 5-9
Connection Diagrams for Self-Contained Meter Sockets

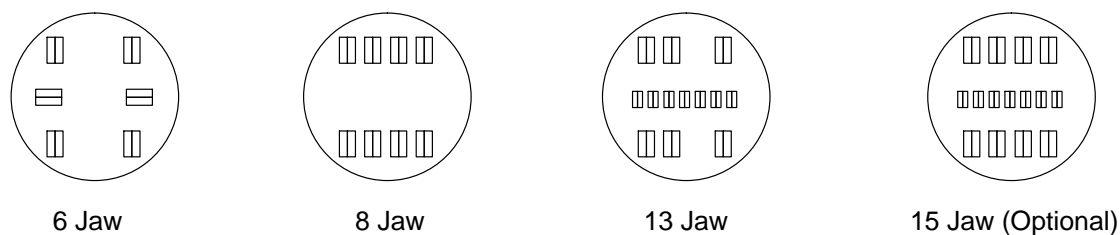


Figure 5-10
Connection Diagrams for Transformer-Rated Meter Sockets

NOTE: PG&E is responsible for wiring transformer-rated meter sockets.

5.6.1. Using a Meter Socket Adapter for Overhead-to-Underground Conversion

Applicants may use approved meter socket adapters to convert existing services. Do **not** use them to establish new service. For more information, see PG&E's [Numbered Document 061032, "Residential and Small Commercial Overhead to Underground Electric Service Conversion."](#)

Consult a PG&E project coordinator to determine which conversion method to use. The applicant must ensure that the meter socket adapter's grounding strap is connected to the grounded wire within the meter panel.

5.6.2. Installing Non-Allowed and Unauthorized Customer Equipment

Applicants must **not** install any type of customer or third-party-owned meter-adapter, surge suppressor or protection device (e.g., TVSS), meter socket adapter, power usage or recording device, security or monitoring equipment, or similar interface device in, on, or between the electric revenue meter and meter sockets or inside any PG&E sealed section, including the instrument transformer (i.e., CT, PT) or service termination sections. These types of installations are not allowed and compromises the applicant's electric service. If safe to do so, PG&E personnel will remove any customer-owned devices and leave them on the applicant's premises if they are discovered.

Only PG&E-approved meter socket adapters used for overhead-to-underground conversions and PG&E's green meter adapter (GMA) used with specific types of residential solar (i.e., photo-voltaic) generation systems are exempt.

5.6.3. Fire-Pump Connections

PG&E allows the following types of service connections to new and existing switchboards and fire-pump meter panels. The requirements are described below.

- A. All fire-pump service connections must be approved by the local city, county, or state inspecting Authority Having Jurisdiction (AHJ). Site plans and equipment drawings must be submitted to PG&E for approval.
- B. The service disconnect, meter panel, switchboard, or switchgear for the fire pump **must be located in the same electrical room** as the main service meter panel, switchboard, or switchgear, as well as the utility termination section. They cannot be located in another room or building. When installed outdoors, the equipment must be located next to each other.
- C. For switchboards rated up to 600 volts (i.e., secondary), the following types of connections are allowed.
 1. Preferred connection for new switchboards: A fire-pump service connected in a dedicated tap section installed in the main switchboard. See Option #1 in Figure 5-11, "Fire-Pump Equipment Location and Service Connection Options," on Page 5-31.

5.6.3. (continued)

If allowed, the local AHJ **could** require the tap section to be located away from the main breaker on the opposite side of the termination section.

2. Alternative connection for new or existing switchboards: A fire-pump service connected to the load side (i.e., after the main breaker) of the main switchboard. See Option #2 in Figure 5-11 on Page 5-31.
- D. For switchgear (i.e., primary) rated between 601–25,000 volts, applicants can use the following types of connections.
 1. A fire-pump service connected in a dedicated tap section of the switchgear.
 2. A fire-pump service connected to the load side (i.e., after the main breaker) of the main switchgear.
- E. For main switchboard or switchgear service termination equipment rated between 0–25,000 volts, applicants can use the following type of connection.
 1. A separate and dedicated utility service that is connected directly to the fire-pump meter panel, switchboard, or switchgear. Usually, this is referred to as a second PG&E service. See Option #3 in Figure 5-11 on Page 5-31.
- F. **Do not** place a fire-pump service tap or connections in the utility termination, instrument transformer, or metering sections.
- G. Ensure that the wiring configurations for fire-pumps (either 3-wire or 4-wire) are the same as the wiring configurations for the main switch.
- H. Ensure that required access panels **and** required signage for meter panels and switchboards serving fire pumps are installed.
- I. Ensure the ampacity rating of the fire pump switchboard or meter panel does not exceed the ampacity rating for main service termination equipment (e.g., main switchboard, meter panel).

5.6.3. (continued)

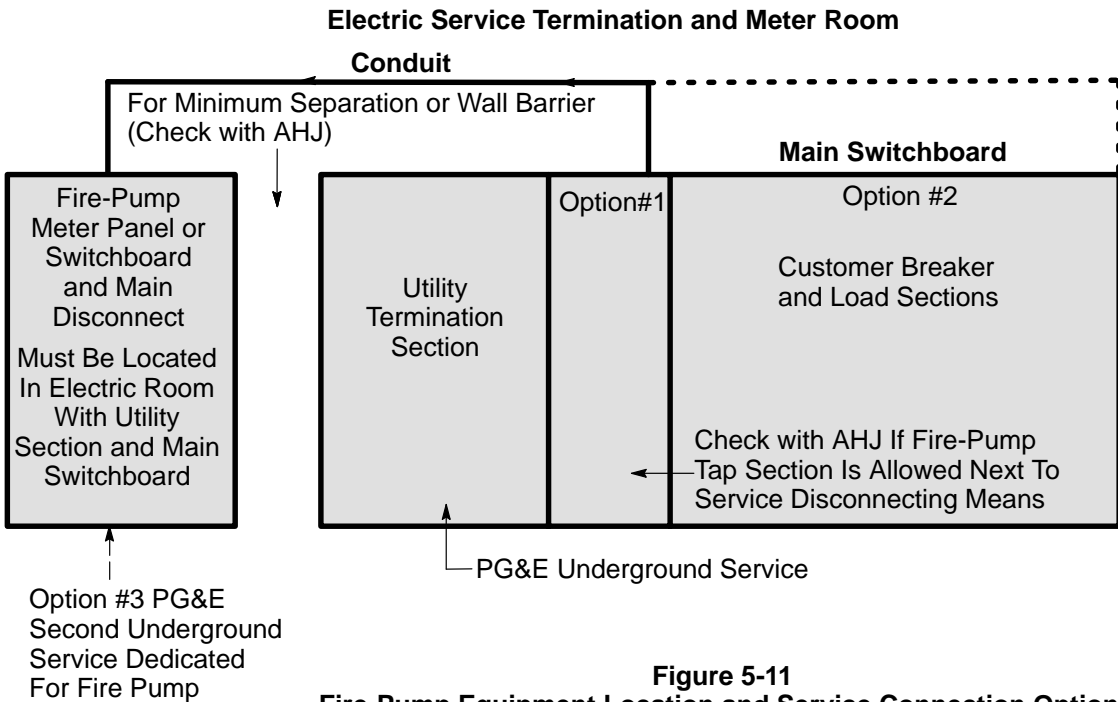


Figure 5-11

Fire-Pump Equipment Location and Service Connection Options

5.7. Main Service Disconnects and Switching Sequences

5.7.1. Main Service Disconnects

For each installed meter, the applicant, in compliance with applicable codes, must furnish and install a fusible switch, circuit breaker, or other approved disconnecting means for controlling all of (and **only**) the energy registered by that meter. When the governing code or ordinance permits, the disconnect means may consist of a group of fusible or circuit-breaker disconnects. PG&E requires access to these disconnects.

For all metering equipment, applicants must place the main service disconnect switch adjacent to the meter(s), not more than 10 feet away and within line of sight. The main service disconnect switch may be located inside an approved meter room or outside of the building being served, while adjacent to the metering equipment.

PG&E prefers applicants to have provisions for individual disconnects when they use switchboards with multimeter installations.

NOTE: See [Section 1, “General,” Subsection 1.14., “Determining the Service Rating,” Paragraph B., “Enclosure Nameplate Labeling and Rating.”](#) when more than one disconnecting means is installed.

5.7.2. Main Service Disconnect Switch Rated for Amperes Interrupting Capacity (AIC)

State and local codes require the service equipment’s main disconnect switch and fuse, or the circuit breaker, to be rated at the available short-circuit current value.

5.7.2. (continued)

When possible, PG&E designs its facilities so that the short-circuit duty at the service termination will not exceed 10,000-amps symmetrical for new, single-family, residential applicants that are supplied by an individual service drop or lateral that is rated at 225 amps or less. This service includes mobile homes and duplexes.

For short-length service drops or laterals rated at 225 amps or less that are constructed from the PG&E distribution system to the service termination equipment, it is not practical for PG&E to design its facilities to limit the short-circuit duty to 10,000 amps. For short-service installations and for all service termination equipment rated greater than 225 amps, PG&E provides, on request by the applicant, the maximum-available short-circuit current based on the service equipment's capacity. If the applicant increases the service equipment's capacity, the maximum-available short-circuit current may be higher.

5.7.3. **Arc Flash Assessment**

PG&E's electric system is dynamic and continually being reconfigured due to system needs and general maintenance. Therefore, due to its many variables, a range of impedance's should be considered in an arc flash assessment. To request an arc flash assessment, contact your local project coordinator.

5.7.4. **Electronic Trip Circuit Breakers**

Electronic circuit breakers using a trip unit are programmable devices that measure the current flowing through the circuit breaker and initiate a trip signal, when appropriate. An electronic trip unit has multiple dials that can be adjusted to various settings.

The IR setting is the continuous current value and must not exceed the ampacity rating of the enclosure. It is similar to the capacity or ampacity rating on thermal or thermal magnetic circuit breakers. The IR settings must be indicated on the trip unit. The IR settings typically are lettered and identified on a chart with the corresponding ampacity values. Electronic trip units are available with multiple ratings for each standard frame size.

The circuit breaker frame is the housing that contains the current-carrying and current-sensing components, along with the tripping and operating mechanism. The frame size (e.g., 800, 1,200, 1,600 amps) is the largest ampere rating available in a group of circuit breakers of similar physical configuration. Other types of breakers may have different frame sizes.

5.7.4. (continued)

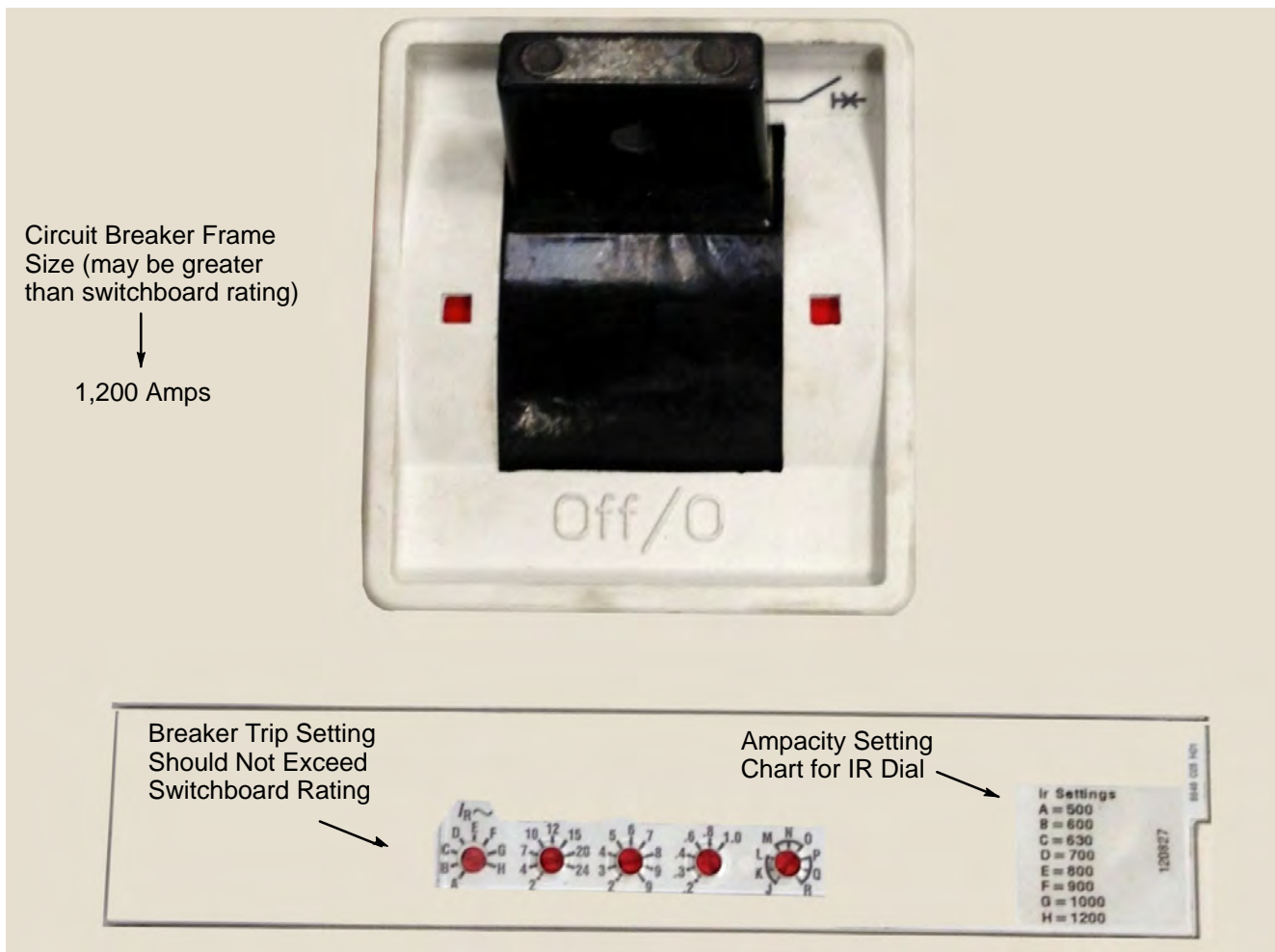


Figure 5-12
Circuit Breakers with Electronic Trip Unit

Note in reference to Figure 5-12.

1. Match the letter on the IR dial to which the arrow head is pointing with the letter on the IR setting chart to determine the ampacity setting for the breaker.

5.7.5. Meter and Main Service Switch Sequence

PG&E places its meters and metering equipment ahead of (i.e., on the supply side of) the applicant's main service disconnecting means. Figure 5-13, "Single Meter With Main Service Switch," Figure 5-14, "Single Meter With Multiple Service Switches," and Figure 5-15, "Multimeter Disconnect Without Main Switch," below, all provide examples of this type of installation. Figure 5-17, "Multiple Remote Switchboard or Meter Panel Locations," on Page 5-35, also provides an example of meter and main service switch sequences for large projects with multiple meter rooms or buildings.

5.7.5. (continued)

PG&E permits exceptions to this sequence only in circumstances where applying the electrical code requirements result in the applicant's main service disconnect means being installed ahead of PG&E's metering and metering equipment. Figure 5-16, "Multimeter Installation with Main Disconnect Switch," below, provides an example of this type of installation. In these instances, an individual disconnect switch also must be installed on the load side of each meter.

The local jurisdiction having authority for enforcing the electrical code requirements determines most of the requirements that applicants must follow when installing their means to disconnect. PG&E requires a main service disconnect for multimeter installations with more than six meters or individual service disconnects.

In large meter rooms where additional metered switchboards may be electrically connected after the main switchboard, or where wall-mounted meter stacks are electrically connected to a tap section of a switchboard, a map and signage indicating where the main service breaker is located are required on each connected switchboard or meter stack.

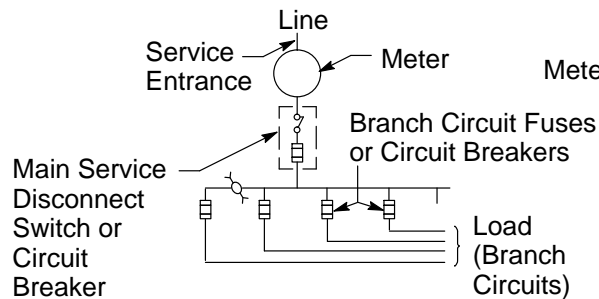


Figure 5-13
Single Meter with Main
Service Switch

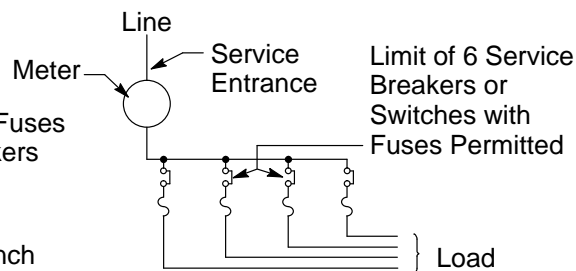


Figure 5-14
Single Meter with Multiple
Service Switches

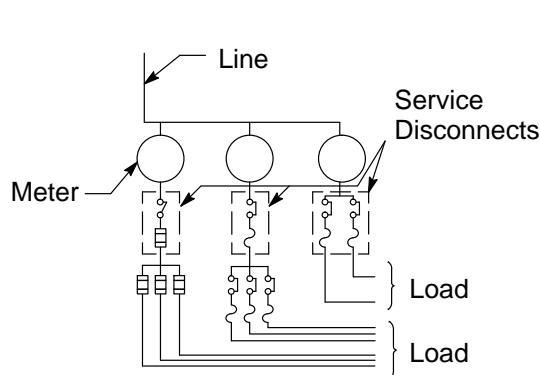


Figure 5-15
Multimeter Installation Without
Main Disconnect Switch

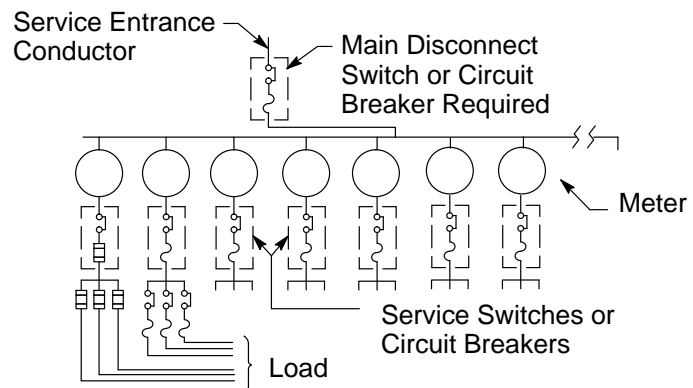


Figure 5-16
Multimeter Installation with
Main Disconnect Switch

5.7.5. (continued)

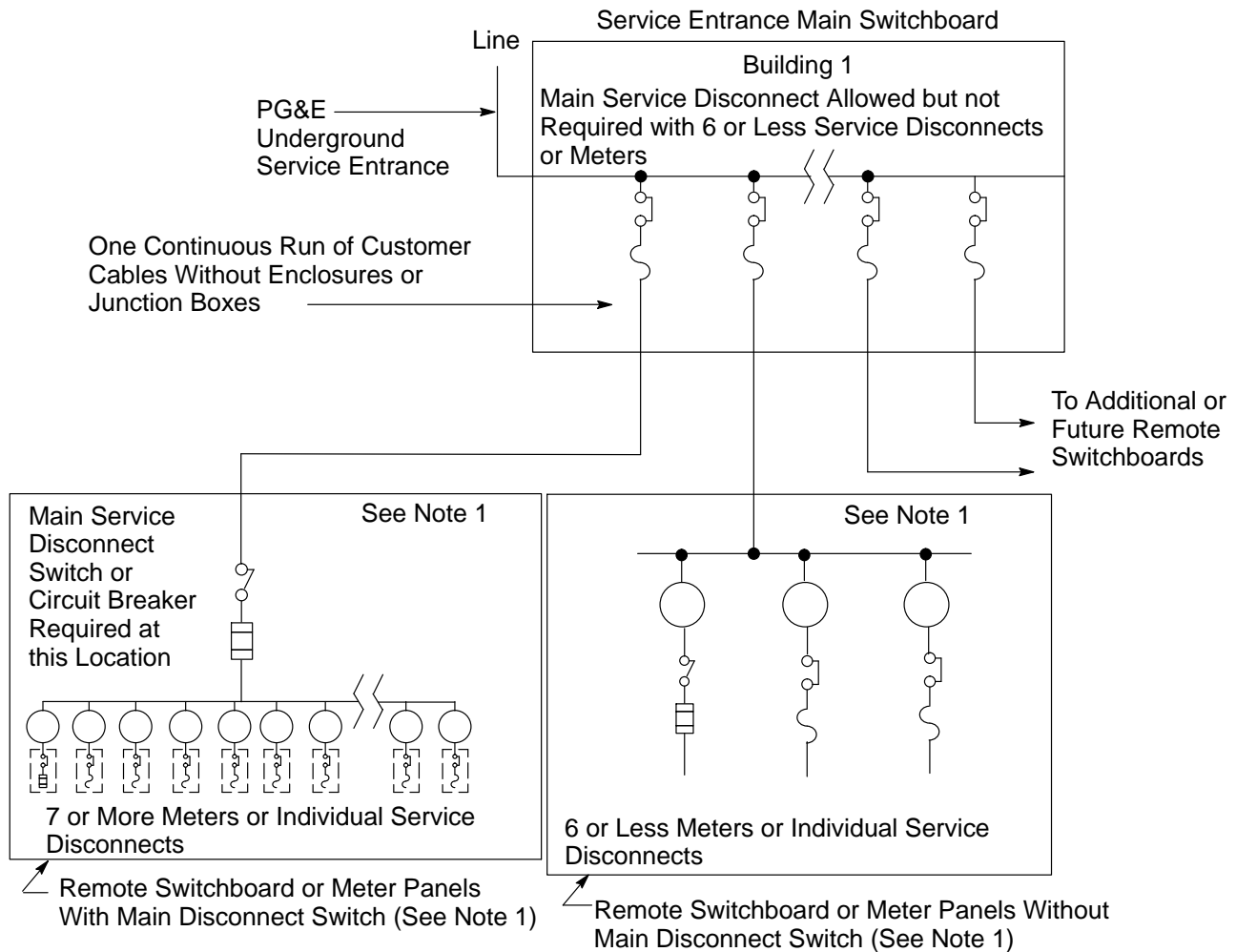


Figure 5-17
Multiple Remote Switchboard or Meter-Panel Locations

Notes in reference to Figure 5-17.

1. When a switchboard or meter panel is located in a different room, floor, or building from the main switchboard, it is considered remote.
2. Customer services installed from the main switchboard to remote switchboards or meter panels must be one continuous run of cables without any entering enclosures or junction boxes along the path.

5.8. Grounding

Applicants must bond and ground their electric services and metering equipment as required by applicable electrical codes, local ordinances, and PG&E requirements.

A. Applicants must **not** use PG&E's gas facilities as part of the electrical grounding system.

1. Do **not** install electrical devices or equipment, wires, cables, bonding or grounding wires, clamps, or ground rods around the gas meter set as shown in Figure 2-19, "Electric and Gas Meter Set Separation Dimensions and Clearance," on Page 2-33, and Figure 2-23, "Dimensions for Typical, Residential, Multimeter Installations," on Page 2-40.

5.8. (continued)

2. Do **not** use PG&E's gas service piping, gas risers, or meter facilities for electric bonding or grounding that allows the gas meter, piping, or other gas facilities to become current-carrying conductors.
3. Do **not** allow gas pipe to be electrically bonded within meter enclosures, cabinets, or meter rooms.
- B. PG&E supplies single-phase, 120/240-volt and 120/208-volt services and three-phase, 4-wire wye and delta services with a grounded service neutral conductor. When PG&E permits a three-phase, 3-wire, 240-volt service, one phase conductor must be grounded.
- C. **Applicants must locate the terminations (e.g., ground terminal) for their grounding electrode conductors outside of any section that PG&E seals.** Applicants must ensure that their terminations are designed to permit their grounding systems to be isolated, when necessary, from PG&E-supplied services. See "Notes in reference to Figure 5-18 and Figure 5-19," on Page 5-37, specifically Note 3, "Equipment Bonding," which requires a continuous bond wire when grounding outside of the PG&E sealed section.
- D. **Applicants must not locate their grounding electrodes, grounding electrode conductors, or grounding ring conductors inside or near any PG&E electrical distribution equipment, enclosures, or vaults.**
- E. As mandated in the applicable sections of the electrical code, applicants may be required to physically protect their grounding electrode conductor against mechanical damage. PG&E prefers, but does not require, the grounding electrode conductor wire to be protected against physical damage by rigid steel conduit or armored cladding. Metal conduit must be bonded to an effective, grounded, fault-current path as described in the electrical code requirements.
- F. Applicants must ensure that a grounded neutral connection, which is required for **safety** and metering purposes, exists in the PG&E-sealed section and is terminated in the same enclosure as the grounding electrode conductor.
- G. When installing ground rods, applicants must only use approved ground rods and clamps as described in [Numbered Document 013109, "Corrosion Resistant Ground Rods and Ground Rod Clamps."](#) located in [Appendix C](#). For homes and buildings, an Ufer grounding system using rebar is an acceptable substitute to the ground-rod method.

When ground rods are installed for concrete pads, refer to [Numbered Document 045292, "Concrete Pad for Three-Phase, Loop-Style, Pad-Mounted Transformers."](#) When ground rods are installed for equipment pads other than transformers (e.g., switchboards), install them according to their application. Finally, when installing ground rods in box pads, use [Numbered Document 064309, "Box-Pad for Pad-Mounted Transformers."](#) for installation information.

- H. To ensure proper access to PG&E facilities during installation and maintenance, do not attach the bonding and grounding attachments for communication equipment on or near any PG&E sealed sections of the meter panel that would restrict access to the panel doors and meter.

5.8. (continued)

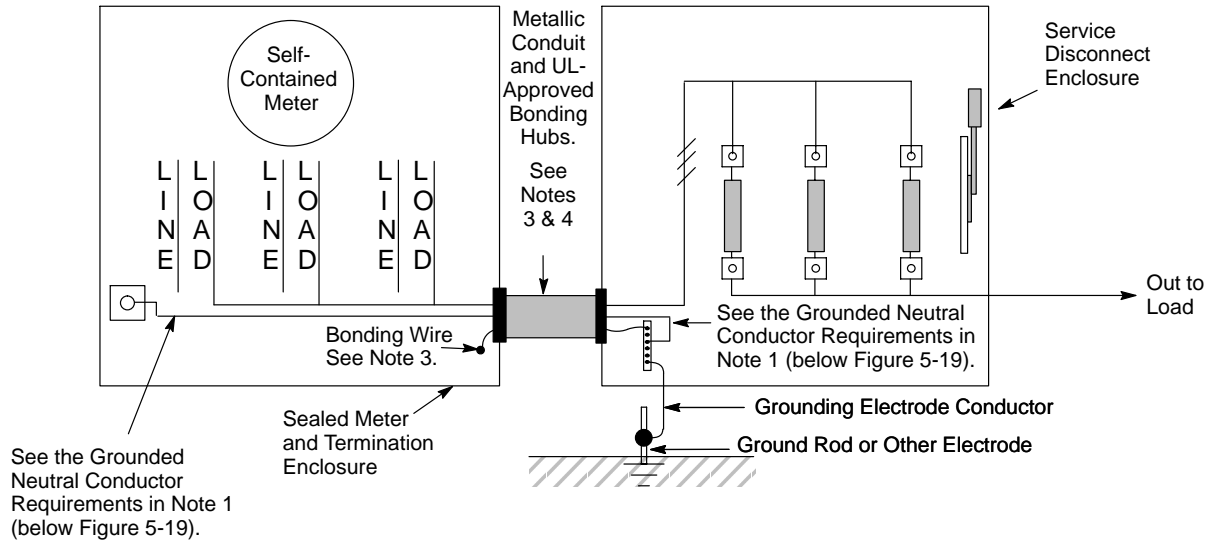


Figure 5-18
Grounding Outside of the Sealed Section—Self-Contained Meter

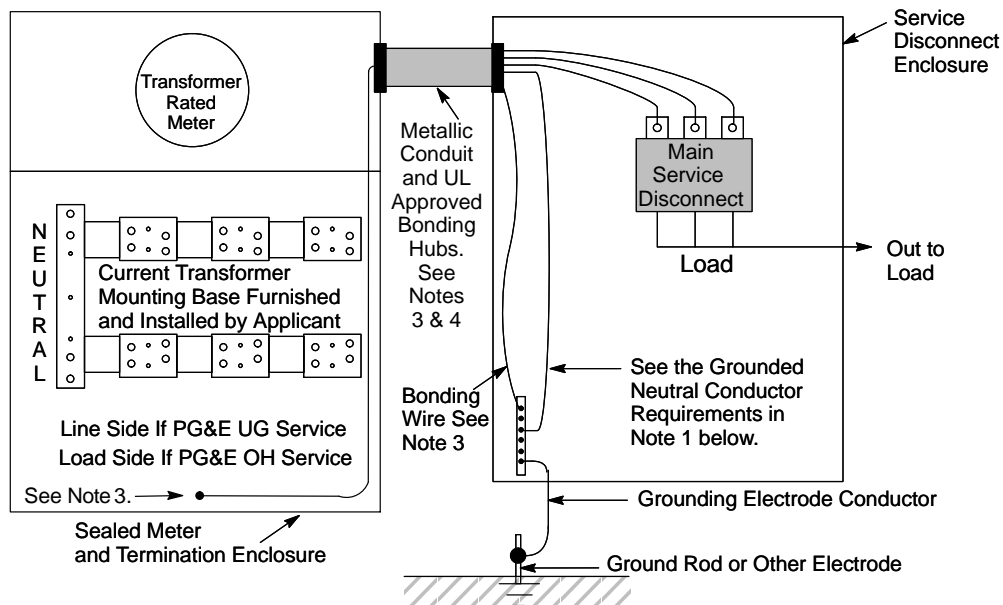


Figure 5-19
Grounding Outside of the Sealed Section—Transformer Rated Meter

Notes in reference to Figure 5-18 and Figure 5-19 are required for the safety of workers and the proper operation of PG&E facilities.

- 1. Neutral Conductor:** PG&E requires that the neutral conductor be grounded. Ground the neutral conductor by using the preferred methods described in Note 2 and Note 2.a. Or use the nonpreferred method described in Note 3.

Notes continued on the next page

5.8. (continued)

Notes in reference to Figure 5-18 and Figure 5-19 (continued).

2. Service Disconnect Enclosure:

- a. Extend the neutral conductor from the meter panel to the service disconnect enclosure and terminate it to a grounded (i.e., non-insulated) ground/neutral terminal bus as shown in Figure 5-18, “Grounding Outside of the Sealed Section–Self-Contained Meter,” and Figure 5-19, “Grounding Outside of the Sealed Section–Transformer-Rated Meter,” both above.
- b. The service disconnect switch and its enclosure must be within 10 feet or less from the service termination and metering equipment and within the line of sight.
- c. The grounding electrode conductor’s termination point and the ground/neutral terminal bus must be located in the service disconnect and cannot be located in gutters or raceways.

3. Equipment Bonding: Install an equipment grounding conductor (EGC) between the PG&E service termination enclosure (e.g., meter panel) and the service disconnect enclosure. The EGC is required in this layout. Run the EGC (i.e., bonding wire) through metallic conduit and attach it to the inside of each enclosure. Use Myers hub fittings to connect the conduit with the enclosures. These fittings are Underwriters Laboratories (UL) certified for bonding and are required to connect the conduit with the enclosures. PG&E and the local authority having jurisdiction must approve the conduit and fittings. The customer bond wire is allowed to terminate in a manufactured bond lug installed at the bottom of meter panel.

4. Conduit: The conduit diameter size connected to the meter panel must be equal to, or larger than, the diameter of the maximum knockout manufactured in the panel. The approved bonding hubs should not extend out past the edges of the meter panel.

Table 5-5 Grounding Requirements for Wall-Mounted Panels

	Material			
	Neutral Wire	Customer Cables to Disconnect Switch	Ground Rod and Wire	Bond Wire
Allowed to be Terminated Inside Sealed Sections of Meter Panel	Yes	Yes	No	Yes

5.9. Temporary Service

5.9.1. Temporary Service Using Permanent Service Panels

To lessen the potential for damage by staples and nails during the construction phase, applicants must use only **galvanized rigid steel (GRS)** in locations where permanent service facilities will be installed and/or energized before completing the wall. The steel protects the conduit and/or cables from damage.

5.9.1. (continued)

Applicants also must protect their grounding conductors against mechanical damage by rigid steel conduit or armor cladding that runs from the main panel to a subterranean location and is embedded in concrete (e.g., garage). The service facilities and the wall must be a permanent and stable structure. If couplers are installed they must be of the same type (**GRS**) as the conduit. If transitioning from steel to rigid plastic the coupler must not reduce the internal diameter of the conduit. Refer to the steel and steel to plastic couplers in [Numbered Document 062288, “Underground Conduits,”](#) located in [Appendix C](#).

For the installation requirements of GRS conduit and couplings, see [Section 3, Subsection 3.3.3.1., “Galvanized Rigid Steel Conduit and Couplings,”](#) on Page 3-12.

The service panel and facilities must meet all PG&E and local jurisdiction requirements. The service facilities must pass inspection by a PG&E inspector before being energized.

As an alternative to constructing a permanent wall to support the meter panel, two flat steel bars that are each a minimum of 1/4 inch thick and 3 inches wide may be permanently cemented into the foundation and run vertically parallel with both sides of the meter panel. The flat side of the steel bars must face the sides of the panel, be long enough to reach the top of the panel, and be permanently secured to the panel.

5.9.2. Temporary-Service Metering Pedestal

Applicants must coordinate the connection of pedestal service conductors with PG&E project coordinators. **Before** installing temporary-service metering pedestals, applicants must obtain any inspections and permits that are required from the local authority having jurisdiction.

Applicants must install temporary-service metering pedestals as shown in Figure 5-20, “Temporary-Service Metering Pedestal,” on Page 5-40.

5.9.2. (continued)

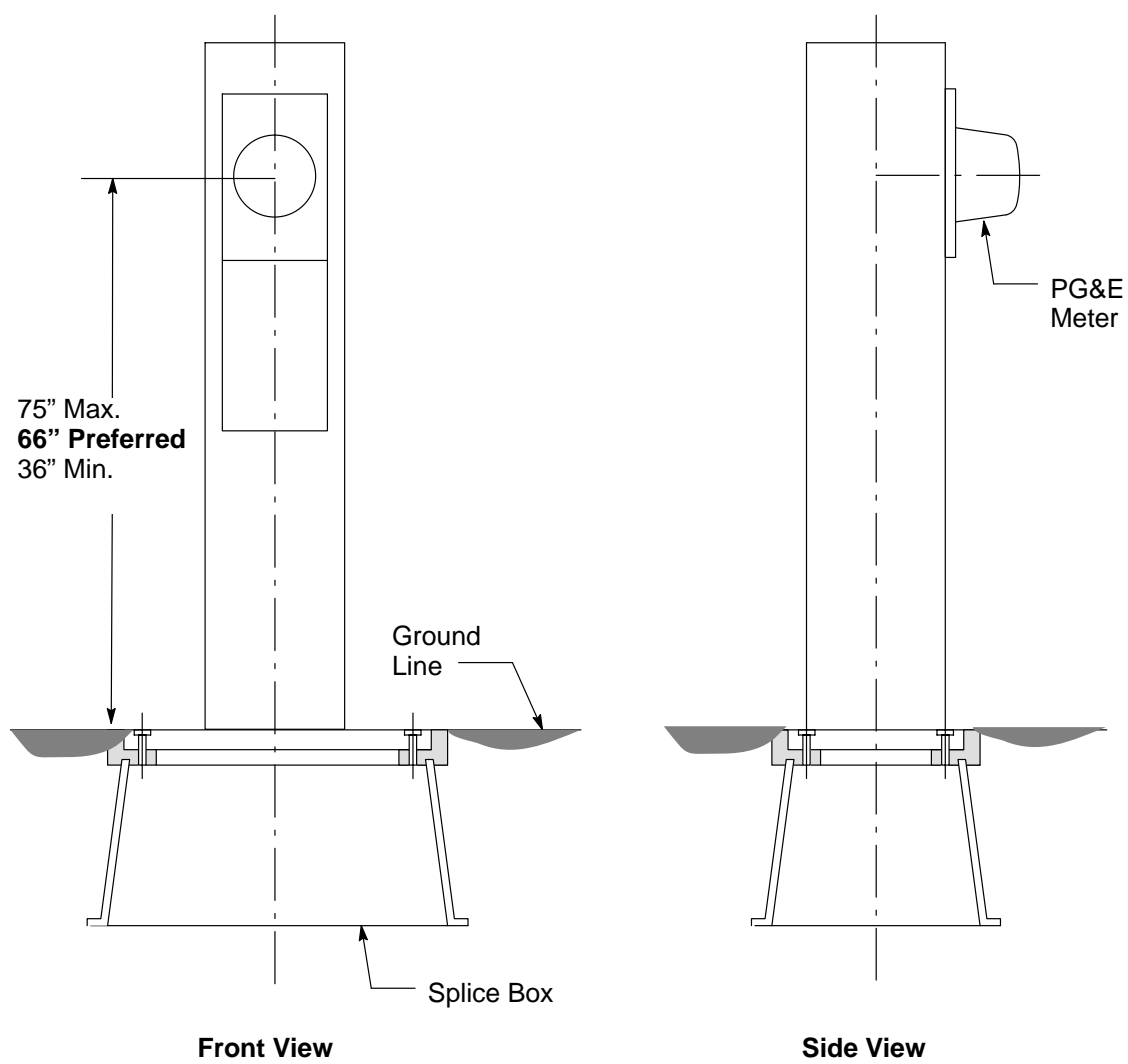


Figure 5-20
Temporary-Service Metering Pedestal

5.9.3. Temporary Plug-In Service

The local inspection authority having jurisdiction must approve all of the permanent service connections to the main service disconnect **before** an applicant installs a temporary service adapter. Additionally, the local authority having jurisdiction must approve the applicant's plan for installing and using temporary service adapters.

Applicants must install temporary plug-in service as shown in Figure 5-21, "Plug-In Temporary Service," and Figure 5-22, "Typical Plug-In Adapter," below.

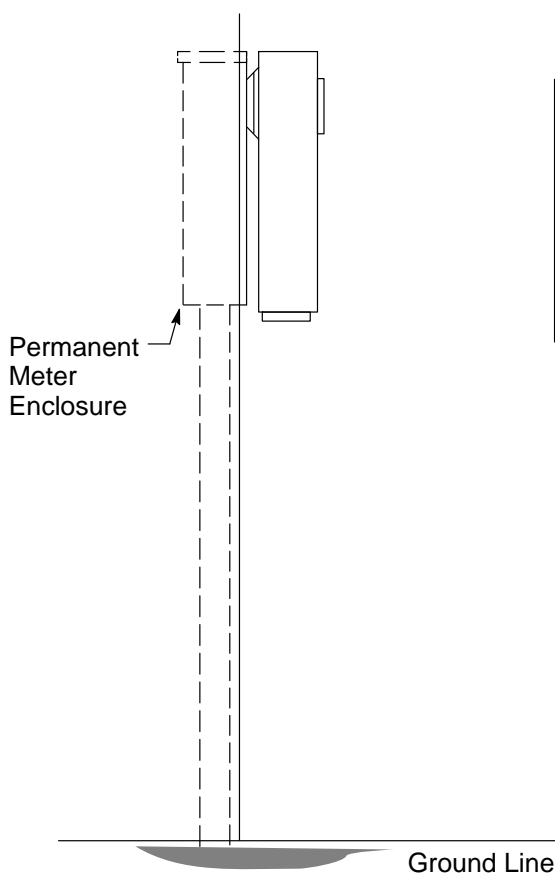


Figure 5-21
Plug-In Temporary Service

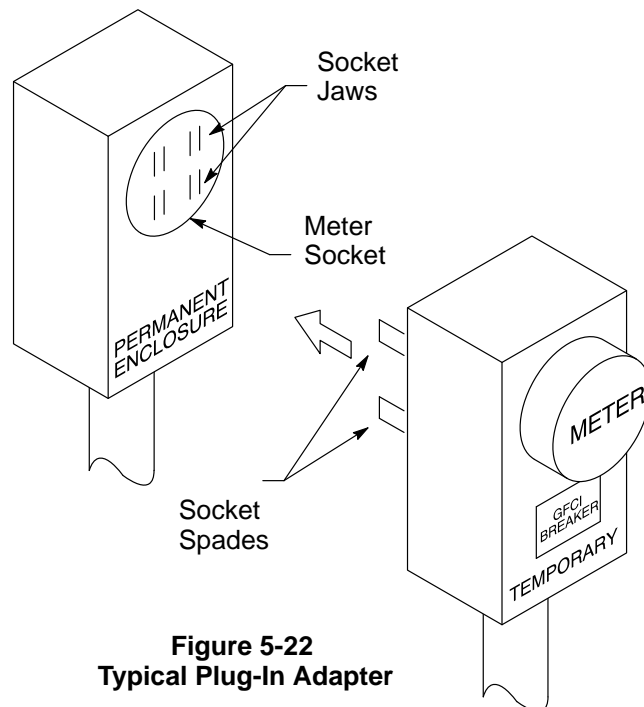


Figure 5-22
Typical Plug-In Adapter

Note: Make a neutral connection by attaching a pigtail directly to the neutral with a #4 copper wire.

5.10. Connecting Non-Utility Power Sources to Utility Services

By enacting [California Health and Safety Code, Division 104, “Environmental Health,” Part 15, “Miscellaneous Requirements,” Chapter 5, “Electrical Hazards,” Sections 119075 through 119090](#), the legislature of the state of California intended to prevent electricity generated by permanent or portable electric generators from backfeeding into a utility’s electrical distribution system. In addition, [California Code of Regulations \(CCR\) Title 8, Section 2320.9, “Backfeeding or Interconnection,”](#) says that electrical power sources, both permanent and temporary, can **not** be connected to a premises’ wiring system, or parts of such a system, unless positive means are used to prevent electricity from being transmitted beyond the premises’ wiring system, or beyond any intentionally segregated parts of such a system.

EXCEPTION: The service utility can authorize an interconnection.

A **positive means** is defined in this CCR subpart as a device that, when used or operated, interrupts or prevents the flow of current to or from the electrical system. Also, a positive means provides the device operator or user with a visual or definite indication of the existing condition or state of the electrical system.

PG&E requires customers to notify the company when they are installing generation or using a generator. If installing an applicant-owned and operated generator that operates in parallel (back feeds) with PG&E’s system, or has any battery storage capabilities, the applicant must contact PG&E’s Electric Generation Interconnection (EGI) department by email at rule21gen@pge.com.

If the applicant-owned and operated generator will never operate in parallel with PG&E’s system or is fueled by natural gas connected to PG&E’s gas meter, the applicant must contact the PG&E Business Customer and Renovation Center at 877-743-7782 for the interconnection requirements specific to the location where it will be used.

Customers installing applicant-owned and operated generators that will not run in parallel with PG&E’s system, do not have battery-storage, and are not fueled by natural gas connected to a PG&E gas meter must call the PG&E Customer Service Line at 800-743-5000 to have their generators noted on the service point at their premises.

Also, for interconnection requirements, applicants should refer to PG&E’s [Distribution Interconnection Handbook](#), which is available on PG&E’s Internet website at <http://www.pge.com/mybusiness/customerservice/nonpgeutility/generateownpower/distributedgeneration/interconnectionhandbook/index.shtml>

NOTE: See [Numbered Document 060559, “Disconnect Switch Requirements for Distributed Generation Customers,”](#) located in [Appendix C](#), when customer generation systems are installed on their premises.

5.10.1. Specific Interconnection Requirements for Services Up to 600 Volts

Residential and small commercial applicants with generating facilities on their premises who want to take advantage of PG&E’s standard net energy metering (NEM) program must meet the following requirements.

5.10.1. (continued)

A. Requirements for Small Power Generators (Qualifying Facilities) and Co-Generation Interconnections Including NEM Interconnection Installations

Table 5-6 below shows the requirements for an ac disconnect.

Table 5-6 Requirements for AC Disconnect Switches

Inverter-Based Generators	Phase(s)	AC Disconnect Required?
Self-Contained Meter Panel, Socket-Based, 320 Amps or Less (Continuous Current Rating) ¹	Single	No ²
All Other Self-Contained or Transformer-Rated Meter Panels	All	Yes
Non-Inverter-Based Generators	Phase(s)	AC Disconnect Required?
All Self-Contained and Transformer-Rated Meter Panels	All	Yes

¹ An ac disconnect is required for all K-base meter panels of any ampacity rating.

² If an ac-disconnect switch is installed, it must be PG&E approved.

A fusible ac disconnect switch is required for generator interconnections ahead of the main breaker (line/supply side connection) and after the meter. Also required is an engraved placard (signage), indicating there is a line/supply side connection, installed on the metering equipment. For specific requirements, refer to [Numbered Document 094670, “Supply Side Interconnection Requirements for Distributed Generation.”](#)

A nonfusible ac disconnect switch may be installed if the generation is connected to a dedicated, alternative generation breaker that came manufactured (e.g., solar ready) with the meter panel. For specific requirements, refer to [Numbered Document 094670](#), located in [Appendix C](#).

As specified in [Electric Rule 21, “Generating Facility Interconnections,”](#) and as required by PG&E, the generating facility must have an ac disconnect switch that meets the requirements described in [Numbered Document 060559](#) and listed below.

- Easily accessible by PG&E, when requested.
- Manual and gang operated. Lockable in the “open” position.
- Allows visible verification that an air-gap of separation has occurred.
- Located 10 feet or less from PG&E’s electric meter at the point of common coupling or interconnection and is seen easily, in line of sight, from the panel.

5.10.1. (continued)

- Permanent, approved sign(s) attached at PG&E's electric revenue meter's point of common coupling. A map showing the location of the ac disconnect switch also may be required.
- Installed in a safe and acceptable location (either outdoors or in a meter room) that meets the same location, height, and working space requirements as a meter panel. The height is measured from the ground to the top of the switch.
- The disconnect switch must be installed to only isolate the customer generation sources and must not disconnect customer loads.
- The disconnect switch must not be electronically controlled from a remote location to close in the switch to the "On" (energized) position.

For additional information on disconnect switches and distributed generation requirements, see PG&E's [Distribution Interconnection Handbook](#).

B. Virtual Net Energy Metering – VNEM (NEMV)

This program allows qualified participants to install a single solar system to cover the electricity load of both common and tenant metered areas connected at the same service delivery point.

This [Electric Rate Schedules](#) table helps housing owners allocate a solar system's electricity to tenants enabling residents to receive the direct benefits of the building's solar system without requiring the generator to be physically connected to each billing meters.

Refer to [Numbered Document 076249, "Virtual Net Energy Metering Installations,"](#) found in [Appendix C](#), which explains the requirements for VNEM installations and illustrates the various metering and connection options for VNEM projects. Check the PG&E [Electric Rate Schedules](#) website for the latest information on this program.

C. Requirements for Generators That Are Not Permanently Connected (i.e., Temporary Connections)

Portable electric generators must be connected as described in the [California Health and Safety Code, Division 104, Part 15, Chapter 5, Section 119075\(b\)](#). This code says that any portable electric generator that can be connected temporarily to an applicant's electrical system, and that is supplied typically by an electrical corporation or state or local public agency, can be connected only after separating the applicant's electrical system from that of the electrical corporation or state or local agency.

This rule applies to any generator connected as a temporary (i.e., nonroutine, nonscheduled) or emergency source of power.

Connect any portable electric generator that is used periodically as a source of power, either on an as-needed or scheduled basis, as described in Subsection 5.10.1.D., on Page 5-45. An example would be a generator used to provide backup power for equipment maintenance.

5.10.1. (continued)



D. Requirements for Generators That Are Connected Either Permanently or Periodically to an Electrical Service and Used on a Planned, Routine, or Scheduled Basis, but Do Not Operate in Parallel with the PG&E System.

Generators falling under this category must have a disconnect switch that is accessible to, and in a location approved by, the serving utility.

These generators must be connected as described in PG&E's [Electric Rule 2, "Description of Service," Item E.6](#), and in the [California Health and Safety Code, Division 104, Part 15, Chapter 5, Section 119075\(c\)](#).

These rules state that any electrical generator that can be permanently connected to an applicant's electrical system must be connected only by means of a **double throw switch** (see Figure 5-23 on Page 5-45). This switch isolates the applicant's electrical system from that of the electrical corporation or state or local agency.

EXCEPTION: Generators that are designed to run in parallel with the servicing utility's system, and that are approved by that utility, are exempt from these rules.

The double throw switch may be either a manual or automatic transfer switch meeting the requirements of [UL Standard 1008, "Transfer Switch Equipment."](#) The switch may be an integral part either of the generator assembly or of the service facilities, and must be approved by the authorities having jurisdiction.

Please visit "[Electric Generator Safety](http://www.pge.com/generator/)" (<http://www.pge.com/generator/>) for more information.

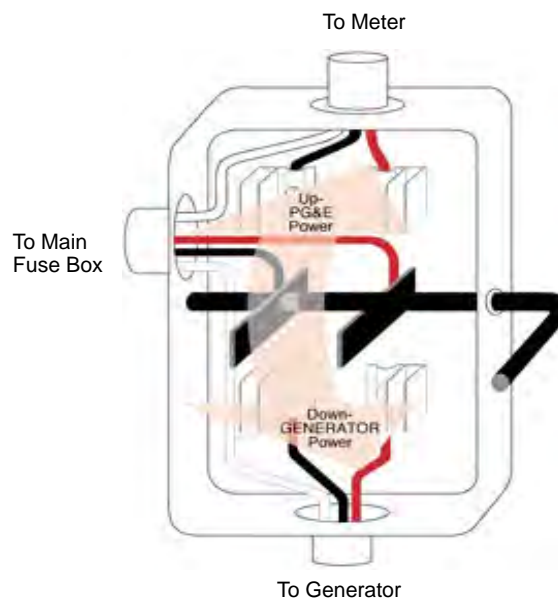


Figure 5-23
Transfer Switch

NOTE: Ensure that the transfer switch is installed **after** the meter panel on the customer's side, **not before** the meter panel on PG&E's side.

5.10.1. (continued)

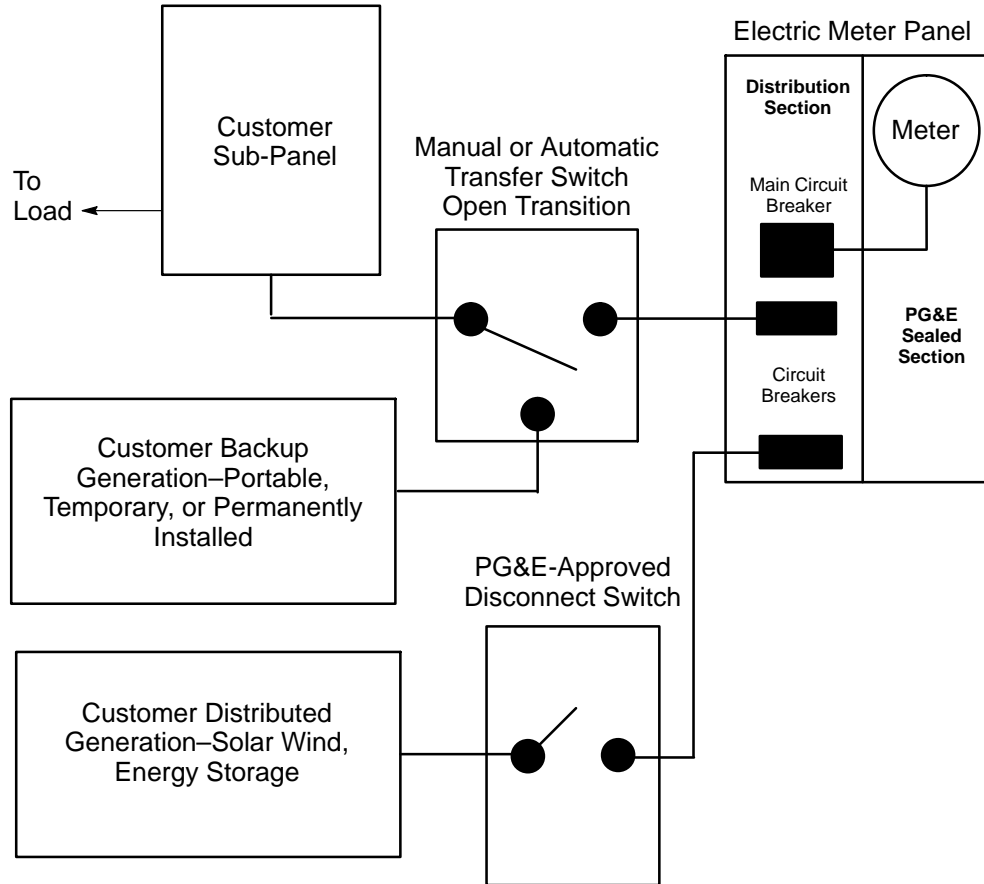


Figure 5-24
SLD Manual Transfer Switch

Notes in reference to Figure 5-24.

1. Ensure that the automatic or manual transfer (safety) switch is a double-pole, double-throw switch certified to Underwriters Laboratories (U.L.) Standard 1008, "Transfer Switch Equipment."
2. **Do not** reroute or modify line-side (supply) cables or busing coming from the meter compartment to the distribution section of the panel. Do not modify PG&E-sealed sections.
3. A disconnect switch is required to be installed between the transfer switch and meter panel. The disconnect switch may be exempt from being installed if one of the following conditions are met.
 - If a manual transfer switch is installed, the blades have a visible air gap when switched to the "off" position.
 - If an automatic transfer switch is installed, the transfer scheme is a "break before make" open transition.
4. For some meter panels, a disconnect switch may need to be installed between the transfer switch and customer generation.

5.10.1. (continued)

E. Requirements for NEM Revenue Metering With a 4-Wire System at the Point of Common Coupling

NEM revenue metering that has a 4-wire system at the point of common coupling also must have a NEM meter panel configured for a 4-wire system (three phases and a neutral).

When the normal source of voltage supplying PG&E co-generation metering potentially can be interrupted, PG&E, at its option, may install metering with an auxiliary source of power at the applicant's expense.

F. Requirements for Generators Powering 10 kW (or Less), Stand-Alone, Field-Installed Telecommunication Facilities and Special Applications

Applicants can own 10 kW (or less) generators used for stand-alone, field-installed, telecommunication facilities and special applications. However, PG&E field personnel perform maintenance and routine testing on electric supply and meter facilities, and must be able to perform these functions even when applicants are unable to be present.

Applicants **must provide** a positive means to prevent their generators from backfeeding into the utility system. This requires installing special equipment, as described in the PG&E [*Distribution Interconnection Handbook*](#).

Usually, these equipment installations are performed in the field. The generator or alternate power source either is integrated with or is made a part of stand-alone equipment and metering facilities. For example, an applicant could install a double throw switch to isolate his or her equipment and power supply and prevent electricity from flowing into the electric metering and supply system.

5.10.2. Warning Statements and Labels for Interconnected Services

[*California Health and Safety Code, Division 104, Part 15, Chapter 5, Section 119080\(a\)*](#), requires that every manufacturer of a portable or permanent electrical generator that is capable of being connected either permanently or temporarily to a commercial, industrial, or residential structure's electrical system include a warning statement.

The warning statement must be published in the generator's instruction manual and a legible warning label must be present on the generator. The warning statement must contain the requirement found in [*California Health and Safety Code, Division 104, Part 15, Chapter 5, Section 119075*](#), and explain potential electrical hazards that backfeed can create when it flows into a utility's distribution system.

The same warning information must be included in all advertisements offering portable electrical generators.

5.10.2. (continued)

[*California Health and Safety Code, Division 104, Part 15, Chapter 5, Section 119080\(b\)*](#) also requires that portable electrical generators display a legible warning label on a visible surface of the generator. It goes on to say that individuals or public agencies can **not** sell or rent to another person or public agency, or offer for sale or rent to another person or public agency, a portable generator that does not have a warning labeled displayed on the equipment.

5.10.3. Violation

[*California Health and Safety Code, Division 104, Part 15, Chapter 5, Section 119090*](#), states that violating the requirements of [*Section 119075 through Section 119085*](#) is a misdemeanor offense, subject to a fine of not more than \$500.00 or not more than 6 months imprisonment.

5.10.4. References for Customer Generation

PG&E has numerous requirements for installing portable or permanent sources of customer generation. Customers who install solar, battery storage, and backup generation systems will find useful information and requirements in these documents listed below.

Table 5-7 Customer Generation References

060559	Disconnect Switch Requirements for Distributed Generation Customers
076249	Virtual Net Energy Metering Installations
094670	Supply Side Interconnection Requirements for Distributed Generation
094684	Green Meter Adapter (GMA) for Customer Generation
TD-2306M	Distribution Interconnection Handbook

5.11. Plug-In Electric Vehicle Interconnections

Residential customers with Plug-In Electric Vehicles (PEVs) can connect the Electric Vehicle Supply Equipment (EVSE) to their residences under PG&E's existing [Electric Schedules](#). Customers must notify PG&E of the additional electrical load before connecting a PEV. The increased load may require the electric service cables, conduit, and meter panel to be upgraded.

Additional PEV information can be found in PG&E's [Electric vehicles](#) website at <http://www.pge.com/electricvehicles/>. For questions regarding PG&E's PEV requirements, please contact the [Discover building and renovation services](#) at 877-743-7782.

**SECTION 6
ELECTRIC METERING:
RESIDENTIAL**

SECTION 6 ELECTRIC METERING: RESIDENTIAL

Section 6

Electric Metering: Residential

6.1. Scope

This section of the manual provides the Pacific Gas and Electric Company (PG&E/the Company) service specifications and requirements for residential electric metering. Also, it describes the required locations for those residential meters. This section includes specific information that is **not** covered by the basic requirements in [Section 5, “Electric Metering: General.”](#)

6.2. Residential Electric Service: Specifications and Requirements

PG&E typically provides electricity for residential and commercial applicants served on a domestic rate schedule with 3-wire, 120/240-volt, single-phase, 60-hertz (Hz), alternating current (ac) service. However, the Company is able to supply 3-wire, 120/208-volt, single-phase, 60 Hz, ac service at some locations. **This service is limited to a service-entrance rating of 225 amperes (amps).** Applicants should contact their local PG&E project coordinators and ask about the type of services that are available for their specific locations.

NOTE: See [Table FM-1, “Service Planning Office and Inspection Desk Contact Information,”](#) at the front of this manual starting on Page iv, for specific contact numbers listed by area.

6.2.1. Service Classes

The 125-amp-rated panels are classified as Class 100. The 225-amp-rated panels are classified as Class 200.

6.2.2. Test-Bypass Facilities

For single-phase residential installations, test-bypass facilities may be provided, but are not required. However, test-bypass facilities **are** required for any of the following installations.

- A. Single-family residential Service Class 320 meter, or residential meter panels that are larger than 225 amp, 120/240 volt, single phase, 3-wire.
- B. Live-work homes, housing, or buildings.
- C. Residential meter panels of any size or phase that supply power to elevators.

NOTE: Single-family homes may be exempt if the elevator system has integrated safety features with a backup battery system acting as an emergency power supply.

- D. All common and tenant area meter panels of any size or phase, at multi-residential and live-work buildings with 2 to 5 units, that supply power to fire alarms or equipment, security alarms, laundry rooms, or significant interior lighting. Significant interior lighting is for hallways, storage rooms or areas, and garage areas.
- E. All common and tenant area meters at multi-residential and live-work buildings with 6 or more units.

6.2.3. Electric Meter Socket Covers and Seals

When service cable connections are made at residential or nonresidential customer overhead or underground meter panel, termination enclosure, or pull section, whether the service is left energized or de-energized, the following requirements apply.

- A. Cover and seal all meter sockets with an approved blank-off cover (i.e., pie plate) or set the electric meter(s). PG&E material codes for electric meter covers are M249424 and M249559.
- B. Seal all sealable covers on the customer-owned service termination and metering equipment using PG&E-approved seals.

Do not energize meter panels and sockets unless blank-off meter covers are installed on vacant meter sockets.

6.3. Meter Locations

An applicant must consult a PG&E project coordinator during the initial construction phase of his or her project to determine the appropriate meter panel and current-transformer cabinet (if installed) location and to ensure that adequate space is provided for the metering equipment. PG&E must review and approve all meter installations **before** the meters are installed.

When meters are installed in a confined or enclosed area, applicants must ensure that they design a way for PG&E personnel to read the meters from the **outside** of the enclosures (e.g., window, opening).

The following four, lettered paragraphs provide location requirements that are applicable to residential metering.

- A. Locate the meters and metering equipment either in outdoor, unfenced areas **or** mount them on, or recess them in, an exterior building wall. Do **not** mount metering equipment on, or recess metering equipment in, single family residences or inside garages.
- B. Locate the meters and metering equipment in a meter room that is accessible through an outside doorway.
- C. For a multifamily or residential building, locate the meters and metering equipment in a meter room either on the ground floor or in the basement level (or other acceptable location). The installation must be accessible directly from a public area.
- D. In large, multifamily, multistory, high-rise residential buildings where the walking surface of the highest tenant-occupied floor is over 75 feet high, PG&E may, at its option, approve grouped meter locations on one or more upper floors.
- E. An applicant who plans to install metering equipment on any floor above the ground floor in a multistory building must contact a PG&E project coordinator as early as possible during the initial stages of the project. Except for qualified high-rise buildings, PG&E **will not approve** of any equipment location that is above the building's ground level.

6.3. (continued)

- F. When meters will be installed indoors see [Numbered Document 094683, “Smart Meter Electric Network Requirements for Indoor Meter Rooms and High-Rise Buildings,”](#) located in [Appendix C, “Electric and Gas Engineering Documents.”](#)
- G. Locate electric meters in the same general area as gas meters when designing single-family residences. For clearance specifications refer to [Section 5, “Electric Metering: General,” Subsection 5.4.3., “Meter Set Clearance Requirements,”](#) on Page 5-16, and [Section 2, “Gas Service.”](#)

6.3.1. Installing Utility Services to Mobile Homes

- A. Typically, PG&E will **not** supply utility services and/or metering facilities to mobile homes that are located or set up in any area, including a mobile home park, where utility service facilities are attached directly to the mobile home **except** under the following circumstances.
 - 1. The mobile home is fixed in place (i.e., no running gear or wheels). The mobile home must **not** be capable of movement.
 - 2. The mobile home is installed on a foundation system as described in [State of California, Title 25, “Housing and Community Development,” Division 1, “Housing and Community Development,” Chapter 2, “Mobilehome Parks and Installations,” Article 7, “MH-Unit and Commercial Modular Installations and Facilities,” Section 1333, “Foundation Systems.”](#)
- B. PG&E will make an **exception** and install utility services to a location where mobile homes may be moved, including mobile home parks, under certain, specific conditions.
 - 1. The mobile homes must be served by meter pedestals or other PG&E-approved services **and** the meter facilities must be installed at a fixed location.
 - 2. Applicants are responsible for connecting their mobile homes to those fixed locations and to the meter pedestals or other utility facilities.

See [Numbered Document 052521, “Electrical Service Requirements for Mobile Home Developments,”](#) for more information and for specifications. This PG&E document is included in [Appendix C, “Electric and Gas Engineering Documents,”](#) and also in PG&E’s [Electric Underground Construction Manual](#), Book 1.

6.4. Services

6.4.1. Single Meter: Underground Service

A. Services, 0 Amps Through 225 Amps, Single Phase

Figure 6-1, “Typical Underground Service-Termination Enclosure, Combination Meter-Socket Panel (Residential, 0 Amps–225 Amps),” on Page 6-5, illustrates a single, underground, residential, single-phase meter panel (i.e., 4 terminal for a 120/240-volt service and 5 terminal for a 120/208-volt service).

The numbered items below describe the applicant’s requirements when designing these types of underground services.

1. Design the socket and enclosure for underground service conductors.
2. Ensure that enclosures designed for either overhead or underground service entry meet all of the requirements for **both** types of service.
3. Ensure that all cable-termination lugs are suitable to use with both aluminum and copper conductors. The lugs must be compatible with a range of conductor sizes.

The **minimum** conductor size for services up to 125 amps is #6 American wire gauge (AWG) to 1/0 AWG. The **minimum** conductor size for services rated from 126 amps to 225 amps is #2 AWG to 250 thousand circular mils (kcmil).

4. Use separate, independently supported, service-termination lugs that extend from the socket, and connect to it, using a bus bar. Provide a minimum radial clearance of 1-1/2 inches between the hot bus terminals and the ground or neutral surfaces. The termination facilities cannot be side- or angle-mounted in relation to the front of the panel.
5. Ensure that the socket enclosure has a separate lug in the sealable section. Use this lug exclusively for terminating PG&E’s neutral conductor. If the neutral terminal is insulated from the enclosure, PG&E will provide the applicant with a bonding screw or jumper.
6. Ensure that the applicant-owned wiring that extends from the distribution section (i.e., branch circuits) does **not** pass through the sealable section(s).
7. Locate the applicant’s service-grounding electrode conductor outside of the sealable section and design it to permit the applicant’s grounding system to be isolated easily from PG&E’s neutral, when necessary.

6.4.1. (continued)

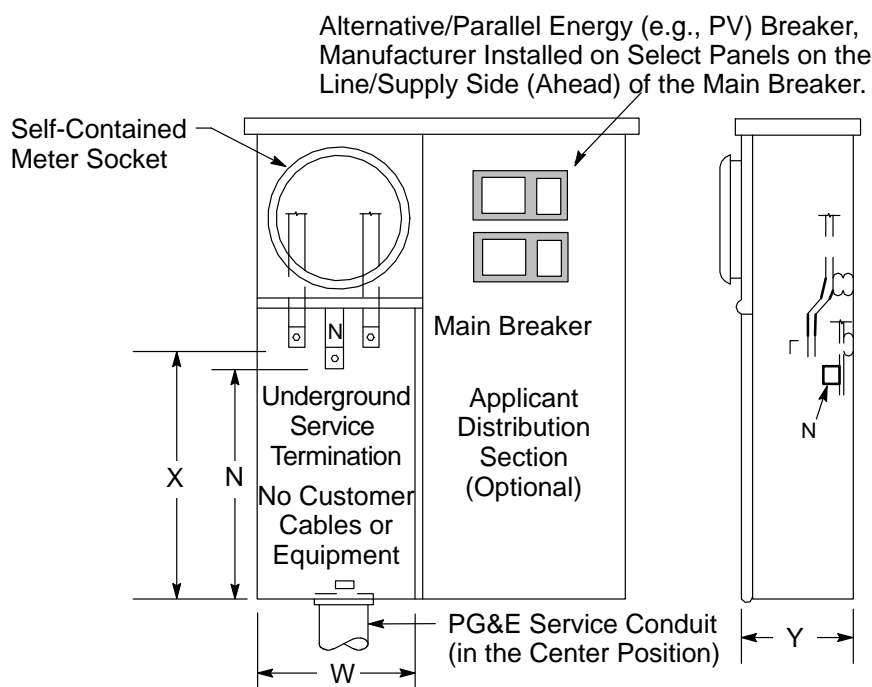


Figure 6-1

Typical Underground Service-Termination Enclosure, Combination Meter-Socket Panel (Residential, 0 Amps–225 Amps)

Notes in reference to Figure 6-1.

1. These panels are allowed with or without a manufactured-installed alternative energy breaker on the line (supply) side of the main breaker.

Table 6-1 Residential (0 Amps–225 Amps) Enclosure

Rating in Amps	X	Y	N	W	Conduit
	Minimum Dimensions (In Inches)				
Up to 125	8	4	6	6.5	2 – 3
126 to 225	11	5	8-1/2	6.5	3 – 4

B. Services, 226 Amps Through 320 Amps, 120/240 Volts, Single Phase, Residential

Figure 6-2, “Typical Service-Termination Enclosure, Combination Meter-Socket Panel for a Class 320 Meter (Residential, 120/240-Volt, 226-Amp Through 320-Amp Service),” on Page 6-6, illustrates a single, underground, residential, single-phase, 120/240-volt, Class 320-amp meter panel. Applicants must ensure that this panel:

1. Conforms to the requirements for underground-fed, 320-amp metering equipment.
2. Is designed with test-bypass facilities and has provisions for using manual bypass links.

6.4.1. (continued)

3. Is marked with either a rating of “320 Amperes Continuous” or “400 Amperes Maximum (320 Amperes Continuous).”
4. Is only used with residential services.

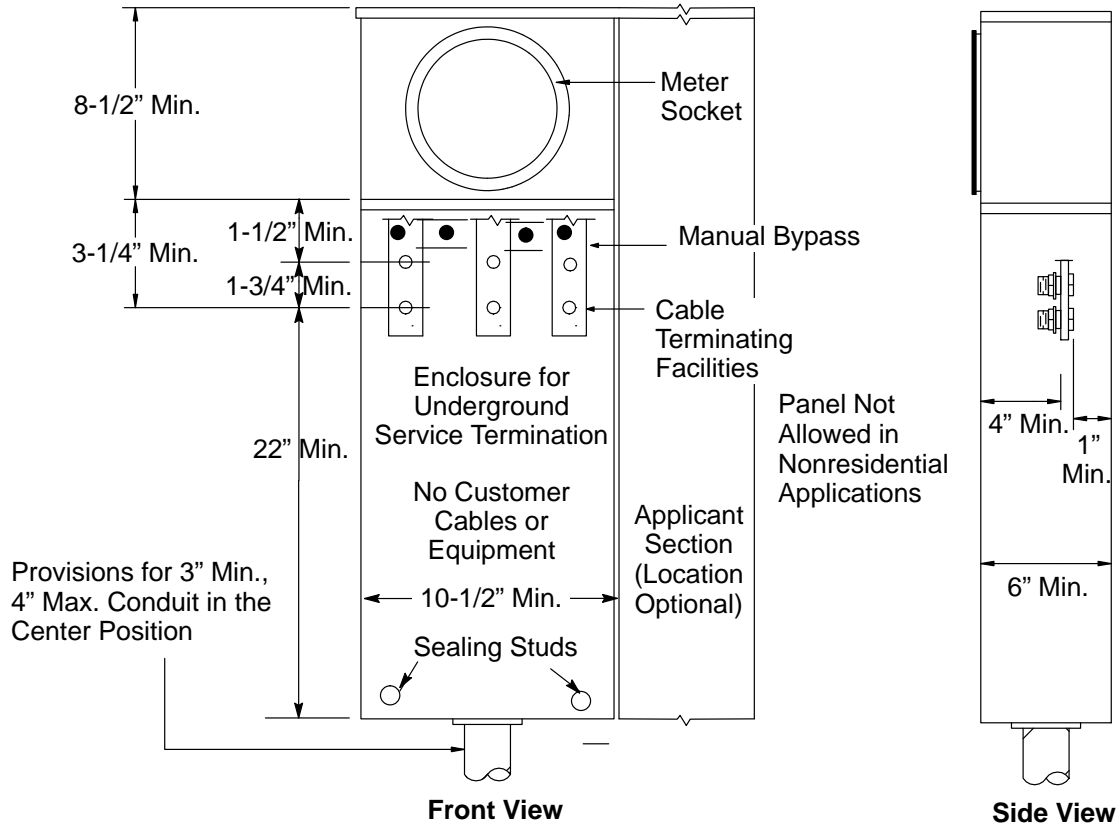


Figure 6-2
Typical Service-Termination Enclosure, Combination Meter-Socket Panel for a Class 320 Meter (Residential, 120/240-Volt, 226-Amp Through 320-Amp Service)

C. Services, 201 Amps Through 600 Amps, Single Phase or 400 Amps Three Phase with Current Transformers

Applicants **must** consult their local PG&E project coordinators when single-phase services exceed 400 amps. Applicants may need to install three-phase service to conform to PG&E’s [Electric Rule 2, “Description of Service.”](#) requirements.

Figure 6-3, “Underground Combination Meter and Current-Transformer Cabinet (201 Amps–400 Amps; 1Ø or 3Ø),” on Page 6-7, illustrates a single-metered, underground, residential meter panel.

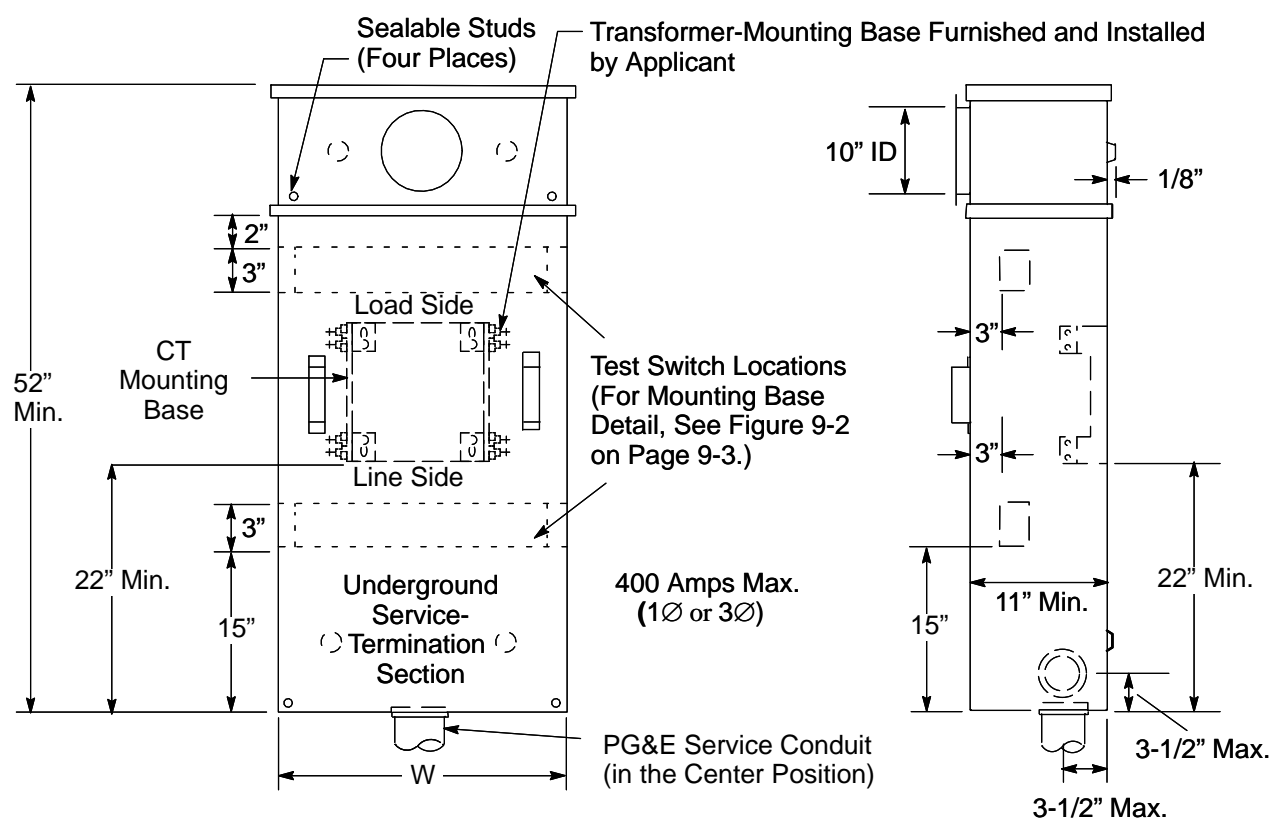
Figure 6-4, “Typical Underground, Separate-Bused, Current-Transformer Cabinet and Safety-Socket Meter Box Assembly, 201 Amps–400 Amps, 3Ø and 201 Amps–600 Amps, 1Ø,” on Page 6-8, illustrates how service and metering components can be separated into individual enclosures.

NOTE: See [Section 9, “Electric Metering: Components.”](#) for details about the components in Figure 6-3 and Figure 6-4.

6.4.1. (continued)

Applicants must ensure their conductors are installed before PG&E installs the current transformers. Also, applicants must ensure that their service-entrance conductors and equipment meet the following requirements.

1. The current transformer mounting base must include termination bolts, Belleville washers, and nuts on the line and load sides necessary to connect the PG&E current transformers and service conductors to the line side.
2. The applicant conductors must be terminated on the top (load side) of the current-transformer mounting base or termination enclosure busing. Applicant conduit must not be installed within 2 inches of the PG&E service entrance conductors. Applicant conductors must be routed properly to ensure they do not cross in front of or behind the PG&E conductors and conduit and do not obstruct the PG&E current transformers or test switch areas.



W Dimensions:
 3-Wire 1Ø = 24" Min.
 4-Wire 3Ø = 36" Min.

Figure 6-3
Underground Combination Meter and Current-Transformer
Cabinet (201 Amps–400 Amps, 1Ø or 3Ø)

6.4.1. (continued)

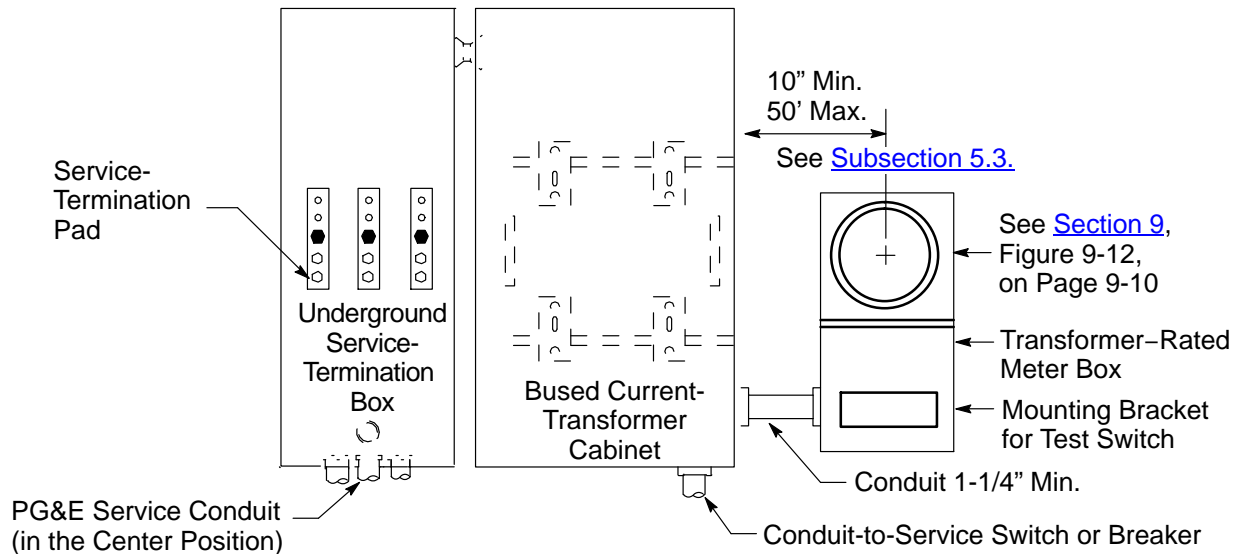


Figure 6-4
Typical Underground, Separate-Based, Current-Transformer Cabinet and Safety-Socket Meter Box Assembly (201 Amps–400 Amps, 3Ø and 201 Amps–600 Amps, 1Ø)

6.4.2. Single Meter: Overhead Service

A. Services, 0 Amps Through 225 Amps, Single Phase

Figure 6-5, “Combination Meter Socket Load Center,” on Page 6-9, illustrates the 4-terminal, 120/240-volt and 5-terminal, 120/208-volt overhead service and meter panel. This panel is only allowed for residential customers with a single-phase overhead service. Individual meter socket boxes that do not have a main breaker as part of the panel are not allowed.

Enclosures designed for a combination of overhead and underground conductors must meet **all** of the requirements for both types of conductor entry.

6.4.2. (continued)

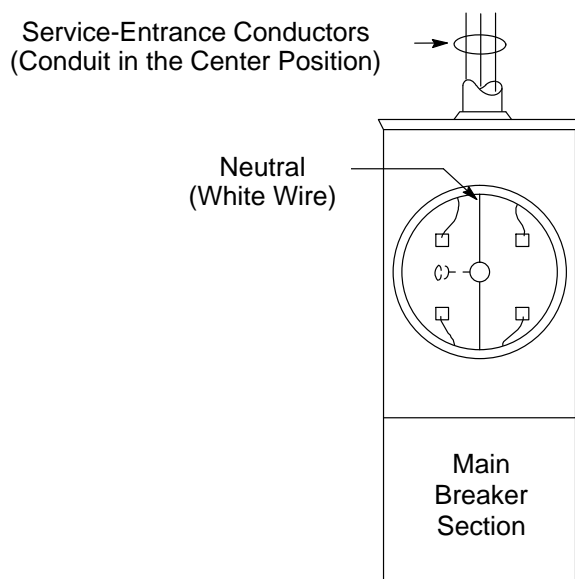


Figure 6-5
Combination Meter Socket Load Center

Notes in reference to Figure 6-5.

1. Allowed only for single-family residential homes.

B. Services, 226 Amps Through 320 Amps, 120/240 Volts, Single Phase

Applicants must ensure that this panel:

1. Conforms to the requirements for overhead-fed, 320-amp metering equipment.
2. Is designed with test-bypass facilities and has provisions for using manual bypass links.
3. Is marked with either a rating of “320 Amperes Continuous” or “400 Amperes Maximum (320 Amperes Continuous).”
4. Is used only with residential services.

6.4.2. (continued)

Provisions for 3" Min.,
4" Max. Conduit in the
Center Position

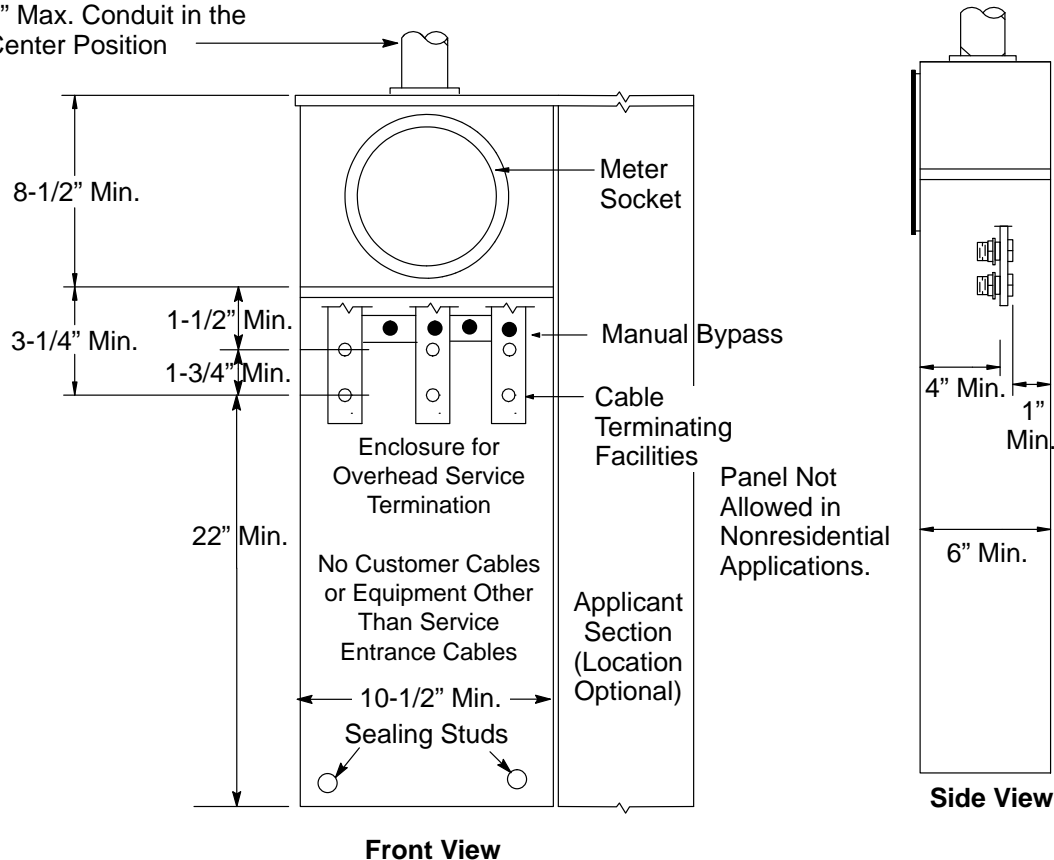


Figure 6-6
Typical Combination Meter and Service Termination Panel for a
Class 320 Meter (Residential, 120/240-Volt, 226-Amp Through 320-Amp Service)

C. Services, 201 Amps Through 400 Amps, Single Phase or Three Phase, with a Current Transformer

Applicants **should** consult with a PG&E project coordinator before installing single-phase services that exceed 400 amps. Applicants may need to install three-phase service to conform to PG&E's [Electric Rule 2](#) requirements.

Figure 6-7, "Overhead-Fed Combination Meter and Current-Transformer Cabinet, (201 Amps–400 Amps, 1Ø or 3Ø)," on Page 6-11, illustrates a single-metered, overhead, residential meter panel.

Figure 6-8, "Overhead-Fed, Separate-Bused, Current-Transformer Cabinet and Meter Box (201 Amps–400 Amps, 1Ø or 3Ø)," on Page 6-12, illustrates a single, overhead, residential, single-phase or three-phase service and meter panel with current transformers.

NOTE: See [Section 9](#) for details about the components in Figure 6-7 and Figure 6-8.

6.4.2. (continued)

Applicants must ensure their conductors are installed before PG&E installs the current-transformers. Also, applicants must connect the service entrance conductors to the line and load sides of the current-transformer mounting base.

1. The current transformer mounting base must include termination bolts, Belleville washers, and nuts on the line and load sides necessary to connect the PG&E current transformers. See [Section 9](#), for details about these internal components.
2. The applicant's service entrance conductors must be terminated on the top (line side) of the current-transformer mounting base or termination enclosure busing.
3. The applicant's load conductors must be terminated on the bottom (load side) of the current-transformer mounting base or termination enclosure busing.
4. Applicant conduit must not be installed within 2 inches of any corner of the cabinet.
5. Applicant's conductors must be routed properly, ensuring they do not obstruct the PG&E current transformers or test switch areas.

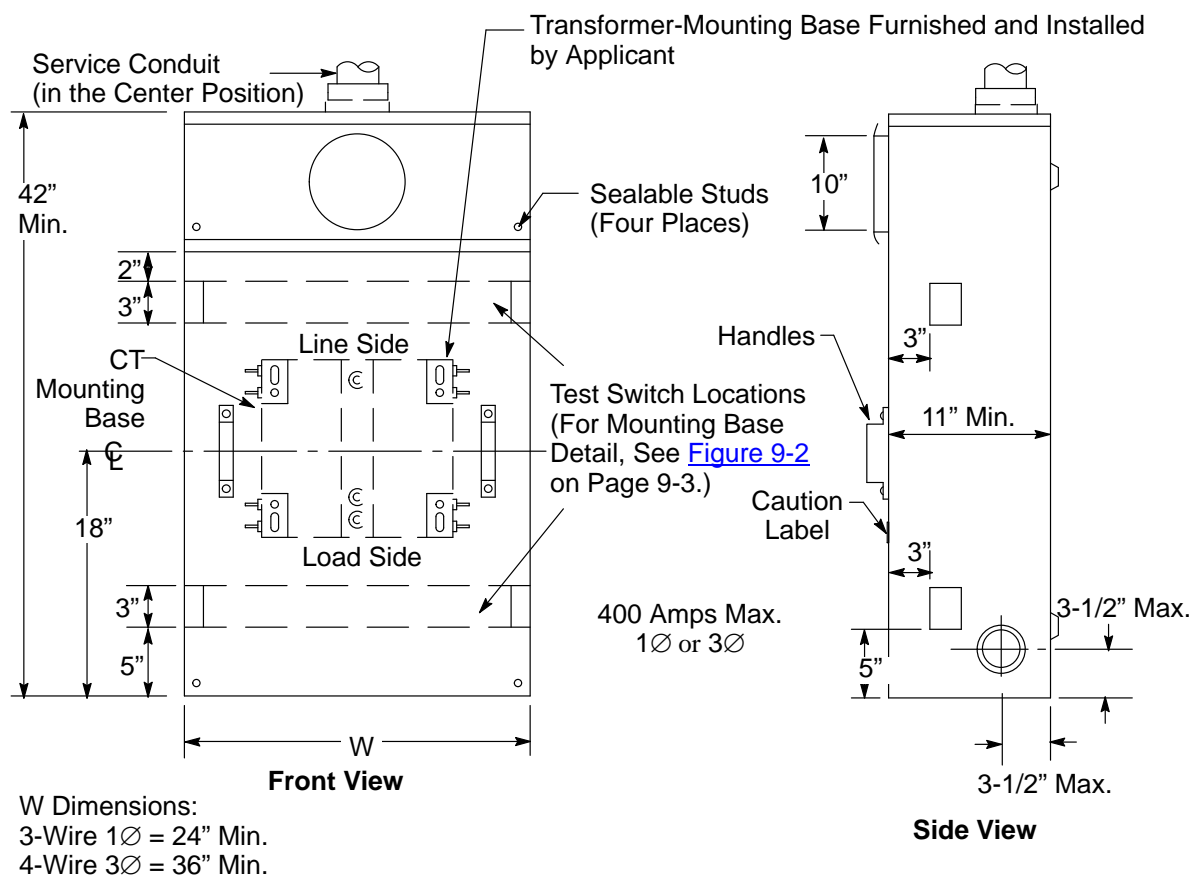


Figure 6-7
Overhead-Fed Combination Meter and Current-Transformer Cabinet
(201 Amps–400 Amps, 1Ø or 3Ø)

6.4.2. (continued)

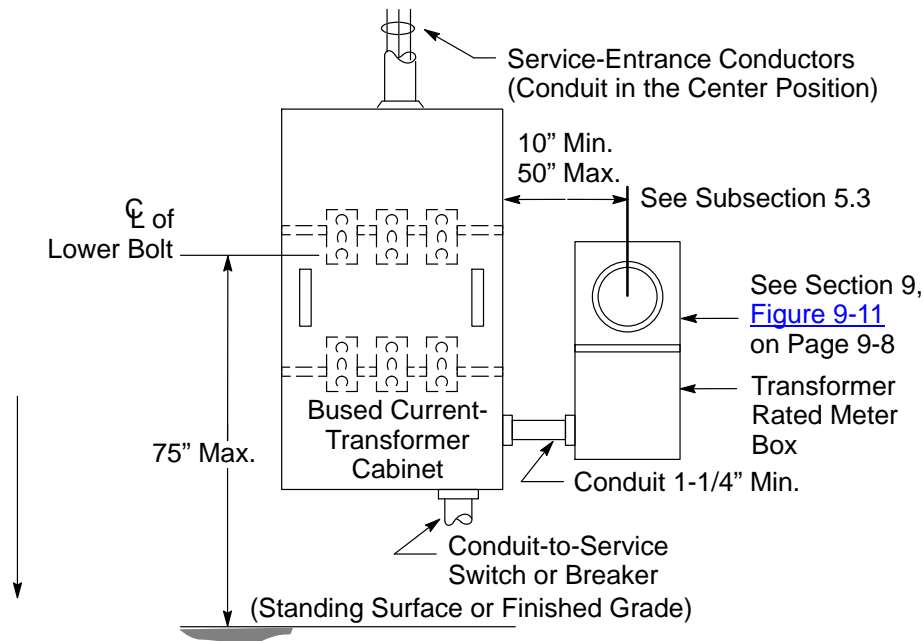


Figure 6-8
Overhead-Fed, Separate-Based, Current-Transformer Cabinet and Meter Box
(201 Amps–400 Amps, 1Ø or 3Ø)

6.4.3. Single Meter: Combination Overhead and Underground Service Equipment

Enclosures designed for a combination of either overhead or underground service entrance conductors must meet **all** of the requirements for both types of conductor entries.

- A. See the requirements in Subsection 6.4.1., “Single Meter: Underground Service,” on Page 6-4, and Subsection 6.4.2., “Single Meter: Overhead Service,” on Page 6-8.
- B. For overhead services, applicants must ensure the service entrance conductors are long enough to provide a bending radius that is equal to or greater than 10 times the diameter of the conductors.
- C. Overhead service panels must have a manufactured raceway built for the panel to isolate the service entrance conductors.

6.4.3. (continued)

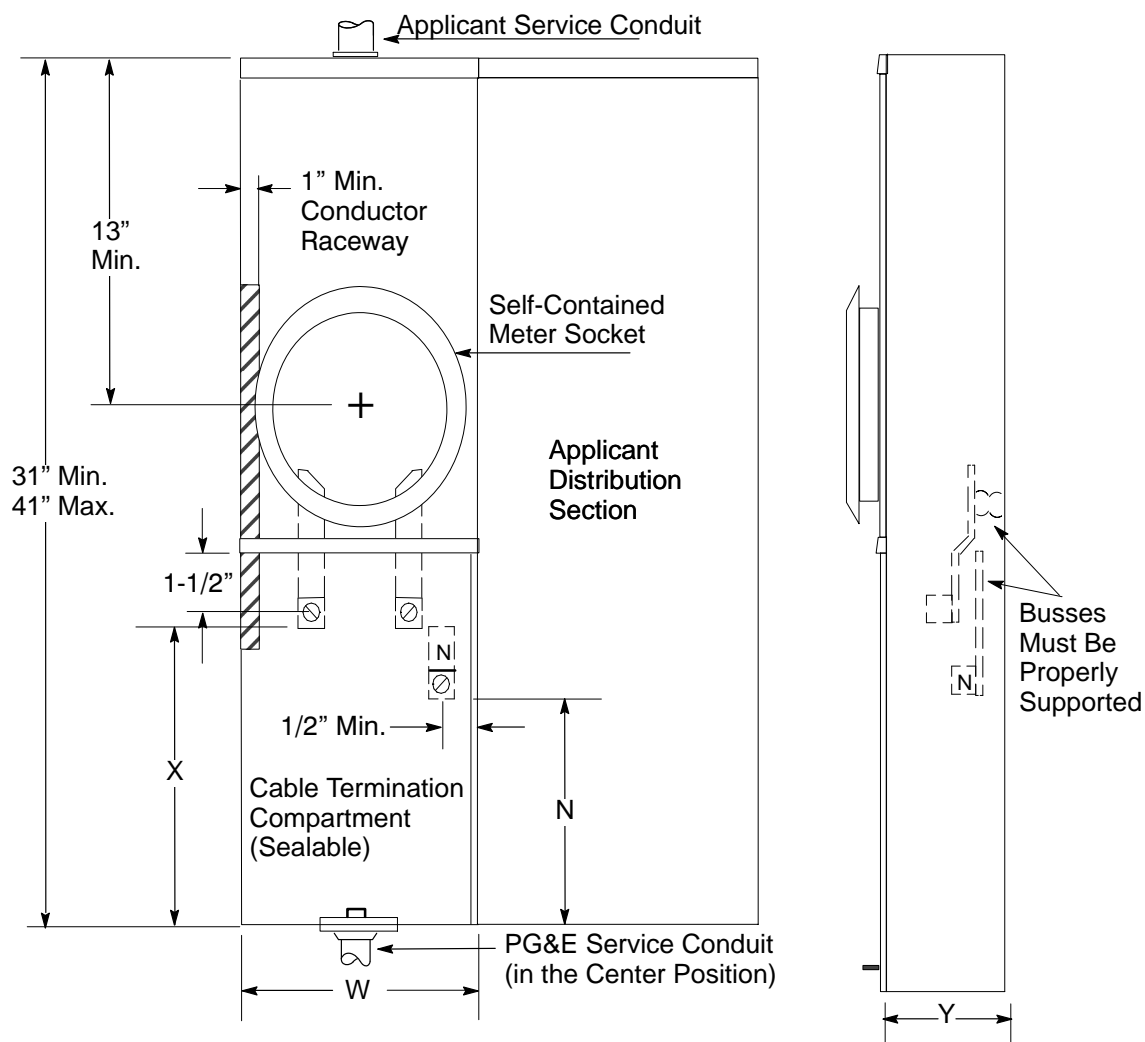


Figure 6-9
Overhead- or Underground-Fed Combination Meter and Service-Termination Panel
(225 Amps, 1Ø)

Table 6-2 Residential Combination (OH/UG) Meter Panel

Rating in Amps	X	Y	N	W	Conduit Range
	Minimum Dimensions (In Inches)				
225	12	7	9½	6½	3 – 4

6.4.3. (continued)

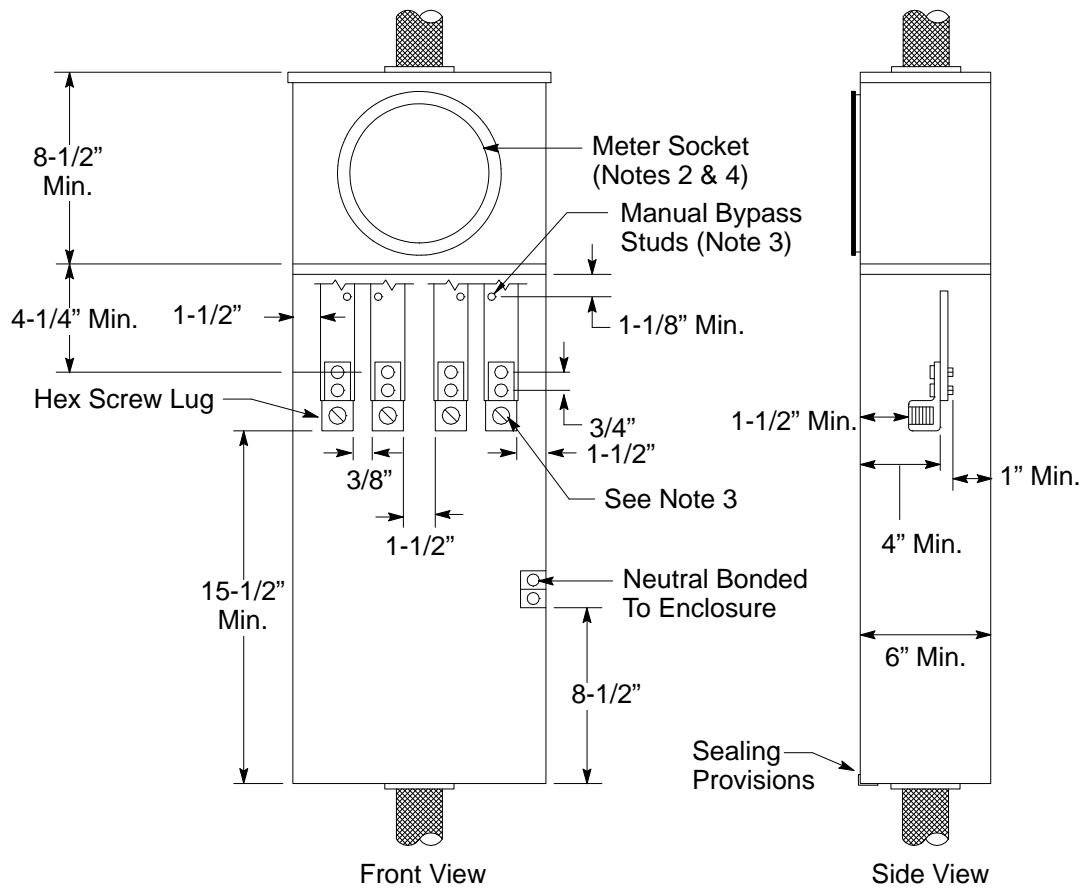


Figure 6-10
Overhead or Underground Service-Termination Meter Panel
with Manual Bypass studs (320 Amps, 120/240-Volt, 1Ø)

Notes in Reference to Figure 6-10.

1. Ensure that this service equipment is marked with a continuous amp rating of 320 amps. Alternatively, service equipment can be marked "400 amp" (320 amps continuous).
2. Each phase bus section must include 12–24 bypass studs, 1/2 inches in height with 1/2-inch hex nuts (measured across the flat). The studs must have a horizontal spacing of 1-1/2 inch (measured from the centers) between the line- and load-bus sections and must be offset from the line-side termination lugs to permit cable to enter from the top without interfering with the utility-provided manual bypass links.
3. Terminations for service conductors must be aluminum-bodied mechanical lugs with a range-taking ability of #1 American Wire Gauge (AWG) through 600 thousand circular mils (kcmil). The lugs must be secured to ensure vertical alignment. Line-side lugs must be offset from the face of the bus to permit cable to enter from the top. The line and load positions must be identified in 3/4-inch high block letters.

6.4.4. Multiple Meters

PG&E requires grouped, single-meter installations for multifamily residential buildings.

This requirement excludes row-type condominiums where each unit is considered a single-family residence and is metered individually. Row-type condominiums must meet the applicable metering requirements described in the following subsections.

A. Grouped-Meter Installation Ampacity Ratings

The information below describes how to determine the ampacity rating of a grouped-meter installation.

1. For installations **without** a main switch or breaker, the service rating will be the rating of the electrical enclosure or service termination section, pull can, or other service-termination enclosure where PG&E terminates and connects its supply facilities and conductors. Also, see Subsection 1.14.B. on Page 1-15.
2. For installations **with** a main switch or breaker, the rating of the service to be supplied is the rating of the termination section, pull can, service section, or main service switch continuous current rating, typically whichever is greater. Also, see Subsection 1.14.A. on Page 1-15.

B. Grouped Meter-Socket Spacing

PG&E requires a 7-1/2-inch horizontal and 8-1/2-inch **minimum** vertical center spacing between meter sockets.

C. Individual Meter Sockets with Wiring Raceway/Gutters

PG&E accepts meter sockets with wiring gutters as shown in Figure 6-11, “Overhead Service, Grouped-Meter Installation *Without* a Main Switch (400 Amps Maximum, 1Ø or 3Ø), and Figure 6-12, “Underground Service, Grouped-Meter Installation *Without* a Main Switch,” both on Page 6-16.

PG&E will accept individual meter sockets in combination with a wiring gutter **only** for an applicant’s service-entrance conductors and **only** when unmetered service-entrance conductors and metered-load conductors are **not** installed in the same conduit, raceway, or wiring gutter.

To conserve space and lower equipment costs, applicants should consider installing a combination multimeter, as described in Subsection 6.4.4.D., “Combination Multimeter Installation,” on Page 6-16. Only if applicants are reconstructing or adding to an existing installation can they install a meter trough, as described in Subsection 6.4.4.E., “Meter Trough Installations,” on Page 6-19.

6.4.4. (continued)

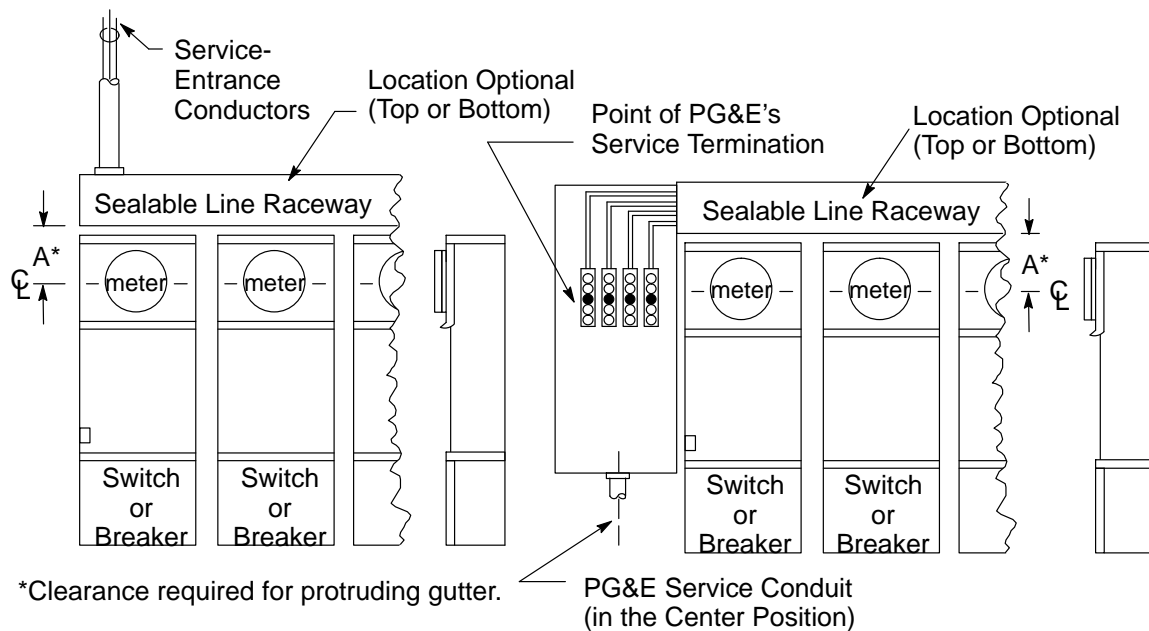


Figure 6-11
Overhead Service, Grouped-Meter
Installation Without a Main Switch
(400 Amps Max, 1Ø or 3Ø)

Figure 6-12
Underground Service, Grouped-Meter
Installation Without a Main Switch

D. Combination Multimeter Installation

A combination multimeter installation consists of the following equipment.

- A main switch (if one is installed or required by local jurisdiction)
- Unmetered wiring gutter
- Multiple meter sockets
- An appropriate number of circuit breakers

See [Section 5, Subsection 5.7., “Main Service Disconnects and Switching Sequences.”](#) on Page 5-31, for more information on disconnects and switches.

Examples of PG&E-approved, combination, multimeter installations are illustrated in Figure 6-13, “Typical, Manufactured, Combination, Multimeter Installation: Seven Meters or More,” on Page 6-17, and Figure 6-14, “Clearances for a Typical, Manufactured, Combination, Multimeter Installation,” on Page 6-18.

Applicants must ensure that all multimeter installations meet the following requirements.

1. Individually meter multiple apartments in one building. Separate metered and unmetered conductors.

6.4.4. (continued)

2. Use factory (or factory-equivalent), harness-style wiring **or** bus between the unmetered wiring gutter and the line terminals of each meter socket. Harness-style wiring or bus also must be used between the load terminals of each meter socket and the line side of the corresponding circuit breaker.
3. Ensure that the panels are designed to permit any individual meter socket block or jaw assembly to be replaced. Applicants must **not** mount more than two meters on a single, removable panel. Removable meter-panel covers must **not** exceed 6 square feet in area.
4. Ensure that the panel's design and construction meets the clearance requirements provided in Figure 6-14 and in Table 6-3, "Dimension Specifications for Multimeter Installations," on Page 6-19.
5. Increase Dimension B, shown in Figure 6-14 on Page 6-18, by the amount that the main switch door, including the operating handle, reduces the clearance when opened 90°.
6. Ensure that panels are removable so that PG&E personnel can perform wiring inspections.

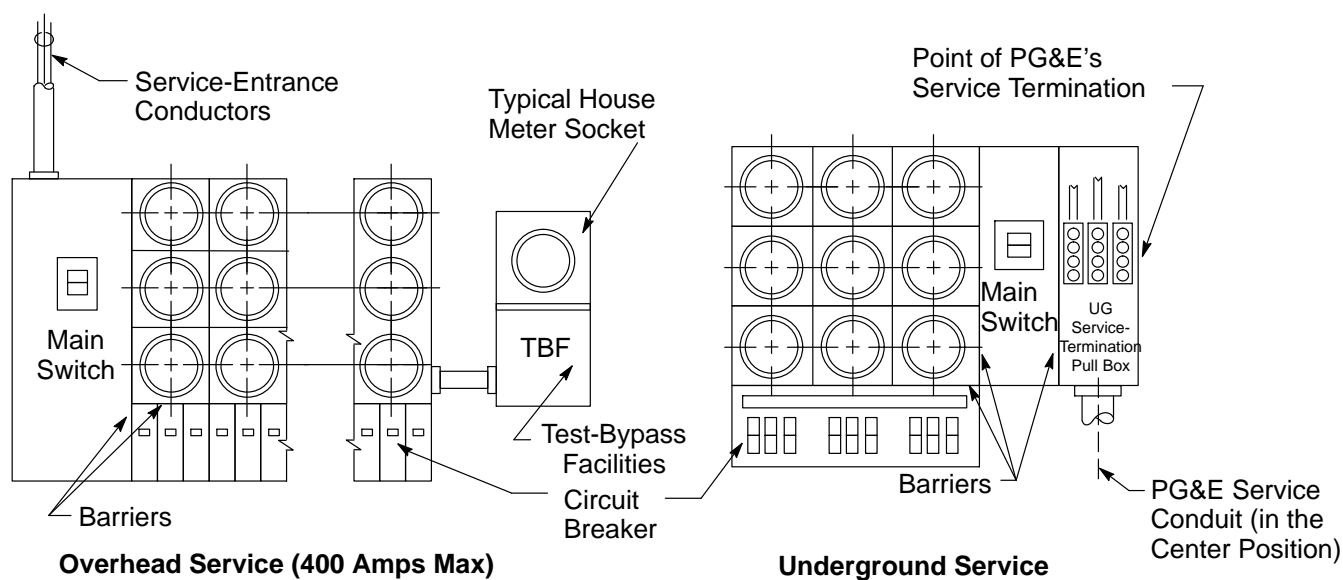


Figure 6-13
Typical, Manufactured, Combination, Multimeter Installation: Seven Meters or More

6.4.4. (continued)

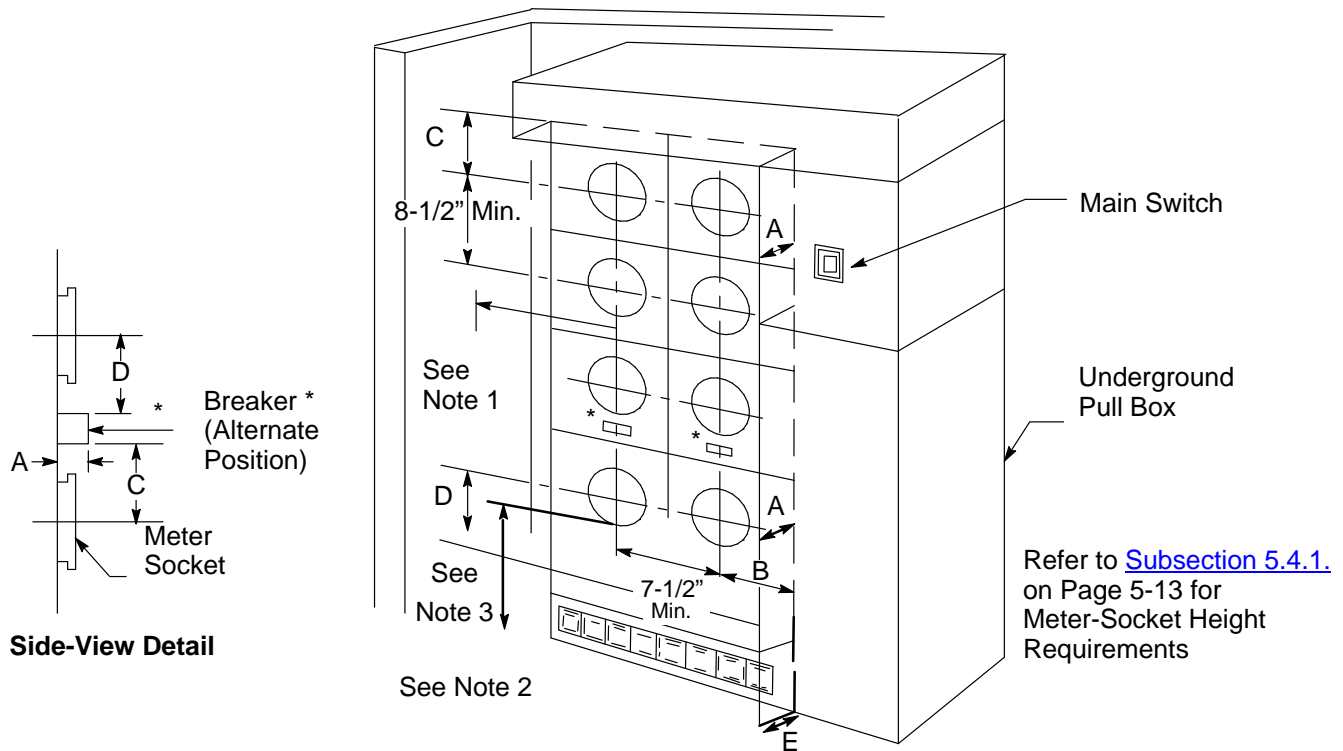


Figure 6-14
Clearances for a Typical, Manufactured, Combination, Multimeter Installation

Notes in reference to Figure 6-14.

1. Where an adjacent wall or other obstruction extends more than 11-inches perpendicular from the face of the meter panel, a 10-inch minimum dimension to the meter socket axis is required. For obstructions extending 11 inches or less from the meter panel, the side clearance must conform to that of Dimension B.
2. The requirements described in [Subsection 5.4.4., "Working Space."](#) must be met at all times.
3. From the floor surface up to the bottom of the lowest row of meter sockets, protrusions, and equipment **must not extend** past the front face of the meter panels and sockets.

6.4.4. (continued)

Table 6-3 Dimension Specifications for Multimeter Installations

A–Protrusions (in Inches)	B	C	D	E
	All Measurements Are Minimum Dimension (in Inches)			
0 (No Protrusion)	3-3/4	4	4-3/4	See Note 3 for Figure 6-14
Greater Than 0 to 1-1/8	4-1/4	4	4-3/4	
Greater Than 1-1/8 to 2	4-1/4	4-1/4	6-1/4	
Greater Than 2 to 4	6-1/4	4-1/4	8	
Greater Than 4 to 11 (Maximum)	6-1/4	10	8	

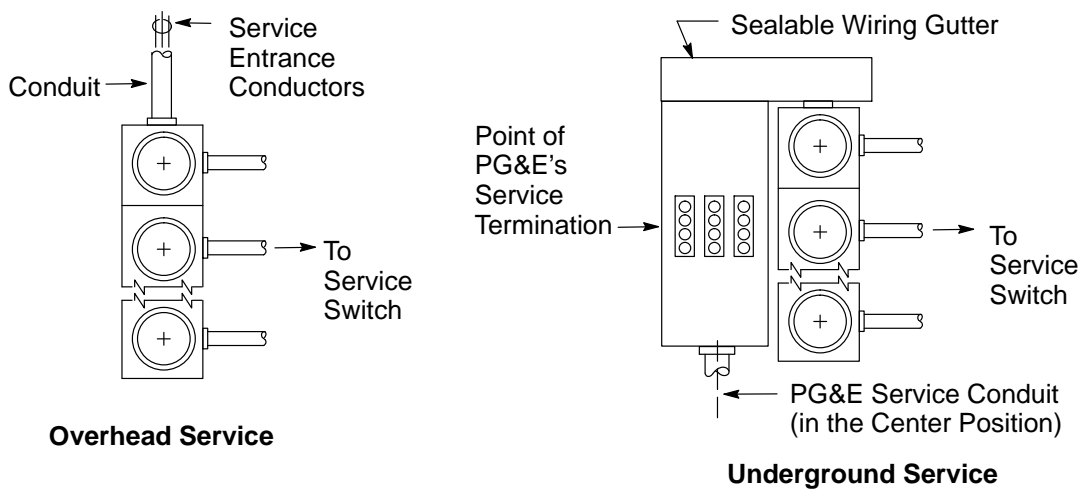
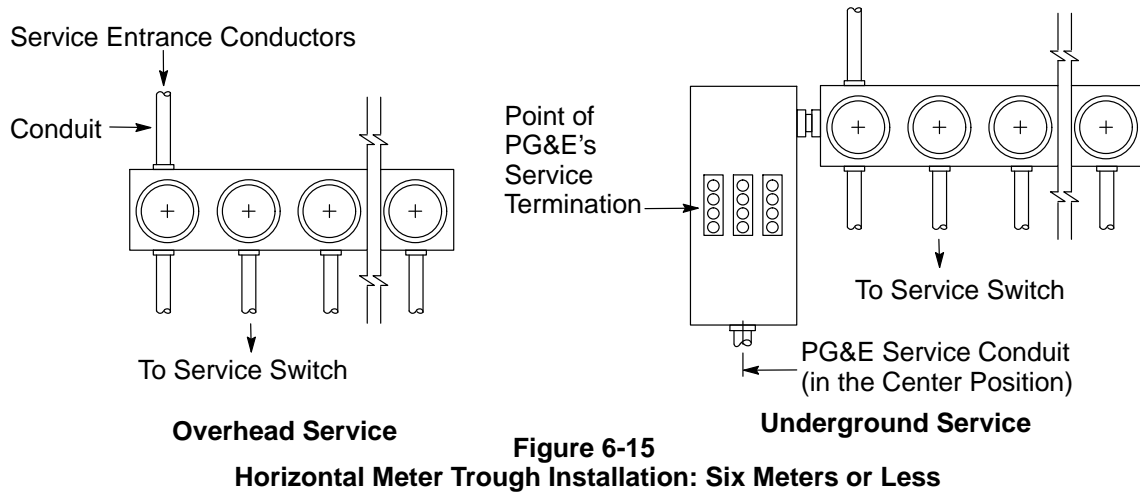
E. Meter Trough Installations

PG&E does **not** accept new installations of meter troughs but does accept single-meter installations only for reconstructing and adding to existing installations. In addition to meeting the general requirements for meter sockets, applicants must ensure that meter troughs meet the following general requirements.

1. Where there are four, five, or six sockets in one trough, the incoming service conductors must terminate on a main bus that is supported independently of the socket jaw assembly.
2. The panel design must permit individual, meter-socket blocks or jaw assemblies to be replaced individually. Applicants must **not** mount more than two meters on a single, removable front panel.
3. Metered and unmetered conductors must be separated, clearly showing that the entire load is being metered.
4. The panels must be removable so that wiring inspections can be performed.

6.4.4. (continued)

Figure 6-15 and Figure 6-16, below, illustrate meter trough installations served by underground or overhead service.



SECTION 7
ELECTRIC METERING:
NONRESIDENTIAL, INDUSTRIAL,
AND AGRICULTURAL

SECTION 7 ELECTRIC METERING: NONRESIDENTIAL, INDUSTRIAL, AND AGRICULTURAL

Section 7

Electric Metering: Nonresidential, Industrial, Commercial, and Agricultural

7.1. Scope

This section of the manual provides the Pacific Gas and Electric Company (PG&E/the Company) service specifications and requirements for commercial, industrial, and agricultural electric metering. Also, it describes the required locations for these nonresidential meters. This section includes specific information that is **not** covered by the basic requirements in [Section 5, “Electric Metering: General.”](#)

NOTE: Residential meter panels rated for 320 amperes (amps) shown in [Section 6, “Electric Metering: Residential.”](#) can not be used for nonresidential (e.g., commercial, industrial, and agricultural) applications.

7.2. Service Specifications and Requirements

The following three subsections describe service specifications and requirements for commercial, industrial, and agricultural electric meters.

7.2.1. Permitted Types of Electric Service

PG&E does **not** permit overhead service connections in areas zoned for underground service by local ordinance, or where underground service is required by [California Public Utilities Commission- \(CPUC-\)](#) approved tariffs.

7.2.2. Required Test-Bypass Facilities

Test-bypass facilities are required, regardless of the panel ampacity, for both single-phase and three-phase, nonresidential installations. Applicants must furnish, install, and maintain a meter socket with PG&E-approved, manual, test-bypass facilities. This equipment also is used for the following types of services.

- All three-phase, nonresidential services **without exception**.
- All single-phase, nonresidential services. See the exceptions in Subsection 7.2.3., “Required Approvals for Meter Equipment Without Test-Bypass Facilities,” on Page 7-2.

Refer to Figure 7-1, “Bused, Safety-Socket Meter Box for Self-Contained Metering (0 Amps–125 Amps),” on Page 7-4, and Figure 7-2, “Bused, Safety-Socket Meter Box for Self-Contained Metering (126 Amps–200 Amps),” on Page 7-5.

7.2.3. Required Approvals for Meter Equipment Without Test-Bypass Facilities

PG&E requires an approval **before** installing meter equipment without test-bypass facilities. If approved, the meter equipment may be exempt only when all of the conditions are met in Item 7.2.3.A. or Item 7.2.3.B., both below.

- A. Single-phase, nonresidential service when **all** of the three following conditions are met.
 - 1. The main disconnect switch's rating does **not** exceed 200 amps.
 - 2. Service to another meter or service will **not** be interrupted when de-energizing the meter socket without test-bypass facilities.
 - 3. The metered service is used **exclusively** for temporary power or nighttime lighting loads.

7.2.4. Meter Locations

Applicants must consult their local PG&E project coordinators during the initial construction phase of their projects to determine the appropriate meter and current-transformer cabinet locations and to ensure that adequate space is provided for the metering equipment. PG&E must review and approve all metering equipment installations **before** they are installed.

Additionally, the following **specific** location requirements apply to nonresidential metering.

- A. Applicants must locate meters on exterior, ground-floor walls or other permanent structures nearest PG&E's distribution facilities. When outdoor meter locations are **not** practical, PG&E will approve interior locations if they are accessible during PG&E's typical working hours **and** if the interior location meets PG&E's access requirements, as described in [Section 5, Subsection 5.3., "Electric Meters: General Location Requirements,"](#) on Page 5-5.
- B. Typically, applicants **must** group meters for multiple-occupancy buildings at one common location; however, PG&E allows the following **exceptions** to this requirement.
 - 1. PG&E may permit applicants to have individual meters located on their premises if the installations comply with all applicable codes. When buildings contain unmetered wiring, applicants must place that wiring in PG&E-approved conduit and/or in sealable wireways.
 - 2. In high-rise buildings where the walking surface of the highest occupied floor is over 75 feet high, PG&E has the option to approve grouped-meter locations on one or more floors.

7.2.4. (continued)

3. PG&E does not permit metering equipment to be located more than 10 feet away and within the line of sight from the service disconnect means, allowing the applicants to separate the metering equipment and service disconnect means remotely. **Any exceptions to this requirement must be approved** by the local PG&E meter shop. Meter shop employees must approve remote meter locations **before** applicants locate meters away from (i.e., remote from) the PG&E service termination point. Also, applicants must provide clearances and working space, as described in [Section 5, Subsection 5.4., “Meter Heights, Clearances, Enclosures, and Protection,”](#) on Page 5-13, for both the meter and metering transformer installations.

Applicants must supply and install rigid steel conduit for the meter wiring between the meter and the metering transformers. The conduit must be 1-1/4-inch minimum diameter and must be limited to 50 circuit feet with a maximum of three 90° bends, **unless** sealable, accessible, exposed conduits are furnished.

When meters are separated by more than 50 circuit feet, PG&E requires a special review and approval for the installation.

7.2.5. Services, 0 Amps Through 200 Amps, Single Applicant, Overhead and Underground

Applicants must meet the following requirements when installing services.

- A. PG&E’s service conductors must be pulled into the enclosure and connected to the bypass-test facility’s line-termination lugs.
- B. One set (i.e., one conductor per phase) of load conductors must be routed and formed to allow PG&E to pull their service laterals without encountering any obstructions.
- C. For overhead service, applicants must provide and install service-entrance conductors from the weatherhead to the enclosure. Applicants must connect the conductors to the bypass-test facility’s line-termination lugs.
- D. The right side, test-bypass blocks (i.e., two poles) are identified as the power leg (i.e., high leg or stinger leg) for metering three-phase, 4-wire, delta service. The power leg is identified by using the color orange. Orange tape is typically used.
- E. All section covers can be removed independently; however, after the meter is in place, the upper cover must **not** be removable. After the meter is in place, the lower cover must be sealable.
- F. For meter socket jaw requirements, see [Section 5, Subsection 5.6., “Meter Types and Connections,”](#) on Page 5-26.
- G. Install range-taking lugs from #6 American wire gauge (AWG) to 1/0 AWG for services up to 125 amps, and #2 AWG to 250 thousand circular mils (kcmil) for services rated from 126 amps through 200 amps.

7.2.5. (continued)

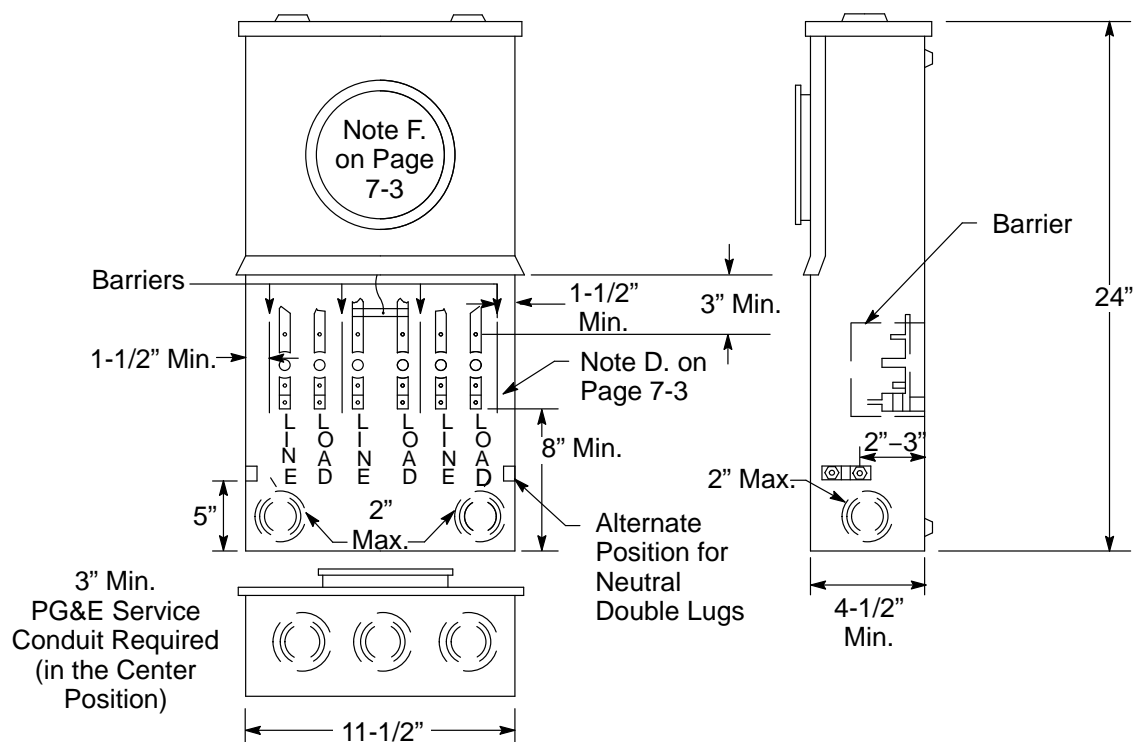


Figure 7-1
Bused, Safety-Socket Meter Box for Self-Contained Metering (0 Amps–100 Amps)

7.2.5. (continued)

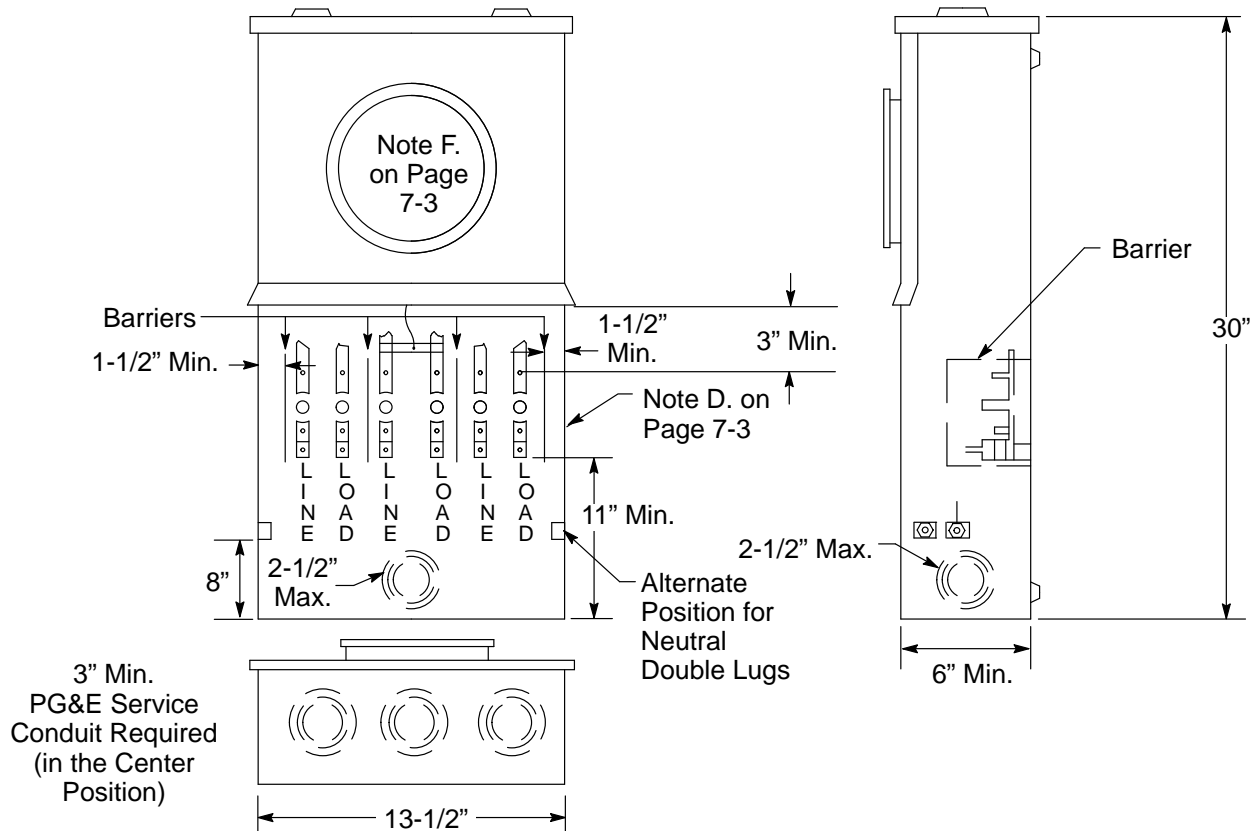


Figure 7-2
Bused, Safety-Socket Meter Box for Self-Contained Metering (101 Amps–200 Amps)

7.2.6. Services, Over 200 Amps, Single Applicant, Underground

Applicants must meet the following requirements when installing services and equipment.

A. Services, 201 Amps Through 400 Amps, Three Phase, and 201 Amps Through 600 Amps, Single Phase

1. When planning a single, underground, single-phase or three-phase service, applicants must furnish, install, own, and maintain combination meter and current-transformer cabinets, as illustrated in Figure 7-3, “Underground Combination Meter and Current-Transformer Cabinet (201 Amps–400 Amps, 1Ø or 3Ø),” on Page 7-7.

NOTE: See [Section 9, “Electric Metering Components and Cable Terminating Facilities,”](#) for details about internal components.

2. The current transformer mounting base must include termination bolts, Belleville washers, and nuts on the line and load sides necessary to connect the current transformers and the PG&E service conductors to the line side.

7.2.6. (continued)

3. Applicants must install a maximum of one set (i.e., one conductor per phase) of load conductors **before** PG&E installs the current-transformers.
4. The applicant's conductor must be terminated on the top (load side) of the current-transformer mounting base or termination enclosure busing.
5. The applicant's conduit and conductors leaving the cabinet must not be installed within 2 inches of any corner of the cabinet or within 2 inches of the PG&E service-entrance conduit location.
6. The applicant's load conductors must be routed and formed properly to allow PG&E to pull their service laterals without encountering any obstructions.
7. The applicant's conductors must not cross in front of or behind the PG&E service entrance conduit and must not obstruct the PG&E current transformers or test switch areas.
8. Applicants must ensure that provisions are made for the underground service neutral when installing an insulated, bondable termination in the current-transformer cabinet.
9. Applicants must mark the power leg (i.e., high leg or stinger leg) of a 240/120-volt, three-phase, 4-wire delta service by using the color orange. This is for metering purposes. Orange tape is typically used.
10. Applicants must ensure that cabinets meet the following requirements.
 - All panels and covers must be sealable and all securing screws must be captive.
 - Outdoor current transformer cabinets are weatherproof.
 - A neutral is bonded to the enclosure.
 - Current transformer cabinets are **not** used as splicing chambers and current transformers are **not** tapped off to supply other meters or used for other purposes.

7.2.6. (continued)

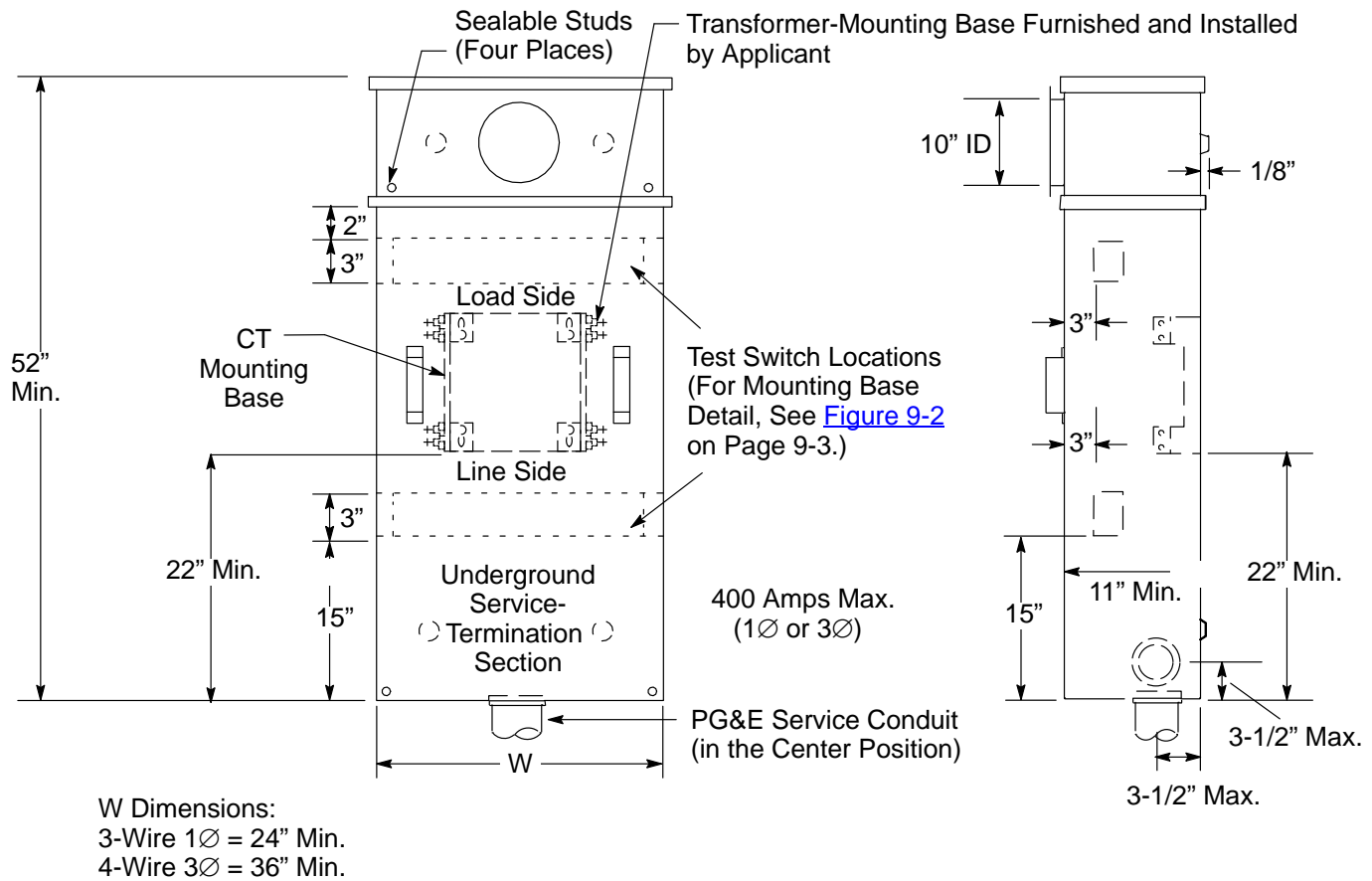


Figure 7-3
Underground Combination Meter and Current-Transformer Cabinet
(201 Amps–400 Amps, 1Ø or 3Ø)

B. Services, 201 Amps Through 400 Amps, Three Phase, and 201 Amps Through 600 Amps, Single Phase, Current-Transformer Metering in Bused, Current-Transformer Cabinets

1. When applicants meter a single, underground service using current transformers, they must furnish, install, own, and maintain underground, service-termination pull boxes with separate, current-transformer cabinets and meter box, as illustrated in Figure 7-4, "Separate-Bused Current-Transformer Cabinet and Meter Box With Underground Service-Termination Pull Box (201 Amps–400 Amps, 3Ø, and 201 Amps–600 Amps, 1Ø)," on Page 7-8.

NOTE: See [Section 9](#), for details about internal components.

7.2.6. (continued)

2. Applicants must furnish and connect a maximum of one set (i.e., one conductor per phase) of service-entrance conductors to the line and load sides of the current-transformer mounting base and to the load side of the termination facilities in the underground, service-termination pull box. The applicants service-entrance conductors and load conductors must be installed before PG&E installs the current transformers.
3. The current-transformer mounting bus bars must include termination bolts, Belleville washers, and nuts on the line and load sides necessary to connect the PG&E current transformers.
4. PG&E pulls and terminates its service-entrance conductor directly to the applicant-furnished, service-termination facility in the underground service-termination pull box.
5. The applicant installs one set (i.e., one conductor per phase) of service-entrance conductors that enter the current-transformer cabinet and terminate on the top (line side) of the current-transformer mounting bus bars.
6. The applicant must not install conduit within 2 inches of any corner of the cabinet.
7. The applicant's conductor must be routed properly to ensure they do not cross in front of or behind the PG&E current transformer wires and do not obstruct the PG&E current transformer area.

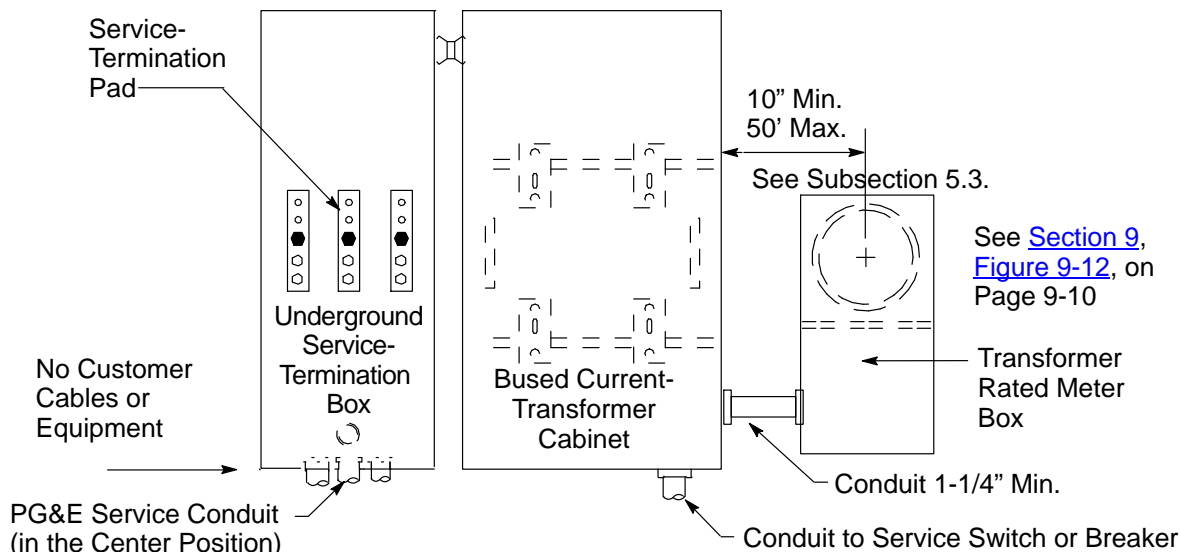


Figure 7-4
Separate-Based Current-Transformer Cabinet and Meter Box
with Underground Service-Termination Pull Box
(201 Amps–400 Amps, 3Ø and 201 Amps–600 Amps, 1Ø)

7.2.6. (continued)

C. Services, 600 Amps Through 800 Amps, Single Phase or Three Phase, Current-Transformer Metering in Bused, Current-Transformer Cabinets

1. When planning a single, underground, three-phase service, applicants must furnish, install, own, and maintain combination meter and current-transformer cabinets, as illustrated in Figure 7-5, “Underground Service Combination Meter and Current-Transformer Cabinet (600 Amps, 1Ø or 3Ø, 800 Amps 3Ø),” on Page 7-10.

NOTE: The only PG&E-approved manufacturer of the enclosure in Figure 7-5 is Milbank Manufacturing.

2. This enclosure is allowed in wall-mounted applications connected to an underground service. The enclosure must be installed so the bottom is between 6 inches to 9 inches above grade or above the working space area.
3. The current transformer mounting base must be rated for the exact ampacity as the PG&E service and must include termination bolts, Belleville washers, and nuts on the line and load sides necessary to connect the current transformers and the PG&E service conductors to the line side.
4. Applicants must install and connect no more than three load-side conductors per phase to the current transformer mounting base.
5. The applicant’s conductor must be terminated only on the top (load side) of the current transformer mounting base.
6. The applicant’s conduit and load conductors must be installed so they leave the enclosure (cabinet) either out of the top or exit out of the right or left side, no less than 12 inches from the top of the enclosure.
7. The applicant’s load conductors must be routed and formed correctly. The load conductors must not run downward to the middle or bottom of the enclosure, cross in front of or behind the PG&E service entrance conduit, or obstruct the PG&E current transformers or test switch areas.
8. Applicants must ensure that provisions are made for the underground service neutral when installing an insulated, bondable termination in the current transformer cabinet.
9. For metering purposes, applicants must mark the power leg (i.e., high leg or stinger leg) of a 240/120-volt, three-phase, 4-wire delta service by using the color orange. Orange tape is typically used.

7.2.6. (continued)

10. Applicants must ensure enclosures meet the following requirements:

- All panels and covers must be sealable, and all securing screws must be captive.
- Outdoor current transformer cabinets are weatherproof.
- A neutral is bonded to the enclosure.
- Current transformer cabinets must **not be** used as conductor splicing chambers and do not tap off conductors from the current transformer's or its mounting base to supply other meters.

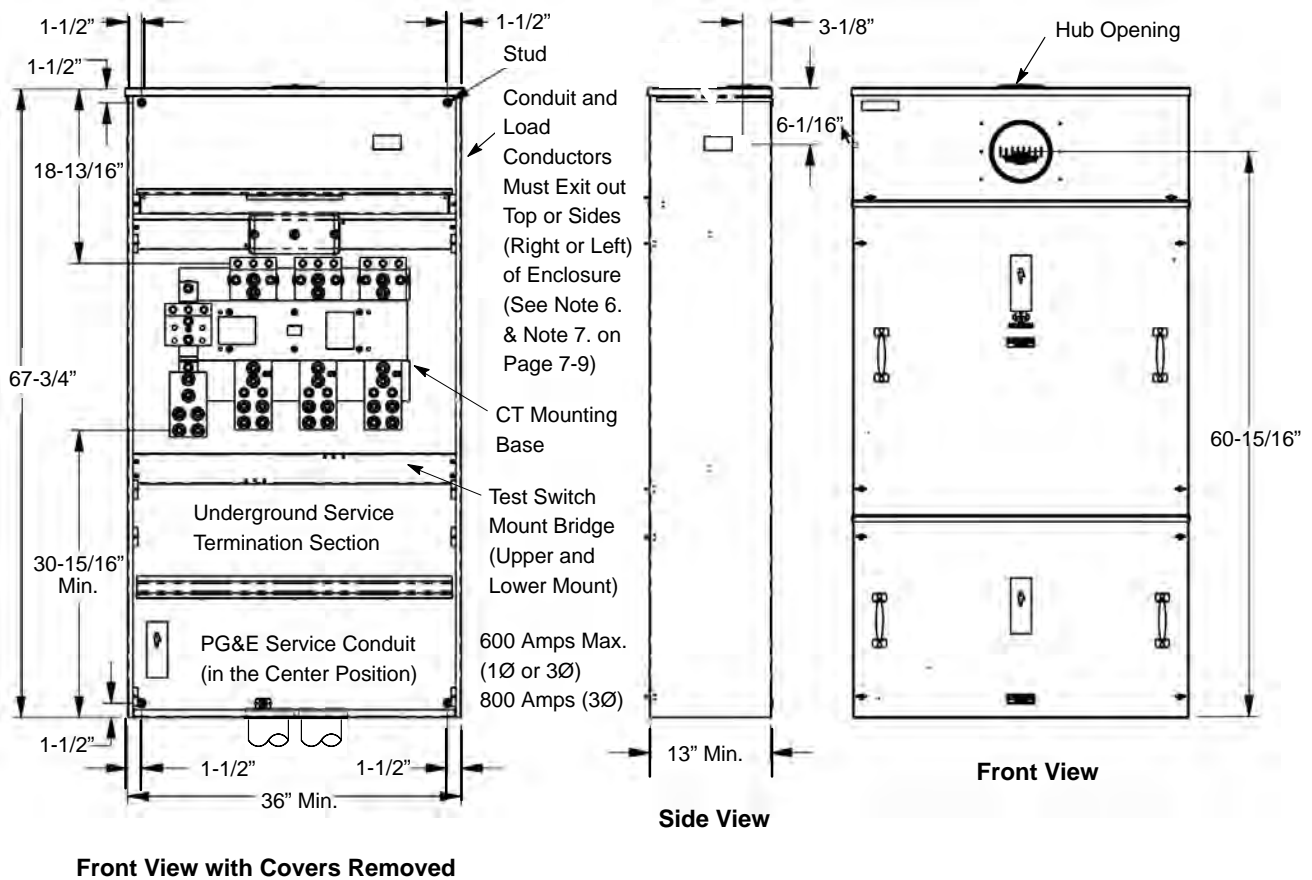


Figure 7-5
Underground Service Combination Meter and Current-Transformer Cabinet
(600 Amps, 1Ø or 3Ø, 800 Amps 3Ø)

Notes in reference to Figure 7-5.

1. The only PG&E-approved manufacturer of this specific enclosure is Milbank Manufacturing.
2. This enclosure must be installed so the bottom is between 6 inches to 9 inches above grade or above the working space area.

7.2.6. (continued)

D. Services, 201 Amps and Above, Current-Transformer Metering in Switchboard Service Sections

1. When applicants meter a single underground service using current transformers, they must furnish, install, own, and maintain a switchboard service section and facilities for terminating underground service conductors.
2. Figure 7-6, Figure 7-7, and Figure 7-8, below, illustrate typical arrangements of the switchboard service sections that are used in conjunction with a pull section or pull box for underground service-conductor termination.
3. PG&E pulls and terminates its service conductors directly to the applicant-furnished service-termination facilities in the underground service-termination pull section, pull box, or service section.

NOTE: See [Section 10, “Electric Switchboards: 0 Volts Through 600 Volts.”](#) for details.

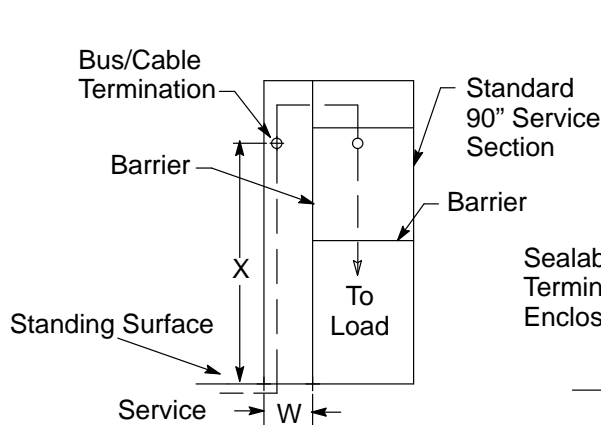


Figure 7-6
Switchboard Pull Section

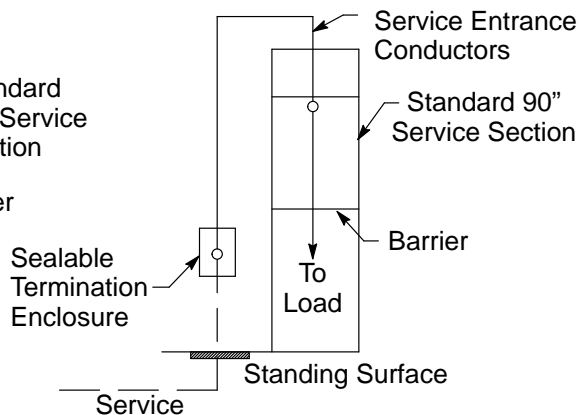


Figure 7-7
Separate Pull Box

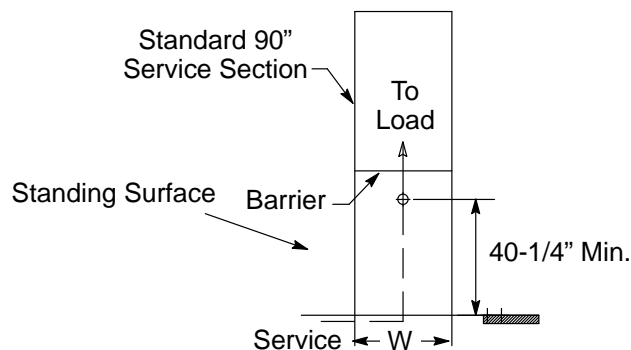


Figure 7-8
Bottom-Fed Service Section

7.2.7. Services, Over 200 Amps, Single Applicant, Overhead

Applicants must meet the following requirements when installing single-applicant, overhead services that are over 200 amps.

For all agricultural overhead services, install a cable protector around the service-entrance conductors entering the wall-mounted or panelboard-mounted meter panel. Order using either Material Code 382034 or Material Code 382045, found in [Numbered Document 062288, “Underground Conduits,” Table 14](#), on Page 8 (in [Appendix C, “Electric and Gas Engineering Documents”](#)).

A. Services, 201 Amps Through 400 Amps, Single Phase or Three Phase with Current Transformers

1. When installing a single, overhead, single-phase or three-phase service, applicants must furnish, install, own, and maintain combination meter and current-transformer cabinets, as illustrated in Figure 7-9, “Overhead-Fed Combination Meter and Current-Transformer Cabinet, (201 Amps–400 Amps, 1Ø or 3Ø),” shown on Page 7-13. See [Section 9](#) for details about internal components.
2. Applicants must install one set (i.e., one conductor per phase) of service-entrance conductors before PG&E installs the current-transformers. Also applicants must connect the service entrance conductors to the line and load sides of the current-transformer mounting base.
3. The current-transformer mounting base must include termination bolts, Bellevue washers, and nuts on the line and load sides necessary to connect the current transformers. See [Section 9](#) for details about these internal components.
4. The applicant’s service entrance conductor must be terminated on the top (load side) of the current-transformer mounting base or termination enclosure busing.
5. The applicant’s load conductor must be terminated on the bottom (load side) of the current-transformer mounting base.
6. The applicant’s conduit must not be installed within 2 inches of any corner of the cabinet.
7. The applicant’s conductors must be routed and formed properly to ensure they do not obstruct the PGE current transformer and test switch areas.
8. Applicants must ensure that cabinets meet the following requirements.
 - All panels and covers must be sealable and all securing screws must be captive.
 - Outdoor CT cabinets are weatherproof.
 - A neutral is bonded to the enclosure.
 - CT cabinets are **not** used as splicing chambers and CTs are **not** tapped off to supply other meters or used for any other purposes.

7.2.7. (continued)

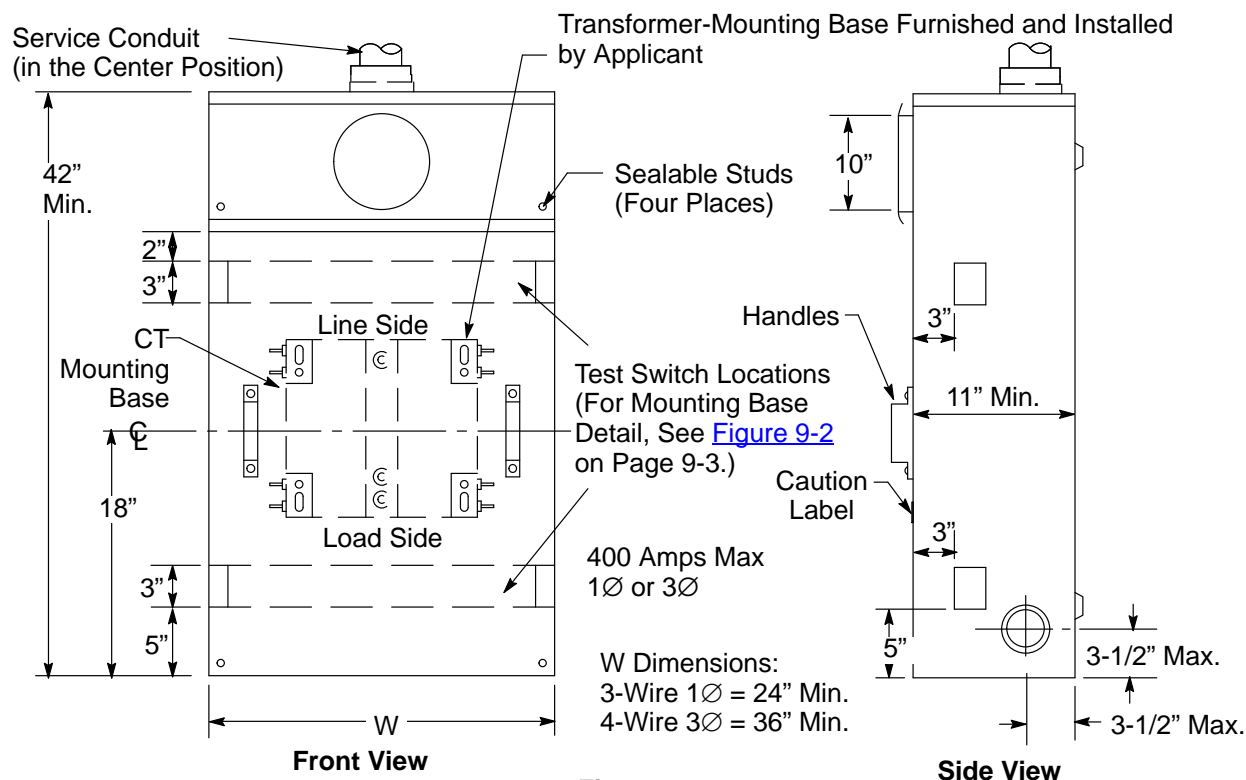


Figure 7-9
Overhead-Fed Combination Meter and Current-Transformer Cabinet,
(201 Amps–400 Amps, 1Ø or 3Ø)

B. Services, 201 Amps Through 400 Amps, Single Phase or Three Phase, with Current-Transformer Metering

1. When installing a single, overhead, single-phase or three-phase service using current transformers, applicants must furnish, install, and maintain separate current-transformer cabinets and meter boxes, as illustrated in Figure 7-10, “Overhead-Fed, Separate-Bused, Current-Transformer Cabinet and Safety-Socket Meter Box (201 Amps–400 Amps, 1Ø or 3Ø),” on Page 7-14. Also required are service-entrance conductors, conduit, and weatherhead to the point of attachment to PG&E’s overhead service.

NOTE: See [Section 9](#), for details about internal components.

2. Applicants must install one set (i.e., one conductor per phase) of line-side conductors and one set of load-side conductors before PG&E installs the current transformers. Connect the service-entrance conductors to the line side of the current-transformer mounting bus bars and load the conductors to the load side of the current-transformer mounting bus bars.

7.2.7. (continued)

3. The current transformer bus bars must include termination bolts, Belleville washers, and nuts on the line and load sides necessary to connect the current transformers. See [Section 9](#), for details about these internal components.
4. The applicant's conduit must not be installed within 2 inches of any corner of the cabinet.
5. The applicant's conductors entering and exiting the cabinet must be formed and routed properly to ensure they do not obstruct the PG&E current transformer area.

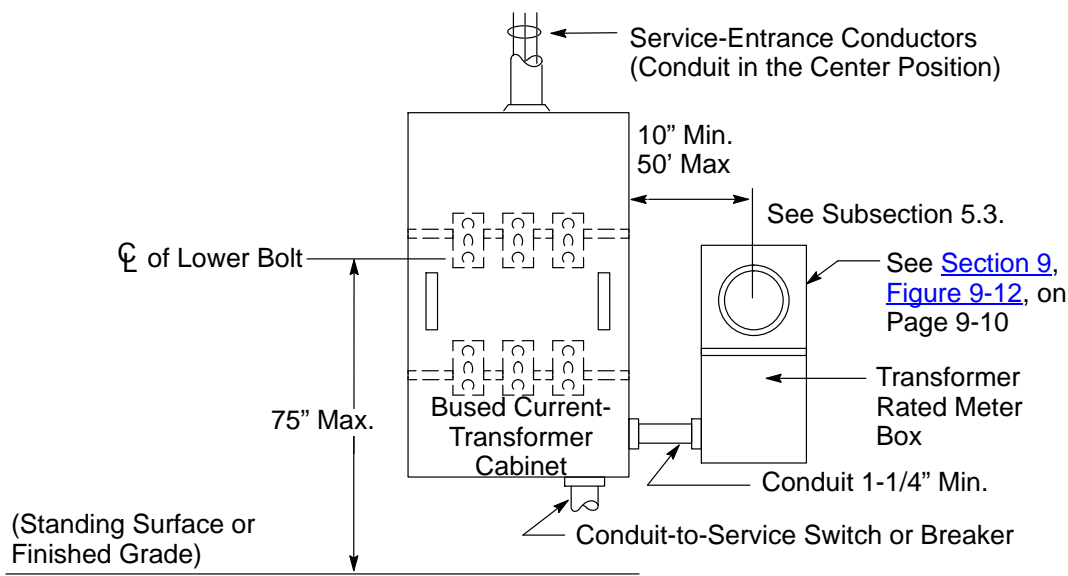


Figure 7-10
Overhead-Fed, Separate-Bused, Current-Transformer Cabinet and
Safety-Socket Meter Box (201 Amps–400 Amps, 1Ø or 3Ø)

C. Services, 201 Amps and Above, Current-Transformer Metering in Switchboard Service Sections

1. When installing a single, overhead service using current transformers, applicants must furnish, install, own, and maintain a switchboard service section with provisions for the overhead service termination.
2. Typical switchboard service-section arrangements are illustrated in Figure 7-11, “Overhead, Service-Termination, Standard Switchboard Service Section (0 Volts–600 Volts),” on Page 7-15.

NOTE: See [Section 10, “Electric Switchboards: 0 Volts Through 600 Volts,”](#) for details.

7.2.7. (continued)

3. Applicants must furnish and install service-entrance conductors and either cable or bus bars, as described below.
 - When switchboards are served through bus-bar conductors, the conductors must enter through the top or at the side or back in the upper 10-inch section.
 - When switchboards are served through cable conductors, the conductors must enter through the top of the switchboard. Figure 7-11, on Page 7-15, illustrates an extension that allows for horizontally incoming conduits from the side or rear of the standard switchboard service section.
4. Applicants must ensure that the service-entrance conductors feed from top to bottom. Load conductors must leave **below** the metering compartment barrier. Applicants must ensure that service entrance conductors are connected to the busing in the service sections with lugs approved for the type of conductors used.

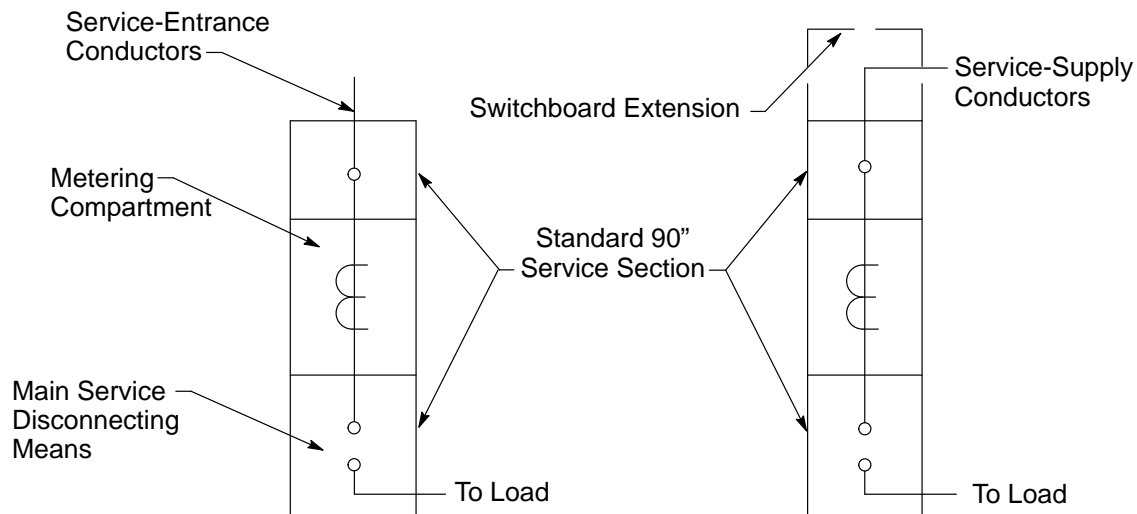


Figure 7-11
Overhead, Service-Termination, Standard Switchboard Service Section
(0 Volts–600 Volts)

7.2.8. Multi-Applicant Meter Installations

Applicants must meet the following requirements when installing multi-applicant meters.

- A. Applicants must install grouped meters for multi-applicant buildings where each occupant is metered individually.
- B. Each unit of a multi-applicant installation must be considered a single applicant and must meet the metering requirements described in Subsection 7.2.5., “Services, 0 Amps Through 200 Amps, Single Applicant, Overhead and Underground,” on Page 7-3.

7.2.8. (continued)

- C. Applicants must ensure that service entrance conductors for multi-applicant installations extend from PG&E's service termination point to the line side of the meter socket jaw of each socket.
- D. Applicants must ensure that the minimum centerline spacings between meter sockets are 7-1/2 inches horizontal and 8-1/2 inches vertical.

NOTE: PG&E provides and installs nonconductive, meter-socket, blank-off covers before energizing meter panels with vacant meter sockets. PG&E will **not** energize meter panels and sockets unless blank-off meter covers are installed and sealed. See [Section 6, "Electric Metering: Residential," Subsection 6.2.3., "Electric Meter Socket Covers and Seals,"](#) on Page 6-2., for material codes and further information.

- E. For multimeter installations, PG&E determines the ampacity rating of a grouped multimeter installation using one of the following two methods.
 - 1. For installations **without** a main switch or breaker, the service rating will be the rating of the electrical enclosure or service-termination section, pull can, or other service-termination enclosure where PG&E terminates and connects its supply facilities and conductors. Also, see [Section 1, "General," Subsection 1.14.B.,](#) on Page 1-15.
 - 2. For installations **with** a main switch or breaker, the rating of the service to be supplied is the rating of the termination section, pull can, service section, or main service switch continuous current rating (typically whichever is greater). Also, see [Section 1, Subsection 1.14.A.,](#) on Page 1-15.
- F. When a sealable gutter protrudes beyond the meter-mounting surface by more than 4 inches, applicants must maintain 10 inches of clearance from the centerline of the meter face. Otherwise, applicants must have a minimum 4-1/4 inches of vertical clearance.

7.2.8. (continued)

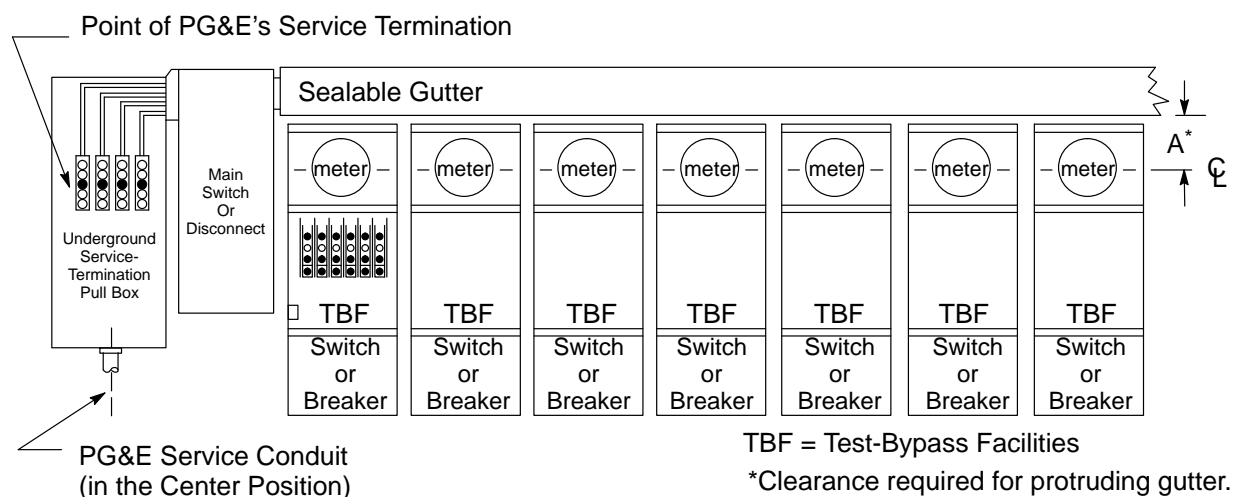
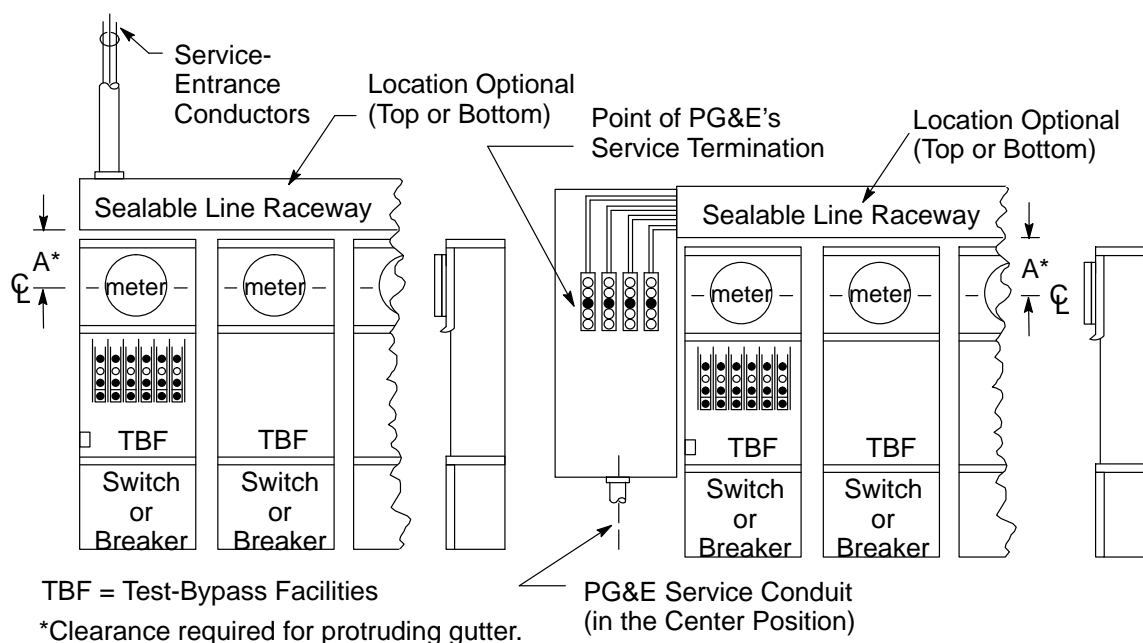


Figure 7-14
Grouped-Meter Installation With a Main Switch
 (Max. 400 Amps, 3Ø, 600 Amps, 1Ø)

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**SECTION 8
ELECTRIC METERING:
PEDESTALS**

SECTION 8 ELECTRIC METERING: PEDESTALS

Section 8

Electric Metering: Pedestals

8.1. Scope

This new section provides the design and installation requirements for electric metering pedestals in the PG&E service territories. ***Only the PG&E-approved metering pedestals described in this section can be installed.***

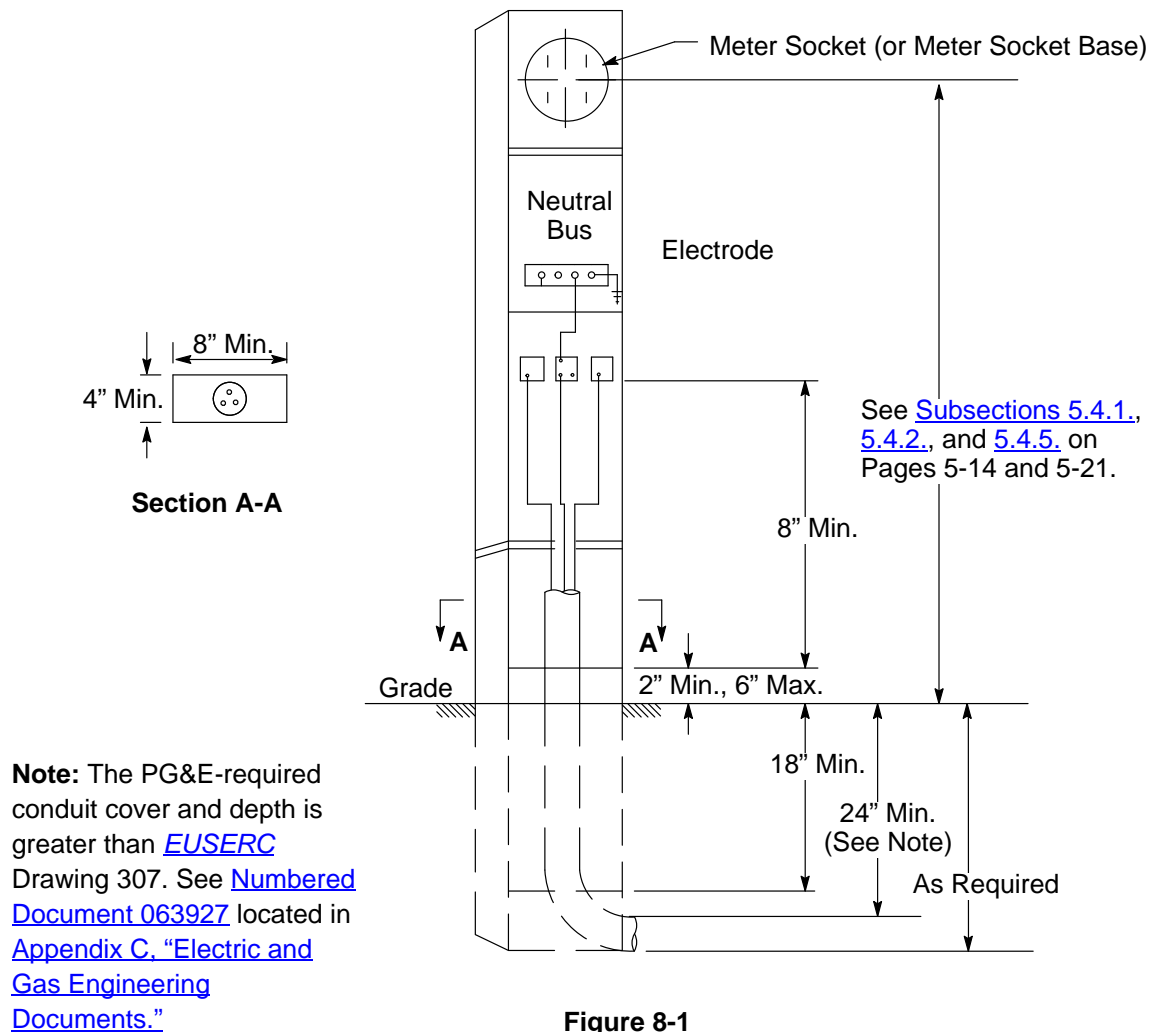
NOTE: This section was previously titled “Electric Metering: Direct Access.” If you have questions regarding direct access, refer to [Electric Rule 22, “Direct Access,”](#) and PG&E’s [Direct Access Standards for Metering and Meter Data \(DASMMD\) in California](#), March 1999 revision (only members can access this information online).

8.2. Residential Electric Metering Pedestals

Residential electric meter pedestals, as shown in Figure 8-1, “Residential Electric Metering Pedestal,” on Page 8-2, must have a minimum rating of 100 amps and a maximum rating of 200 amps. The pedestal also must meet the requirements specified in the [Electric Utility Service Equipment Requirements Committee \(EUSERC\)](#) manual, Drawing 307.

For authorization to attach telephone and cable television terminating facilities to the post, contact your local PG&E project coordinators.

8.2. (continued)



8.3. Nonresidential Single-Meter Service Pedestals, 100–200 Amps

Applicants must ensure that nonresidential service pedestals meet the following requirements.

A. **Exterior Hood:** An enclosing cover that is hinged to allow the front, sides, and top of the hood to rotate upward and back, 90 degrees or more, as one unit to expose the internal metering compartment.

1. Ensure that the lifting force required to open the hood does not exceed 25 pounds.
2. Also, the hood must have a locking device to prevent it from closing while in the open position.

8.3. (continued)

- B. Metering Compartment:** The meter socket must be mounted on a support, attached to the meter panel, and provided with a sealing ring. Enclose the metering compartment with an enclosing cover (i.e., exterior hood) that meets the following requirements.
1. Ensure the area in front of the meter sockets and test bypass is not blocked with side panels, enclosure walls, or other obstruction as described in 8.3.A., “Exterior Hood,” on Page 8-2. This provides additional safety for personnel in the event of an arc flash.
 2. Equipped with a lifting handle.
 3. Sealable and lockable with a padlock having a 5/16-inch lock shaft.
 4. Provided with a fixed poly-carbonate viewing window.
- C. The test-bypass compartment cover:**
1. Must be sealable and fitted with a lifting handle.
 2. Has two lifting handles if the cover is more than 16 inches wide.
- D. Test-bypass blocks with rigid barriers** are furnished, installed, and wired or bused to the meter socket by the manufacturer. Connection sequences must be line-loaded from left to right and clearly identified by block-letter labeling at least 3/4 inch high.

Applicants must ensure that test-bypass facilities are installed with the following clearances.

1. Facilities require 3 inches of vertical clearance from the upper test connector stud to the upper compartment access opening.
 2. Facilities require 3 inches from the center of the cable terminal screw to the lower compartment access opening.
 3. Facilities require 1-1/2 inches of side clearance from the rigid insulating barriers to the compartment sides and 1 inch to the compartment access openings.
- E. Utility compartment covers** (i.e., exterior hood and pull section) are sealable and lockable using a padlock with a 5/16-inch lock shaft.
- F. Secure internal equipment** (attached to the outer walls of the enclosure) in place with devices that cannot be loosened from the outside. Do not use screws or bolts requiring special tools for installation or removal.

8.3. (continued)

G. The terminating pull-section of the pedestals:

1. Comply with the minimum dimensions illustrated in Table 8-1, “Minimum Dimensions: Inches,” on Page 8-5.
2. Accept a minimum 3-inch conduit.
3. Have covers equipped with lifting handles.
4. Are equipped with aluminum-bodied mechanical lugs, ranging from #6 AWG through 250 kcmil, for terminating the service conductors.
5. Have insulated cables or busses installed between the termination lugs and the test-bypass facilities.
6. Have protective metallic barriers, 16-gauge minimum, provided between the pull sections and their (the applicants’) distribution sections.
7. Have a 1/4-inch minimum clearance between the applicants’ section walls and the barriers to prevent screws and bolts from protruding into the pull sections.

For information on structural-mounting requirements and pedestal support, consult your local PG&E project coordinator and meter shop.

8.3. (continued)

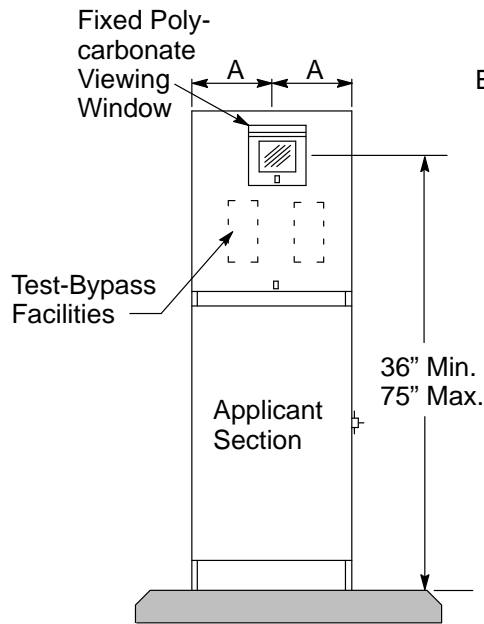


Figure 8-2
Front View

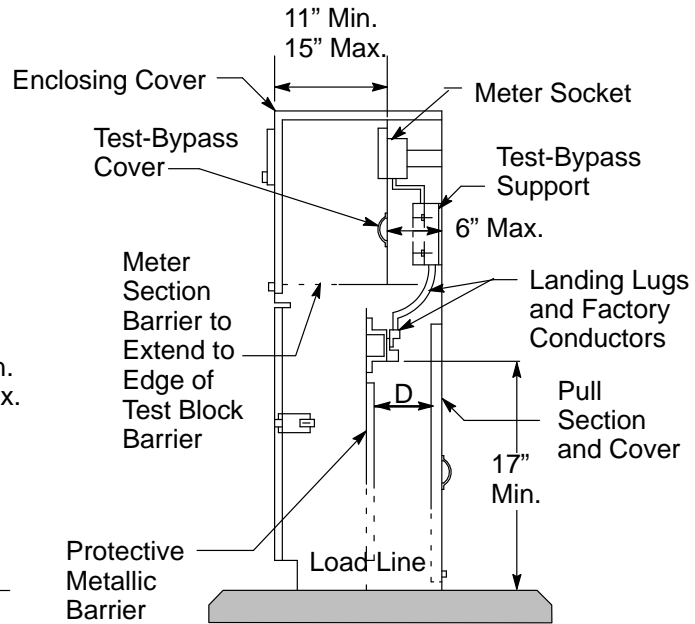


Figure 8-3
Side View

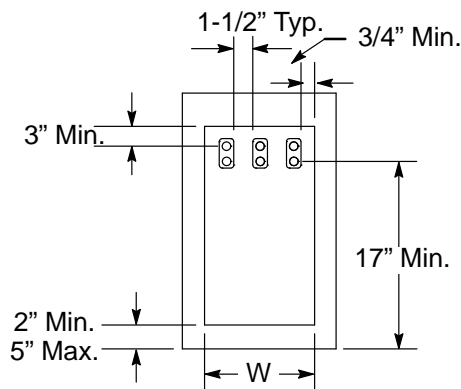


Figure 8-4
Service Cable
Termination Section

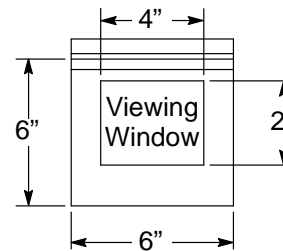


Figure 8-5
Fixed Polycarbonate
Viewing Window

Table 8-1 Minimum Dimensions (Inches)¹

Service	W	A	D
Single Phase	10-1/2	10	4.5
Three Phase	12-1/2		

1. Applies to figures in Section 8.3.

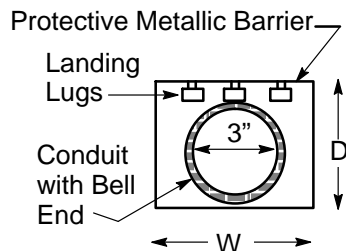


Figure 8-6
Service Cable Termination
Section—Top View

Note: These figures represent generic design configurations. To submit other designs for review and approval, contact your local project coordinator. The project coordinator will consult with PG&E's electric standards and electric metering departments.

8.4. Nonresidential Dual-Meter Service Pedestals, 100–400 Amps

This subsection provides information on nonresidential dual-meter pedestals, either single phase or three phase, rated between 100 amps or 400 amps. These pedestals have two self-contained meter sockets, each rated for up to a maximum of 200 amps. The cable termination (i.e., pull section) may be located on the back or side of the pedestals. **Applicants must ensure that nonresidential service pedestals meet the requirements shown in the figure below.**

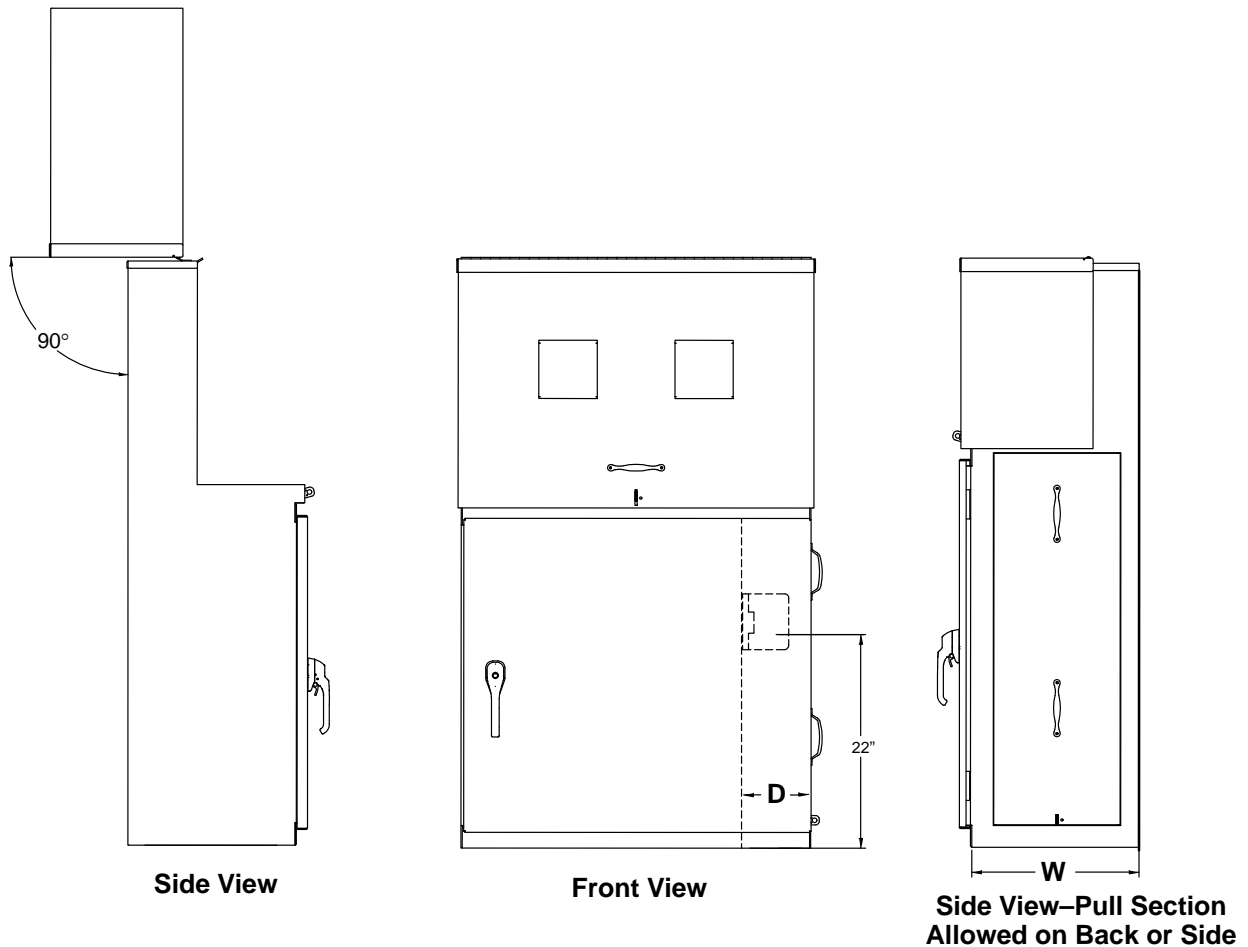


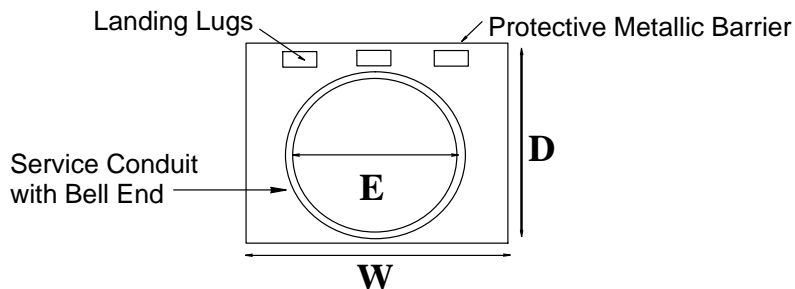
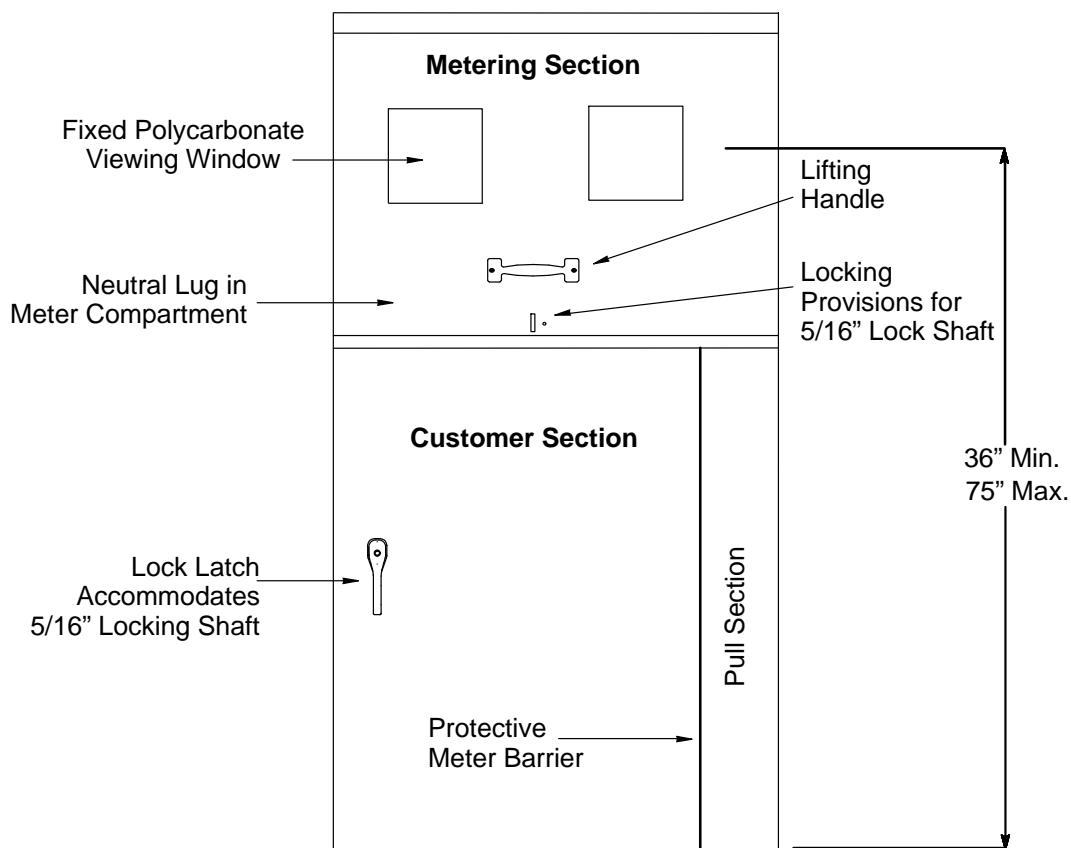
Figure 8-7
Directional Views

8.4. (continued)

Table 8-2 Minimum Dimensions (Inches)¹

Service	A	B	C	D	E	W
Single Phase	6	4.5	12	6	4	12
Three Phase	6	4.5	12	7	5	16

1. Applies to figures in Section 8.4.

**Figure 8-8
Service Cable Termination Section—Top View****Figure 8-9
Front Outside**

8.4. (continued)

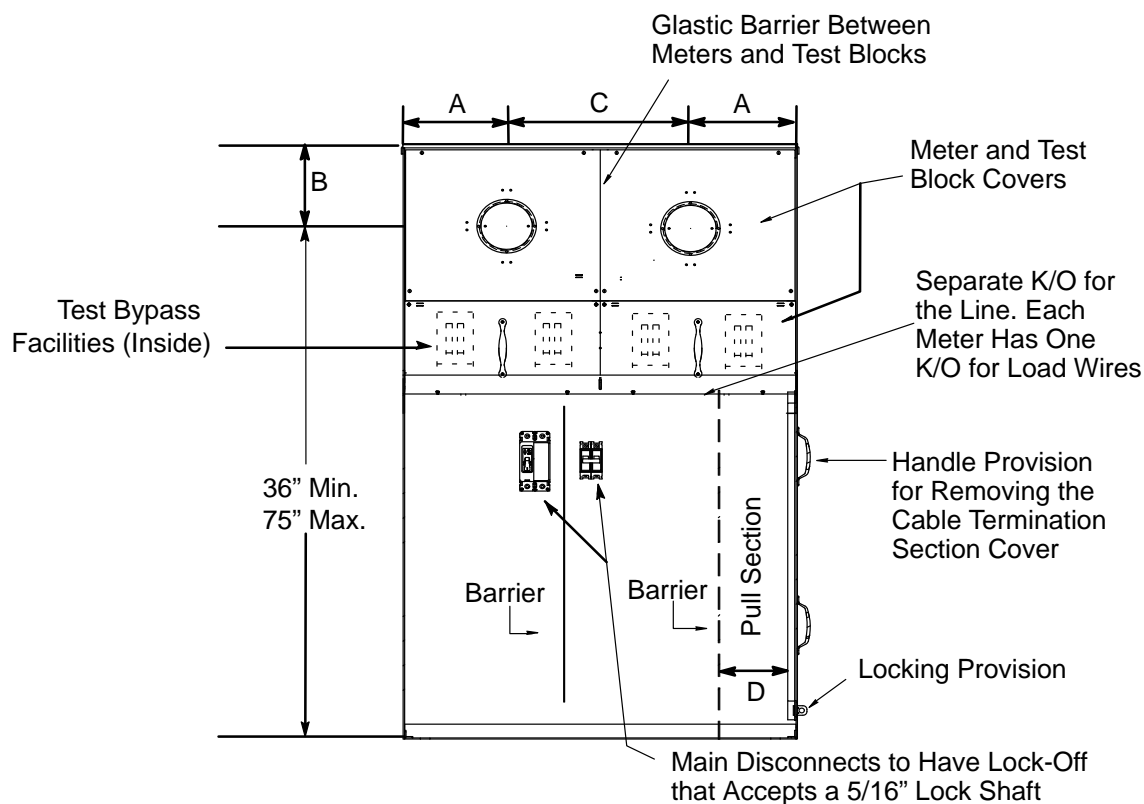


Figure 8-10
Front Inside

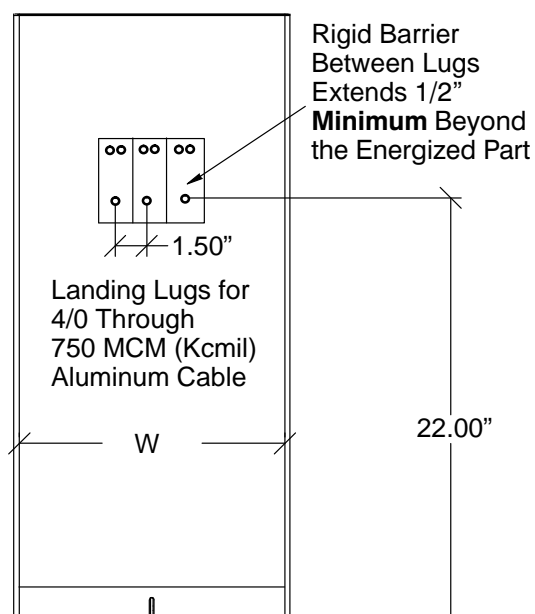


Figure 8-11
PG&E Service Cable Termination (Pull) Section

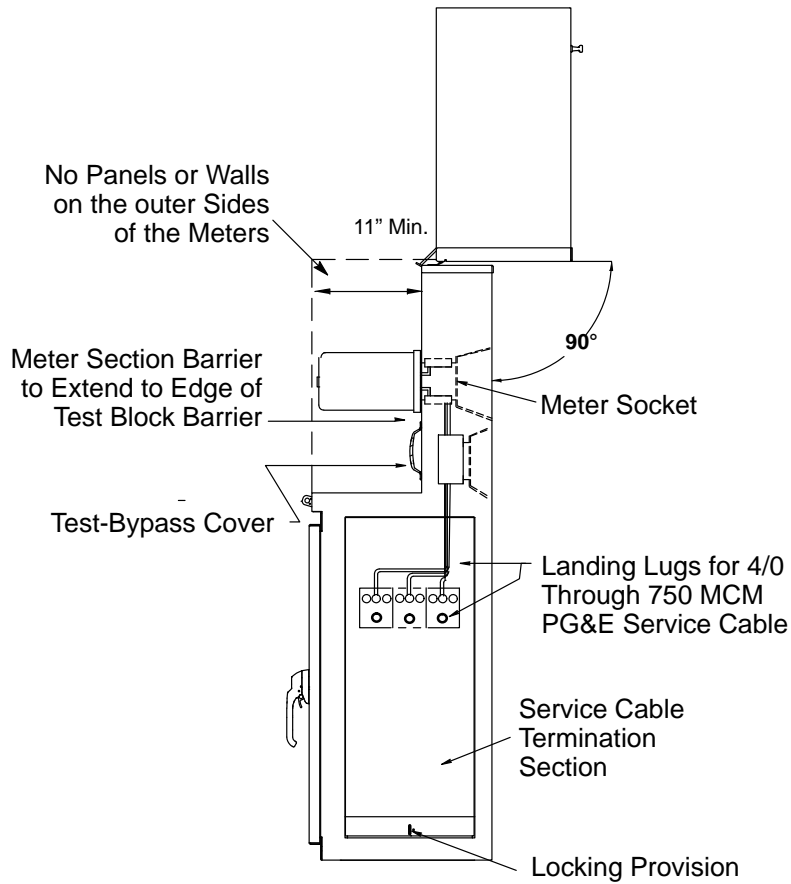


Figure 8-12
Side View: Cover Removed

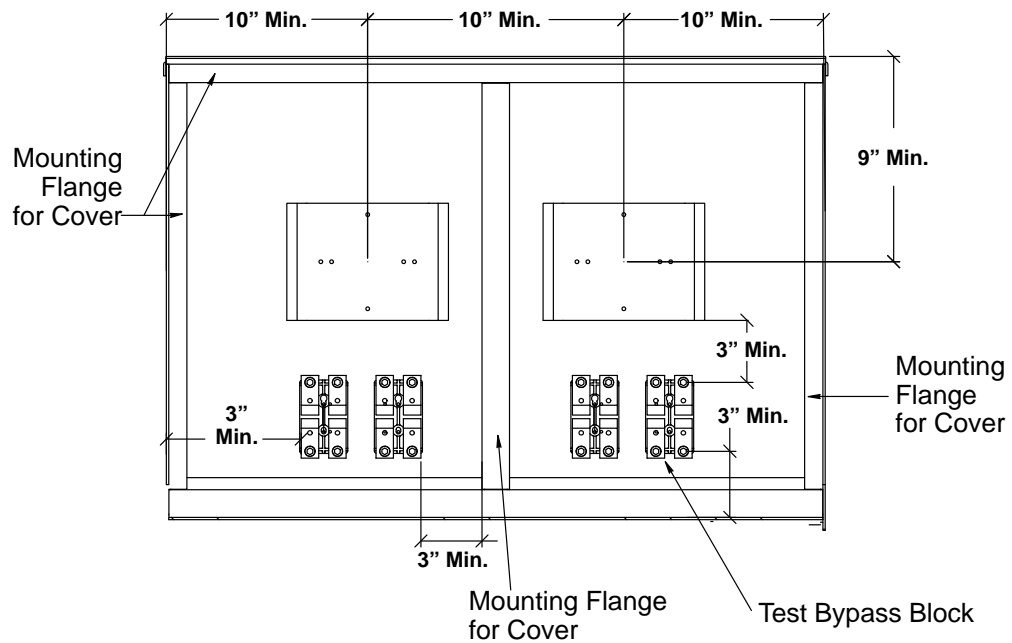


Figure 8-13
Front View-Interior Cover Removed

8.4. (continued)

Applicants must ensure that nonresidential service pedestals meet the following requirements.

A. **Exterior Hood:** An enclosing cover that is hinged to allow the front, sides, and top of the hood to rotate upward and back, 90 degrees or more, as one unit to expose the internal metering compartment.

1. Ensure that the lifting force required to open the hood does not exceed 25 pounds.
2. Also, the hood must have a locking device to prevent it from closing while in the open position.

B. **Metering Compartment:** The meter socket must be mounted on a support, attached to the meter panel, and provided with a sealing ring. Enclose the metering compartment with an enclosing cover (i.e., exterior hood) that meets the following requirements.

1. Ensure the area in front of the meter sockets and test bypass is not blocked with side panels, enclosure walls, or other obstruction as described in 8.4.A., “Exterior Hood,” above. This provides additional safety for personnel in the event of an arc flash.
2. Equipped with a lifting handle.
3. Sealable and lockable with a padlock having a 5/16-inch lock shaft.
4. Provided with a fixed poly-carbonate viewing window.

C. The test-bypass compartment cover:

1. Must be sealable and fitted with a lifting handle.
2. Has two lifting handles if the cover is more than 16 inches wide.

D. Test-bypass blocks with rigid barriers are furnished, installed, and wired or bused to the meter socket by the manufacturer. Connection sequences must be line-loaded from left to right and clearly identified by block-letter labeling at least 3/4-inch high.

Applicants must ensure that test-bypass facilities are installed with the following clearances.

1. Facilities require 3 inches of vertical clearance from the upper test connector stud to the upper compartment access opening.
2. Facilities require 3 inches from the center of the cable terminal screw to the lower compartment access opening.
3. Facilities require 1-1/2 inches of side clearance from the rigid insulating barriers to the compartment sides and 1 inch to the compartment access openings.

8.4. (continued)

- E. Utility compartment covers (i.e., exterior hood and pull section) are sealable and lockable using a padlock with a 5/16-inch lock shaft.
- F. Secure internal equipment (attached to the outer walls of the enclosure) in place with devices that cannot be loosened from the outside. Do not use screws or bolts requiring special tools for installation or removal.
- G. The terminating pull-section of the pedestals:
 1. Comply with the minimum dimensions illustrated in Table 8-2, “Minimum Dimensions: Inches,” on Page 8-7.
 2. Accept a minimum 4-inch and a maximum 5-inch conduit.
 3. Have covers equipped with lifting handles.
 4. Are equipped with aluminum-bodied mechanical lugs, ranging from 4/0 through 750 kcmil, for terminating the service conductors. 1-1/2 inch minimum spacing will be provided between the energized lugs or bussing. The 1-1/2 inch spacing may be reduced if rigid insulating barriers (1/16-inch minimum thickness) are provided that extend a minimum of 1/2 inch beyond any exposed, energized part when the maximum wire size is installed.
 5. Have insulated cables or busses installed between the termination lugs and the test-bypass facilities.
 6. Have protective metallic barriers, 16-gauge minimum, provided between the pull sections and their (the applicants’) distribution sections.
 7. Have a 1/4-inch minimum clearance between the applicants’ section walls and the barriers to prevent screws and bolts from protruding into the pull sections.

For information on structural-mounting requirements and pedestal support, consult your local PG&E project coordinator and meter shop.

8.5. Nonresidential Current-Transformer Rated Pedestals, 400 – 600 Amps 1Ø or 3Ø, 800 Amps 3Ø

This subsection provides information on single-metered, current-transformer (CT-) rated metering pedestals from 400 amps up to 800 amps. These pedestals are built with the utility cable termination compartment on the back and with the metering compartment on the front top above the customer section, or a meter panel connected to the side of the pedestal. Refer to Figure 8-14, “Nonresidential CT Pedestal (400 – 600 Amps 1Ø or 3Ø, 800 Amps 3Ø),” on Page 8-13, and Figure 8-15, “Nonresidential CT Pedestal – Side Mount Meter Panel (400 – 600 Amps, 1Ø or 3Ø, 800 Amps 3Ø),” on Page 8-14. These pedestals are only approved for the manufacturers and model numbers listed in Table 8-3, “CT Pedestal Approved Manufacturer’s Model Numbers, and Figures” on Page 8-12.

8.5. (continued)

Table 8-3 CT Pedestal Approved Manufacturer's Model Numbers and Figures^{2, 3}

Manufacturer	Model/Catalog Numbers		Figure
Milbank	CP3 Series ¹		8-14 & 8-15
Tesco Controls	24-412CTSBXB	24-418CTSBXB	8-14

¹ Full model numbers are not listed due to numerous variations. Pedestals must meet all PG&E requirements. Final approval is in the field.

² These pedestals are only approved for a single meter socket at specific voltages and amperages. See [Section 10, Table 10-3, "Dual-Socket, Hinged, Meter-Panel Requirement,"](#) on Page 10-39, for dual-socket requirements.

³ For low-profile switchboards, refer to [Figure 10-28, "Low-Profile Switchboard Service Section, with CT Compartment, for Underground Service,"](#) on Page 10-41.

8.5. (continued)

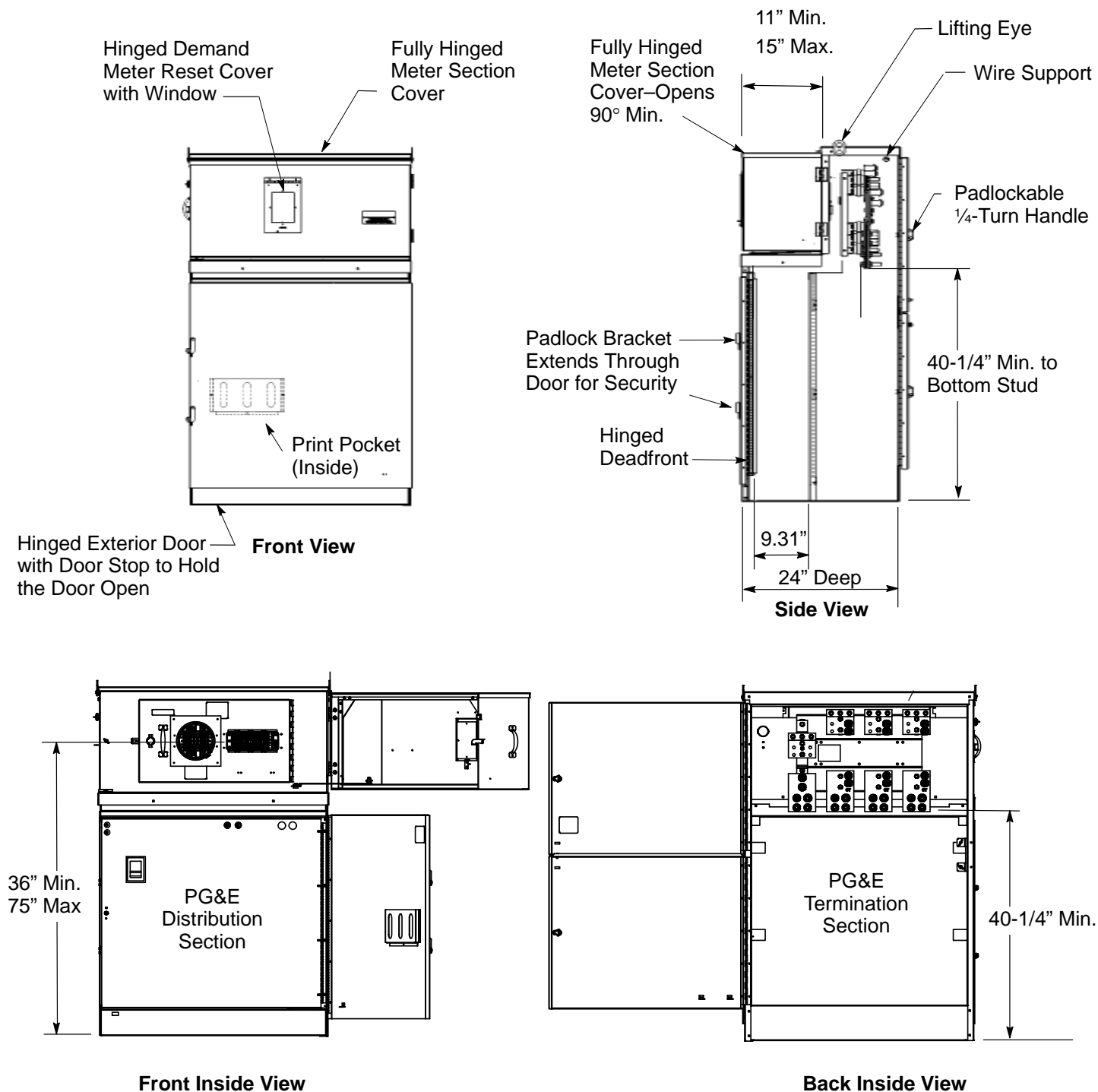
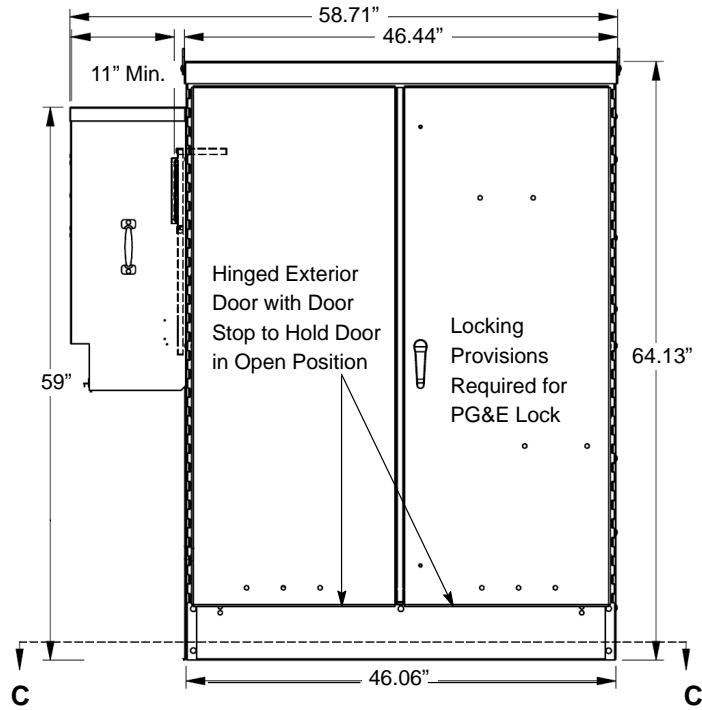
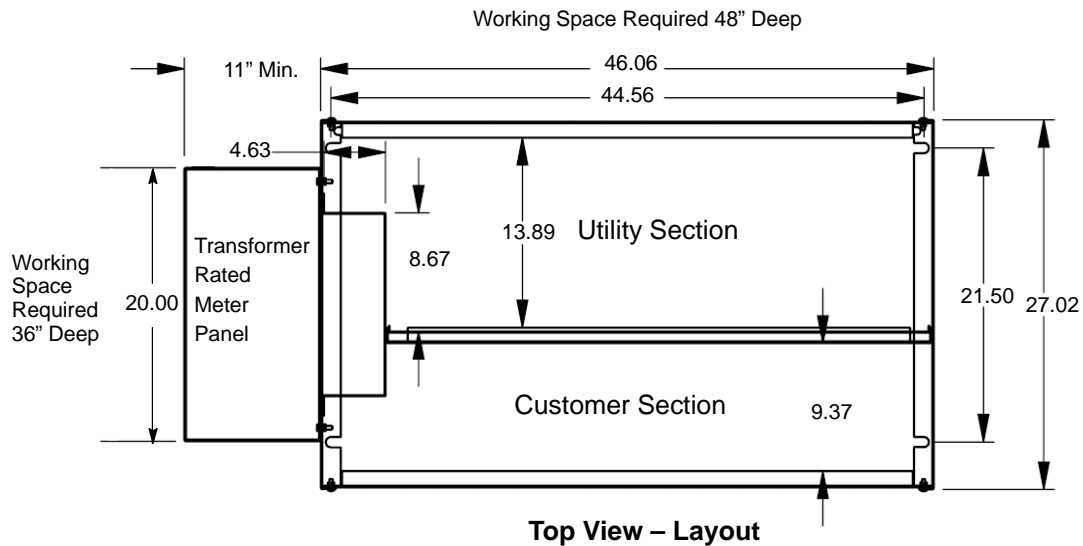


Figure 8-14
Nonresidential CT Pedestal
(400 – 600 Amps 1Ø or 3Ø, 800 Amps 3Ø)

8.5. (continued)



Front View – Load Compartment



Top View – Layout

Figure 8-15
Nonresidential CT Pedestal – Side Mount Meter Panel
(400–600 Amps, 1Ø or 3Ø, 800 Amps 3Ø)

8.5. (continued)

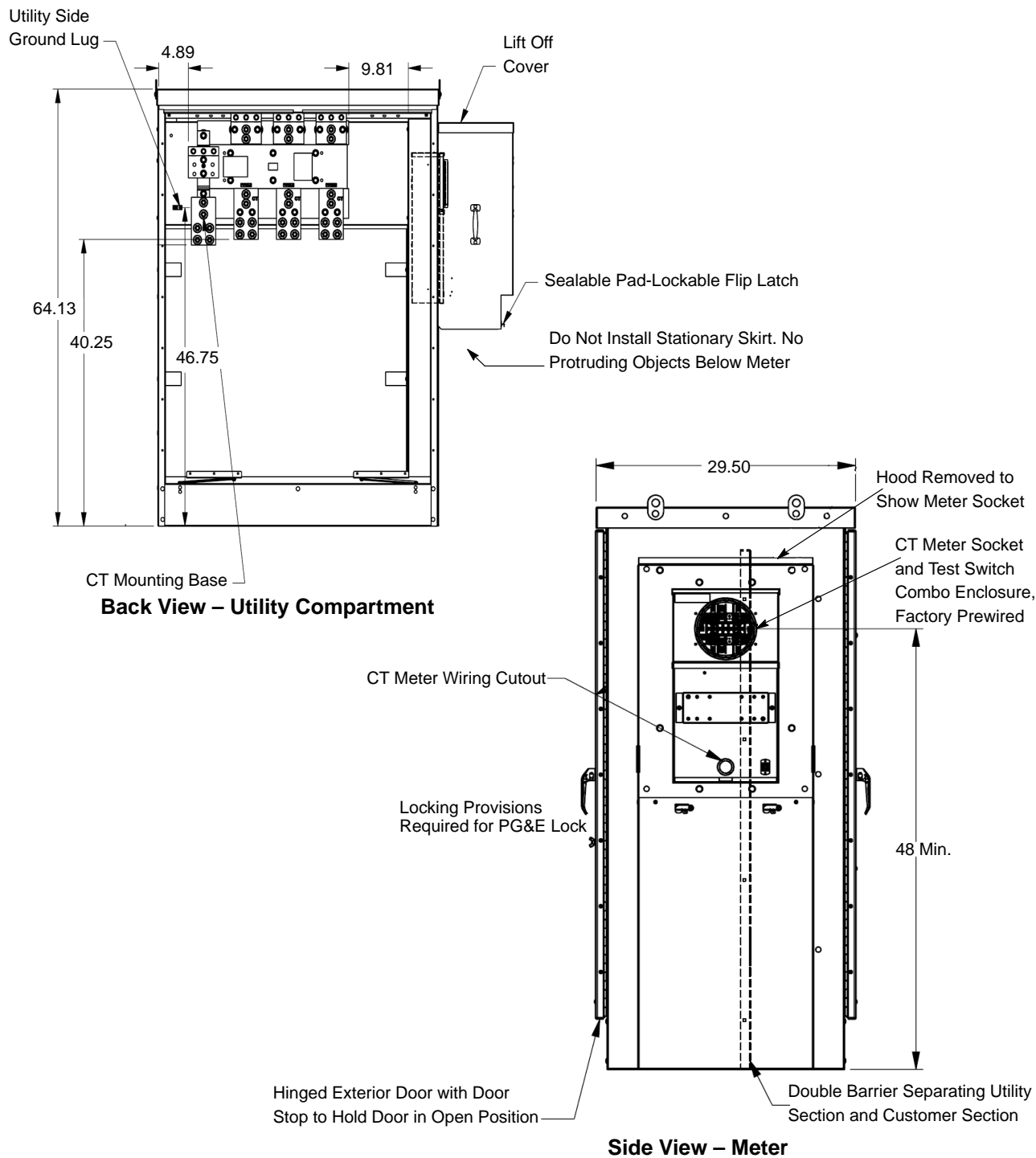


Figure 8-15 (continued)
Nonresidential CT Pedestal – Side Mount Meter Panel
(400–600 Amps, 1Ø or 3Ø, 800 Amps 3Ø)

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**SECTION 9
ELECTRIC METERING:
COMPONENTS AND CABLE
TERMINATING FACILITIES**

SECTION 9 ELECTRIC METERING: COMPONENTS AND CABLE TERMINATING FACILITIES

Section 9

Electric Metering: Components and Cable Terminating Facilities

9.1. Scope

This section of the manual provides detailed information on individual electric metering components and underground service cable termination compartments or sections that Pacific Gas and Electric Company (PG&E) finds acceptable for use in electric metering and service construction projects.

The [*Electric Utilities Service Equipment Requirements Committee \(EUSERC\)*](#) book, Section 300, contains service and meter-equipment details for PG&E-approved components, as well.

9.2. Test Blocks for Self-Contained Metering, 0 Amps Through 225 Amps

A test block is a specific type of test-bypass **device**. A test block differs from a test-bypass **facility**, which is any mechanism used to bypass meter sockets. Both test blocks and test-bypass facilities are used for self-contained metering exclusively.

Applicants must ensure that test blocks meet the following requirements.

- A. The hex nut must measure 5/8-inch across flats with a copper washer attached. The hex nut must de-energize the meter socket when backed off.
- B. Stud A, located at each conductor terminal, is used to bypass the applicant's load current. Applicants must ensure that these studs are used as described in the following three bullets.
 - Stud A must be located in the clear area between the terminating lug and the circuit-closing nut.
 - Stud A may be positioned on the terminal body, on the terminal screw, or on the bus member.
 - Stud A may be incorporated as part of the wire stop.
- C. Terminals must be aluminum-bodied and suitable for copper and aluminum conductors. The terminal screw may be an Allen type, 3/16-inch across flats for 100-ampere meters, or 5/16-inch across flats for 200-ampere meters.
- D. If Stud A is a part of the terminal screw, the terminal screw must be a 5/8-inch hex.

9.4. (continued)

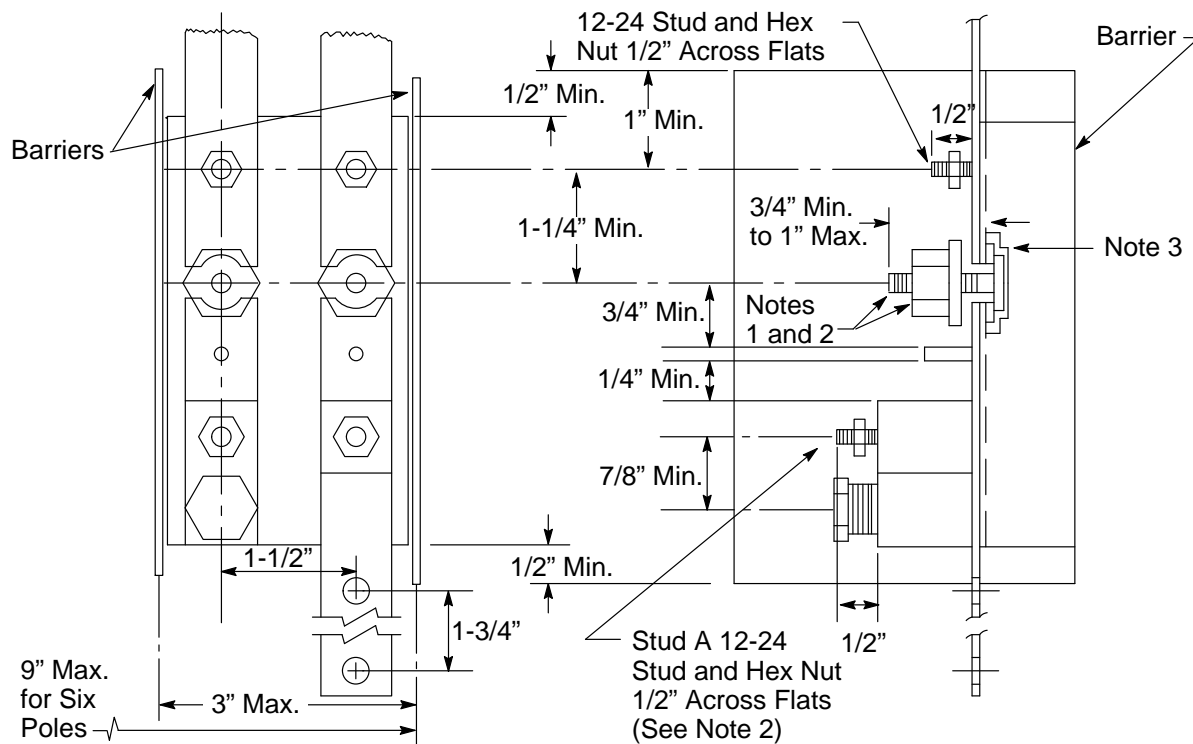


Figure 9-1
Test Blocks for Self-Contained Metering, 0 Amps–225 Amps

Notes in reference to Figure 9-1.

1. A hex nut (i.e., 5/8-inch across flats with a copper washer attached) de-energizes the meter socket when backed off.
2. Stud A, located at each conductor terminal, permits PG&E to bypass the applicant's load current. Locate Stud A in the clear area between the terminating lug and the circuit-closing nut. Stud A may be positioned on the terminal body, on the terminal screw, on the bus member, or incorporated as part of the wire stop.
3. Terminals must be aluminum-bodied and suitable for copper and aluminum conductors. The terminal screw may be an Allen-type (i.e., 3/16-inch across flats for 100-amp meters or 5/16-inch across flats for 200-amp meters). If Stud A is a part of the terminal screw, the terminal screw must be a 5/8-inch hex.
4. **Do not use** an automatic bypass or manual lever bypass. These types of test blocks are not allowed.

9.3. Test Switch Mounting Base Detail

Figure 9-2, below, shows the base dimensions for mounting a removable test switch.

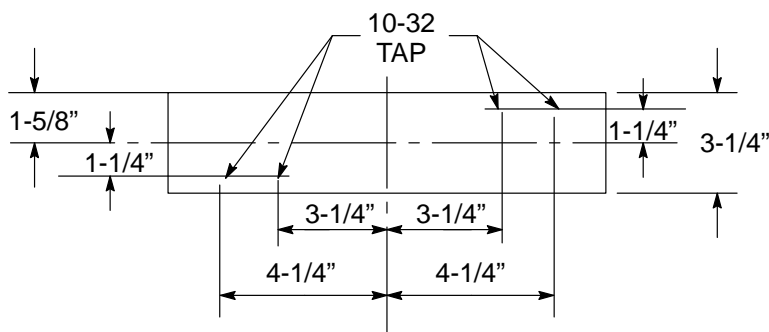


Figure 9-2
Removable Test Switch Mounting-Base Detail

9.4. Separate CT Cabinet, 201 Amps and Above, Single Phase and Three Phase

Applicants must ensure that cabinets meet the following requirements.

- A. All covers are sealable.
- B. Outdoor current transformer (CT) cabinets are weatherproof.
- C. Grounding lugs are provided.
- D. CT cabinets are **not** used as splicing chambers.
- E. CTs are **not** tapped off to supply other meters or used by applicants for any other purposes.
- F. PG&E's underground service-lateral conductors do **not** terminate in CT cabinets.

9.4. (continued)

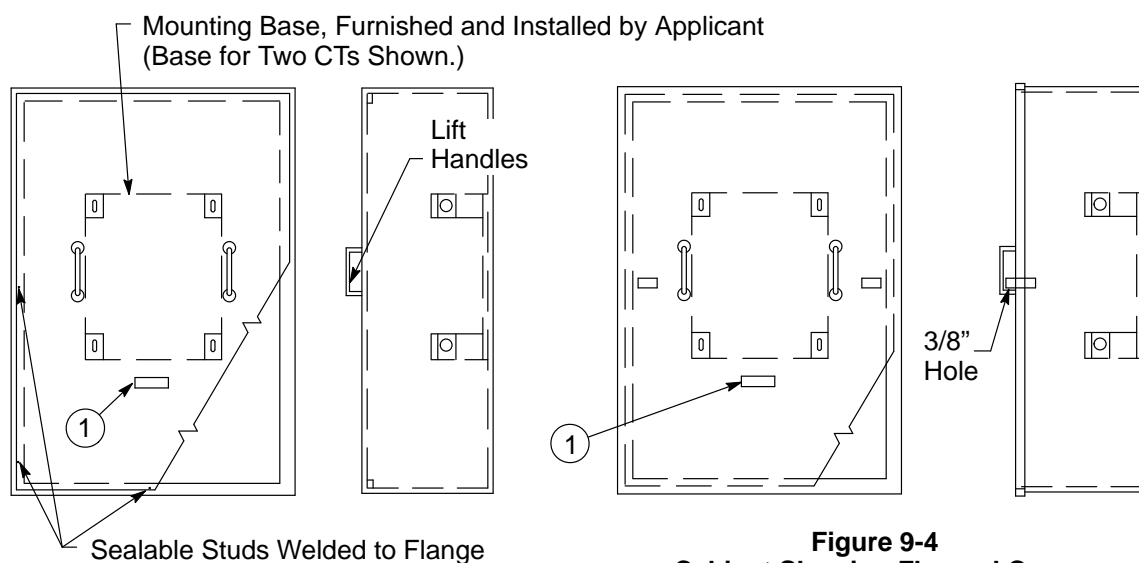


Figure 9-3
Cabinet Showing Stud-Mounted Cover

Figure 9-4
Cabinet Showing Flanged Cover
Fastened by Sealable Rivet Latches

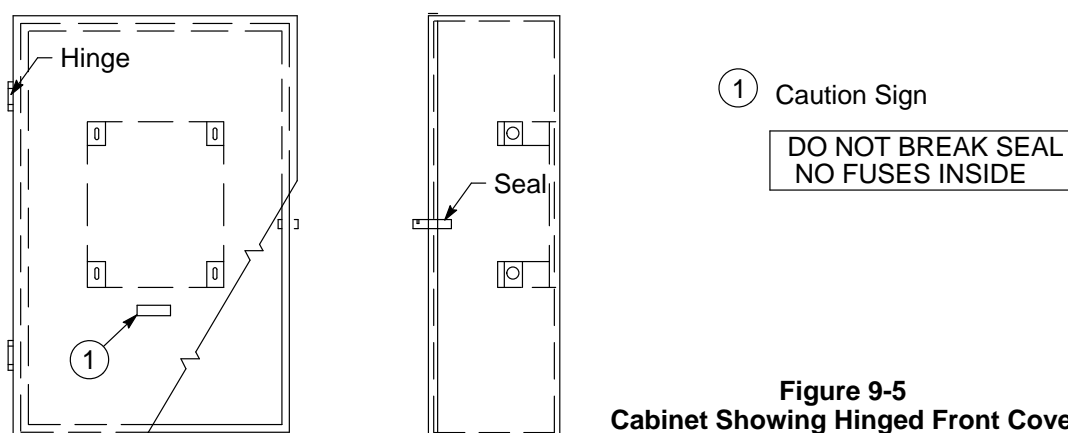


Figure 9-5
Cabinet Showing Hinged Front Cover

Table 9-1 CT Cabinet Minimum Dimensions

Type of Service	Cabinet Size (in Inches)	CT Mounting Base	CT Cabinet
3-Wire, 1Ø	24w x 48h x 12d	Figure 9-6	Figure 9-8
4-Wire, 3Ø	36w x 48h x 12d	Figure 9-7	Figure 9-10

9.5. CT Mounting Base, 201 Amps Through 400 Amps

Applicants must ensure that all of the required bolts are furnished and that conductors are connected to the line and load terminals on the CT mounting base. Also, the ampacity rating of the mounting base must not be greater than the PG&E service rating.

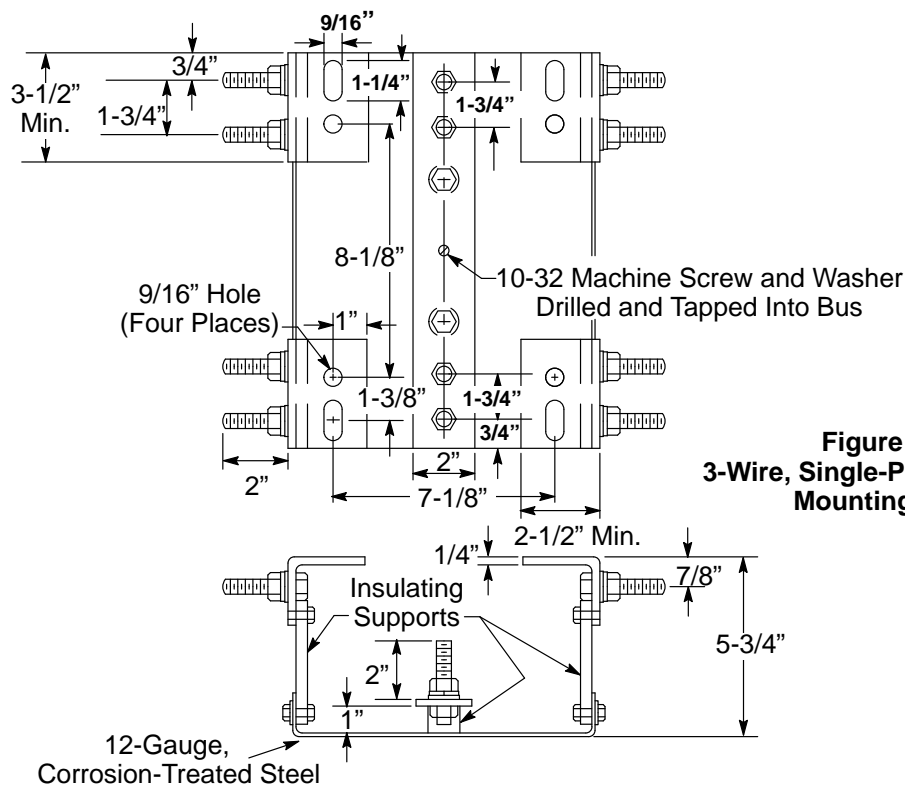


Figure 9-6
3-Wire, Single-Phase Service,
Mounting Base

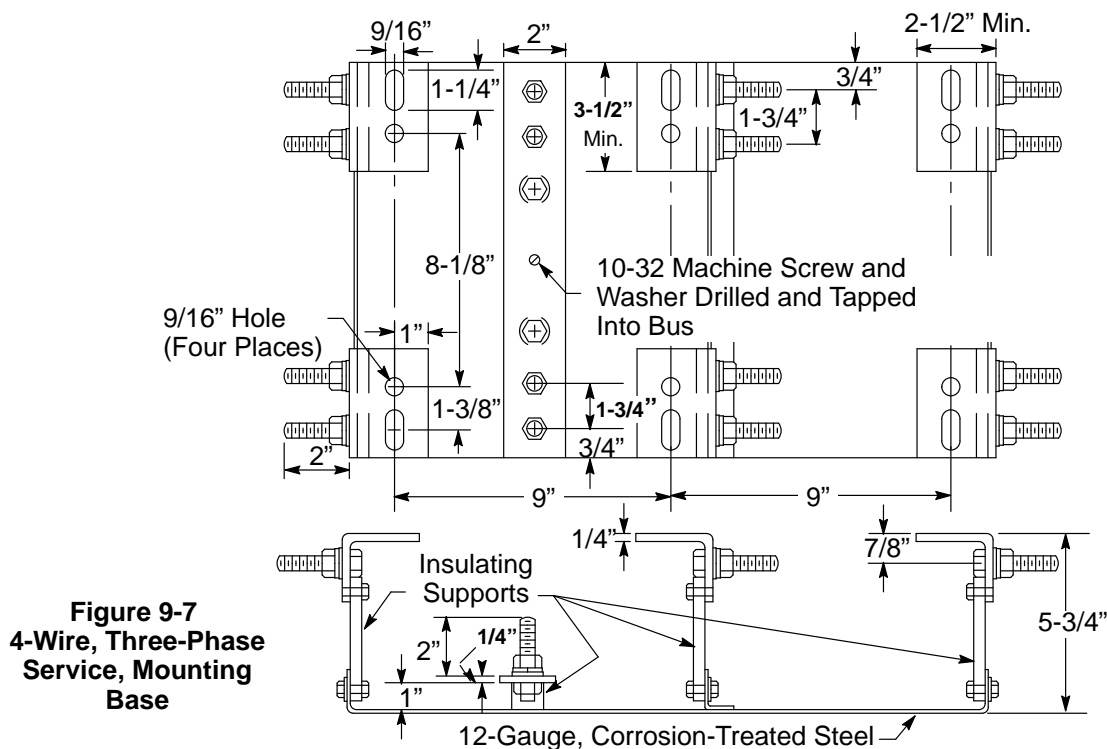


Figure 9-7
4-Wire, Three-Phase
Service, Mounting
Base

9.6. Alternate CT Mounting Base, One Phase or Three Phase

Applicants must ensure that mounting bases meet the following requirements.

- A. Insulated supports are rated for the serving voltage and have sufficient mechanical strength for the application.
- B. Mounting bases only accept bar-type CTs.
- C. Two 1/2-inch steel, Grade 5 bolts are provided for each cable-terminating and CT-mounting position. Each bolt must be furnished with a 2 1/4-inch diameter Belleville washer and a nut. Bolts must be secured in place and spaced as shown in all figures. All parts must be plated to prevent corrosion.
- D. The ampacity rating of the mounting base must not be greater than the PG&E service rating being supplied.

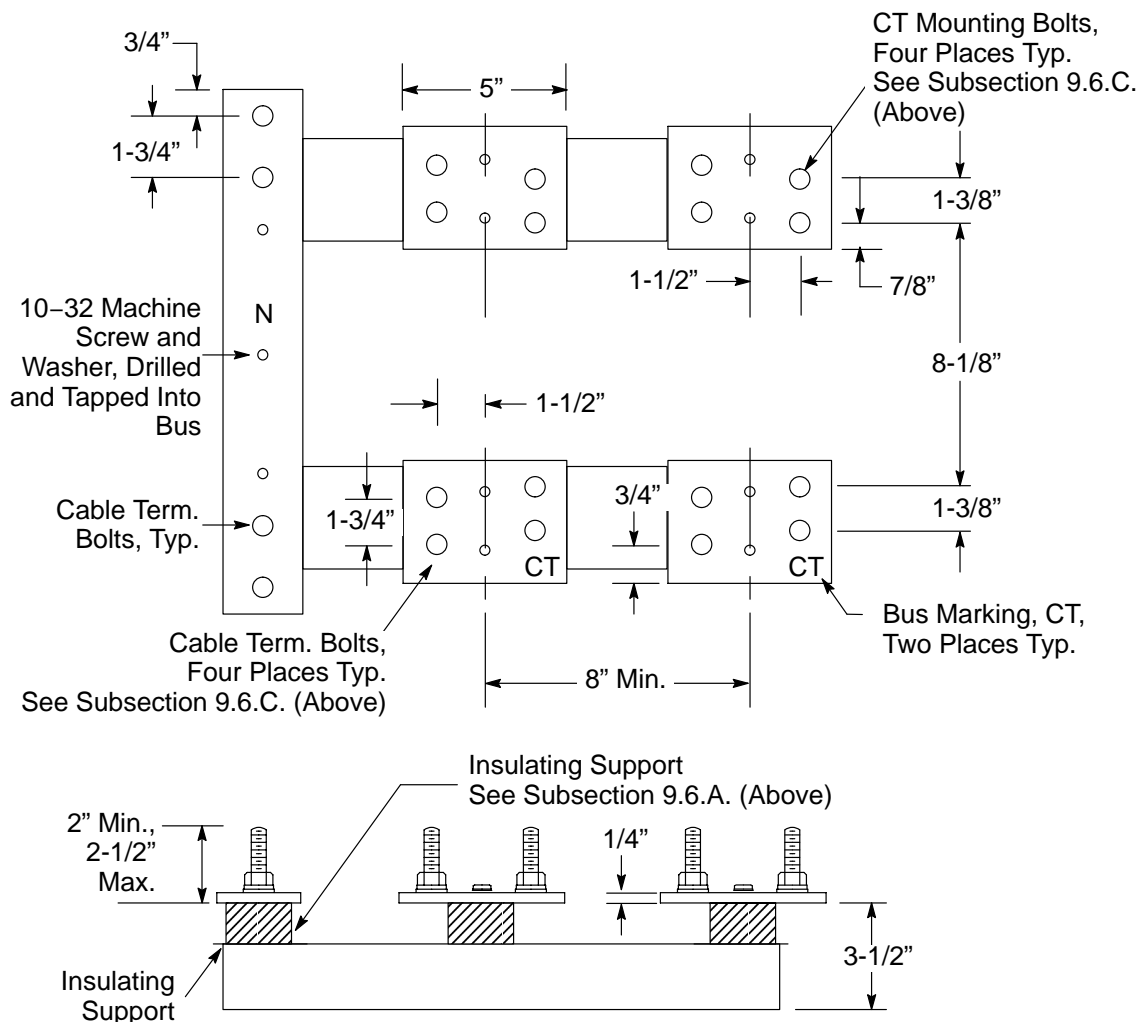


Figure 9-8
CT Mounting Base
 (Single-Phase, 3-Wire, 400 Amps–600 Amps, 0 Volts–600 Volts)

9.6. (continued)

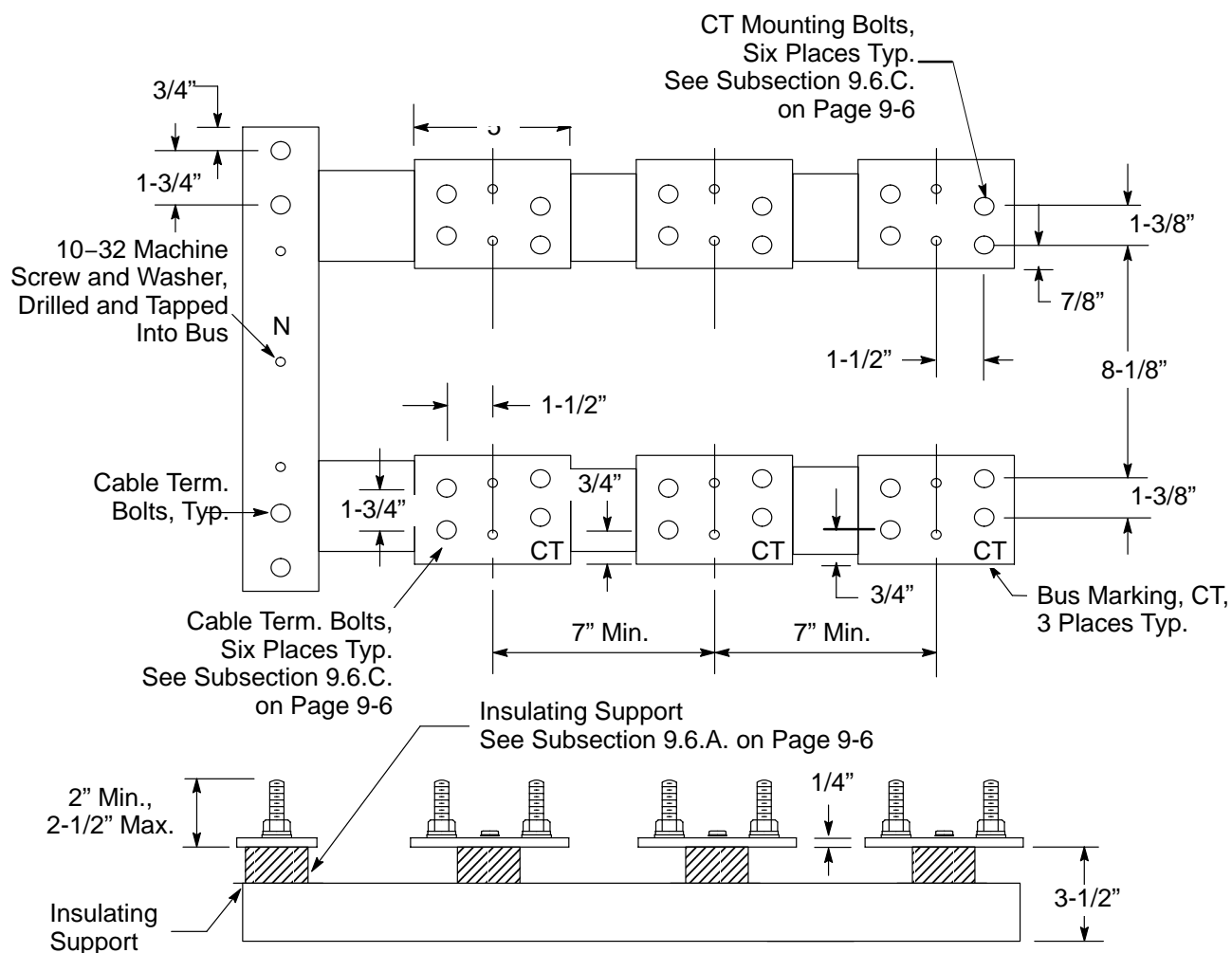


Figure 9-9
CT Mounting Base
(Three Phase, 4-Wire, 400 Amps–800 Amps, 0 Volts–600 Volts)

Notes in reference to Figure 9-8 on Page 9-6 and Figure 9-9 above.

1. CT mounting bases rated for 600 amps and 800 amps are allowed only for select types of wall-mounted and pad-mounted service termination and metering equipment.

9.7. Bused CT Cabinet, 3-Wire Service, 201 Amps Through 600 Amps

Applicants must ensure that cabinets meet the following requirements.

- A. All covers are sealable.
- B. Outdoor CT cabinets are weatherproof.
- C. Grounding lugs are provided.
- D. Neutral or unmetered wiring, either cable or bus bar, is located on either side of the cabinet.
- E. CT cabinets are **not** used as splicing chambers.
- F. PG&E's underground service lateral conductors do **not** terminate in CT cabinets.
- G. For Virtual Net Energy Metering (VNEM) and Net Generation Output Meter (NGOM) applications only, CT cabinets rated at 600–800 amps may be allowed, including multiple cables per phase on the line and load side of this CT cabinet.
- H. Limited to a maximum of 400 amps for overhead services.

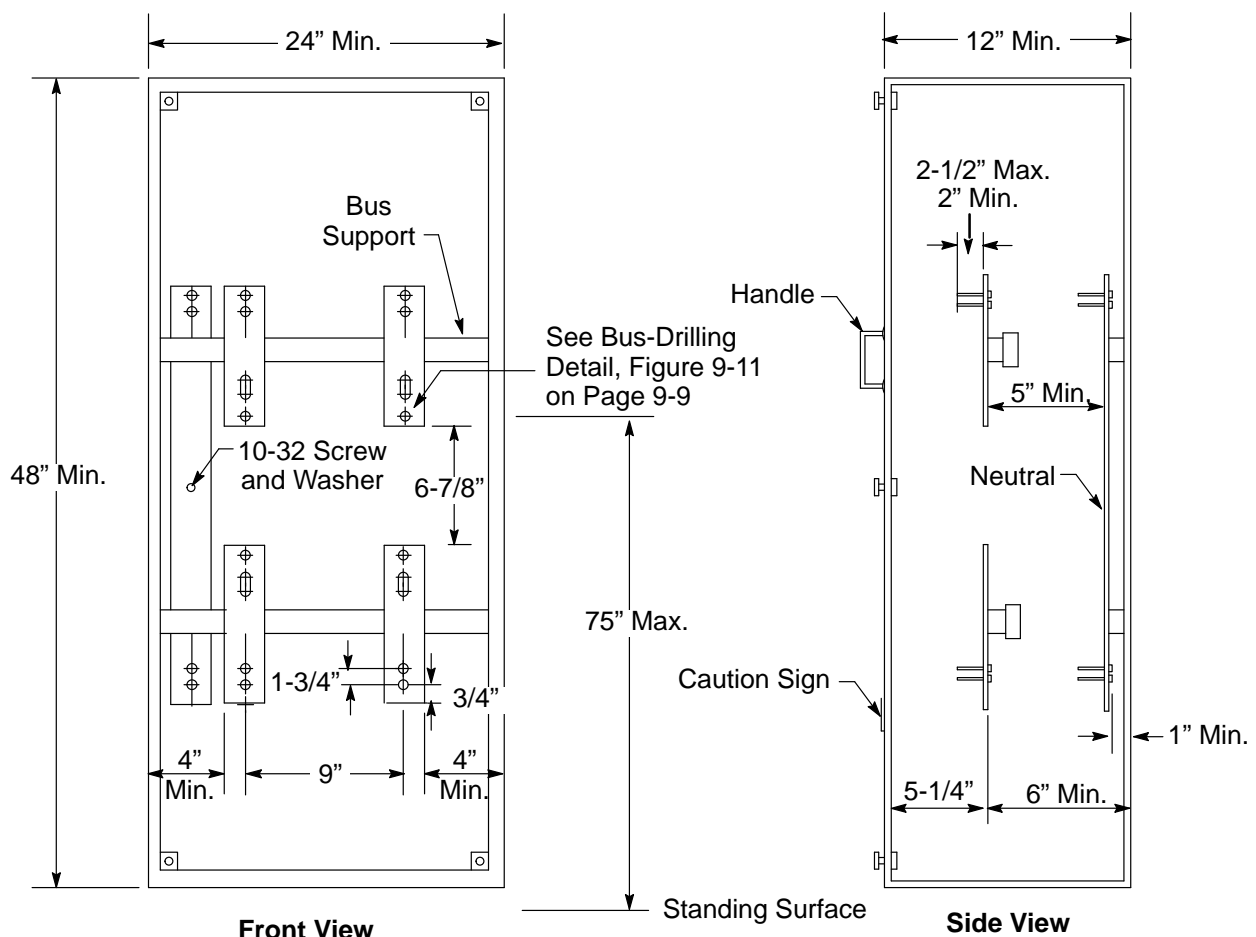


Figure 9-10
Bused CT Cabinet, 3-Wire Service, 400 Amps–600 Amps

9.8. Bused CT Cabinet, 4-Wire Service, 400 Amps

Applicants must ensure that cabinets meet the following requirements.

- A. All covers are sealable.
- B. Outdoor CT cabinets are weatherproof.
- C. Grounding lugs are provided.
- D. Neutral or unmetered wiring, either cable or bus bar, is located on either side of the cabinet.
- E. CT cabinets are **not** used as splicing chambers.
- F. PG&E's underground service lateral conductors do **not** terminate in CT cabinets.
- G. For VNEM and NGOM applications only, CT cabinets rated at 600–800 amps may be allowed, including multiple cables per phase on the line and load side of this CT cabinet.

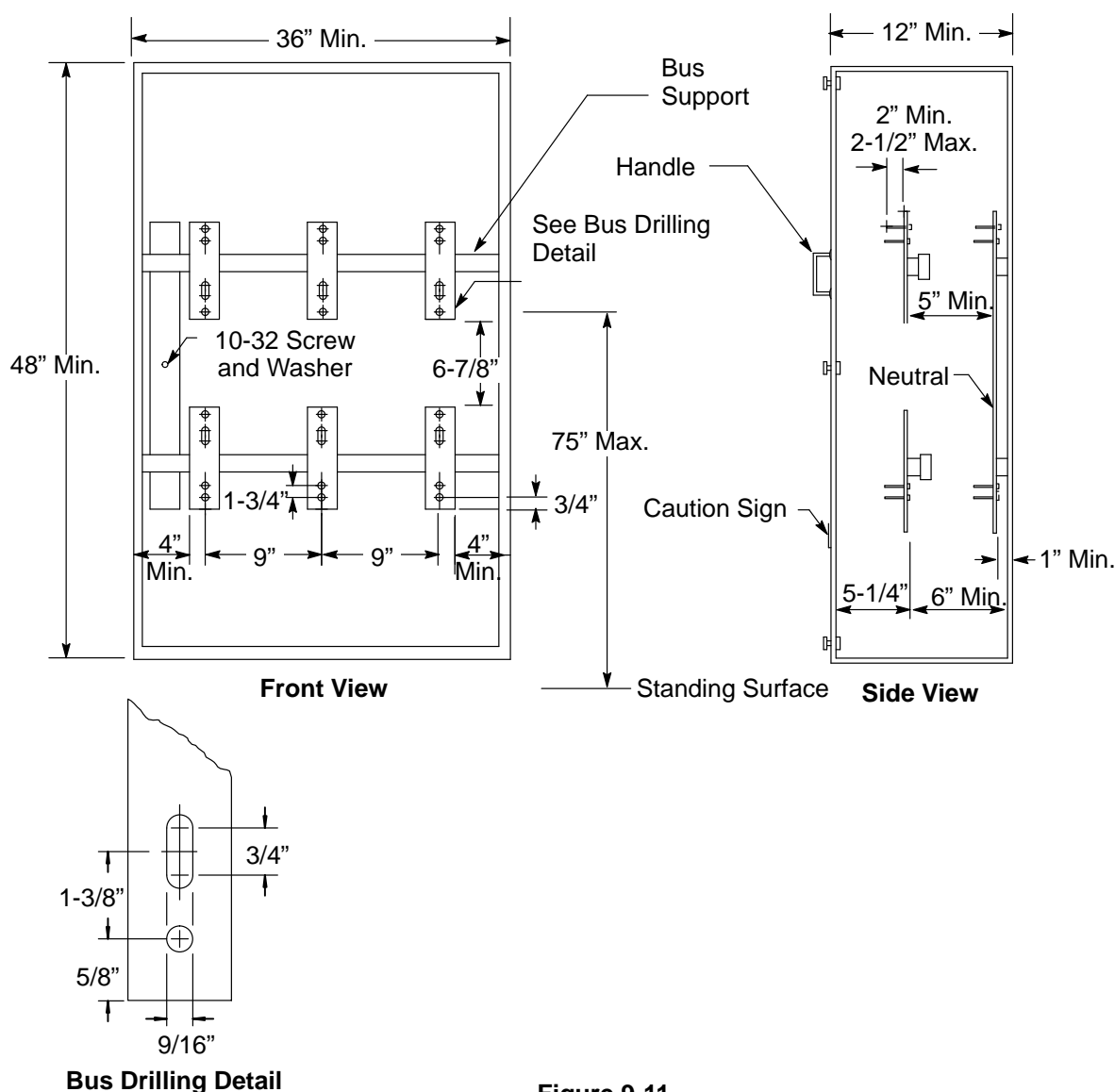


Figure 9-11
Bused CT Cabinet (4-Wire Service, 400 Amps Max)

9.9. Meter Box for Transformer-Rated Metering

Applicants must ensure that meter socket jaw requirements and connections are made according to the rules in [Section 5, “Electric Metering: General,” Subsection 5.6., “Meter Types and Connections,”](#) on Page 5-26.

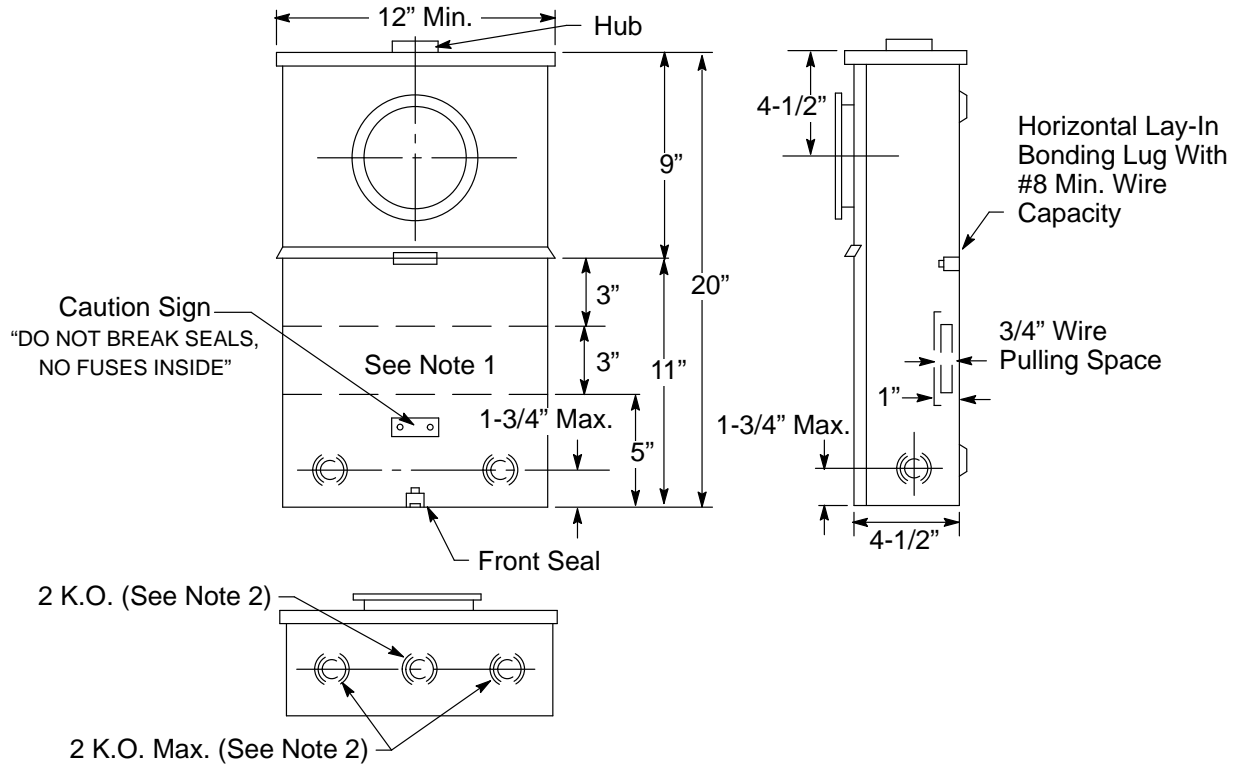


Figure 9-12
Meter Box for Transformer-Rated Metering
(Single-Phase or Three-Phase Installations)

Notes in reference to Figure 9-12.

1. Location of mounting bracket for test switch or reactive transformer.
2. K.O.—knock out

9.9. (continued)

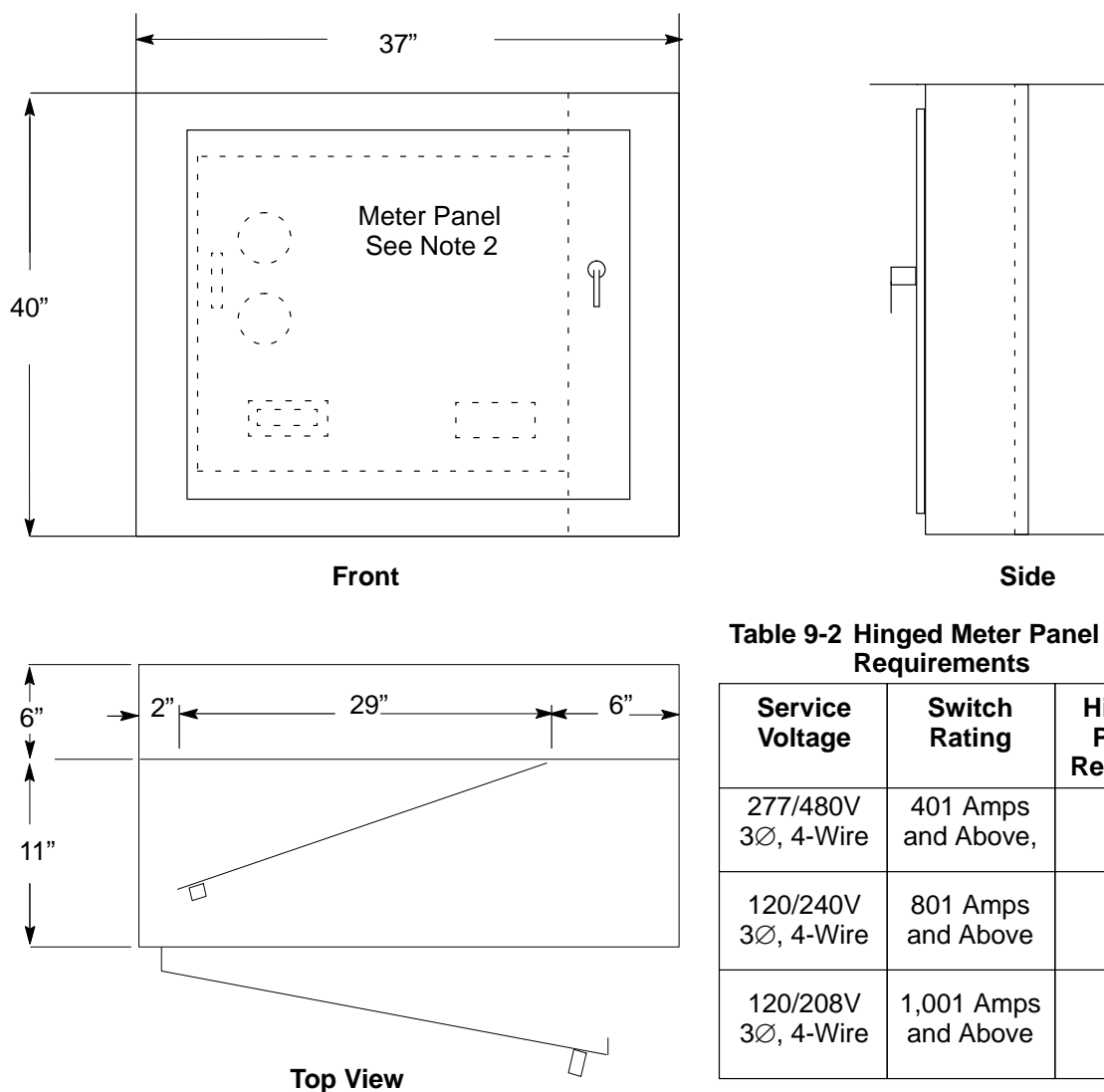


Figure 9-13
Remote Metering Cabinet (Three-Phase Installations)

Notes in reference to Figure 9-13.

1. The enclosure must be:
 - a. Equipped with a device to secure the door in the open position at 90° or more.
 - b. Secured in the closed position with a handle-operated latching mechanism, and lockable with a padlock having a 5/16" lockshaft.
2. For meter panel requirements, see [Section 10, Figure 10-30, "Standard Switchboard Service Section, 30-Inch Panel for Socket Meters and Recorder,"](#) on Page 10-43.
3. Written information must be provided and marked inside of the meter panel. This information must include:
 - a. Potential Transformer/Current Transformer (PT/CT) designation (Type)
 - b. Rating Factor (RF)
 - c. Burden
4. Remote metering must be approved by the the local meter shop before installation.
5. See Table 9-2, "Hinged Meter Panel Requirements," above.

9.10. Underground Service Cable-Termination Compartments or Sections

Applicants must ensure that underground service-termination compartments or sections meet the following requirements.

- A. The termination compartment covers must be removable, sealable, provided with two lifting handles, and limited to a maximum size of 9 square feet.
- B. The cover panel can be sealed using two drilled stud-nut and wing-nut assemblies on opposite sides of the panel.
- C. The minimum dimensions specified in Table 9-3, “Minimum Wall-Mounted Pull-Section Dimensions: Residential and Nonresidential, Single-Phase or Three-Phase,” on Page 9-13, are used when the service conduit enters the bottom of the termination compartment or termination enclosure and all load conductors exit above the terminals. When the service conduit enters from the side or back of the pull box, use the X dimensions from the closest portion of the conduit to the nearest termination bolt.
- D. Applicants must not use wall-mounted service-termination and pull enclosures for three-phase, nonresidential installations rated 401 amps through 2,500 amps. See Table 9-4, “Minimum Pad-Mounted (Floor-Standing) Switchboard Pull-Section Dimensions: Residential and Nonresidential, Single-Phase and Three-Phase,” on Page 9-13, and [Section 10, Table 10-1, “Minimum Bottom-Fed Pull Section Dimensions,”](#) on Page 10-27, for bottom-entry installation requirements. See [Table 10-2, “Pull Section Dimensions \(Minimums\) Below Ground Level,”](#) on Page 10-31, for side-entry or back-entry requirements.
- E. A PG&E project coordinator is contacted when developing nonresidential, 401-amps-and-above services. Applicants must ensure that they meet PG&E’s requirements for underground service-termination pull boxes, which include the following:
 - 1. Installing multiple sets of utility service cables.
 - 2. Provide stacking provisions (i.e., bolts) to terminate cables in any three-phase installation that is 1,200 amps or greater.
 - 3. Providing additional space (i.e., depth, width, and termination height), when required, in any section of switchboard, panel board, or other enclosure intended as a termination point for PG&E’s service cables. This additional space will provide the mandatory clearances between phases and grounded surfaces, as well as accommodate the installed service cables.

See [Numbered Document 063928, “Methods and Requirements for Installing Non-Residential Underground Electric Services 0–600 Volts to Customer-Owned Facilities.”](#) for the appropriate conduit and cable requirements to use when designing nonresidential service installations. This document is included in [Appendix C, “Electric and Gas Engineering Documents.”](#)

- F. See additional requirements for pad-mounted switchboards in [Section 10, Subsection 10.3.14., “Underground, Cable-Terminating Facilities in Pull Boxes or Pull Sections,”](#) on Page 10-34. The information and figures describe additional requirements for applicants who install these facilities.

9.10. (continued)

Table 9-3 Minimum Wall-Mounted Pull-Section Dimensions: Residential and Nonresidential, Single-Phase ¹ or Three-Phase ¹

Service Rating (Amps)	Minimum Access Opening "W"		X		Y	
	3-Wire	4-Wire	Bottom Entry	Side/Rear Entry	Bottom Entry	Rear Entry
	All Measurements in Inches					
0–225 ²	10-1/2	14	11	36	6	15
226–400	10-1/2	14	22	42	6	24
401–600 ³	16-1/2	—	26	48	11	24
Over 600 ^{4, 5}	See Table 9-4, below, for all single-phase services over 600 amperes and all three-phase services over 400 amperes.					

¹ See "Notes" at the bottom of this page in reference to Table 9-3 and Table 9-4.

² See [Section 6, Table 6-1, "Residential \(0 Amps–225 Amps\) Enclosure,"](#) on Page 6-5, and [Table 6-2, "Residential Combination \(OH/UG\) Meter Panel,"](#) on Page 6-13, for minimum dimensions of residential (combination) meter panels.

³ Single phase only.

⁴ 800-amp services and greater must be three phase and terminate in pad-mounted equipment. Refer to Table 9-4 below.

⁵ Excludes the wall-mounted panel in [Section 7, Figure 7-5, "Underground Service Combination Meter and Current-Transformer Cabinet \(600 Amps, 1Ø or 3Ø, 800 Amps 3Ø\),"](#) on Page 7-10.

Table 9-4 Minimum Pad-Mounted (Floor-Standing) Switchboard Pull-Section Dimensions: Residential and Nonresidential, Single-Phase and Three-Phase

Service Rating (Amps)	Minimum Access Opening “W”		Termination Height “X” 5
	3-Wire	4-Wire	
	All Measurements in Inches		
321–400	24	24	42 Minimum–72 Maximum (see Note 4 below)
401–800	24	24	
801–1,200	24	30	
1,201–2,000	30	35	
2,001–2,500	—	42	60 Minimum–72 Maximum

Notes in reference to Table 9-3 and Table 9-4.

1. If termination bus-landing stubs are installed perpendicular to the back of the board, a wider enclosure dimension will be required to accommodate the installation of PG&E's cables.
2. Maintain a clear working space. When return flanges are necessary, ensure they do not intrude into service-conductor space.
3. Dimension W is the minimum width of the pull section access opening.
4. The minimum termination height is 40-1/4 inches for bottom-fed service sections only as shown in [Section 7, Figure 7-7](#) on Page 7-8 and [Section 10, Figure 10-16](#) on Page 10-27.
5. The X-dimension is measured from the bottom of the enclosure to the first phase bolt.

9.10. (continued)

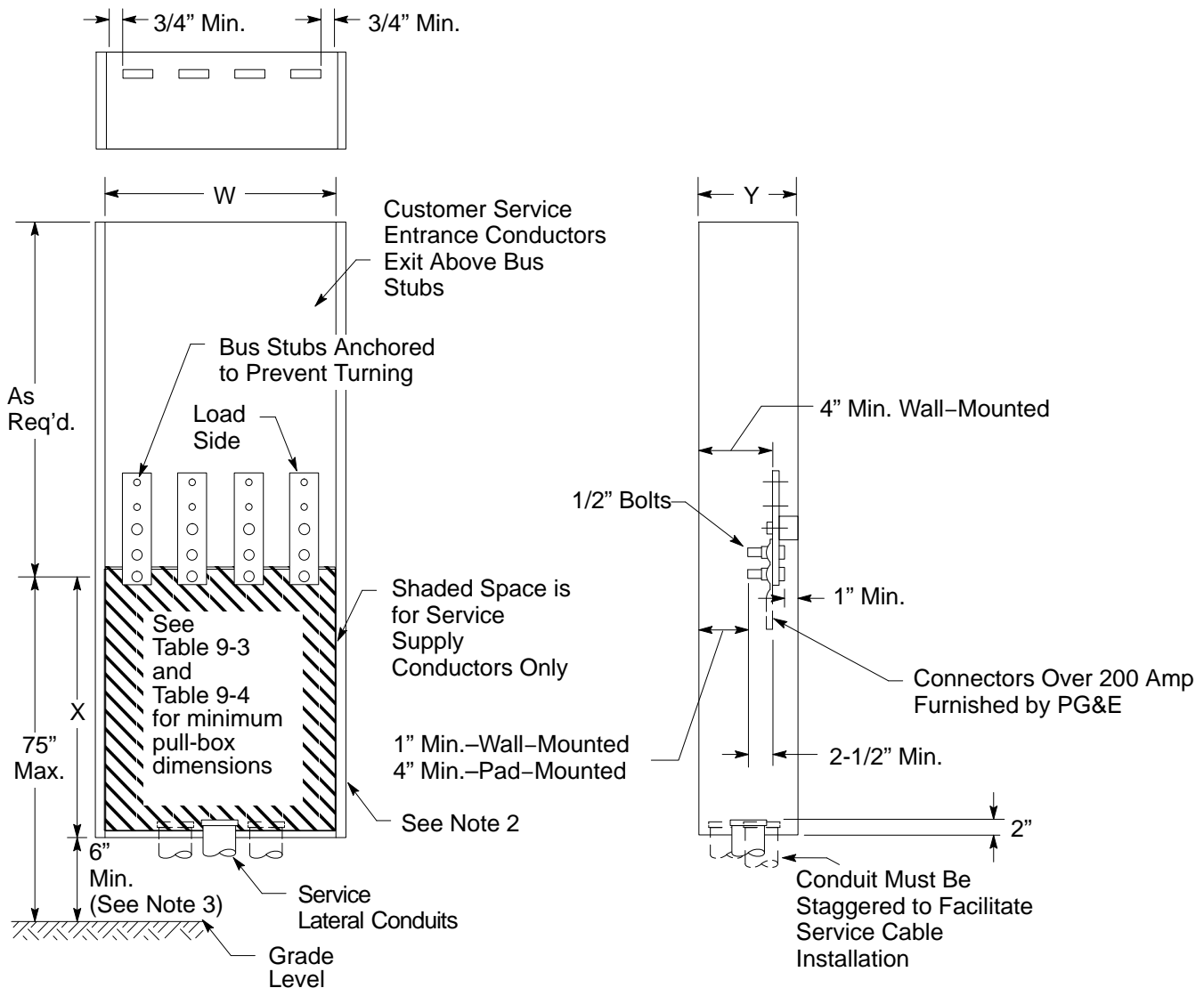


Figure 9-14
Typical Underground Service Termination Section and Pull Box,
Wall-Mounted or Pad-Mounted (Floor-Standing)

Notes in reference to Figure 9-14.

1. Ensure that pull-box covers are removable, sealable, provided with two lifting handles, and limited to a maximum size of 9 square feet. Sealing provisions must consist of two drilled stud-and-wing nut assemblies on opposite sides of the panel. Ensure that all security screws are captive.
2. Maintain a clear working space. When return flanges are necessary, ensure that they do not intrude into service conductor space (designated by shading).
3. The 6-inch minimum height requirement from grade to panel does not apply for a floor-standing switchboard.
4. A main service switch rated at 2,501 amps and above requires bus-duct configuration.

Notes continued on the next page

9.10. (continued)

Notes in reference to Figure 9-14, continued.

5. Lugs for terminating the customer's ground wire (or other grounding conductors) must be located outside of the sealable section and must be designed to readily permit the customer's neutral system to be isolated, when necessary, from the serving agency.
6. Ground buss, when provided, must be located at the rear of underground terminating enclosures (i.e., pull boxes and pull sections).
7. Switchboard pull and termination sections must not contain line/supply side cable tap connections. A dedicated tap section or a dedicated termination enclosure must be installed.

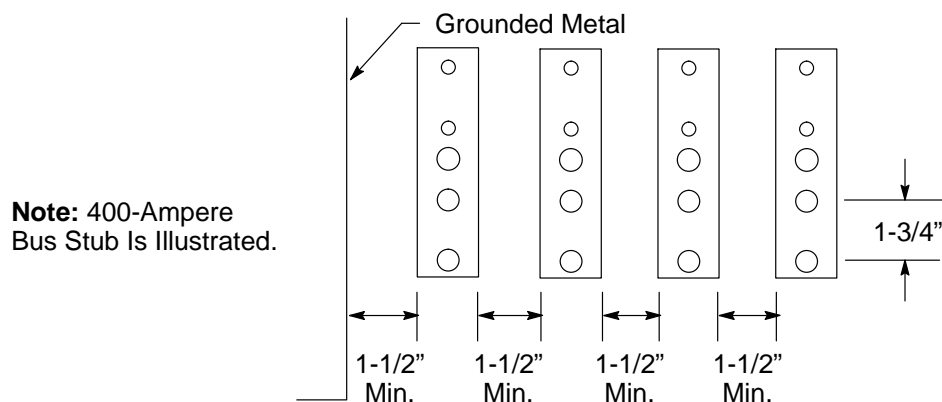


Figure 9-15
Detail of Clearance Requirements for Adjacent Termination Bus Stubs

9.10. (continued)

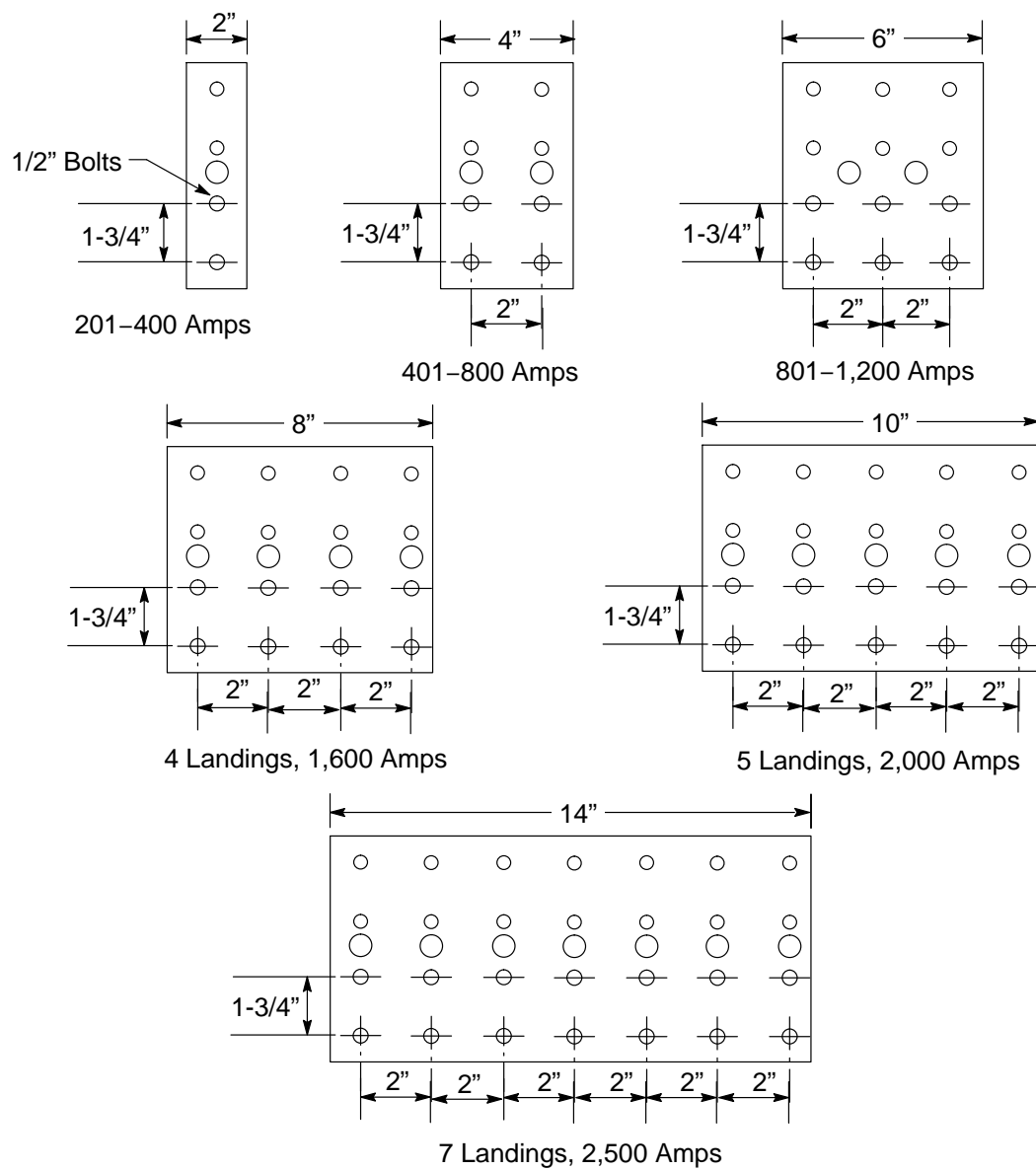


Figure 9-16
Detail of Aluminum Termination Bus Stubs

9.11. Approved Service-Terminal Conductor Connectors

Applicants must observe the following requirements when they plan to install approved, service-terminal conductor connectors.

- A. Applicants must furnish and install PG&E-approved, range-taking connectors, suitable for aluminum conductors, for enclosures rated at 0 through 225 amps.
- B. PG&E must furnish and install approved, cable-to-flat-bar connectors on the termination bus stub, as specified in Table 9-5, “Approved, Compression-Type Service-Terminal Connectors,” on Page 9-18, for enclosures rated above 225 amps. For a Class 320-amp panel, cable-to-flat-bar connectors on the termination bus stub are preferred; however, 320-amp-rated meter panels with hex lug terminations are acceptable also.
- C. Applicants **may** use one-bolt, bus attachment connectors for 0- through 225-amp services **if** the connectors are anchored to prevent the connector assembly from twisting.

Applicants must **not** use pin termination connectors to install cables larger than those intended for the range-taking connectors in their service panel or service enclosure.

NOTE: Do **not** peel stranded cables to fit conductors into termination connectors.

See PG&E [Numbered Document 015251, “Connectors for Insulated Cables Underground Distribution Systems,”](#) Table 28, “Specifications for Terminal Connectors–Aluminum Cable-to-Flat-Bar,” Page 26, for more information. This document is included in [Appendix C](#).

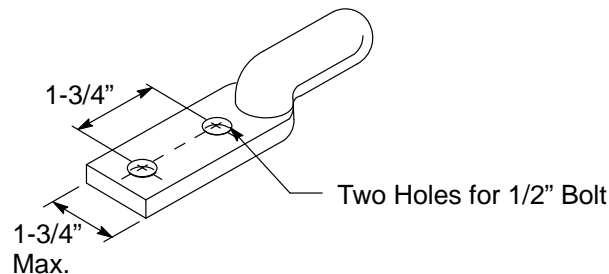


Figure 9-17
Service-Terminal Conductor Connector

9.11. (continued)

Table 9-5 Approved, Compression-Type, Service-Terminal Connectors

Conductor Size: AWG or kcmil	Manufacturer and Catalog Number						Tool Index Number
	Mac	Homac	Burndy	Electrical Specialty	3M Company	Code	
4/0	NLRB4/0-8N	AL-4/0-NTN	YAK28A-2G2	—	—	303759	4/0 AS
	MLB4/0-8N	—	YA28-A5	AHL-4/0-BNTP	40145	—	4/0 A
350	NLRB350-8N	AL-350-NTN	YAK31A-2G2	—	—	303758	350 A
	MLB350-8N	—	YA31-A3	AHL-350-BNTP	40156	—	350 A
700/750	NLRB750-8N	AL-750-NTN	YAK39A-2G2	—	—	303833	700/750 A
	MLB750-8N	—	YA39-AM 2	AHL-750-BNTP	40172	—	700/750 A
1,000	NLRB1,000-8N	AL-1,000-SSN	YAK44A-2NG7	—	—	303834	1,000 A
	MLB1,000-8N	—	YCAK44 A-2G2	AHL-1,000-BNTP	40178	—	1,000 A

**SECTION 10
ELECTRIC SWITCHBOARDS:
0 Volts THROUGH 600 Volts**

SECTION 10 ELECTRIC SWITCHBOARDS: 0 Volts THROUGH 600 Volts

Section 10

Electric Switchboards: 0 Volts Through 600 Volts

10.1. Scope

This section of the manual provides specific dimensions and details for service and meter equipment that is assembled by the manufacturer in freestanding, self-supporting switchboards.

10.2. General Requirements

Applicants must meet the following requirements when they plan to install electric switchboards.

- A. Ensure that switchboard service and meter equipment is built to the requirements of this section.
- B. Ensure that metering switchboard and panelboard drawings, with current ratings of **320 amperes (amps) or above**, are submitted in triplicate to Pacific Gas and Electric Company (PG&E) for review and approval. Drawings must contain specific [Electric Utility Service Requirements Committee \(EUSERC\)](#) or *Electric and Gas Service Requirements (Greenbook)* drawing and sheet numbers for reference purposes. Refer to [Section 5, “Electric Metering: General,” Subsection 5.2.2., “Drawing Submittal Requirements for Metering and Service Termination Equipment.”](#) on Page 5-1, for detailed requirements.
- C. Ensure that drawings submitted for PG&E’s review and approval include the following information.
 - The contractor’s name and address
 - The applicant’s name
 - The job location
 - Phase, voltage, and ampacity rating
 - Energy Reduction Maintenance Switch (ERMS) and associated component’s location
- D. Before authorizing the manufacture of a switchboard, an applicant must consult his or her local PG&E project coordinator for specific general utility requirements.

NOTE: See [Table FM-1, “Service Planning Office and Inspection Desk Contact Information.”](#) at the front of this manual starting on Page iv, for specific contact numbers listed by area.

10.2. (continued)

E. General utility requirements include the following:

- Horizontal bus-bar requirements
- Service voltage, phase, and wires
- Meter-panel requirements to determine the applicable rate schedule
- Service-termination location
- Switchboard and/or meter location(s)
- Size and number of service conductors

F. PG&E provides and installs meters, metering transformers, test switches, and all secondary wiring from the metering transformers to the meter.

G. Applicants must ensure that separation exists between the meters and metering transformers for the following reasons.

- To ensure meter accessibility.
- To prevent metering inaccuracies.
- To prevent unacceptable environmental conditions.

H. Applicants must ensure that rigid steel conduit is installed between the meter and the metering transformers. The rigid steel conduit must be 1-1/4 inches minimum diameter and must be limited to three 90° bends **unless** the applicant provides sealable, accessible, exposed conduits.

I. Service-entrance conductors must enter the metering transformer compartment from one end and leave from the opposite end. The direction of the feed may be either from the top or from the bottom of the compartment.

Load conductors must **not** reenter or pass through a current transformer (CT) compartment or any PG&E sealed compartment or section. Even if the conductors are inside of a raceway.

J. When transformer-rated meters are installed for multiple applicants, there must be a separate service section for each installed meter and its associated service switch.

K. When applicants install totalized metering, they must install, own, and maintain nominal 1-1/4-inch metal conduit between the switchboard metering facilities.

L. Applicants should group self-contained meters and switches only when they meet the following conditions.

1. Do not run unmetered service entrance conductors and metered load conductors in the same conduit raceway or wiring gutter.
2. Ensure that each meter position and each service switch or breaker is marked clearly and permanently and is identified by the building owner, or a representative of the building owner, to indicate the occupancy being served.

10.2. (continued)

- M. Ensure an Energy Reduction Maintenance Switch (ERMS) and its associated components are not installed in PG&E sections, when required to be installed. If components of the ERMS are installed in an unmetered bus location, they must be covered and barriered off from the bus and a label (e.g., ERMS NEC 240.87) must be affixed indicating the National Electric Code (NEC) rule number requiring the ERMS equipment.
- N. See Subsection 10.8., “Adding New Metering Equipment to Existing Switchboards,” on Page 10-45, before connecting a new meter panel or meter section to an existing switchboard.

10.3. Switchboard Service Section

A switchboard service section is the section of an applicant’s switchboard provided specifically for terminating the service conductors and for housing the metering transformers (if required), revenue meters, test facilities, and service switch or breaker.

10.3.1. Standard Switchboard Service Section

Applicants must ensure that:

- A. For all switchboard service sections with current ratings of 400 amps or above, the manufacturer submits drawings, in triplicate, to PG&E for approval. See Figure 10-14, “Pull Section,” on Page 10-27, for more information.
- B. Switchboard drawings for **all** co-generation and self-generation installations are submitted to a local PG&E project coordinator for review and approval by the PG&E electric metering department **before** the switchboard is constructed or built. Ask your local project coordinator to submit them.

10.3.2. Specifically Engineered Switchboard Service Sections

A switchboard design that does **not** conform to the [EUSERC](#) standards is considered specially engineered. Typical examples are:

- Switchboards over 3,000 amps.
- Switchboards with service-breaker ratings too large for the standard switchboard service section.
- Multimeter service sections.

The general arrangement of the specially engineered switchboard service sections must follow, as nearly as possible, the requirements for standard switchboard service sections, as described in Subsection 10.3.1., “Standard Switchboard Service Section” (above), and the requirements described in Subsection 10.3.3., “Requirements for All Switchboard Service Sections” (below).

10.3.3. Requirements for All Switchboard Service Sections

This subsection describes the general requirements for all switchboard service sections and applies to all applicants.

- A. The general arrangement and spacing of CTs and the methods of mounting CTs must conform as closely as possible to the illustrations in Figure 10-2 through Figure 10-8 on Page 10-8 through Page 10-18.
- B. Mount the socket meters that are used with metering transformers on hinged panels. Mount the self-contained meters on nonhinged panels.
- C. When a hinged meter panel is located behind an enclosure door, leave a clear space of at least 11 inches between the meter panel and the door. That is the minimum space required to mount the meter.
- D. The meter panels must open at least 90° after the meters and test facilities are in place. If needed, applicants must increase the width of the section to meet these requirements.
- E. Applicants must provide a clear space in the back of a meter panel for the secondary wiring and associated equipment.
- F. For **hinged meter panel doors**, applicants must provide at least the minimum dimensions between the facility's meter panel and the nearest bus, as shown in Figure 10-2 through Figure 10-8 on Page 10-8 through Page 10-18.
- G. For **nonhinged meter panel doors**, applicants must provide a clear space of at least 4 inches to any barrier or obstruction.
- H. Applicants must ensure that the minimum clearance be maintained between meters as shown in Figure 10-13, "Standard Section for Self-Contained Meter Sockets, 0 Amps–225 Amps, Installed in Switchboards: Nonresidential," on Page 10-25, and Figure 10-14, "Pull Section," on Page 10-27.
- I. An applicant must maintain a minimum clear space of 4 inches directly below the bottom slot of the meter test switch. This space permits test leads to be connected safely.
- J. Applicants must **not** mount more than two self-contained meters on any removable meter panel.
- K. Applicants must ensure that panels providing access to metering transformers or a service-terminating pull section are no larger than 9 square feet in area. Removable panels must have two lifting handles.
- L. Applicants must ensure that the front edge of the CT bus bars are located in the same switchboard section, and in the same vertical plane.
- M. Applicants must use either one-bolt or four-bolt connections for switchboards that are rated 1,001 amps through 3,000 amps and have 4-inch buses installed. For switchboards with 5-inch buses, use either two-bolt or six-bolt connections.

10.3.3. (continued)

- N. Applicants must ensure that buses are securely supported in the metering transformer compartment to withstand the mechanical stresses of a short circuit and to resist movement. The bus supports must **not** interfere when CTs either are installed or are removed. Do **not** use CTs to support the buses.
- O. Applicants should ensure that the buses and CT mountings are designed so that each of the CTs can be removed from its mounting position directly through the access panel without disturbing any other CT. When using multi-leaf buses, orient the buses so that they appear “edgewise” when viewed from the access panel.
- P. When using an aluminum bus, applicants must ensure that the aluminum bus bar is **plated** to prevent corrosion.
- Q. Applicants must ensure that all electric meter panels and all equipment doors or panels that are intended to provide access to potential transformers (PTs) and CTs are permanently marked or labeled to indicate the service voltage being supplied.
- R. **In switchboards rated over 800 amps, applicants must ensure that the bus bars extend from the termination section and service landing lugs into the CT compartment.** In switchboards with multiple meters, the bus bars must extend from the termination section and service landing lugs to the meter sockets in multimeter boards.
- S. Switchboard manufacturers must provide accessories, such as additional Belleville washers, at the time of delivery and/or installation.
- T. Switchboards must meet all of the design and test conditions of [Underwriters Laboratories \(UL\)](#) UL891, “Standard for Switchboards.”
- U. Applicants must ensure that bus arrangement and supports are provided. An **exception** is the neutral bus, which may be located on either sidewall.
- V. Applicants must locate the CT compartment on the supply side of the service-section main switch or breaker.
- W. Applicants must ensure that only metering conductors pass through this CT compartment.
- X. Applicants must ensure that a neutral, bus-bar extension is provided in the instrument transformer compartment **above** the lower CT bus support when the service-section phase buses are supplied from the horizontal cross busing.
- Y. Applicants must ensure that the return flanges for the lower- and upper-meter panel supports do **not** project more than 3/4 inch up or down from the adjacent switchboard panels.
- Z. Applicants must ensure that each bus has a connector that accepts a stranded conductor with the amp capacity of the service-section main switch or breaker.
- AA. Applicants must ensure that the power-leg bus for a 4-wire delta service is identified.

10.3.3. (continued)

- AB. Applicants must ensure that a removable link is installed in the right-side phase bus when using the service section for three-phase, 3-wire service.
- AC. Applicants must ensure that each switchboard service section is completely barriered from other service sections, pull sections, service switches, or disconnects. If possible, use barriers made of either steel or the same material as the section walls.

Barriers may have an opening to allow unmetered conductors to pass between sections. The barrier between sealed utility metering sections and the pull section must be 1/8 inch minimum. Glastic or other equivalent barrier is not preferred but may be acceptable. The clearance between the bus bar and barrier must be a maximum of 3 inches. A barrier **is not required** between individual phases and the neutral. See Figure 10-1, "Switchboard Wall Opening Between Sections," on Page 10-6.

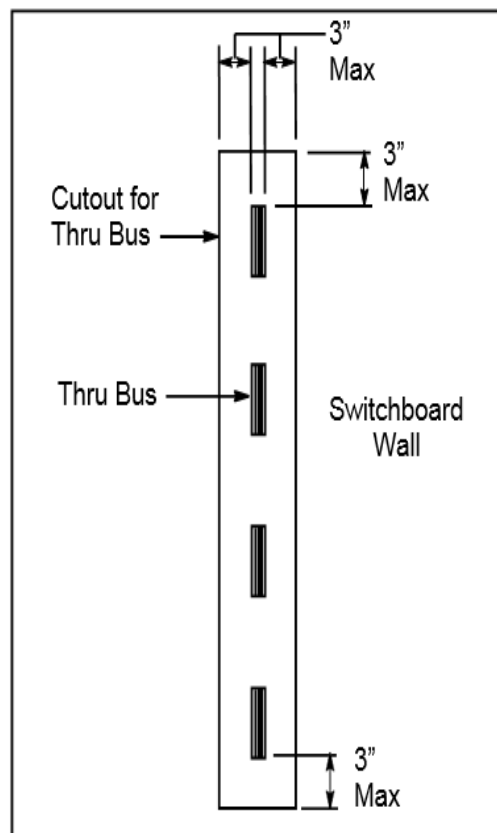


Figure 10-1
Switchboard Wall Opening Between Sections

10.3.4. Standard Switchboard CT Compartment, 0 Amps Through 1,200 Amps, Single-Phase or Three-Phase, 3-Wire Service

Applicants must ensure that the following requirements are met. These requirements apply specifically to this type of CT compartment.

- A. The bus dimensions are a minimum of 1/4 inch by 2 inches and a maximum of 3/4 inch by 2 inches.
- B. The barrier must be constructed of insulating, nontracking material. Ensure that openings in the barrier and clearances to the outer edges do not exceed 3/8 inch. Use non-conductive fasteners to attach the barrier.
- C. The minimum clearance between the meter panel or socket and the bus is 6.5 inches. If a clearance of 6.5 inches is not possible, use a 4-inch bus as required in Subsection 10.3.6., “Standard Switchboard CT Compartment, 1,001 Amps Through 3,000 Amps, Single-Phase or Three-Phase, 3-Wire Service,” on Page 10-11.
- D. A clear, unobstructed workspace is provided around the current transformer bus units as measured from the inside edge of the compartment access opening.

10.3.4. (continued)

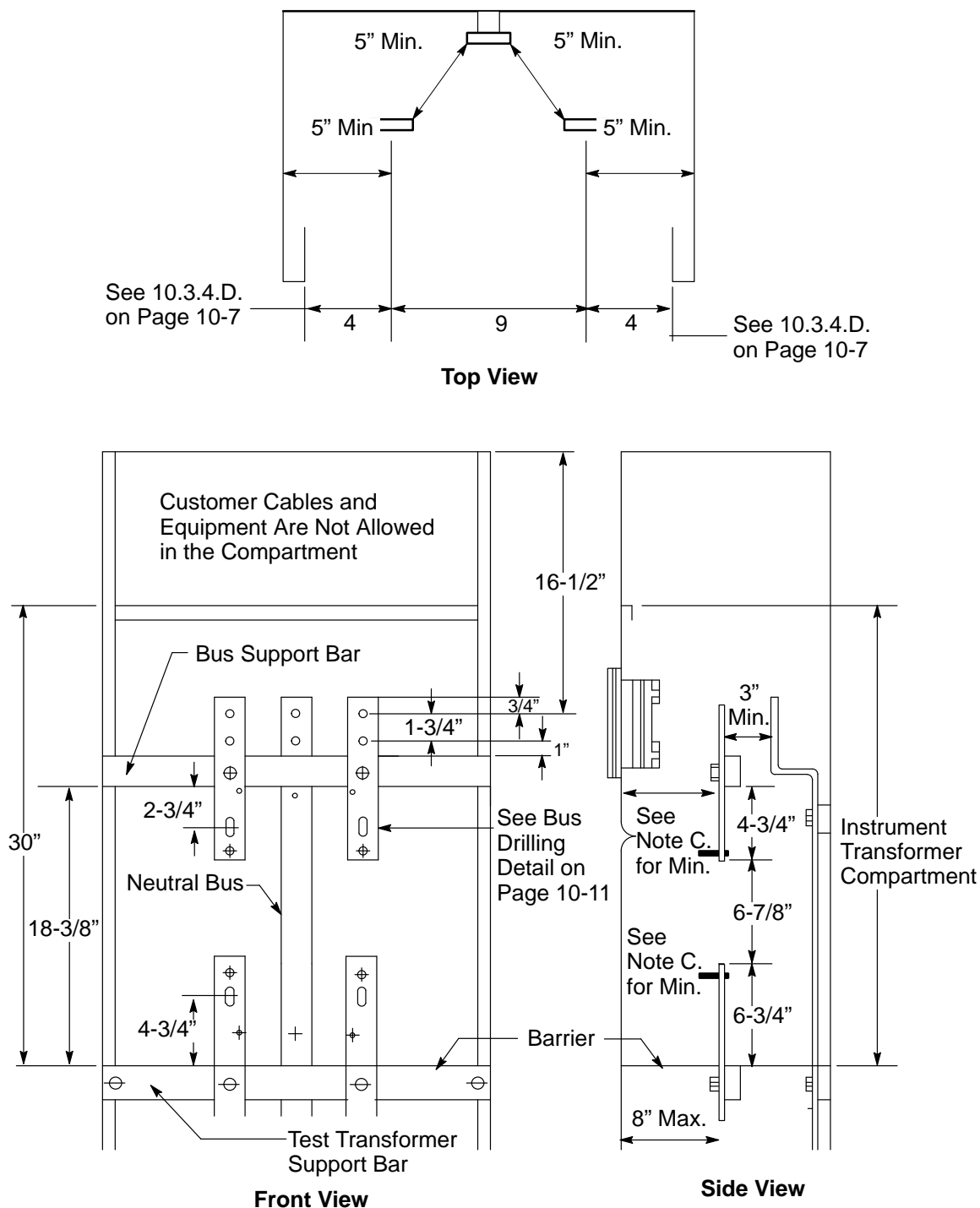


Figure 10-2
Standard Switchboard, CT Compartment, 0 Amps–600 Amps, Single Phase

10.3.5. Standard Switchboard CT Compartment, 0 Amps Through 1,200 Amps, Three-Phase, 3-Wire and 4-Wire Services

Applicants must ensure that the following requirements are met. These requirements apply specifically to this type of CT compartment.

- A. Ensure that the bus dimensions are a minimum of 1/4 inch by 2 inches and a maximum of 3/4 inch by 2 inches.
- B. Ensure that the barrier is made of an insulating, nontracking material. Ensure that openings in the barrier and clearances to the outer edges do not exceed 3/8 inch. Use nonconductive fasteners to attach the barrier.
- C. The minimum clearance between the meter panel or socket and the bus is 7.0 inches up to 1,000 amps and 7.5 inches for amp compartments between 1,001–1,200 amps. If a clearance of 7.5 inches is not possible, use a 4-inch bus as required in Subsection 10.3.7. on Page 10-13.
- D. A clear, unobstructed work space is provided around the current transformer bus units as measured from the inside edge of the compartment access opening.

10.3.5. (continued)

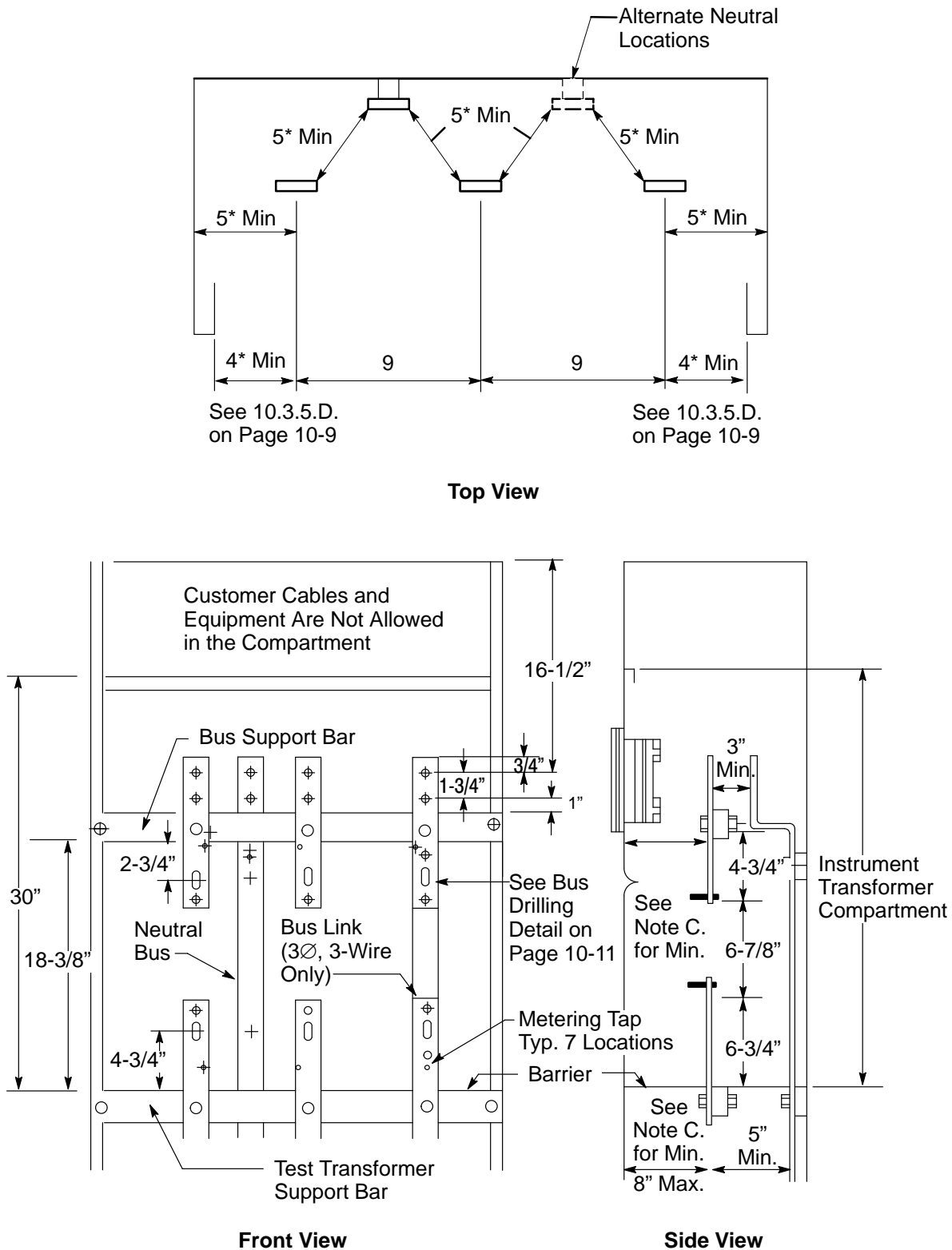


Figure 10-3
Standard Switchboard, CT Compartment, 0–1,000 Amps
and 1,001–1,200 Amps, Three Phase

10.3.5. (continued)

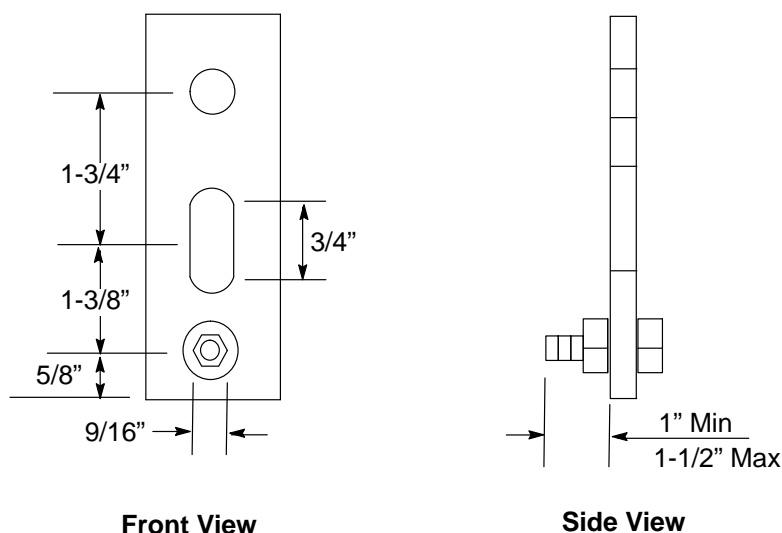


Figure 10-4
Bus Drilling Detail

10.3.6. Standard Switchboard CT Compartment, 1,001 Amps Through 3,000 Amps, Single-Phase or Three-Phase, 3-Wire Service

The following requirements specifically apply to the CT compartment shown in Figure 10-5, “Standard Switchboard, CT Compartment, 1,001 Amps–3,000 Amps, Single-Phase or Three-Phase, 3-Wire Service,” on Page 10-12. Applicants must:

- A. Ensure that the buses are anchored so that they will remain in position when the removable section is out.
- B. Ensure that the bus corners are rounded to prevent damaging the insulation.
- C. For underground services, ensure that the buses extend into the pull section.
- D. Be aware that the maximum permissible bus unit consists of four 1/4-inch by 4-inch bars spaced 1/4 inch apart.
- E. Ensure that the barrier is a minimum of 45 inches and a maximum of 50 inches above the standing surface.
- F. For a single-phase switchboard, ensure that the neutral bus is located at the side of the compartment.
- G. Ensure that the switchboard manufacturer secures the removable bus link to the upper- and lower-CT bus units using 1/2-inch hex-head (Grade 5) steel bolts with 2-1/4-inch diameter Belleville washer and nut.
- H. Ensure that openings in the barrier and clearances to the outer edges do not exceed 3/8 inch. Use nonconductive fasteners to attach the barrier.

10.3.6. (continued)

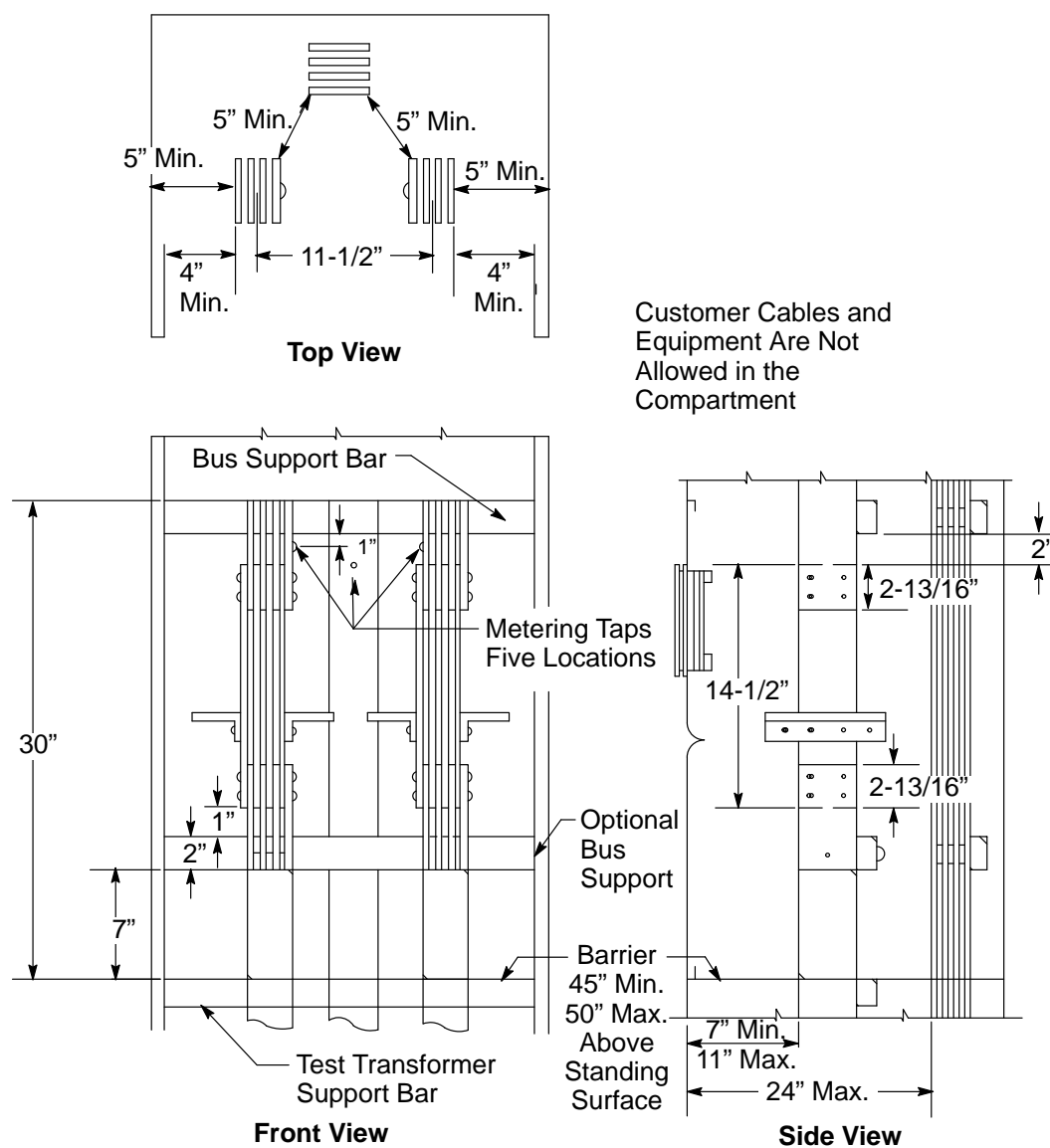


Figure 10-5
Standard Switchboard, CT Compartment, 1,001 Amps–3,000 Amps,
Single-Phase or Three-Phase, 3-Wire Service

10.3.7. Standard Switchboard, CT Compartment, 1,001 Amps Through 3,000 Amps, Three-Phase, 4-Wire Service

The following requirements specifically apply to the CT compartment shown in Figure 10-6, “Standard Switchboard, CT Compartment, 1,001 Amps–3,000 Amps, Three-Phase, 4-Wire Service,” on Page 10-14. Applicants must:

- A. Ensure that the buses are anchored so that they will remain in position when the removable section is out.
- B. Ensure that the bus corners are rounded to prevent damaging the insulation.
- C. For underground services, ensure that the buses extend into the pull section.
- D. Be aware that the maximum permissible bus unit consists of four 1/4-inch by 4-inch bars spaced 1/4 inch apart.
- E. Ensure that the barrier is a minimum of 45 inches and a maximum of 50 inches above the standing surface.
- F. Ensure that the switchboard manufacturer secures the removable bus link to the upper- and lower-CT bus units using 1/2-inch hex-head (Grade 5) steel bolts with 2-1/4-inch diameter Belleville washers and nuts.
- G. Ensure that openings in the barrier and clearances to the outer edges do not exceed 3/8 inch. Use nonconductive fasteners to attach the barrier.

10.3.7. (continued)

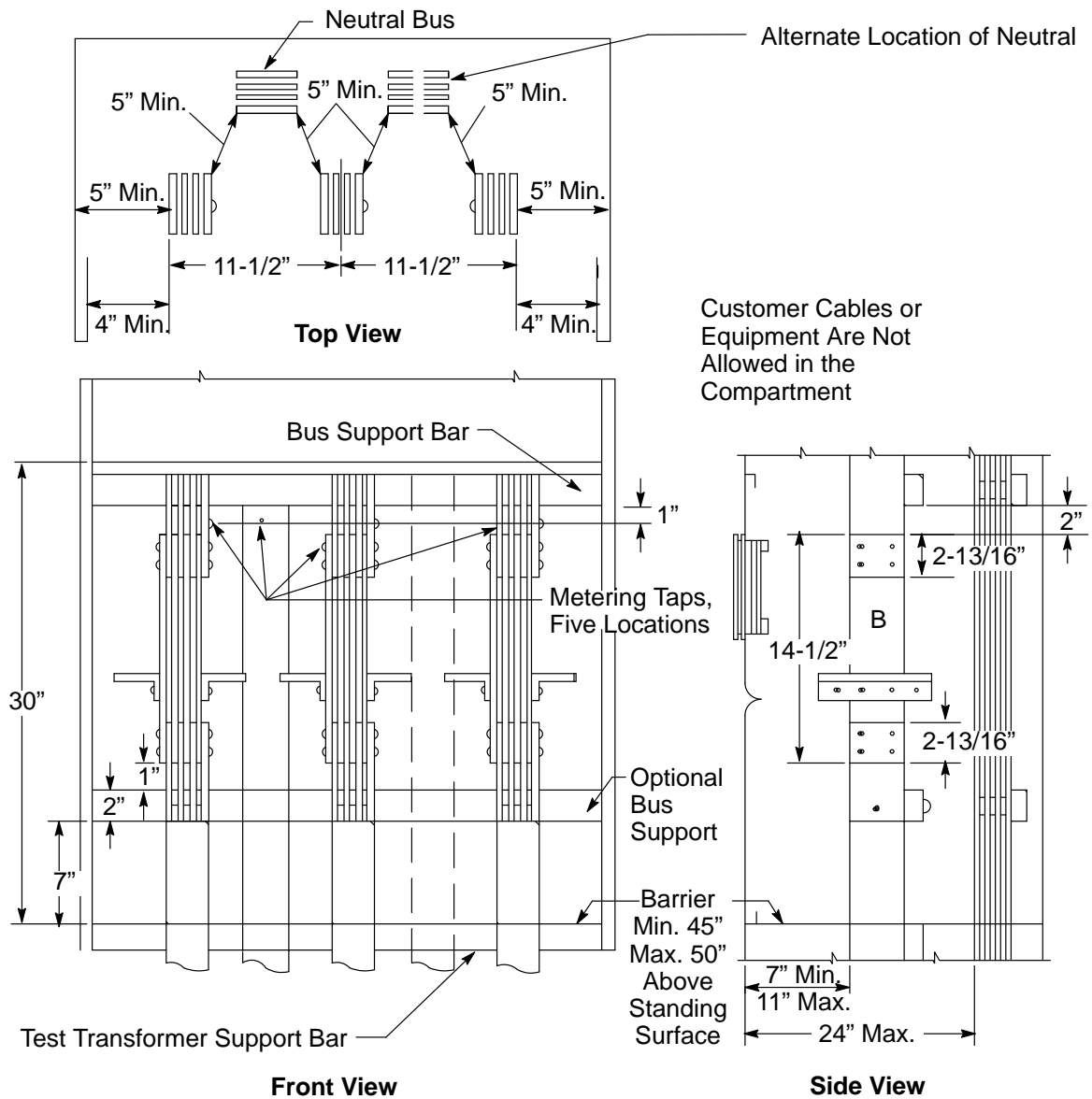


Figure 10-6
Standard Switchboard, CT Compartment,
1,001 Amps–3,000 Amps, Three-Phase, 4-Wire Service

10.3.8. Standard Switchboard CT Compartment, 3,001 Amps and Larger, Three-Phase, 3-Wire Service

The following requirements specifically apply to the CT compartment shown in Figure 10-7, “Standard Switchboard, CT Compartment, 3,001 Amps and Larger, Three-Phase, 3-Wire Service,” on Page 10-16.

Applicants must:

- A. Ensure that the buses are anchored so that they will remain in position when the removable section is out.
- B. Ensure that the bus corners are rounded to prevent damaging the insulation.
- C. For underground services, ensure that the buses extend into the pull section.
- D. Be aware that the maximum permissible bus unit consists of four 1/4-inch by 4-inch bars spaced 1/4 inch apart.
- E. Ensure that the barrier is a minimum of 45 inches and a maximum of 50 inches above the standing surface.
- F. Ensure that the switchboard manufacturer secures the removable bus link to the upper- and lower-CT bus units using 1/2-inch, hex-head (Grade 5) steel bolts with 2-1/4-inch diameter Belleville washers and nuts.
- G. Ensure that openings in the barrier and clearances to the outer edges do not exceed 3/8 inch. Use nonconductive fasteners to attach the barrier.

10.3.8. (continued)

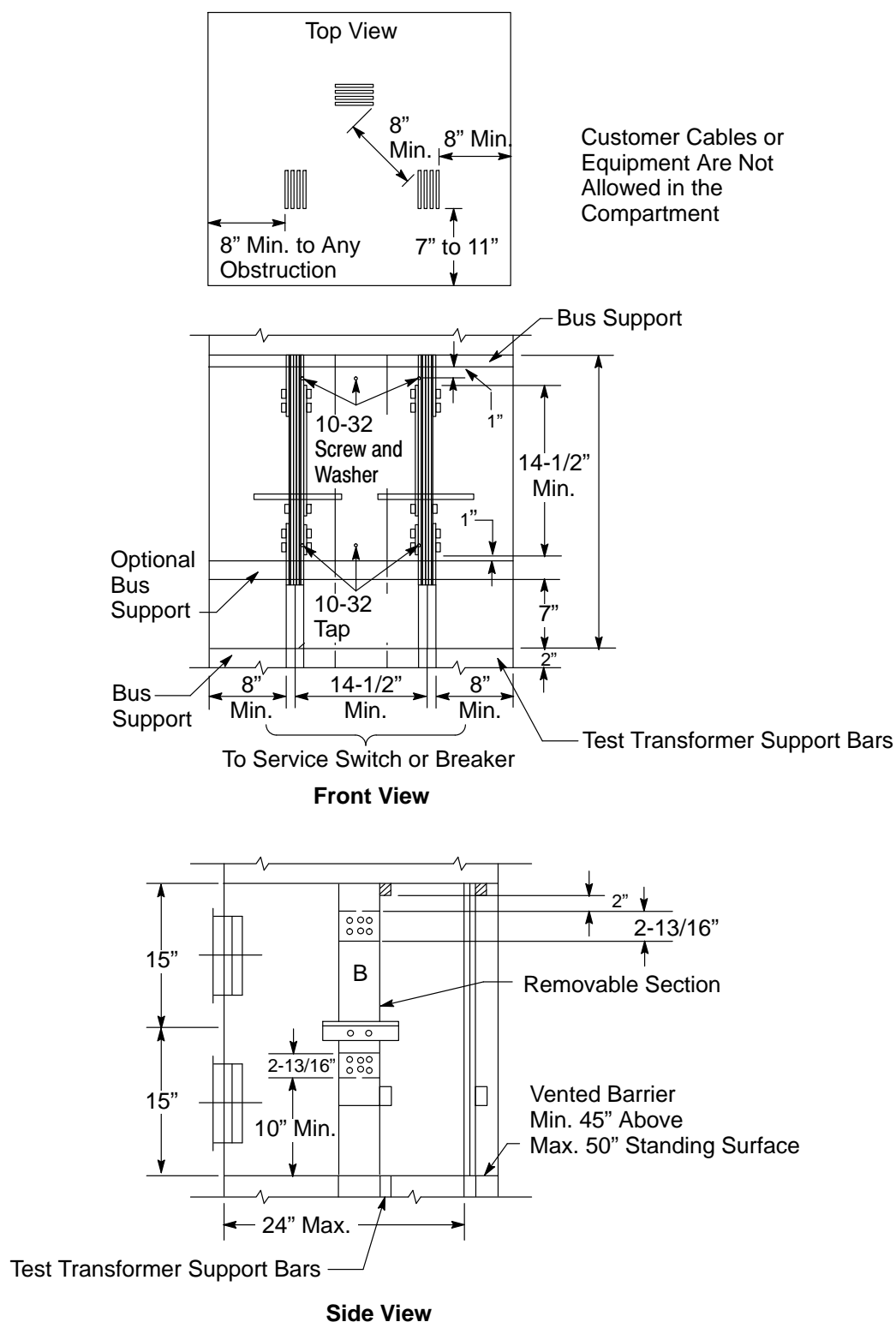


Figure 10-7
Standard Switchboard, CT Compartment,
3,001 Amps and Larger, Three-Phase, 3-Wire Service

10.3.9. Standard Switchboard CT Compartment, 3,001 Amps and Larger, Three-Phase, 3-Wire or 4-Wire Service

The following requirements specifically apply to the CT compartments shown in Figure 10-8, “Standard Switchboard, CT Compartment, 3,001 Amps and Larger, Three-Phase, 3-Wire or 4-Wire Service,” on Page 10-18. Applicants must:

- A. Ensure that the buses are anchored so that they will remain in position when the removable section is out.
- B. Ensure that the bus corners are rounded to prevent damaging the insulation.
- C. For underground services, ensure that the buses extend into the pull section.
- D. Be aware that the maximum permissible bus unit consists of four 1/4-inch by 4-inch bars spaced 1/4 inch apart.
- E. Ensure that the barrier is a minimum of 45 inches and a maximum of 50 inches above the standing surface.
- F. Ensure that the switchboard manufacturer secures the removable bus link to the upper- and lower-CT bus units using 1/2-inch hex-head (Grade 5) steel bolts with 2-1/4 inch diameter Belleville washers and nuts.

10.3.9. (continued)

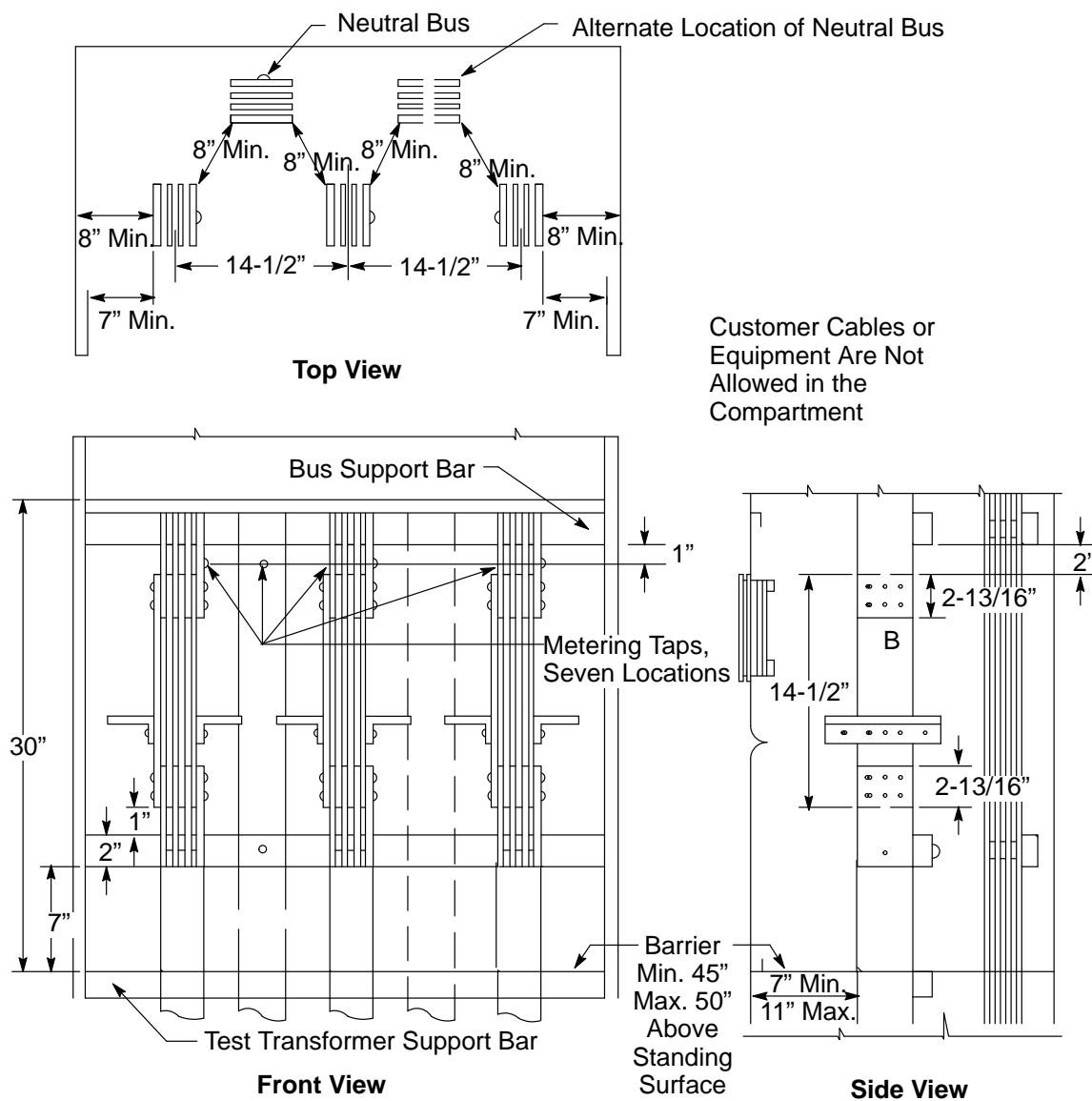


Figure 10-8
Standard Switchboard, CT Compartment,
3,001 Amps and Larger, Three-Phase, 3-Wire or 4-Wire Service

10.3.10. Removable Link Assemblies

The removable link assemblies for 0-volt through 600-volt CT compartments from 1,001 amps through 3,000 amps, and 3,001 amps and larger, are shown in Figure 10-9 through Figure 10-12 on Page 10-20 through Page 10-23.

Applicants may use either a one-bolt connection, as shown in Figure 10-9, “Switchboards, 0 Volts–600 Volts, CT Compartment, 1,001 Amps–3,000 Amps, Removable Link and CT Support (One-Bolt Configuration),” on Page 10-20, or a four-bolt connection, as shown in Figure 10-10, “Switchboards, 0 Volts–600 Volts, CT Compartment, 1,001 Amps–3,000 Amps, Removable Link and CT Support (Four-Bolt Configuration),” on Page 10-21, for switchboards that are rated 1,001 amps to 3,000 amps and have 4-inch buses installed.

For switchboards with 5-inch buses, use either two bolts, as shown in Figure 10-11, “Switchboards, 0 Volts–600 Volts, CT Compartment, 3,001 Amps and Larger, Removable Link and CT Support (Two-Bolt Configuration),” on Page 10-22, or six bolts, as shown in Figure 10-12, “Switchboards, 0 Volts–600 Volts, CT Compartment, 3,001 Amps and Larger, Removable Link and CT Support (Six-Bolt Configuration),” on Page 10-23.

10.3.10. (continued)

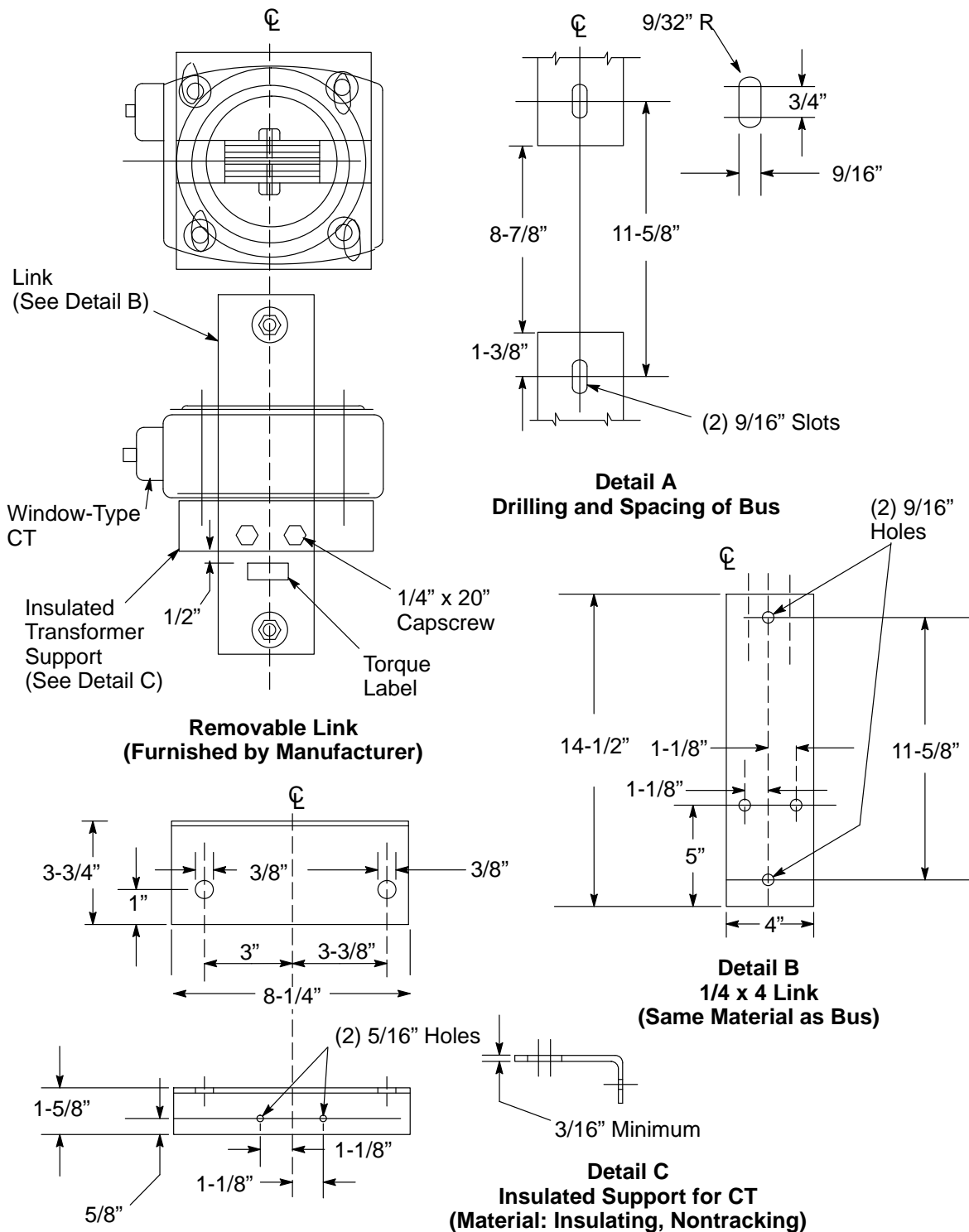


Figure 10-9
Switchboards, 0 Volts–600 Volts, CT Compartment,
1,001 Amps–3,000 Amps, Removable Link and CT Support (One-Bolt Configuration)

10.3.10. (continued)

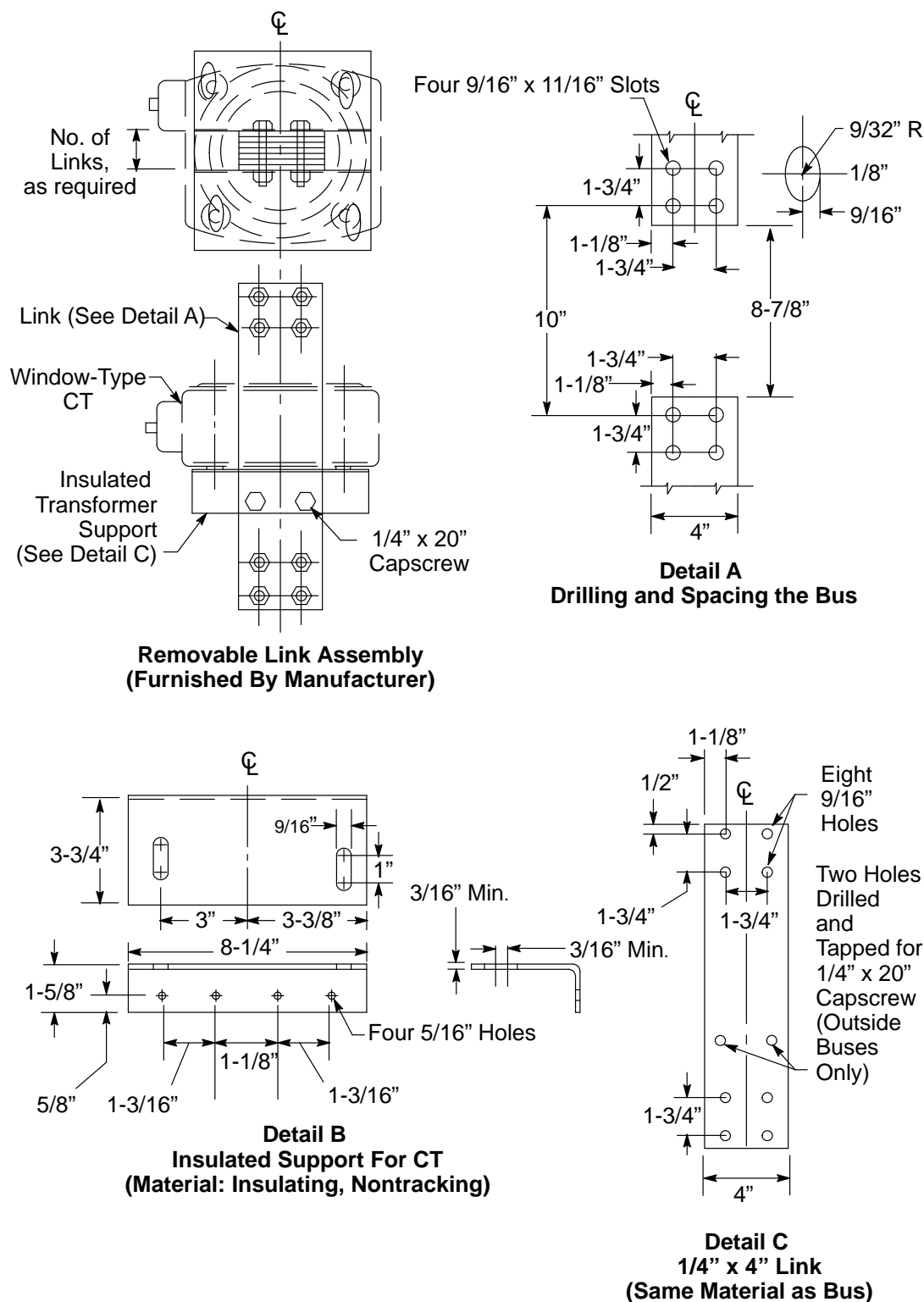


Figure 10-10
Switchboards, 0 Volts–600 Volts, CT Compartment,
1,001 Amps–3,000 Amps, Removable Link and CT Support (Four-Bolt Configuration)

10.3.10. (continued)

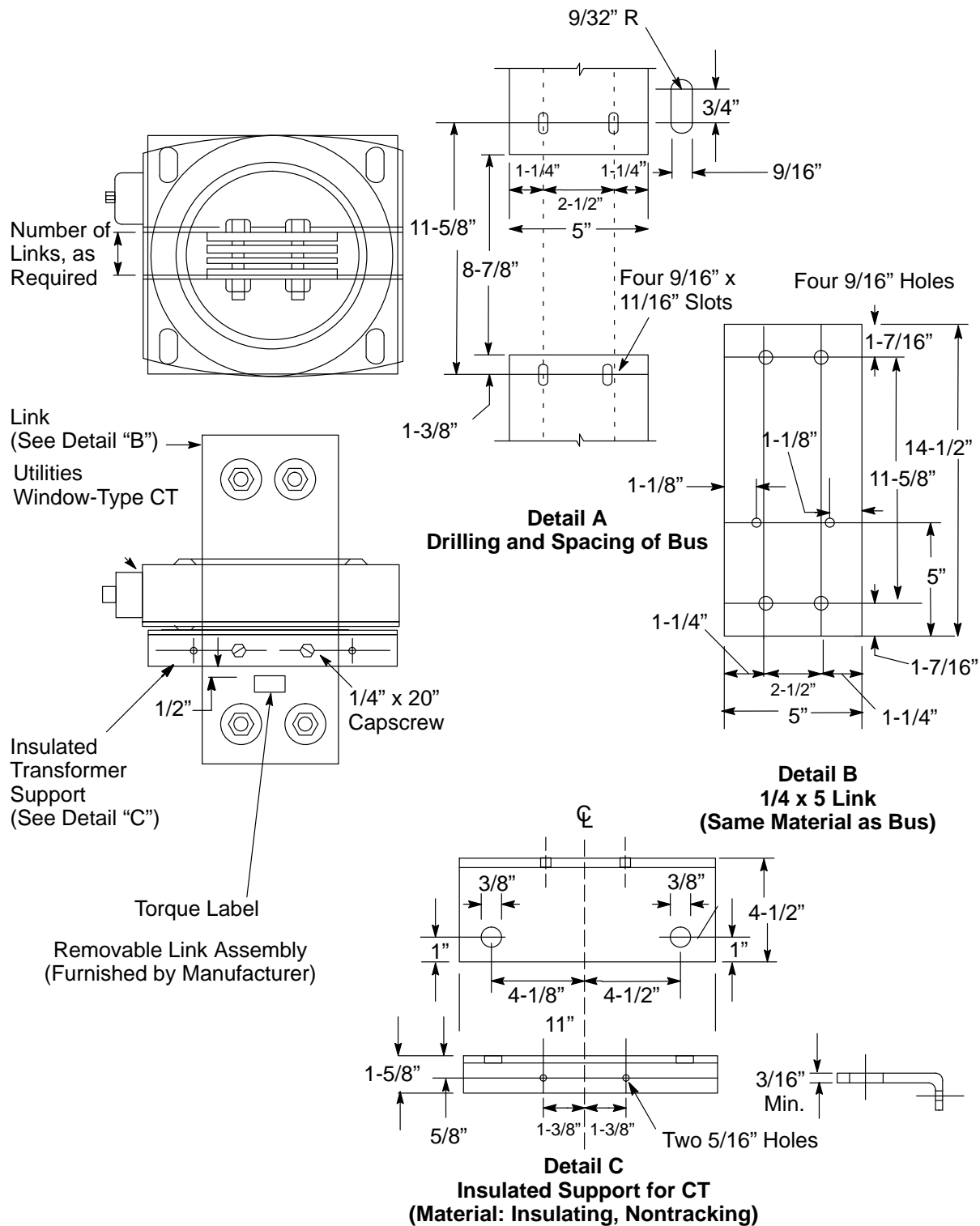


Figure 10-11
Switchboards, 0 Volts–600 Volts, CT Compartment,
3,001 Amps and Larger, Removable Link and CT Support (Two-Bolt Configuration)

10.3.10. (continued)

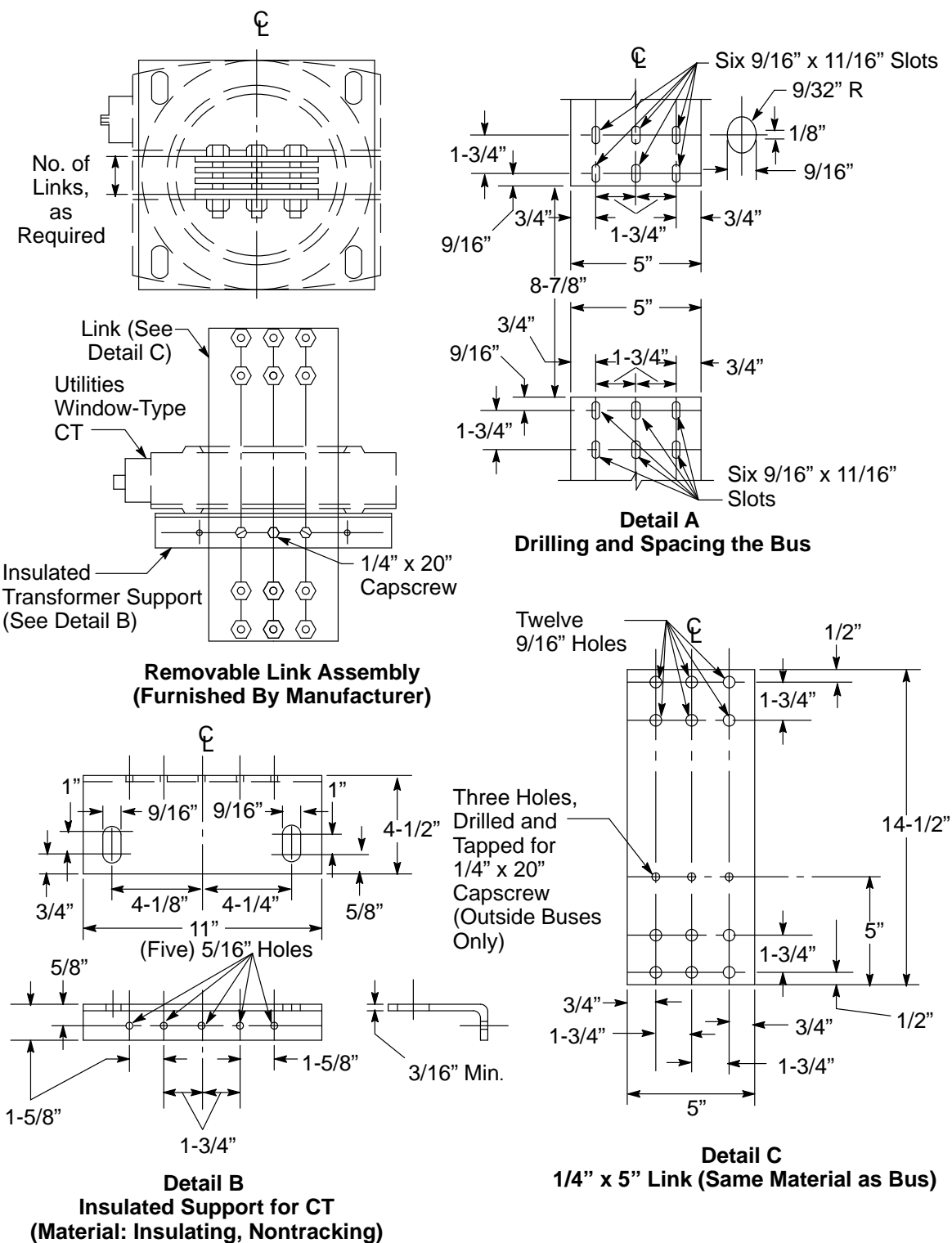


Figure 10-12
Switchboards, 0 Volts-600 Volts, CT Compartment,
3,001 Amps and Larger, Removable Link and CT Support (Six-Bolt Configuration)

10.3.11. Standard Section for Self-Contained Meter Sockets, 0 Amps Through 225 Amps, Installed in Switchboards: Nonresidential

These requirements apply specifically to switchboard service sections for nonresidential, 0-amp through 225-amp meter sockets. Applicants must:

- A. Ensure that the manufacturer furnishes, installs, and wires or buses the test-bypass blocks to the meter socket with four, rigid, insulating barriers. Test blocks must conform to the requirements described in [Section 9, “Electric Metering Components.”](#)
- B. Ensure that the metered conductors do **not** pass through the adjacent metering compartments, except in enclosed wireways.
- C. Ensure that the meter panels are removable with a maximum of two meters per panel.
- D. Ensure that the cover panels for the test-bypass block are sealable and fitted with handles. Panels more than 16 inches wide must have two handles.
- E. Ensure that outdoor or rain-tight enclosures are used, as shown in Figure 10-31 through Figure 10-34, “Outdoor or Rain-Tight Enclosures for Switchboards,” on Page 10-44.
- F. When a neutral is required for metering or testing, ensure that an insulated neutral terminal is provided behind each test-bypass cover panel. The terminal must be readily accessible when the cover panel is removed and must be individually connected to the neutral bus with a minimum Size #8 American wire gauge (AWG) copper wire.
- G. Ensure that factory-installed, full-width, insulating barriers are located at the bottom of each test-bypass compartment. The insulating barrier must deflect a 1/2-inch maximum from a 25-pound downward force.
- H. For three-phase, 4-wire service, ensure that the seventh jaw is connected to the body of the neutral lug with an AWG #12 copper wire.
- I. For three-phase, 4-wire, delta-connected service, ensure that the right-hand, test-bypass block (i.e., two poles) is identified as a power leg.
- J. For three-phase, 3-wire service, ensure that the bus is installed to connect the line and load poles together at the top of the center test-bypass block and the fifth jaw is connected to this bus using an AWG #12 copper wire.
- K. For single-phase, 3-wire service, ensure that the center test-bypass block is omitted.
- L. For single-phase, 3-wire, 120/208-volt service, ensure that the center test-bypass block is omitted and the fifth jaw is connected to the body of the neutral lug with an AWG #12 copper wire.
- M. Ensure that the meter panels are removable. However, they must **not** be removable when the meter is in place. Ensure that the meter socket is attached to the meter panel, and yet is supported independently from the meter panel.

10.3.11. (continued)

- N. Ensure that each line and load position is identified clearly by using 3/4-inch (minimum) block-letter labeling.
- O. Ensure that all of the meter panels are sealable and all of the securing screws are captive.

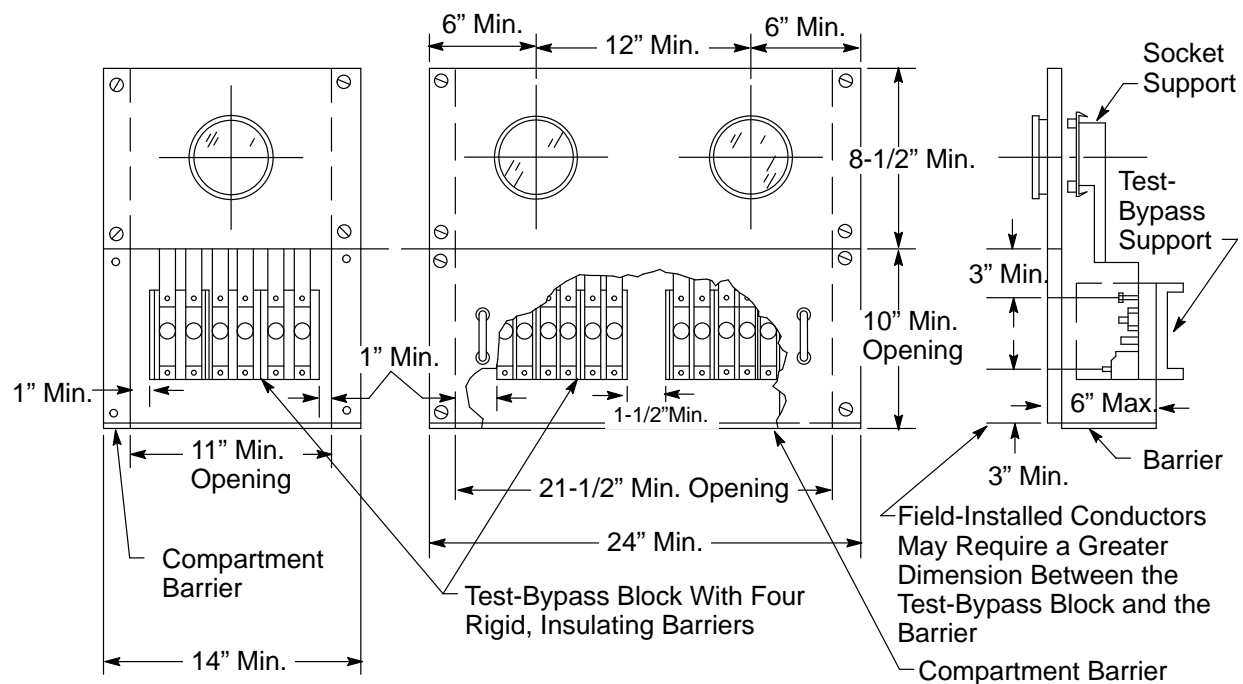


Figure 10-13
Standard Section for Self-Contained Meter Sockets,
0 Amps–225 Amps, Installed in Switchboards: Nonresidential

10.3.12. Service Terminations for Underground Services

NOTE: For overhead services where conductors go into the bottom-fed termination section, the applicant must connect the service-entrance conductors to the line side of the bus stubs in the metering-transformer compartment.

PG&E pulls and terminates its service conductors when terminating facilities that are provided by the applicant as shown in Figure 10-14, “Pull Section,” Figure 10-15, “Separate Pull Box,” and Figure 10-16, “Bottom-Fed Service Section,” all on Page 10-27. The requirements for pulling and terminating service are provided in the following paragraphs.

Applicants must:

- A. When the service section is served from a pull section, ensure that the bus or cable conductors enter in one of the following two ways:
 1. Enter through the side or back in the sealable section above the CT compartment, as shown in Figure 10-14 on Page 10-27.
 2. Enter by means of horizontal cross-busing in back of the metering compartment.
- B. Ensure that all pull and terminating sections provide full-front access.
- C. Ensure that all of the cover panels for the pull section have all of the following attributes:
 - Are removable and sealable.
 - Have two lifting handles.
 - Are limited to a maximum size of 9 square feet in area.
- D. Ensure that the power leg for a 4-wire delta service is identified effectively at the point of termination **before** making the service connection.
- E. Ensure that the minimum width of the pull section has the dimensions specified in Table 10-1, “Minimum Bottom-Fed Pull-Section Dimensions,” on Page 10-27.

10.3.12. (continued)

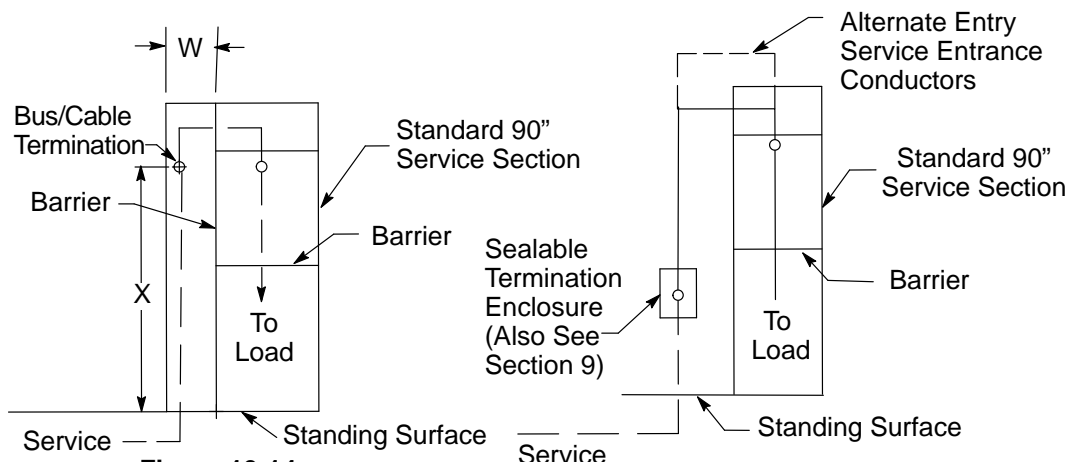


Figure 10-14
Pull Section

Figure 10-15
Separate Pull Box

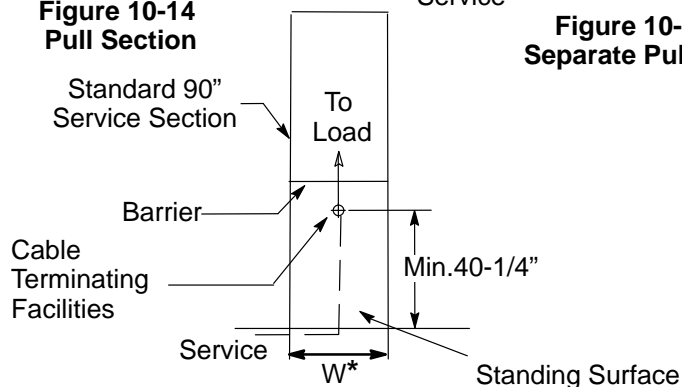


Figure 10-16
Bottom-Fed Service Section

* The minimum width of the pull section must meet the requirements specified in Table 10-1, below.

Table 10-1 Minimum Bottom-Fed Pull-Section Dimensions

Switchboard Rating (Amps)	Minimum Access Opening Dimension (W) ²		Termination Height X
	3-Wire	4-Wire	
Below 400	Consult Serving Agency (All Measurements in Inches)		
400–800	24	24	42 Min. ¹ –72 Max.
801–1,200	24	30	
1,201–2,000	30	35	
2,001–2,500	—	42	60 Min.–72 Max.
2,501–4,000	Bus Duct		

¹ See Figure 10-16, "Bottom-Fed Service Section," above, for the minimum termination height of a bottom-fed service section.

² If the landing stubs in the termination bus are installed perpendicular to the back of the board, PG&E requires the enclosure dimensions to be wider to accommodate the cable installation.

10.3.13. Underground, Service-Termination Pull Section (Located Below Ground Level)

Applicants must follow the requirements in this subsection when underground, service-termination pull sections are located below the ground level.

- A. **Back Entry:** When a service must enter the back of a switchboard pull section, as shown in Figure 10-17, “Switchboard Pull Section, High Entry,” located on Page 10-30, the pull space must have the required X dimension above or below the cable-terminating facilities. The pull sections must also have the required W dimension, as shown in Table 10-2, “Pull Section Dimensions (Minimums) Below Ground Level,” located on Page 10-31.
- B. **Side Entry:** When a service must enter the side of a switchboard pull section, as shown in Figure 10-17 on Page 10-30, and in Figure 10-18, “Switchboard Pull Section, Low Entry,” on Page 10-30, the pull-space must have the required X dimension above or below the cable-terminating facilities. The pull sections must also have the required W dimension, as shown in Table 10-2.
- C. **Additional or Extended Section Entry:** When it is not possible to meet the requirements of dimension X because the service cannot enter the upper or lower areas of the switchboard pull section, or because additional space is needed, another enclosure can be attached to the termination section enclosure.

The following three figures show of how another enclosure provides additional space for the cables to enter the termination section either low enough or high enough to meet the X dimension and facilitate proper cable termination.

- Figure 10-19, “Extended Top on Switchboard Pull Section,” on Page 10-31
- Figure 10-20, “Additional Side or Back Switchboard Pull Section–High Entry,” on Page 10-32
- Figure 10-21, “Additional Side or Back Switchboard Pull Section–Low Entry,” on Page 10-33

PG&E recommends that applicants submit drawings for review **before installing an additional enclosure**. Applicants also should attend a pre-inspection meeting.

- D. **Conduit:** Service conduit installed in the franchise area (i.e., public property) must not be at a depth greater than 60 inches. Conduit entering the switchboard must be group together in a maximum of two rows and centered horizontally between the pull-section side walls. Refer to Figure 10-22, “Arranging Conduit in the Termination or Additional Pull Section (Front View, Back Entry, Example)” on Page 10-34.

10.3.13. (continued)

- E. **X Dimension:** The X dimension is the measured distance between the first bolt on the termination bus to the closest service conduit installed in the pull section for Figure 10-17 on Page 10-30 through Figure 10-19 on Page 10-31. When an additional pull section is used, as shown in Figure 10-20 on Page 10-32 and Figure 10-21 on Page 10-33, the X dimension is measured between the first bolt on the termination bus to the closest position where the service cable will enter into the termination section.
- F. **Water Drainage System:** To prevent water from accumulating in meter rooms (or other types of wet facilities), applicants must ensure the following actions are performed:
1. Design and construct the electrical meter room to discharge any water that may enter the switchboard and below-grade electrical meter room.
 2. Contact PG&E before construction begins to ensure the method(s) for discharging and removing water are approved.
- G. **Cable Support Hanger:** The cable hanger provides support for the cables and increases the cable height above the conduits. This creates a drip loop feature that stops water from dripping onto any exposed, live energized parts. The cable hanger must be structurally strong enough to support the weight of the type (i.e., aluminum [Al] or copper [Cu]) and the maximum number of cables that could be installed for all phases. For large switchboards this could be up to 28 copper cables, mostly sized at 1,000 thousand circular mils (kcmil), with a total weight of about 1,000 pounds. Refer to Table 5 in [Numbered Document 063928, “Methods and Requirements for Installing Non-Residential Underground Electric Services 0–600 Volts to Customer-Owned Facilities.”](#)
- Also, if the cables rest on or touch the support hanger, it must be made from, or wrapped in, a nonconductive material rated for a minimum 600 volts that provides electrical insulation and physical protection for the cables.

10.3.13. (continued)

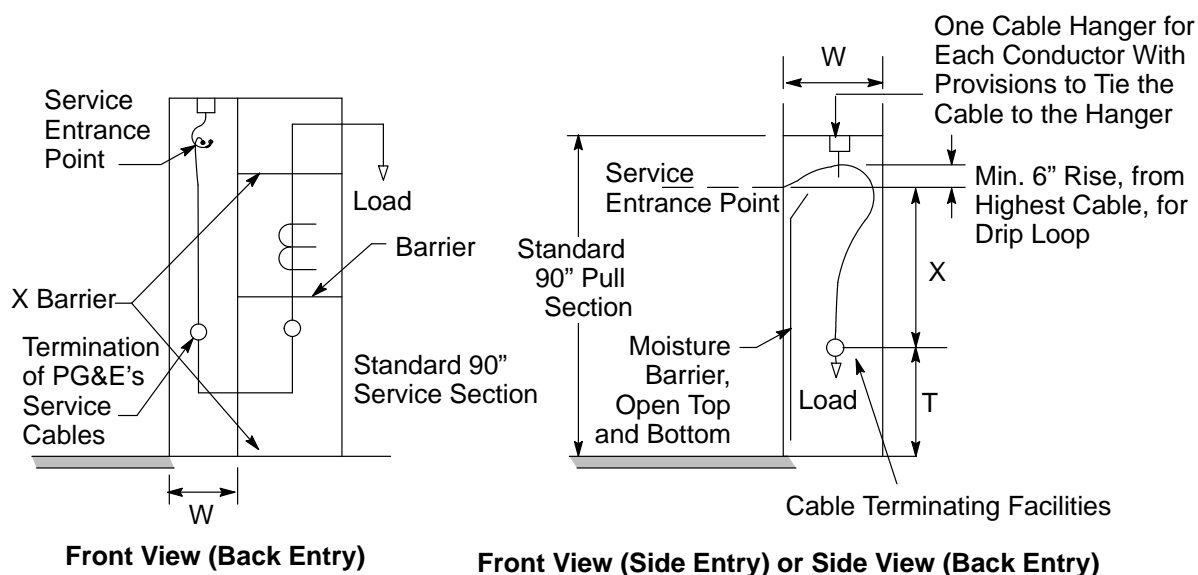


Figure 10-17
Switchboard Pull Section—High Entry

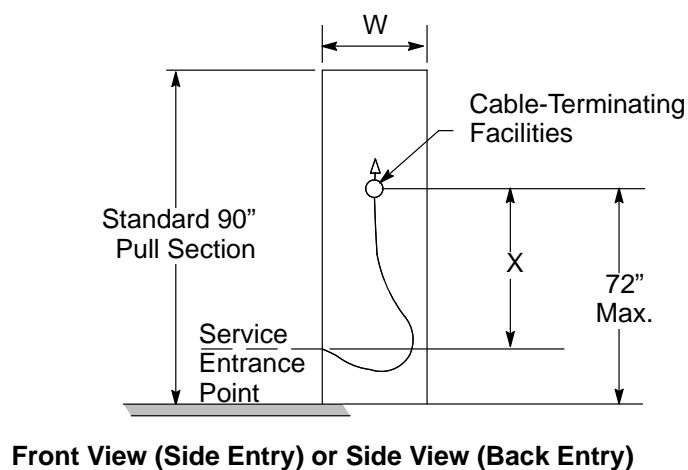


Figure 10-18
Switchboard Pull Section—Low Entry

10.3.13. (continued)

Table 10-2 Pull-Section Dimensions (Minimums) Below Ground Level

Switchboard Rating in Amps	W ^{1, 2}		X ³	T
	1Ø 3-Wire	3Ø 4-Wire	Side or Back Entry	Termination Height
	Measurements in Inches			
201–800	24	24	42	24
801–1,200	24	30	42	24
1,201–2,000	30	35	45	24
2,001–2,500	—	42	60	18
2,501–4,000	Bus Duct			

- ¹ Ensure that the dimension (i.e., width, depth, and height) of the additional pull section are exactly the same as the terminating section.
- ² If the landing stubs in the termination bus are installed perpendicular to the back of the board, PG&E requires the enclosure dimensions to be wider to accommodate cable installation.
- ³ See Item E., “X Dimension,” on Page 10-29.

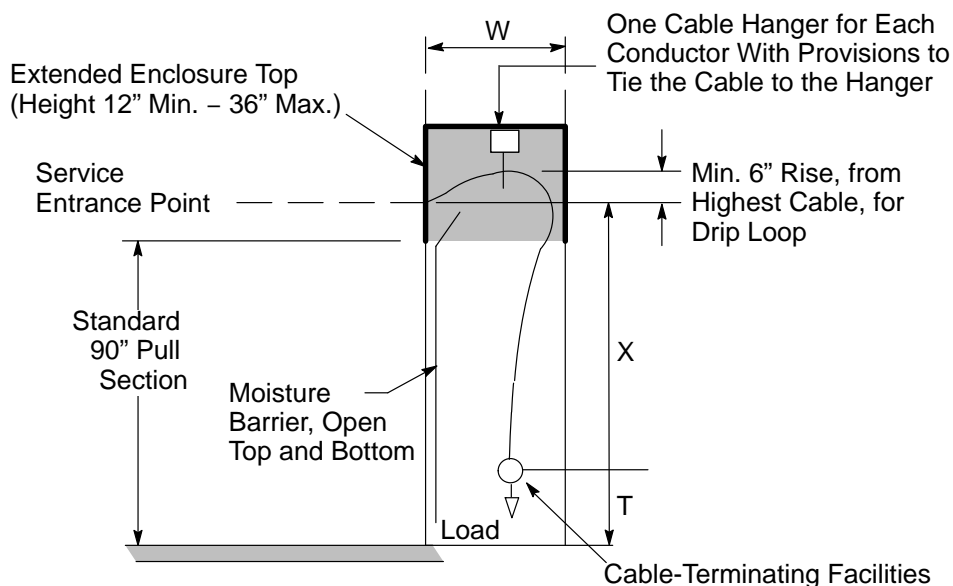


Figure 10-19
Extended Top on Switchboard Pull Section
Front View (Side Entry) or Side View (Back Entry)

10.3.13. (continued)

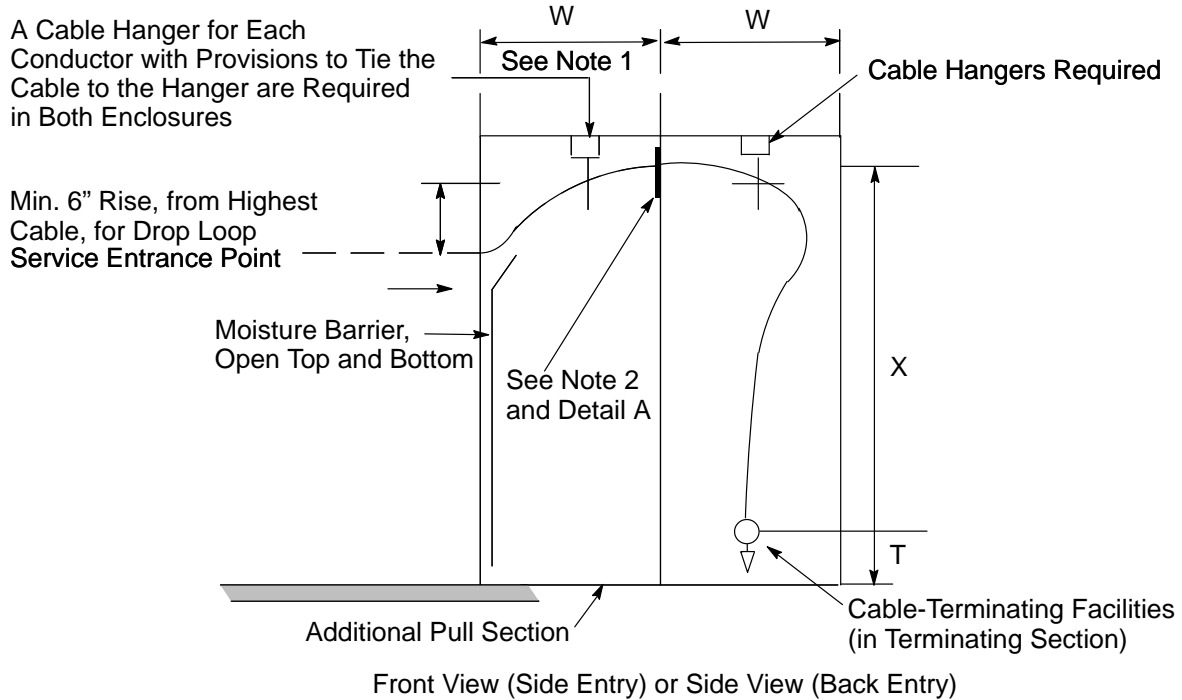
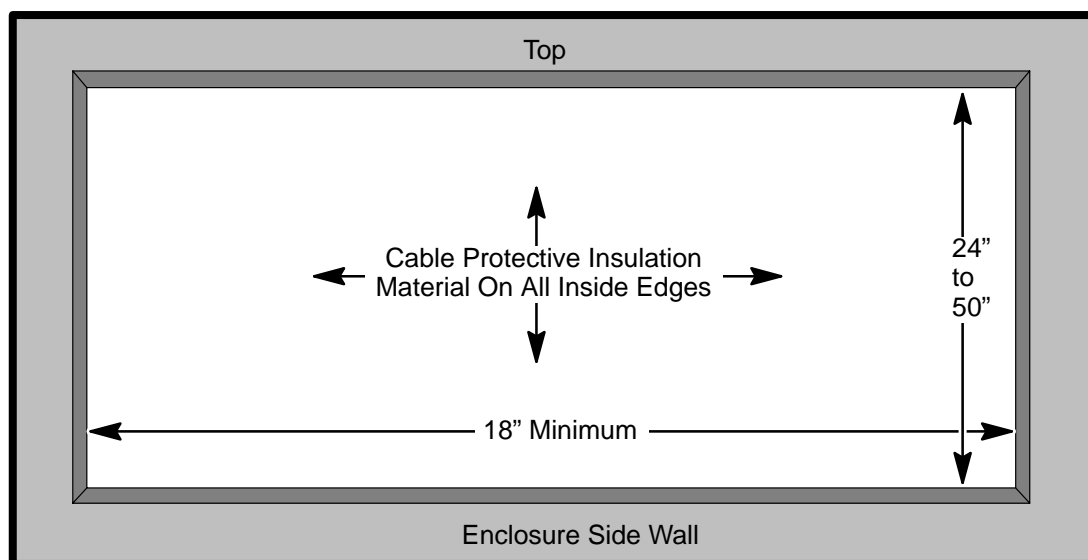


Figure 10-20
Additional Side or Back Switchboard Pull Section—High Entry

Notes in reference to Figure 10-20.

1. Ensure that the dimensions (i.e., width, depth, and height) of the additional pull section are exactly the same as the terminating section.
2. The height of the cable entrance window must be between 24 inches to 36 inches and the width must be a minimum of 20 inches. The edges of the window opening must be insulated to prevent damaging the cables. See Detail A on Page 31.

10.3.13. (continued)



Detail A—Cable Entrance Window

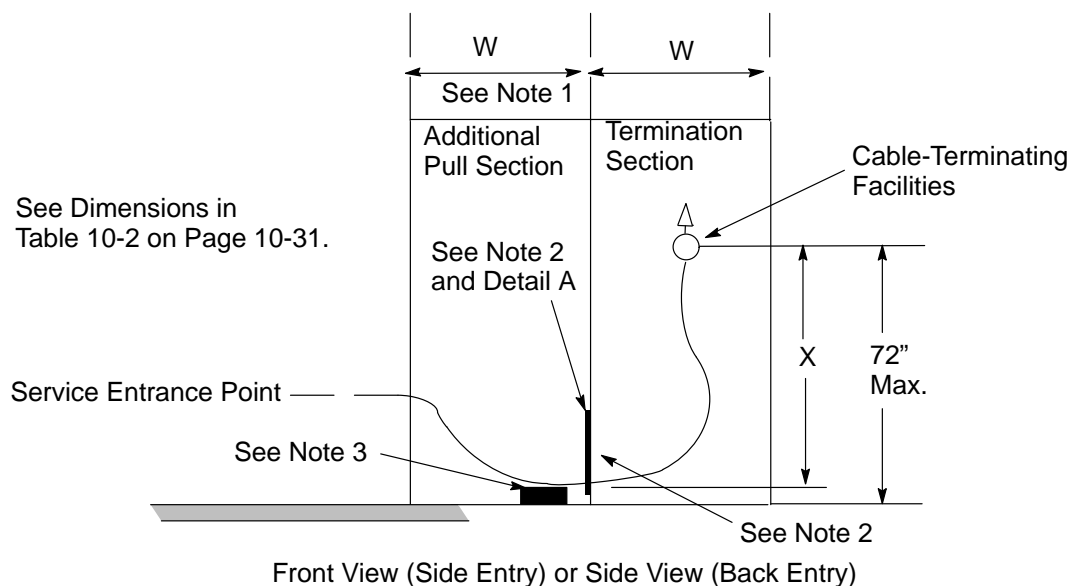


Figure 10-21
Additional Side or Back Switchboard Pull Section—Low Entry

Notes in reference to Figure 10-21.

1. Ensure that the dimensions (i.e., width, depth, and height) of the additional pull section are exactly the same as the terminating section.
2. The height of the cable entrance window above the top of the pad is 3 inches maximum. Ensure that the window size is between 24-inches to 50-inches tall and the width is a minimum of 18 inches. Insulate the edges of the window opening to prevent damage to the cables. See Detail A above.
3. Cables must not lie on the ground. The applicant must provide a cable support system to keep the cables off the ground. Otherwise, the applicant must supply cable blocks using PG&E Material Code 362118.

10.3.13. (continued)

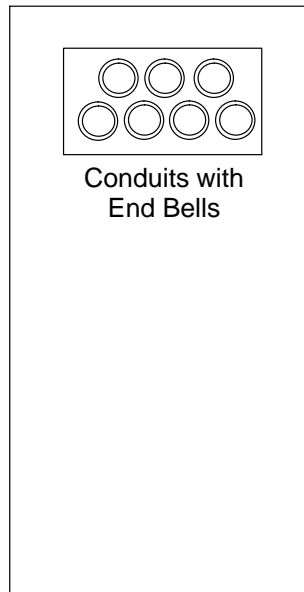


Figure 10-22
Arranging Conduit in the Termination or Additional Pull Section
(Example of a Front View, High Back Entry)

Note in reference to Figure 10-22.

1. All conduits entering the section must be installed in a maximum of two rows.

10.3.14. Underground, Cable-Terminating Facilities in Pull Boxes or Pull Sections

Figure 10-23 through Figure 10-26, all on Page 10-37, provide diagrams and required dimensions for cable-terminating facilities in the pull boxes or pull sections. The following paragraphs describe the requirements for applicants who install these facilities. Applicants must:

- A. Ensure that one landing position per phase is available for each 400 amps of service capacity, as shown in Figure 10-23, "Landing Terminal Detail," on Page 10-37. Also, applicants must ensure that provisions have been made for stacking lugs.
- B. Ensure that bolts are provided with nuts, flat washers, and pressure-maintaining spring washers.
- C. Ensure that all parts are plated to prevent corrosion.
- D. Ensure that bolts are secured in place unless working access is provided on both sides of the mounting bus. If both sides of the bus are accessible, one set of bolts may be used to provide two terminal-mounting positions, one on either side of the bus.

NOTE: "Secured in place" means the stud will not turn, back out, or loosen in any manner when subjected to normal, UL-approved torques while tightening or loosening terminal nuts. This includes cross-threaded situations.

10.3.14. (continued)

- E. In the terminal-mounting area, ensure that a radial clearance of 1-1/2 inches is provided between any bus (including bolts) and any other bus (including horizontal cross-busing) or grounded surface, as shown in Figure 10-24, “Spacing Requirements,” on Page 10-37.

EXCEPTIONS: The following are exceptions from these requirements.

1. The minimum clearance to the back of the pull section or to the front of the pull-section cover may be 1 inch.
 2. The neutral bus or termination may have a minimum clearance of 1 inch from any grounded surface.
 3. Service cables passing over horizontal cross busing must have a minimum 2-1/2-inch radial clearance. This distance may be reduced to 1 inch if the horizontal bus is fully insulated.
- F. Ensure that each cable-mounting position has at least 8 inches of unobstructed space in front of the entire mounting surface when all of the conductors are in place. This space must be accessible from the front of the pull section.
- G. Ensure that the bus stubs are firmly secured to prevent bus misalignment and movement when the cables are installed. See Figure 10-25, “Buses Accessible From Only One Side (Bolts Must Be Secured in Place),” and Figure 10-26, “Buses Accessible From Either Side (Mounting Surfaces on Both Sides of Bus),” both on Page 10-37, for bus stub details through 2,500 amps.
- H. For nonresidential services, either single or three phase, 600 amps and above, PG&E requires applicants to install multiple sets of service conduit. Additionally, PG&E will require applicants to supply stacking lugs for terminating its cables in any installation that is rated nonresidential, three phase, 1,200 amps or greater.
- I. For nonresidential services, additional space (i.e., depth, width, and termination height) may be required in any section of switchboard, panelboard, or other enclosure used to terminate PG&E service cables. This additional space may be necessary to provide proper clearances between phases and grounded surfaces, as well as to accommodate the installation of service cable.
- J. Applicants should review [Numbered Document 063928, “Methods and Requirements for Installing Non-Residential Underground Electric Services 0–600 Volts to Customer-Owned Facilities.”](#) for the appropriate conduit and cable requirements for nonresidential service installations. Find this document in [Appendix C, “Electric and Gas Engineering Documents.”](#)

10.3.14. (continued)

- K. PG&E does **not** allow applicants to install wall-mounted cable termination and pull enclosures for nonresidential, three-phase installations rated at 401 amps through 2,500 amps. For those installations, PG&E requires a switchboard pull section or enclosure meeting the requirements shown in [Section 9, “Electric Metering: Components and Cable Terminating Facilities,”](#) Table 9-4, “[Minimum Pad-Mounted \(Floor-Standing\) Switchboard Pull-Section Dimensions: Residential and Nonresidential, Single-Phase and Three-Phase.](#)” on Page 9-13, and [Table 10-1, “Minimum Bottom-Fed Pull-Section Dimensions,”](#) on Page 10-27, for bottom entry. Also, see [Table 10-2, “Pull Section Dimensions \(Minimums\) Below Ground Level,”](#) on Page 10-31, for side or back entry.
- L. See additional requirements in [Section 9, Subsection 9.10., “Underground Service Cable-Termination Section or Pull Box,”](#) on Page 9-10. The information, tables, and figures provide additional requirements for applicants who install wall-mounted and pad-mounted cable-termination and pull-section equipment.

NOTE: The utility point of service (i.e., service point) is defined as the approved enclosure and the terminated or spliced connections.

10.3.14. (continued)

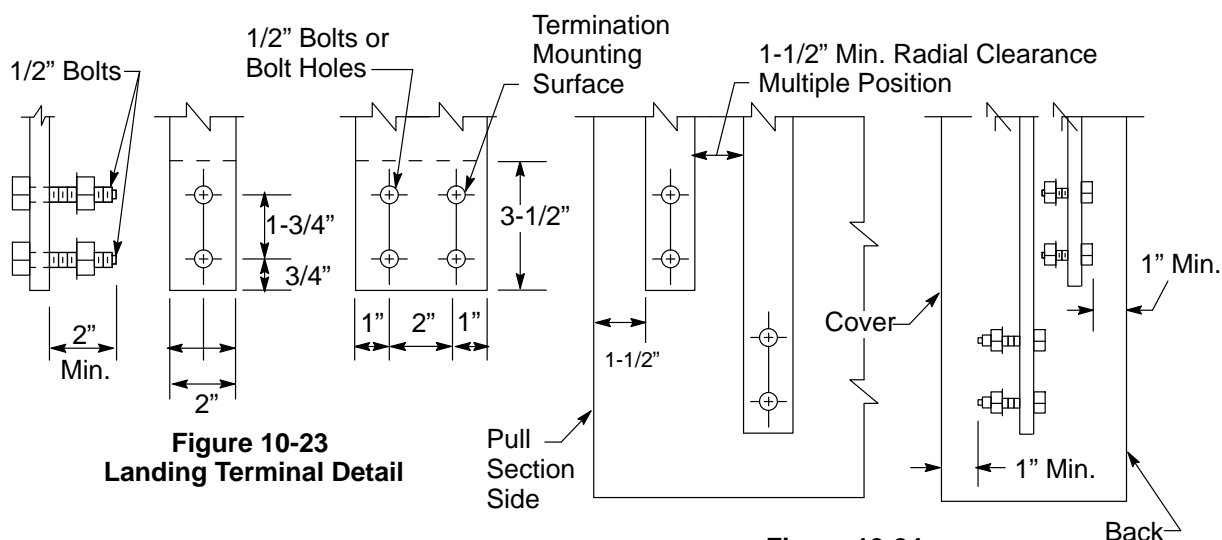


Figure 10-24
Spacing Requirements

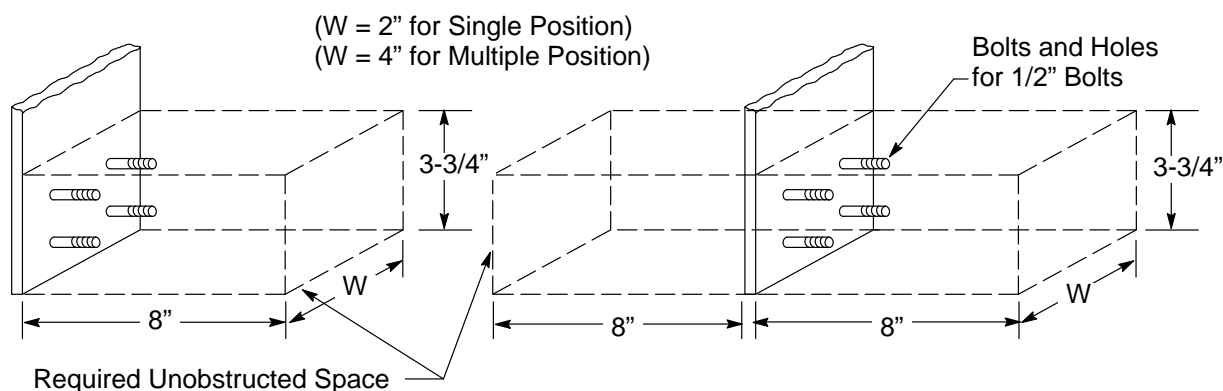


Figure 10-26
Buses Accessible From Either Side
(Mounting Surfaces on Both Sides of Bus)

10.4. Meter and Switch Sequence Requirements

PG&E will locate meters and metering equipment ahead of (i.e., on the supply side) the applicant's main switch and fuse or circuit breaker. Exceptions to this normal sequence are permitted only when required by electric codes and as allowed by PG&E.

10.5. Metering Transformer Compartments

The following requirements apply to applicants who are installing metering transformer compartments.

- A. Bus the CT compartments using a rectangular bus bar. See Figure 10-2 through Figure 10-8 on Pages 10-8 through 10-18 for more information.
- B. Ensure that the covers for metering transformer compartments are:
 - Constructed of 12-gauge steel (minimum).
 - Provided with lifting handles.
 - Attached with sealable studs and wing nuts or using other approved means.
- C. Use a copper or aluminum bus bar on both the line sides and load sides of all CTs. When links and supports are required for through-type CTs, ensure that the bus and removable links are constructed of a compatible material.
- D. Do **not** use PG&E's CTs for any purpose but metering.

Do **not** use the metering transformer compartment as a splicing or tap-making chamber. Ensure that load conductors do not re-enter or pass through a CT compartment even if the conductors are inside of a raceway.

- E. Do **not** use the bolts required for connecting a CT to attach other conductors.

10.6. Meter Panels

The following requirements apply to applicants who are installing meter panels.

- A. Except for remote metering enclosures, use **only** hinged meter panels in front of a metering transformer compartment. The meter panel must be hinged next to the test facilities.
- B. Ensure that a 30-inch tall dual-socket meter panel door is provided in pad-mounted switchboards supplying a demand load of 400 kilovolt amperes (kVA) or more. See Table 10-3, "Dual-Socket Hinged-Meter Panel Requirement," below. See the 30-inch tall panel door, shown in Figure 10-30 on Page 10-43.
- C. Two 15-inch tall meter panel doors are allowed for switchboards with voltages and ampacities not listed in Table 10-3, "Dual-Socket, Hinged, Meter-Panel Requirement," on Page 10-39. Refer to Figure 10-29, "Standard Switchboard Service Section, 15-Inch Hinged Panel for Socket Meter and Test Switch," on Page 10-42, for a 15-inch tall meter panel door. The two panel doors must come bolted together so they can swing open and close together. The bolts and nuts must be removable so the doors can also be opened or closed independently.
- D. Ensure that meter panels are constructed of 12-gauge steel (minimum) and are sealable, hinged, and reversible. Because the meter panels are reversible, the hinges can be used on either the right side or the left side of the panels.
- E. Note that the width of meter panels may sometimes require the service section to be wider than the minimum-allowable width of the transformer compartment.

10.6. (continued)

- F. Mount self-contained meters on nonhinged panels, as shown in Figure 10-13 on Page 10-25.
- G. For switchboards that come with dual sockets, **a test switch cover plate must be installed on the spare socket.**

Table 10-3 Dual-Socket, Hinged, Meter-Panel Requirement

Service Voltage	Switchboard Supply Rating	30-Inch Tall Meter Panel Door Required ¹	Dual Meter Socket Required
277/480V 3Ø, 4-Wire	401 Amps and Above	Yes	Yes
120/240V 3Ø, 4-Wire	801 Amps and Above	Yes	Yes
120/208V 3Ø, 4-Wire	1,001 Amps and Above	Yes	Yes

¹ Two 15-inch-tall doors are not allowed on these switchboards.

10.6. (continued)

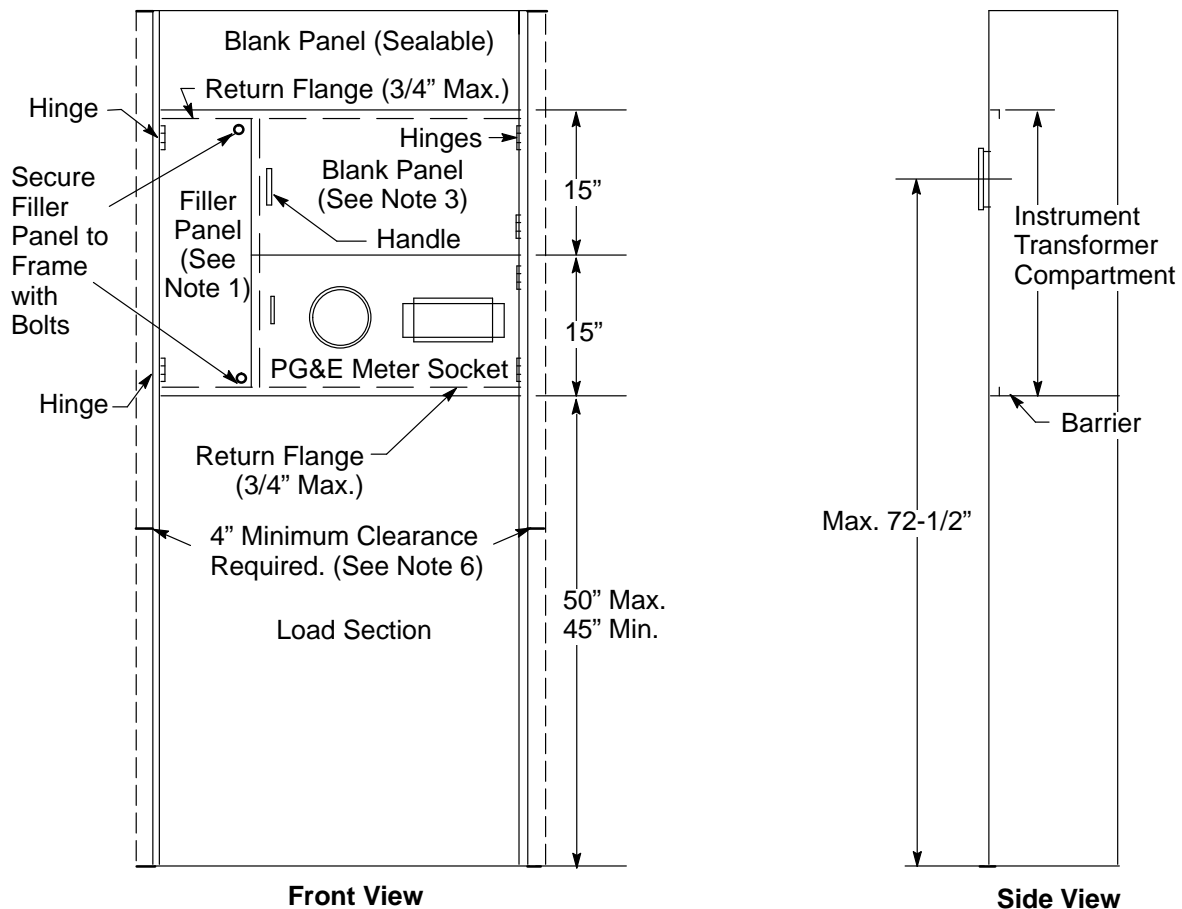


Figure 10-27
Standard Switchboard Service Section with
CT Compartment and Filler Panel, 0 Volts–600 Volts

Notes in reference to Figure 10-27.

1. Use filler panels where the switchboard width exceeds the allowable meter panel width. It is allowed to hinge meter panels to hinged filler panels only if the filler panel is bolted to the switchboard in both corners of the filler panel opposite the hinges.
2. Make the grounding connection in the main switch or breaker compartment.
3. In a split-panel arrangement, mount the kilowatt-hour (kWh) meter panel in the lower position.
4. Equip meter panels and filler panels with stops to prevent the panels from swinging inward beyond the front surface of the switchboard.
5. Ensure that all panels and covers are sealable.
6. Ensure that the meter panels can open 90° with the meter and test facilities in place. Ensure there is at least 4 inches of minimum clearance on the side where the meter panel door opens outward.

10.6. (continued)

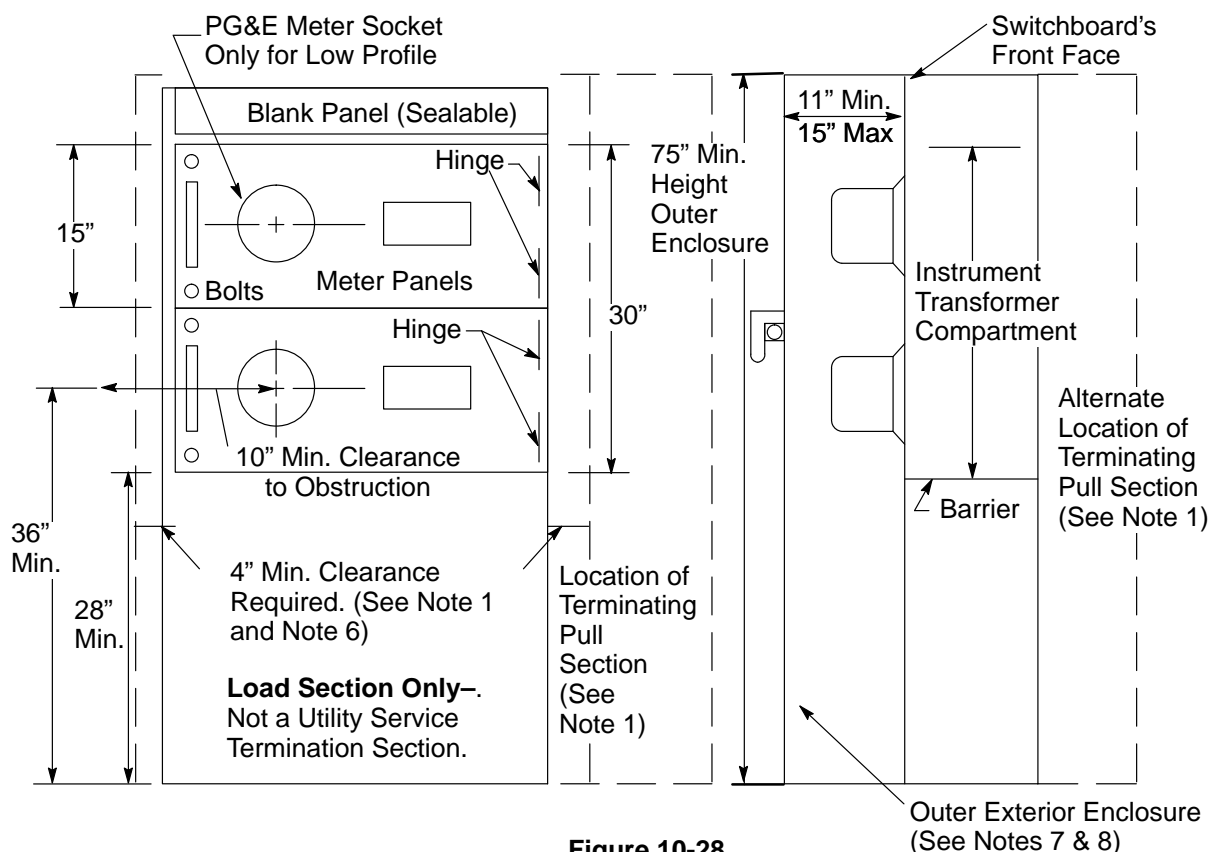


Figure 10-28
Low-Profile Switchboard Service Section,
with CT Compartment, for Underground Service

Notes in reference to Figure 10-28.

1. Locate the terminating pull section beside or behind the metering and current transformer (CT) compartment. The metering and CT compartment must not be recessed back into the switchboard.
2. Use filler panels where the switchboard width exceeds the maximum-allowable meter panel width. It is allowed to hinge meter panels to hinged filler panels only if the filler panel is bolted to the switchboard in both corners of the filler panel opposite the hinges.
3. Make the grounding connection in the main switch or breaker compartment.
4. Equip meter panels and filler panels with stops to prevent the panels from swinging inward beyond the front surface of the switchboard.
5. Ensure that all panels and covers are sealable.
6. Ensure that the meter panels can open 90° with the meter and test facilities in place. Ensure there is at least 4 inches of minimum clearance on the side where the meter panel door opens outward.
7. Only for low-profile switchboards. Place the PG&E meter socket on the top panel.
8. Preferably low-profile switchboards should only be installed indoors.
9. Low-profile switchboards installed in outdoor applications require an outer enclosure that is a minimum of 75 inches tall. This is the required minimum working space height.

10.6. (continued)

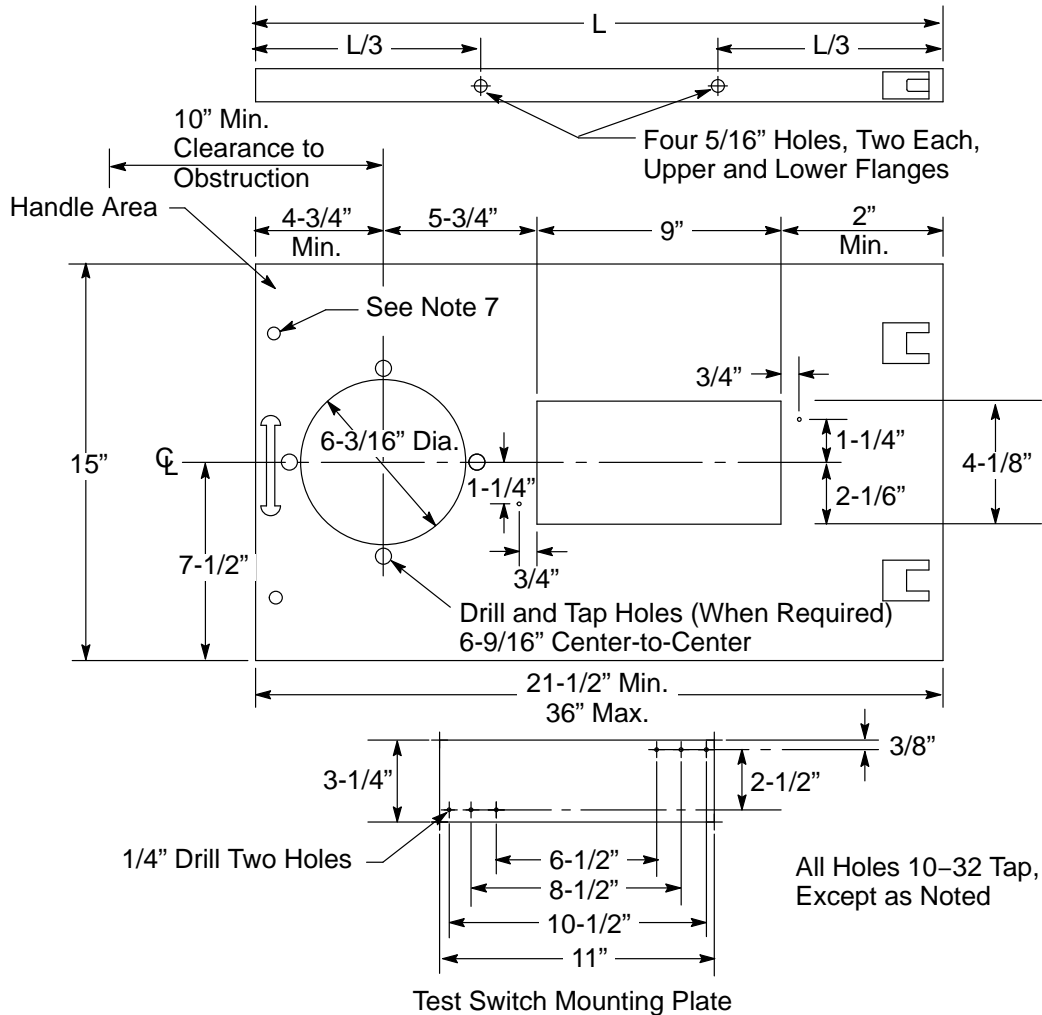


Figure 10-29
Standard Switchboard Service Section, 15-Inch Hinged Panel for Socket Meter and Test Switch

Notes in reference to Figure 10-29.

1. Ensure that the switchboard manufacturer drills, taps, and slots the panel for the secondary test switch, as shown. Also, ensure that the switchboard manufacturer furnishes and installs the socket with a sealing ring.
2. Design the meter sockets to be installed on hinged panels for back (rear) connection.
3. Use the outdoor or rain-tight enclosures shown in Figure 10-31 through Figure 10-33 on Page 10-44.
4. Attach a handle at the unsupported end of the meter panel. Leave a minimum clearance of 1 inch from the handle to the meter socket.
5. Ensure that hinges can support a 25-pound load applied at the unsupported end with a maximum 1/8-inch sag when the panel is open.
6. Secure removable plates to the rear of the panel using screws that do **not** protrude through the face of panel.
7. Ensure that the meter panels can open 90° with the meter and test facilities in place.
8. Ensure that all securing screws and sealing screws on the panels are captive. Studs and wing nuts must be sealable, when they are used.
9. Ensure that hinges are interchangeable and can be used on either the right side of the left side of the meter panels. When using clevis-type or removable pin-type hinges, ensure that the pin can be removed from the type of the meter panel.

10.6. (continued)

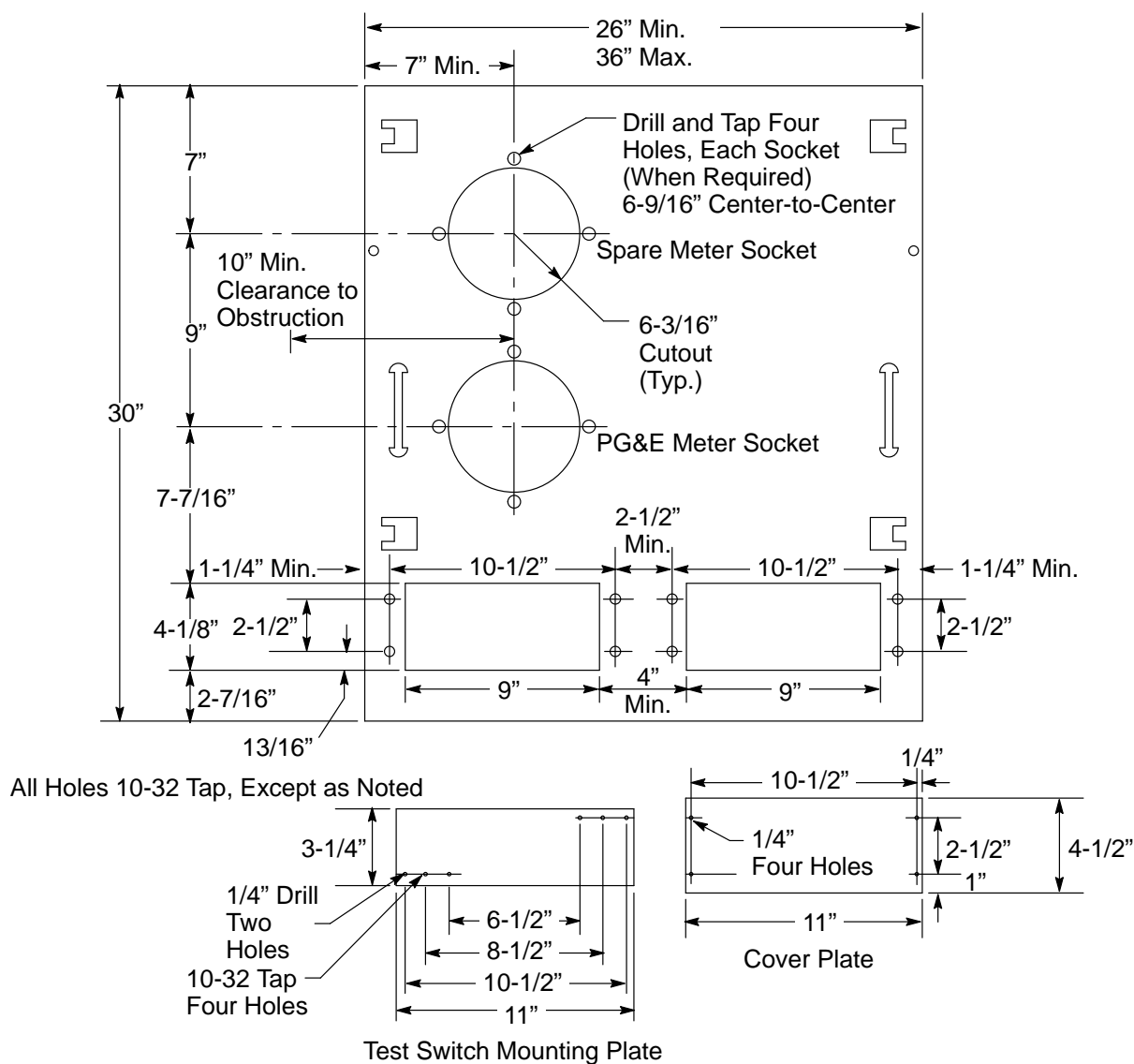


Figure 10-30
Standard Switchboard Service Section, 30-Inch Panel for Socket Meters and Test Switches

Notes in reference to Figure 10-30.

1. Meter socket openings may be on either the right or the left side of the panel.
2. Ensure that the switchboard manufacturer drills, taps, and slots the panel for the secondary test switch, as shown. Also, ensure that the switchboard manufacturer furnishes and installs the socket with a sealing ring.
3. Paint the removable plates and attached them to the panel.
4. Construct meter panels of 12-gauge steel (minimum). Ensure they are hinged and sealable.

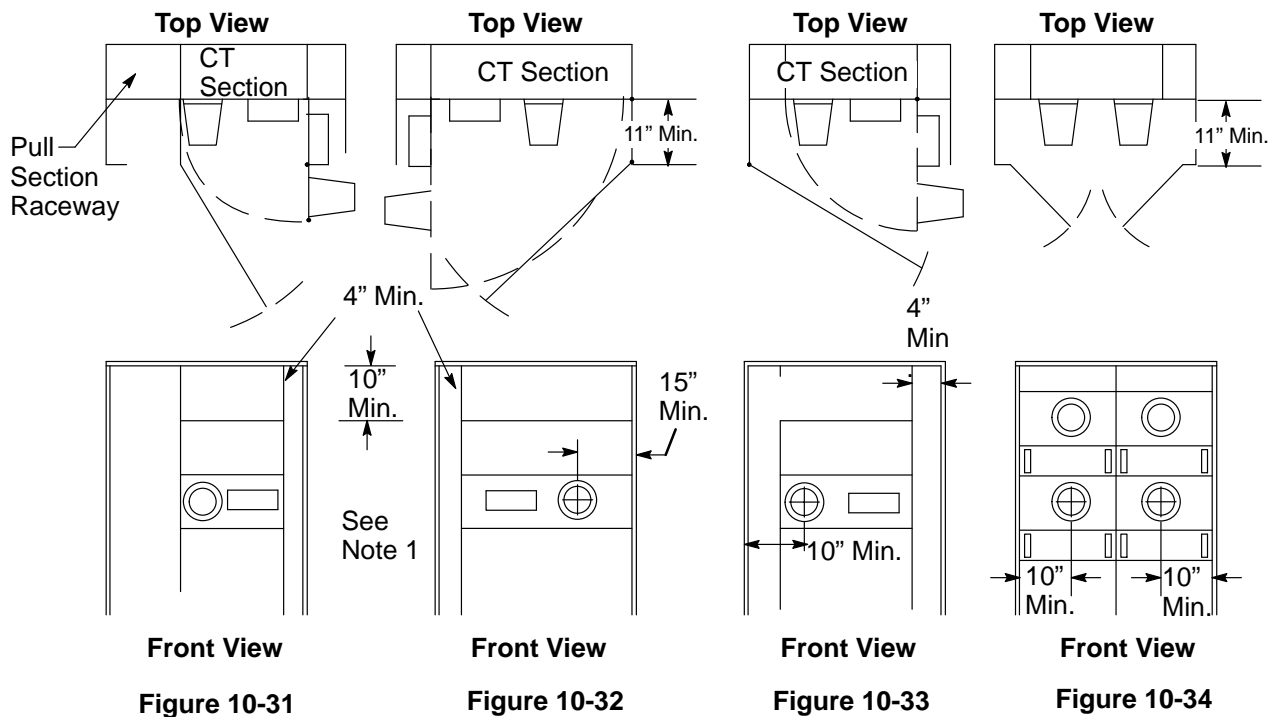
Notes continued on the next page

Notes in reference to Figure 10-30 (continued).

5. Ensure that hinges are interchangeable and can be used on either the right side or the left side of the meter panels. When using clevis-type or removable pin-type hinges, ensure that the pin can be removed from the top of the meter panel.
6. Ensure that hinges can support a 25-pound load applied at the unsupported end with a maximum 1/8-inch sag when the panel is open.
7. It is allowed to hinge meter panels to hinged filler panels only if the filler panel is bolted to the switchboard in both corners of the filler panel opposite the hinges.
8. Ensure that a hinged meter panel can be opened 90° with the meter and test facilities in place. When working with either recessed or enclosed meter panels, see Figure 10-31 below.
9. Ensure that the panel has a handle attached on both sides.
10. All securing screws and sealing screws on the panel must be captive. Stud and wing nuts must be sealable, when they are used.
11. Design the meter sockets to be installed on hinged panels for back (i.e., rear) connection.
12. For panel widths of less than 26 inches, consult your local PG&E meter shop.

10.7. Transformer-Rated and Self-Contained Switchboards

Applicants may use switchboards consisting of a main disconnect (if required), individual meter sockets, and associated circuit breakers or switches for individually metered, multiple occupancies supplied from one service. Figure 10-31, Figure 10-32, and Figure 10-33, below, show standard switchboard service-section detail for transformer-rated meter sockets. Figure 10-34, below, shows standard switchboard service-section detail for self-contained meter sockets rated from 0 amps through 225 amps.



Outdoor or Rain-Tight Enclosures for Switchboards

Notes continued on the next page

Notes in reference to Figure 10-31, Figure 10-32, Figure 10-33, and Figure 10-34 on Page 10-44.

1. Ensure that hinged meter panels and enclosure doors can be opened at least 90° with meter and test facilities in place.
2. For hinged meter panel designs, see Figure 10-27 on Page 10-40 and Figure 10-28 on Page 10-41.
3. Ensure that enclosure doors can be secured in the 90° open position.
4. For approved enclosure-locking provisions, see [Section 5, Subsection 5.3.4., “Electric Meter and Service Termination Equipment Rooms.”](#) on Page 5-8.
5. Ensure that outdoor or rain-tight enclosures are used.

10.8. Adding New Metering Equipment to Existing Switchboards

When applicants want to install a new meter panel or meter section and connect to the load side of an existing switchboard, the required method is to extend the bussing from the last meter or load section of the existing switchboard into a new meter section. See Figure 10-35, “Existing Switchboard,” on Page 10-47, as an example of how to extend the switchboard bussing.

Please contact the local project coordinator before interconnecting and adding load. Project coordinators must ensure that the existing PG&E facilities are upgraded, when necessary.

If the new meter panel or meter section cannot be connected to the end of the switchboard, the interconnection may be allowed, at PG&E’s discretion, in the utility termination section of the switchboard only if **all** of the following conditions below are met.

- A. The total aggregated ampacity of the new panel or new section plus the existing switchboard metering sections is **not** greater than the existing switchboard’s total (supply) ampacity rating. See Table 10-4, “Adding Up Meter Section Ampacities,” and Figure 10-35, “Existing Switchboard,” both on Page 10-47, to calculate the ampacities.
- B. PG&E calculates the new total demand load and, if needed, installs the additional service conductors required to meet that load. A larger transformer may also be required because of the new total demand load.
- C. PG&E identifies available spare landing positions on the terminating facilities. The spare landing positions are in addition to the number of landing positions required in Subsection 10.3.14., “Underground, Cable-Terminating Facilities in Pull Boxes or Pull Sections,” on Page 10-34, that must be reserved for existing and future installation of additional cables.
- D. The utility service termination section (typically 90 inches high) does not contain a main breaker compartment or a metering compartment. This termination section is dedicated only for terminating PG&E service cables. See Figure 10-35, “Existing Switchboard,” on Page 10-47.

If all of the conditions described above are met and PG&E approves the installation of the new meter panel or meter section, applicants must follow the applicable instructions provided in Item E. and Item F. on Page 10-46.

10.8. (continued)

- E. Overhead Service: Applicants must locate the taps in a sealable compartment that is located above and separated from the CT and/or metering equipment compartment.
- F. Underground Service: Applicants must ensure that the taps are located in the underground service-termination pull section or pull box. In this instance, the applicant must ensure that the bus conductors terminate in a suitable, approved manner. Also, the applicant must ensure that the bus conductors are positioned so that the customer's incoming, service-entrance conductors and the tap connections do not encroach into PG&E's pulling area or interfere with PG&E's pull and termination facilities for service-lateral conductors.

NOTE: Due to various types of configurations and arrangements of switchboard compartments in some termination sections, the interconnection may not meet all of the requirements listed above and will be denied. One example is when the PG&E metering compartment or the customer's main breaker compartment is directly above the utility termination section. See Figure 10-27 on Page 10-40.

Table 10-4 Adding Up Meter Section Ampacities¹

Example	Supply Section (Loc 1) Ampacity Rating	Meter Section, (Loc 2) Ampacity Rating	Meter Section, (Loc 3) Ampacity Rating	Aggregated Ampacity of All Metering Selections, and Panels	New Meter Equipment Tap Allowed?
1	2,000	1,200	800	$1,200 + 800 = 2,000$	No. The Total Aggregated Ampacity in Column 5 is not less than Column 2.
2	2,000	1,000	600	$1,000 + 600 = 1,600$	Yes. The Total Aggregated Ampacity in Column 5 is less than Column 2. A new meter panel less than or equal to 400 amps is allowed.

¹ Only two meter sections are shown as an example. Add up the ampacities for all meter sections and meter panels connected to the switchboard.

10.8. (continued)

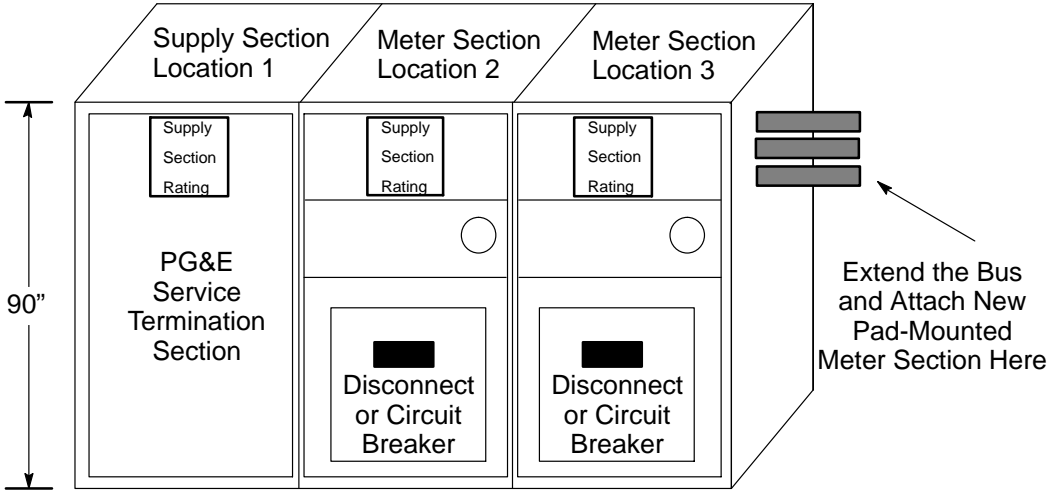


Figure 10-35
Existing Switchboard

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**SECTION 11
ELECTRIC SWITCHBOARDS:
601 Volts THROUGH
25,000 Volts AND
PRIMARY SERVICES**

**SECTION 11 ELECTRIC SWITCHBOARDS: 601 Volts
THROUGH 25,000 Volts AND PRIMARY SERVICES**

Section 11

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

11.1. Scope

This section of the manual provides application and installation details for high-voltage switchboard metering equipment ranging from 601 volts 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 Subsection 11.4., “Interconnection Requirements and Primary Services,” on Page 11-14.

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 \[EUSERC\]](#) manual, Section 400 requirements).

C. A manufacturer must submit three sets of drawings of the proposed equipment to PG&E for pre-approval **before** manufacturing the equipment. The drawings must include the contractor’s name and address, the applicant’s name, and the job location. The job location must be specific and can be the service address or Global Positioning System (GPS) coordinate’s location. Field-design changes are **not** permitted without obtaining PG&E’s approval before making the changes.

11.2. (continued)

- D. Employees perform a field inspection of the switchboard at the jobsite. The switchboard is approved only when it meets all of the specified requirements.

NOTE: Potential transformers (PTs) are also called voltage transformers (VTs). The two terms are used interchangeably in Section 11.

- E. PG&E must furnish and install fuses for PTs, as well as for the following equipment.

- Meters
- Metering transformers
- Test switches
- All secondary wiring from the metering transformers to the meters

When 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 handle **must** be visible when the outer door of the switchboard is 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.
- C. Provide an individual pulling eyebolt (shouldered type) above each of the current transformer (CT) positions to aid CT lifting. Shouldered eyebolts are required due to their rating for angular loading capacity.
- 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 rigid ground bus is located on the right or left side towards the front of the section to provide better accessibility for any work to be performed. This includes the PT, CT, and termination sections.

11.3. (continued)

- I. PT Disconnect Switch: The following requirements apply to the PT disconnect switch.
 1. Only use a gang-operated, “no-load” type, disconnect.
 2. The disconnect switch must have grounds in a blade-and-jaw configuration when it is opened.
 3. Do **not** use fused-drawer disconnect devices or fused, removable, section-type disconnect devices.
 4. Ensure that the maximum amount of operating force required to open and close a PT disconnect switch is no more than 50 foot-pounds.
 5. Ensure the PT disconnect-switch door has a viewing window, so the switch blades are visible.
 6. An interlocking system is required to ensure the PT disconnect is locked open fully before the PT compartment door can be opened and entered.
 7. Apply a label near the switch handle stating, “Meter & PT Disconnect Switch. Does Not De-Energize Load.”
- J. Ensure that PG&E’s working space and clearance requirements are met. **Confirm that there is an unobstructed, 8-foot area cleared in front of all access doors. These areas include the termination, CT, PT, and metering sections.** This area is required for installing and removing PG&E’s safety grounds and other equipment. Maintain this clearance area at all times.
- K. Concrete floors or pads must extend out in front of the whole area a minimum of 96 inches, as measured from the outside of the equipment’s outer doors. See the requirements in [Section 5, “Electric Metering: General.” Subsection 5.4.4., “Working Space,”](#) on Page 5-17.
- L. Mechanical Lug Connectors: Ensure that the requested size and number of lay-in lugs are provided on the rigid ground bus in each of the following sections. Each lug must be accessible and installed towards the front of the section.
 1. **Three lugs** in the PT section to terminate the neutral circuit connected to the ground bus in the CT compartment. The lugs should accept a wire range between #6 to #10 American Wire Gauge (AWG).
 2. **Two lugs** in the termination section to terminate CT and PT ground wires. The lugs should accept a wire range between #8 to #12 AWG.
 3. **One lug** in the termination section for the primary service concentric neutral ground wire. The lugs should accept a wire range between #2 AWG through 250 thousand circular mils (kcmil).
- M. Ensure the requirements in [Section 5, Subsection 5.2.3., “Applicant Responsibilities,”](#) on Page 5-3, are followed.
- N. Ensure that permanent marking or labeling, indicating the service-voltage rating of the switchgear being supplied, is included on the exterior of all electric meter panels and all equipment doors or panels that provide access to the service terminations, PTs, and CTs.

11.3. (continued)

- 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.
- P. Ensure that the primary taps for the PTs are connected only 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.

- Q. To attach the safety grounds, install ball studs (1/2-inch through 13-inch threads with insulating covers) on the line and load side of the CT bus units. Locate the studs less than 7 inches from the end of the bus unit and orient them toward the compartment access opening. Also, install two ball studs on the ground bus inside the CT compartment.
- R. Ensure that each section of the primary switchgear has been certified to all applicable standards by the [Occupational Safety & Health Administration's \(OSHA's\) Nationally Recognized Testing Laboratory \(NRTL\) Program](#). The equipment also must meet the requirements of the [Electric Utility Service Equipment Requirements Committee \(EUSERC\)](#) manual, as well as all applicable *Greenbook* requirements, and be approved by PG&E. Also, see [Section 5, Subsection 5.2.1., "Approved Metering and Service-Termination Equipment,"](#) on Page 5-1. The following requirements also apply.
 - 1. A certification label(s) must be affixed to the switchgear by its manufacturer (if qualified for self-certification) or by a qualified third-party agency (i.e., [Underwriters Laboratories \[UL\]](#) or other [NRTL](#)), indicating that the switchboard meets all applicable standards.
 - 2. Due to the capacity of PG&E distribution circuits, primary switchgear must not have an ampacity rating greater than 600 amps. The maximum ampacity rating must be listed on the switchgear's nameplate label. Refer to [Section 1, "General," Subsection 1.14., "Determining the Electric Service Rating,"](#) on Page 1-15.
- S. Ground Rods and Wire: Install 2 ground rods, ground wire, and conduits for the primary service as shown in Figure 11-1, "Primary Switchgear Termination Section Pad Detail," on Page 11-6. These two ground rods are in addition to the grounding system already installed for the switchgear.

Connect a bare copper ground wire to both ground rods and to the switchgear rigid ground bus. Use #2 solid copper ground wire for 200 amp-rated services (#2 and 1/0 primary cables) and 250 kcmil copper ground wire for services rated greater than 200 amps and up to 600 amps (4/0 and larger primary cables).

11.3. (continued)

For switchgear installed indoors in an electrical room only, where there is a basement, garage, or other room in the building directly below the electrical room, applicants may use a concrete-encased grounding electrode from the building's grounding system (Ufer) instead of installing a ground rod inside the termination section. The concrete-encased grounding electrode typically may use electrically conductive steel reinforcing bars (rebar). The five following requirements also apply.

1. The rebar must be connected to the switchgear's grounding system.
 2. The rebar must be extended upward vertically out of the building's concrete floor or pad into the termination section a minimum of 6 inches to a maximum of 9 inches above the switchgear floor.
 3. The rebar must be placed and extended out of the switchgear floor the same as the ground rod shown in Figure 11-1, "Primary Switchboard Termination Section Pad Detail," on Page 11-6.
 4. A second grounding electrode (ground rod) must be installed outside below grade and away from the building or its foundation.
 5. Connect the two grounding electrodes (rebar and ground rod) together with a ground wire as described above and in Figure 11-1, Note 3.
- T. Submit a termination section drawing detail on all of the switchboard drawings submitted to PG&E. The drawing detail must show the position and details such as size, wire gauge, and measurements (separations where applicable) of the conduit(s), conduit window, ground rods, ground wire, rigid ground bus, lugs, and additional internal components.
- U. Install a transparent, insulated, inner door as a safety barrier in front of the termination section, and CT section (if separate) for all switchboards 601 volts through 25,000 volts.
1. Construct the safety door from a solid piece of clear acrylic that is a minimum 6 millimeters (or 1/4-inch) thick and resistant to damage by impact or puncture.
 2. Ensure the acrylic is rated for the voltage served.
 3. The safety door must extend from the top to the bottom and side-to-side to cover the entire open area of the section, including all energized parts.
 4. A metallic frame or parts may be used to support the door, but metallic parts should be limited to maximize the amount of visibility through the door.
 5. Maintain all clearances.
 6. 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.
 7. **Identify the door on all switchboard drawings submitted to PG&E.**

11.3. (continued)

V. Meter Panel Door: The primary switchgear meter panel door is required to have a minimum of two sockets and a maximum of three sockets, excluding the California Independent System Operator (ISO) socket, as shown in Figure 11-2, "Hinged Meter Panel with Multiple Sockets for 2,400-V to 27,000-V Service," on Page 11-8., and Figure 11-3, "Hinged Meter Panel with Dual Socket for 2,400-V Through 27,000-V Service," on Page 11-9. Consult PG&E for meter-socket questions. If requested, PG&E will furnish and install test switches and wiring for the additional, manufacturer installed meter sockets.

The PG&E metering circuit must not be extended into other sections of the switchboard.

W. Heating Equipment: Manufacturer-installed heaters or heating equipment that prevent moisture buildup inside the switchgear are allowed if they are placed in the back of the section(s) and do not interfere with PG&E equipment or obstruct the working area around the equipment.

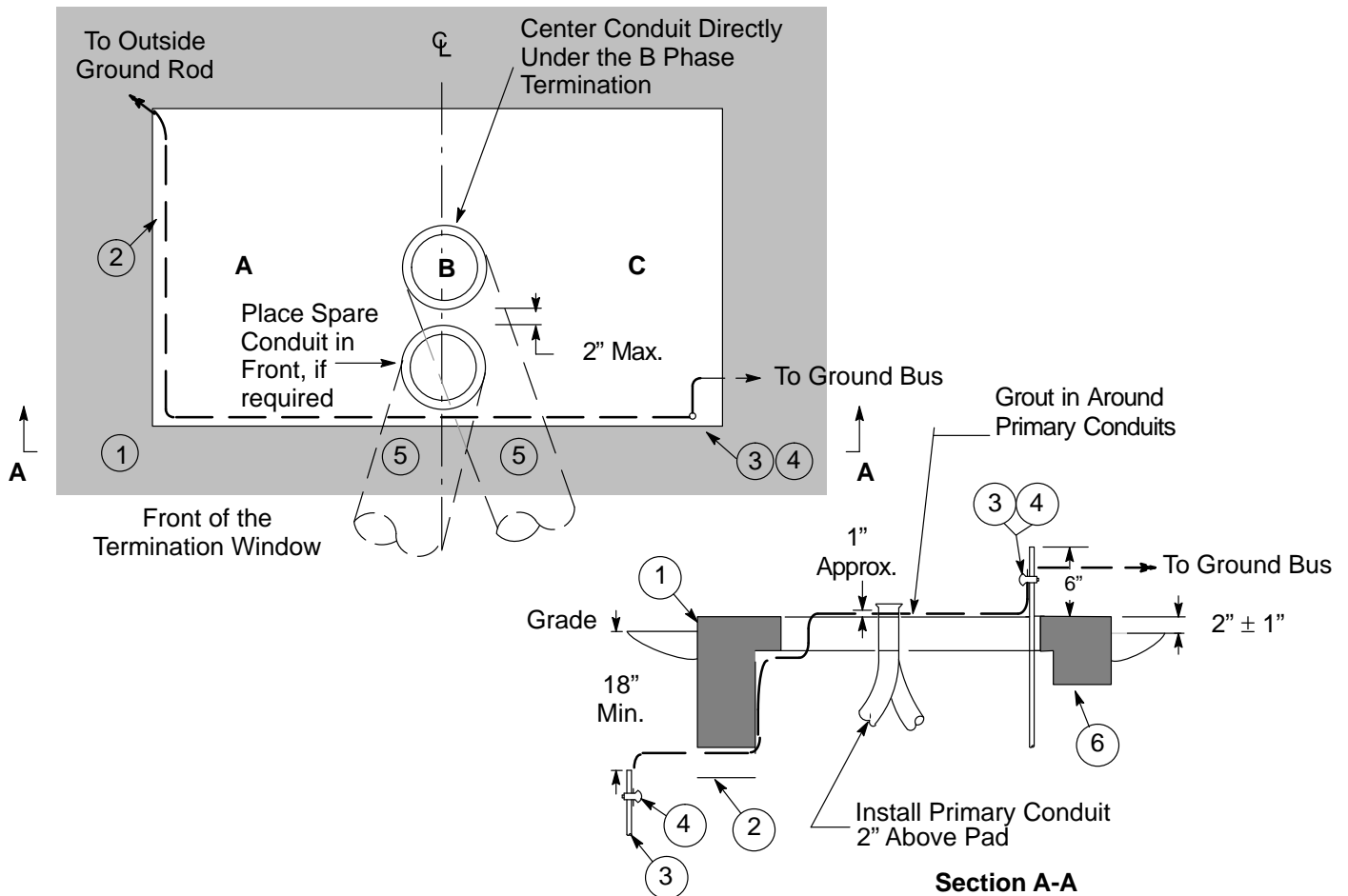


Figure 11-1
Primary Switchgear Termination Section Pad Detail

11.3. (continued)

Notes in Reference to Figure 11-1 on Page 11-6.

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 connects to, and runs from, the outside ground rod, buried in the ground or in the pad, to the inside of the termination section. The wire continues on the inside running above the pad, through the primary window, and attaches to the inside ground rod. Finally, the continuous wire must run from the inside ground rod to a mechanical lug on the switchboard ground bus inside the termination section. The mechanical lug must accept wire between #2 AWG through 250 kcmil.
4. On switchgear termination sections that have a raised floor above the concrete pad, ensure the ground rod installed inside the termination section extends 6 to 9 inches above the switchgear section floor.
5. Install a spare conduit only when required by PG&E.

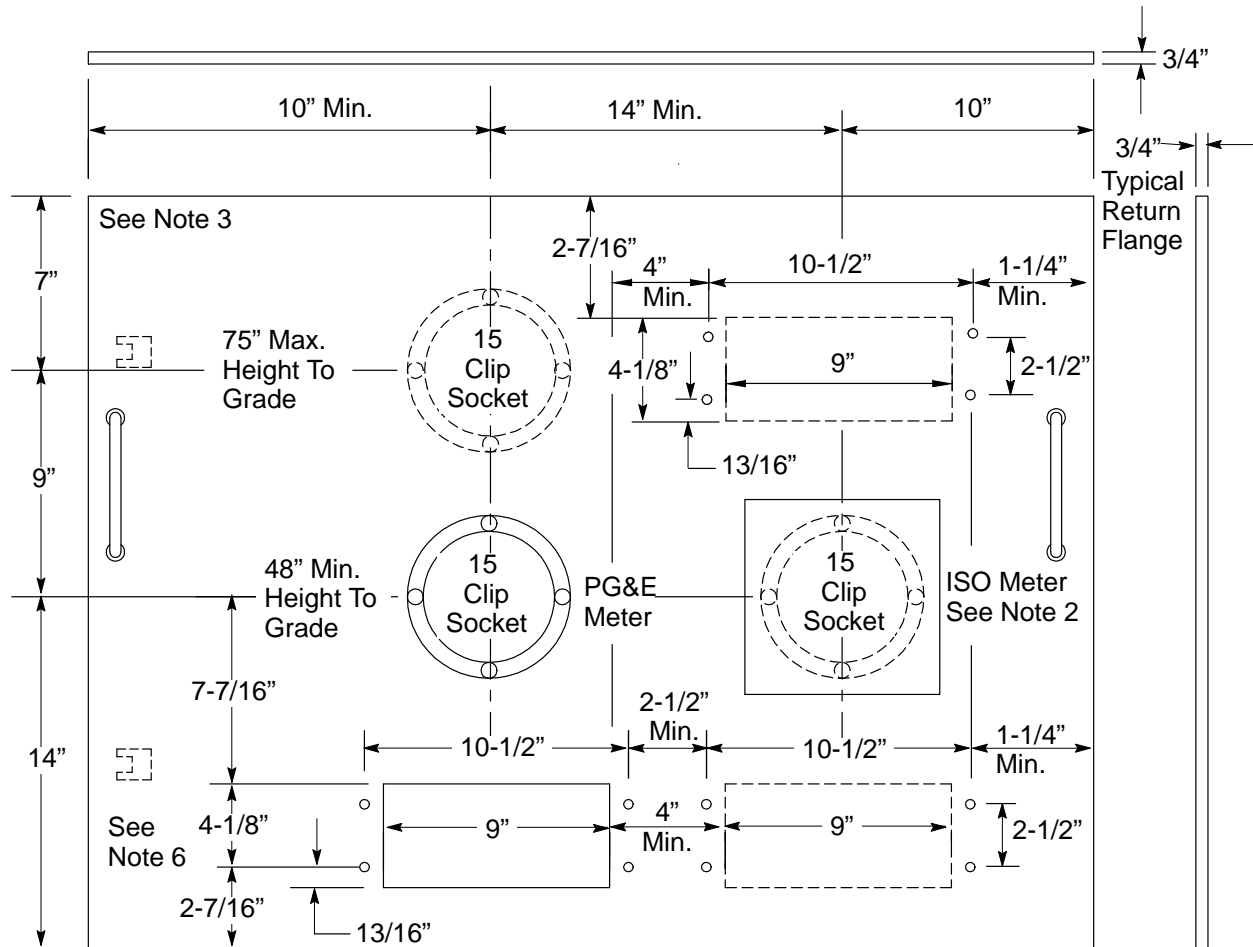
Table 11-1 Bill of Materials for Concrete Pad

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 , or	–	–
		Wire, 250 kcmil, Stranded Medium Hard Drawn ¹		
3	2	Ground Rod, 5/8" x 8', Copper Clad ²	187013	013109
4	2	Clamp, Ground Rod (use with #2 Cu Ground Wire), or	187012	
		Two Bolt Connector, Ground Rod (use with 250 Cu Ground Wire)	305432	015251
5	As required	Conduit, Type and Size (as required)	–	062288
6	As required	Compacted Backfill	–	–

¹ See Item S. on Page 11-4 to determine the required ground wire size.

² Refer to Item S. on Page 11-4 for a description of when rebar connected to the switchgear grounding system can be used instead of a ground rod inside the termination section.

11.3. (continued)



Note: May Be Mirror Imaged

All Holes 10-32 Tap, Except as Noted

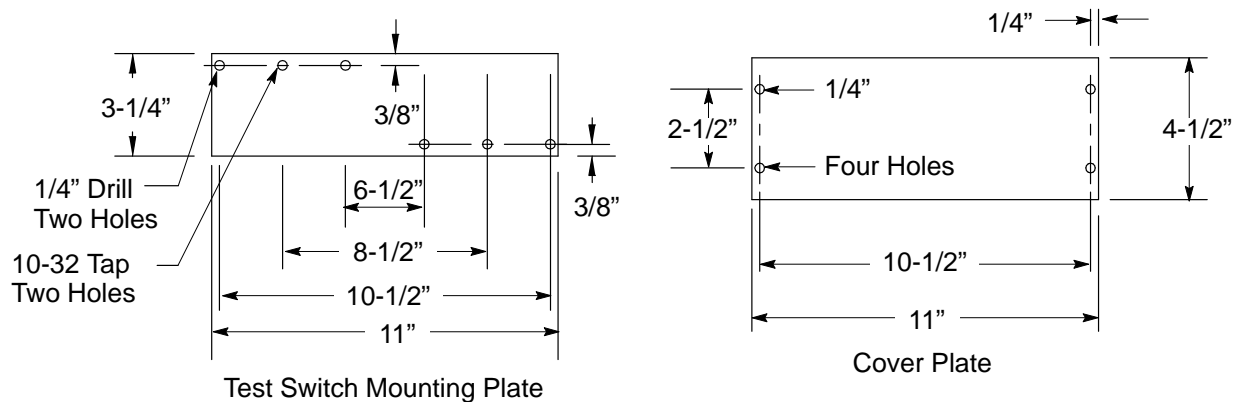


Figure 11-3
Hinged Meter Panel with Dual Socket for 2,400-V Through 27,000-V Service

Notes in reference to Figure 11-2 and Figure 11-3.

1. The panel must be constructed using 12 gauge (minimum) steel and furnished with meter sockets, sealing rings, slotted openings, and a removable plate for installing a secondary test switch. The slotted opening and removable plate edges must be smooth to prevent damaging the meter wiring.

Notes continued on the next page

11.3. (continued)

Notes in reference to Figure 11-2 and Figure 11-3, continued.

2. Provide an ISO Meter Cast Ring Mounting Blank Cover. When a cast meter-mounting ring is provided, the screws used to attach to the meter panel must provide a minimum 1/8-inch clearance between the screw heads and the back of the ring.
3. Auxiliary power connections are not allowed.
4. The removable plates must be attached to the rear of the panel with screws that do not protrude through the face of the pane.
5. Meter sockets must be designed to connect from the back. A maximum of 4 meter sockets are allowed.
6. The panel must be equipped with hinges. The hinges must permit the panel to open to 90 degrees. Hinges must be located on the same side as the PG&E meter socket. Usually, the meter socket panel does not need to be interchangeable, right or left, unless it causes an unsafe egress or other safety-related issue.
7. When fully opened, the panel must support a 25-pound load applied at the unsupported end, with a maximum sag of 1/8 inch.
8. The panel must have a handle attached to both sides.
9. Stud and wing nuts must be sealable when used.
10. Consult PG&E before using a panel with a width of more than 38 inches.
11. The meter panel is required to have a minimum of two sockets and a maximum of four sockets including the ISO socket. Consult PG&E for meter-socket requirements.

11.3. (continued)

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	Refer to the Dimensions in Figure 11-5 on Page 11-13 and Figure 11-6 on Page 11-14.
Minimum, Bare-Bus Clearance Ø to Ø	5	5	7-1/2	
Dimension A	5 Min. 10 Max.	5 Min. 10 Max.	8 Min. 10 Max.	
Dimension B ¹	24 Min.	24 Min.	24 Min.	
Dimension C ¹	24 Min.	24 Min.	24 Min.	
Dimension D (Do not install neutral insulator)	–	–	–	
Dimension E ¹	36 Min.	48 Min.	60 Min.	
Dimension F	42 Min. 48 Max.	42 Min. 48 Max.	42 Min. 48 Max.	
Dimension G	36 Min.	36 Min.	36 Min.	
Dimension H Fuse-Mounting Clip: Center	8-1/2	8-1/2	11-1/2	
Dimension H Fuse Ferrule Diameter	1-5/8	1-5/8	1-5/8	
Dimension I To Bottom of Fuse Clip or Bus Extension (Whichever Is Lowest)	18	18	18	
Maximum Dimension J to Top of Fuse Clip or Bus Extension	30	30	30	
Dimension K Insulated, Inner Safety Barrier Door, Minimum, Clearance ²	6	6	6	

¹ Clearance to any part of the enclosure, including flanges and inner walls.² Uninsulated inner door material, parts, and hardware increase clearance to 8 inches minimum.

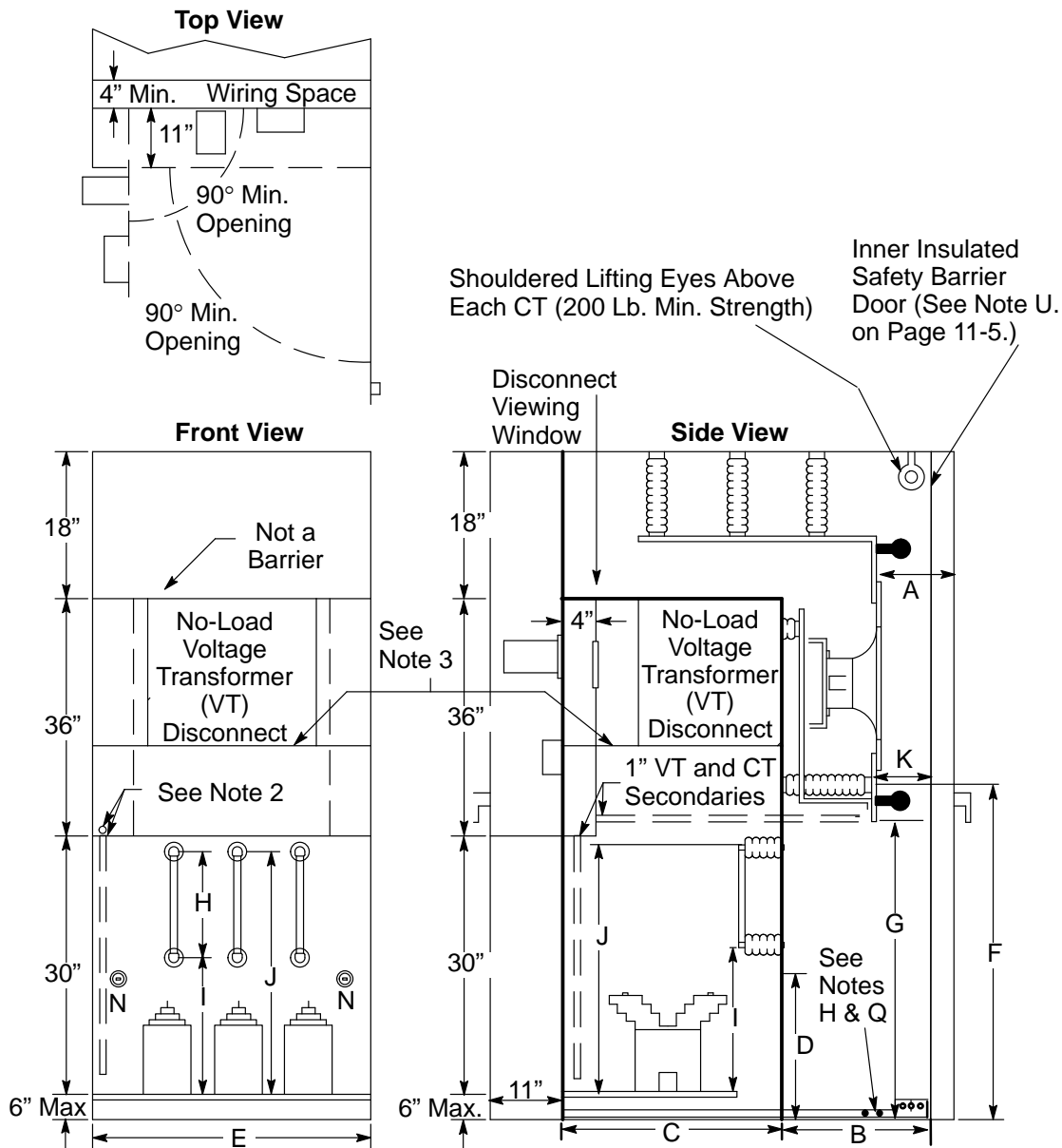


Figure 11-4
Typical, High-Voltage Metering Enclosure: 2,400-V Through 17,000-V Service

Notes in reference to Figure 11-4.

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, non-metallic VT and CT secondary conduits on the same side as the meter's panel hinges.
3. Electrically insulated barrier.
4. Applicants must ask the local project coordinator 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.
5. For VT Mounting rail materials and installation details, refer to the [EUSERC](#) manual, Drawing 407.
6. Ensure that the grounding bus extends on either the left or right sides of the CT compartment's access area. Also, ensure that the ground 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."
7. Do not install the neutral insulator bushing in the PT compartment.

11.3. (continued)

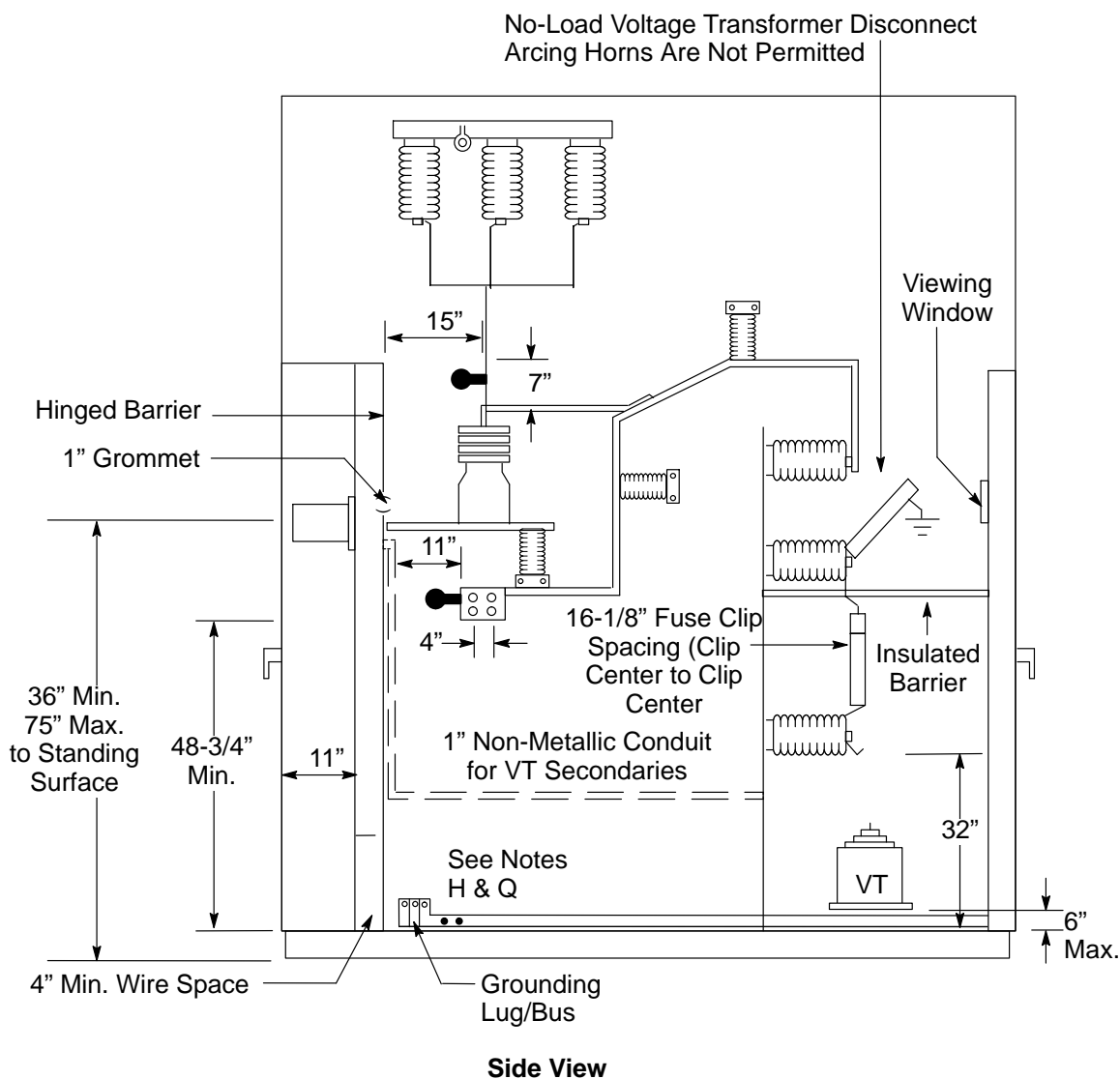


Figure 11-5
Typical, High-Voltage Metering Enclosure: 17,001-V Through 25,000-V Service

Notes in reference to Figure 11-5 above and Figure 11-6 on Page 11-14.

1. For rear access to the door, refer to the [EUSERC](#) manual, 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 metering compartment.
4. Ensure that the ground bus extends on either the left or right side of the CT compartment's access area. Also, ensure that the grounding terminals are 2 aluminum-bodied mechanical lugs accepting a range of 6 American Wire Gauge (AWG) through 250 thousand circular mils (kcmil) conductors. Finally, ensure that they are identified with a label reading "SAFETY GROUNDING POINT FOR UTILITY USE ONLY."
5. Clearance to any part of the enclosure, including flanges and inner walls.
6. For VT Mounting rail materials and installation details refer to the [EUSERC](#) manual, Drawing 407.
7. Do not install the neutral insulator bushing in the PT compartment.

11.3. (continued)

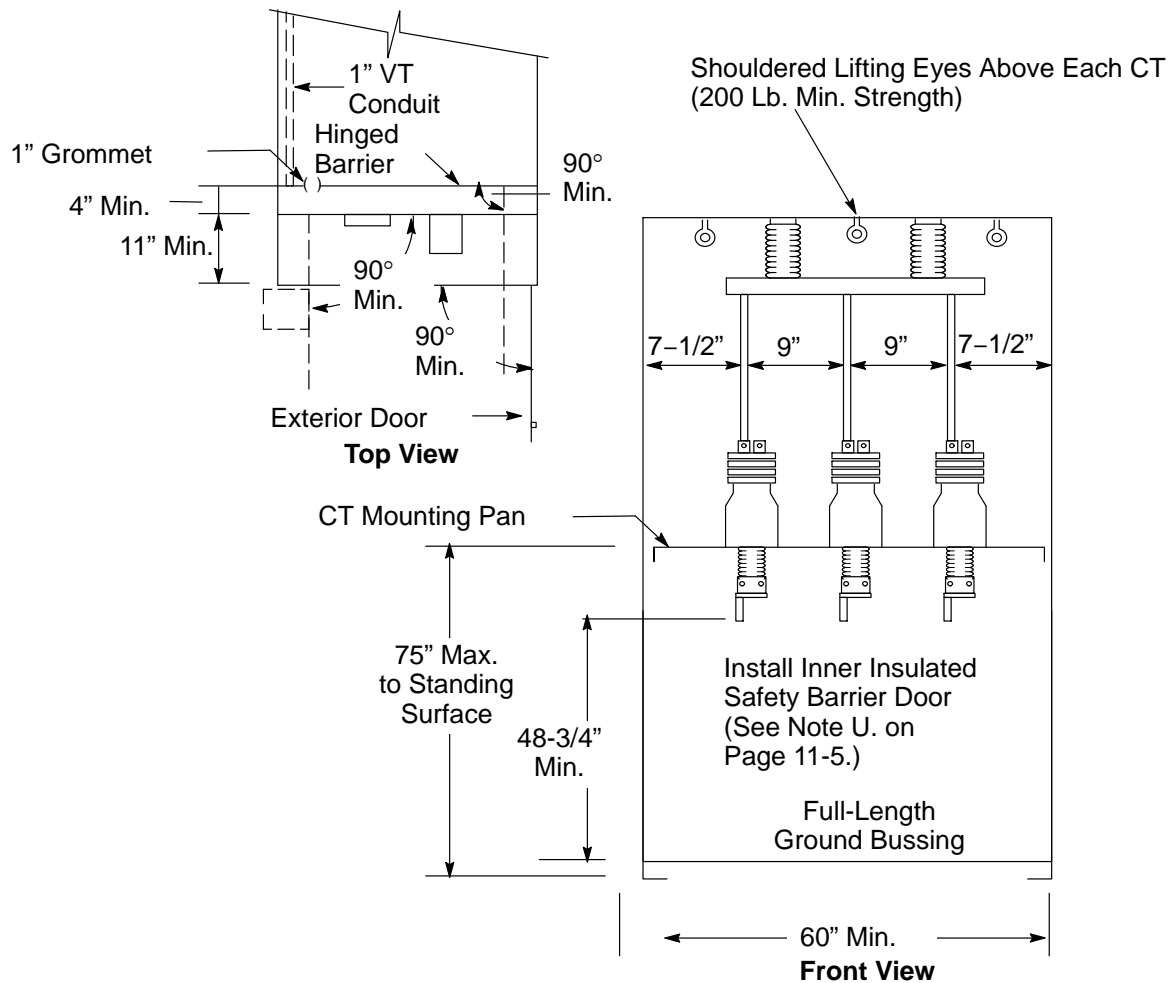


Figure 11-6
Typical, High-Voltage Metering Enclosure, 17,001-V Through 25,000-V Service

11.4. Interconnection Requirements and Primary Services

When new or existing applicants request services above 600 volts, refer to PG&E [Numbered Document 094676, "Primary Electric Service Equipment,"](#) for technical information about primary services. This document is located in [Appendix C, "Electric and Gas Engineering Documents."](#)

If applicants intend to interconnect their generation facilities to PG&E's power system, they must refer to the [PG&E Distribution Interconnection Handbook](https://www.pge.com/en_US/large-business/services/alternatives-to-pge/distribution-handbook.page). (https://www.pge.com/en_US/large-business/services/alternatives-to-pge/distribution-handbook.page).

11.5. Primary Switchgear Located Below Ground Level

When applicants want to install primary switchgear in an electrical meter room below the ground level, applicants must follow all of the requirements in this subsection. Switchgear must not be installed more than one level below grade. If the following requirements in this section cannot be met, then the switchgear must be installed at ground level.

PG&E requires a nonstandard design for switchgear, at all primary voltage levels, when installed below grade. This nonstandard design incorporates an additional pull section for the cable to ensure there is adequate separation between the cable terminations and the service entrance point into the switchgear to reduce the potential of water intrusion into the switchgear's termination section.

PG&E requires that applicants submit drawings for review during the initial design stage of their project and before procuring a primary switchgear.

The following additional requirements apply.

- A. **Additional Pull Section:** Below-grade primary switchgear must have a separate independent pull section that is next to and connected with the termination section. The primary conduits stop at this pull section and the cables run through the pull section and then into the termination section. The pull section must be the same height and depth as the termination section. The wall separating the two sections must have a window for the cables to run through from the pull section to the cable termination bus stubs inside the termination section. The following items are required in the pull section.
 - Cable hanger provisions at the top of the pull section
 - Moisture barrier to contain possible water intrusion
 - Cable blocks or support system on the bottom of the switchgear floor to ensure cables stay off of the floor or pad
- B. **Back or Side Entry:** The conduit and service entering the switchgear must enter the upper back or upper side of the additional pull section no lower than 18 inches from the top of the section.
- C. **Conduit:** The primary service conduit installed in the public property (franchise) area must not be at a depth below grade greater than 60 inches. Conduit may not extend more than 20 feet past the building foundation and into the electric meter room. The conduit must be continuous without breaks or junction boxes in between. Conduit entering the switchgear must enter the upper side or back of the additional pull section.
- D. **Water Drainage System:** To prevent water from accumulating in meter rooms, applicants must ensure they design and construct the electrical meter room to quickly discharge any water that may enter the switchgear and the below-grade electrical meter room.
- E. **Cable Termination Height:** PG&E requires a nonstandard design with higher cable terminations for switchgear installed below grade. The elevated terminations allow for the cables to be bent, installed, and attached correctly. The cable terminations must be between 60 inches to 72 inches. This is measured from the first bolt on the termination bus to the bottom of the cable entrance window.

11.5. (continued)

F. Reference Figures: The following figures show the design of the additional pull section and illustrates how the pull section adjoins the termination section. Also, a detail is provided for the window in the wall between the two sections. The minimum cable termination heights, as well as section widths, are shown in these illustrations.

- Figure 11-7, “Additional Side or Back Switchgear Pull Section–High Entry,” below
- Detail A, “Cable Entrance Window,” on Page 11-17.

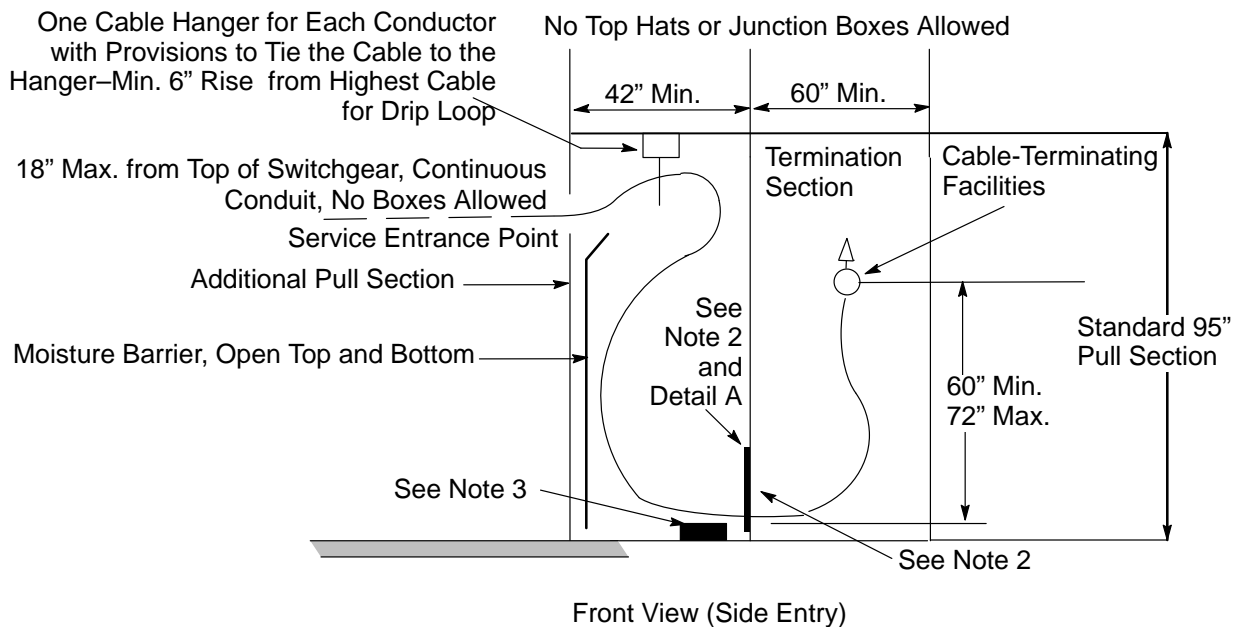
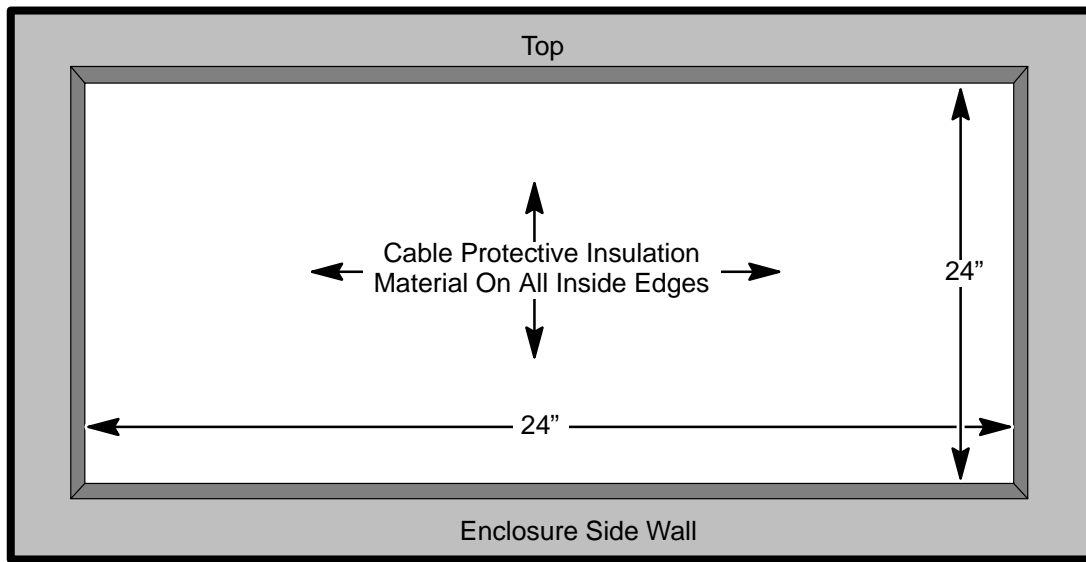


Figure 11-7
Additional Side or Back Switchgear Pull Section–High Entry

11.5. (continued)



Detail A—Cable Entrance Window

Notes in reference to Figure 11-7.

1. Ensure that the height and depth of the additional pull section are exactly the same as the terminating section. The width must be a minimum of 42 inches.
2. The height of the cable entrance window above the top of the pad is 3 inches maximum. Ensure that the window size is a 24 inches wide by 24 inches tall. Insulate all inside edges of the window opening to prevent damage to the cables. See Detail A above..
3. Cables must not lie on the concrete pad or ground. The applicant must provide a cable support system to keep the cables off the ground. Otherwise, the applicant must supply cable blocks using PG&E Material Code 362118.

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APPENDIX A

ACRONYMS & GLOSSARY

APPENDIX A ACRONYMS & GLOSSARY

Appendix A

Acronyms and Glossary

Acronyms

A	ampere, amps
ac	alternating current
AHJ	authority having jurisdiction
AIC	amperes interrupting capacity
ANSI	American National Standards Institute
AWG	American wire gauge
Btu	British thermal unit
CCR	Code of California Regulations
CDF	California Department of Forestry and Fire Protection
CGT	California Gas Transmission
℄	centerline
CPUC	California Public Utilities Commission
CT	current transformer
DA	direct access
DASMMD	<i>Direct Access Standards for Metering and Meter Data</i>
DASR	direct access service request
dc	direct current
DG	distributed generation
DOT	U.S. Department of Transportation
EFV	excess flow valve
ESP	energy service provider
EUSERC	Electric Utilities Service Equipment Requirements Committee
G.O.	General Order
GRS	galvanized rigid steel
GT&D	Gas Transmission and Distribution
HDD	Horizontal Directional Drilling
HDPE	high-density polyethylene

Acronyms (continued)

Hz	hertz
ID	inside diameter
IMC	intermediate metal conduit
IPS	iron pipe size
k	kilo (1,000)
kcmil	thousand circular mils
K.O.	knock out
kVA	kilovolt ampere
MDMA	meter data management agent
MSP	meter service provider
NEC	National Electric Code
NEM	net energy metering
OH	overhead
OSHA	Occupational Safety and Health Administration
PCC	point of common coupling
psig	pounds per square inch gauge
PRC	California Public Resource Code
PT	potential transformer
PUE	public utility easement
PVC	polyvinyl chloride
scfh	standard cubic feet per hour
SRA	state responsibility areas
SS	soft start
TBF	test-bypass facility
TVSS	transient voltage surge suppressor
UG	underground
UL	Underwriters Laboratories
U.S.	United States
USA	Underground Service Alert
UV	ultraviolet

Acronyms (continued)

V	volts
VFD	Variable Frequency Drive
VT	voltage transformer
W	watt
WC	water column

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Glossary

Applicant: This word is used generically throughout the manual to refer to the Pacific Gas and Electric Company (PG&E) customer, or to the person or persons representing the PG&E customer in the application/construction process, including a contractor, design consultant, or installer. The word “customer” will be used only when the word “applicant” is not appropriate. Also, PG&E will sometimes be referred to as the “Company” throughout this manual.

Attachment Structure: A support that connects the service drop to the structure while maintaining the clearances required for the service drop.

Back-Pressure Protection: A check valve between the downstream (i.e., after) section of the meter and the upstream section of the applicant’s piping. This check valve prevents back-flow.

Barricade (Pedestrian Traffic): A suitable barricade to help ensure the safety of pedestrians is a heavy, wire-mesh fencing that is securely supported and is capable of protecting people from the hazards created by the moving parts of stationary machinery.

Barricade (Vehicular Traffic): A suitable barricade for vehicular traffic is concrete-filled steel pipes, 3 inches or greater in diameter, securely set in an adequate concrete pour for support. Also allowed only for some job types is a sleeve-mounted vehicle barricade where the sleeves are set in concrete.

Branch Service Pipe: A pipe that branches off from a gas service pipe to serve two or more applicants.

Conduit System: A system that includes conduits, conduit bends, conduit fittings, and all related components (e.g., bell ends and cable protectors) that are needed to install PG&E cables and conductors.

Cover: The standard distance between the outer surface of an underground facility and the final grade level.

Double Throw Switch: A switch that isolates the applicant’s electrical system from that of the electrical corporation or state or local agency.

Drip Loop: A minimum 18 inches of service-entrance wiring that extends out from the service weatherhead.

Excess Flow Valve (EFV): A device installed in a gas service line at or near the main. An EFV is used to stop the flow of gas if the velocity of the gas passing through the valve creates a pressure difference across the valve that is greater than a specified design limit.

High-Voltage Power Lines: Generally, high-voltage power lines are any overhead lines that connect from pole to pole. These lines typically are 600 volts and greater.

LB: Short-radius conduit fitting. Also known as a service elbow.

Glossary (continued)

Low-Growth Zone: Applicants must establish a 15-foot low-growth zone on both sides of all new, electric, high-voltage lines. The zone under the electric power lines should be a low-growth, tree-planting zone and/or a shrub- and flower-planting zone.

Main Service Disconnect: A fusible switch, circuit breaker, or other approved disconnect means for controlling all of (and **only**) the energy registered by that meter. When the governing code or ordinance permits, the disconnect means may consist of a group of fusible or circuit-breaker disconnects.

Mixed-Use Projects: Construction projects that include both commercial and residential loads.

Non-Utility Facilities: Subsurface facilities not owned by any person, corporation, partnership, business, trust, or public agency belonging to a regional, one-call notification system.

Pad-Mounted (Floor Standing) Equipment: Service termination and metering equipment that are manufactured to be installed and attached to permanently installed, ground-mounted concrete pads or floors.

Point of Attachment: In areas served from overhead lines, PG&E will install an overhead service drop from the Company's distribution line to a point of attachment on the applicant's residence, building, or structure. The point of attachment may be either on the building wall near the PG&E line or on a periscope fixed to the building's roof, usually not more than 18 inches in back of that wall.

Positive Means: A device that, when used or operated, interrupts or prevents the flow of current to or from the electrical system. Also, a positive means provides the device operator or user with a visual or definite indication of the existing condition or state of the electrical system.

Residential: Class of customers commonly served at either 120/240 volts or 120/208 (network) with amperage ranging from 100 amperes to 320 amperes. Mobile homes installed on foundations also are classified as residential customers.

Secured In Place: The stud will not turn, back out, or loosen in any manner when subjected to normal, UL-approved torques while tightening or loosening terminal nuts. This includes cross-threaded situations.

Service Delivery Point (Electric Supply): The point where PG&E's service drop wires/conductors connect to the applicant's service-entrance conductors for an overhead service. For an underground service, either the point where PG&E's service cables/conductors connect to the applicant's electric meter panel, switchboard, or service termination equipment; or the point where PG&E's service cables/conductors connect directly to applicant's service-entrance conductors.

Glossary (continued)

Service Delivery Point (Gas Supply): The point where PG&E's facilities connect to the applicant's house pipe (i.e., houseline). For **residential** and **small commercial** meter sets, the service delivery point is the point where the male threads of the applicant's houseline connect to the female threads of PG&E's gas service tee fitting. Some **commercial** and **industrial** installations do **not** have service tees installed; therefore, the gas supply service delivery point is the first weld or fitting **after** the PG&E-installed bypass valve downstream of (i.e., after) the meter.

Service Elbow: Short-radius conduit fitting. Also known as an LB.

SmartMeter™ Advanced Meter Reading System: A meter using the latest radio frequency technology to transmit meter reads automatically from the gas and electric meters. This allows PG&E's applicants to monitor their daily usage information.

Standard Delivery Pressure: The gas service pressure provided to the service delivery point at 7 inches of water column (WC). This is approximately 1/4 pounds per square inch gauge (psig), as measured at the gas meter outlet.

Switchboard Service Section: The section of an applicant's switchboard provided specifically for terminating the service conductors and for housing the metering transformers (if required), revenue meters, test facilities, and service switch or breaker.

Tariff: A schedule of rates or charges of a business or a public utility.

Test Block: A test block is a specific type of test-bypass **device**. A test block is used for self-contained metering exclusively.

Test-Bypass Facility: Any mechanism used to bypass meter sockets. A test-bypass facility is used for self-contained metering exclusively.

Utility Point of Service (i.e., Service Point): The approved enclosure and the terminated or spliced connections.

Wall-Mounted Equipment: Service termination and metering equipment that are manufactured to be installed and attached to the sides of permanent structures. Wall-mounted equipment include building walls, panelboard structures, poles, posts, and communication pedestals.

Wet-Utility Piping or Facilities: Includes, but is not limited to, water, bioswales, storm sewer, sanitary sewer, steam, liquid fuels, oil, diesel, sprinkler, irrigation, spigots, downspouts, drain or leach lines, propane, or lines for other liquids or volatile, heavier-than-air gases.

Working Space: An area in front of the meter, the meter enclosure, and the service-conductor termination and pulling facilities. A working space permits access to the equipment and provides a safe working environment for personnel.

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**APPENDIX B
ELECTRIC AND GAS
SERVICE DOCUMENTS**

APPENDIX B ELECTRIC AND GAS SERVICE DOCUMENTS

Appendix B

Electric and Gas Service Documents

Appendix B contains the following PG&E utility documents:

Landscaping Guides

- *Community Wildfire Safety Program Guide to Landscaping in High Fire-Threat Areas*
- *Guide to Safe Landscaping Near Gas Pipelines*
- *Guide to Safe Landscaping Near Underground Electric Lines*
- *Tree Planting Matrix Tables*

Miscellaneous Utility Documents

- [Engineering Material Specification EMS-4123, “Backfill Sand”](#)
- [Street Light Conduit Detail](#)
- [Utility Standard TD-S5453, “Joint Trench,” Appendix B, “Joint Trench Configurations and Occupancy Guide”](#)

Utility Bulletin

- [TD-038193-B003, “New Trench, Backfill, and Warning Tape Requirements for Electric Distribution-Only Trenches”](#)
- [TD-5453B-002, “Updated Separation Requirements For Conduit in Joint Trench”](#)

Utility Procedure

- [TD-7106P-01, “Enhanced Vegetation Management Pre-Inspection Procedure”](#)*

* This document is **not** in the printed manual and is available only in the online version of the [Greenbook](#) on www.pge.com/greenbook.

Applicants should access PG&E’s Internet website at www.pge.com/greenbook to find the latest versions of, and updates to, these documents. Also, applicants may contact their local PG&E service planning offices to ensure their documents are current.

NOTE: See [Table FM-1, “Service Planning Office and Inspection Desk Contact Information,”](#) at the front of this manual starting on Page iv, for specific contact numbers listed by area.

Applicants should refer to PG&E’s *Community Wildfire Safety Program Guide to Landscaping in High Fire-Threat Areas* (included on the following two pages) for updated guidance on extending the defensible space around your property, specifically around power lines. Following this guidance could help save both real estate and lives.



Community Wildfire Safety Program

Guide to Landscaping in High Fire-Threat Areas

Following California's recent wildfires, we are working together with customers in high fire-threat areas to create safe space between trees, limbs and power lines. This work is an additional precautionary measure intended to help reduce the risk of wildfire and keep you, your neighbors and your community safe.



Similar to landscaping within the defensible space around your home, the right plant in the right place around power lines can extend the defensible space around your property. When planting near power lines, follow these guidelines:

DO:

- ✓ Use fire-resistant ground covers and shrubs that may resist ignition (please note that fire-resistant does not mean the plant is fire proof)
- ✓ Use high-moisture plants that have low sap or resin content
- ✓ Use plants that tend to not accumulate dry, dead material
- ✓ Use plants that grow low and close to the ground
- ✓ Use native species to your area
- ✓ Follow the proper spacing distances, as outlined on this guide
- ✓ Check with your local nursery for fire-resistant plants that are adaptable to your area and ensure plants are properly maintained and spaced for growth
- ✓ Remember to always properly maintain the health of your landscaping, ensuring proper watering and pruning when necessary

DO NOT:

- ✗ Plant trees near homes, sheds, electric poles or other infrastructure
- ✗ Use plants that contain fine or dry material such as twigs and needles (e.g. Junipers and Cypresses)
- ✗ Use plants that contain flammable substances such as oils, resins, wax, or pitch; these plants may have aromatic leaves or have a strong odor when crushed
- ✗ Use plants that produce a large volume of litter
- ✗ Introduce invasive plant species to your specific area

Spacing between vegetation can help reduce the potential for fire to spread. Depending on the slope of your property, the table below outlines the horizontal distance recommended between trees and shrubs, and the vertical distance needed between the lowest tree branch and the ground or vegetation underneath the tree.

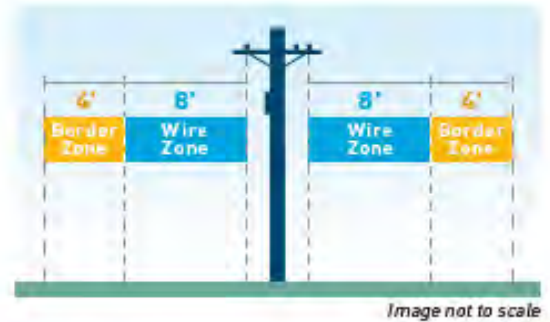
HORIZONTAL SPACING:

Slope	Distance between tree canopies	Distance between shrubs
Flat to mild slope (less than 20%)	10 feet	2 times the height of the shrub (i.e. a 2 foot tall shrub must be 4 feet away from all other vegetation)
Mild to moderate slope (20%–40%)	20 feet	4 times the height of the shrub
Moderate to steep slope (greater than 40%)	30 feet	6 times the height of the shrub

VERTICAL SPACING:

Slope	Distance from lowest tree branch to the ground or vegetation
Flat to mild slope (less than 20%)	6 feet
Mild to moderate slope (20%–40%)	10 feet
Moderate to steep slope (greater than 40%)	15 feet

The right plant in the right location can enhance the defensible space around your home. Below is a list of groundcovers, perennials and shrubs that are compatible in certain areas around power lines. Please note that the suggested list is not all-inclusive.



Wire Zone — 8 feet from either side of the conductor, plants should not exceed 12" in height at maturity.

GROUNDCOVERS:

Bellflower (<i>Campanula portenschlagiana</i>)	Creeping Phlox (<i>Phlox subulata</i>)	Hens and Chicks (<i>Sempervivum species</i>)	Speedwell (<i>Veronica species</i>)	Purple Iceplant (<i>Delosperma cooperi</i>)
Carpet Bugleweed (<i>Ajuga reptans</i>)	Creeping Thyme (<i>Thymus praecox</i>)	Japanese Pachysandra (<i>Pachysandra terminalis</i>)	Star Jasmine (<i>Trachelospermum jasminoides</i>)	Rock Cress (<i>Aubrieta deltoidea</i>)
Crane's Bill (<i>Geranium incanum</i>)	Dead Nettle (<i>Lamium species</i>)	Mahala Mat (<i>Ceanothus prostratus</i>)	Orange Gazania, Treasure Flower (<i>Gazania 'Mitsuwa Orange'</i>)	Western Sword Fern (<i>Polystichum munitum</i>)
Creeping Mahonia (<i>Mahonia repens</i>)	Dianthus, Garden Carnation or Pinks (<i>Dianthus species</i>)	Sedum or Stonecrops (<i>Sedum species</i>)	Pink Pussytoes (<i>Antennaria rosea</i>)	Wild Strawberry (<i>Fragaria species</i>)
				Yellow Iceplant (<i>Delosperma nubigenum</i>)

PERENNIALS:

Basket-of-Gold (<i>Aurinia saxatilis</i>)	Columbine (<i>Aquilegia species</i>)	Evening Primrose (<i>Oenothera species</i>)	Sea Thrift (<i>Armeria maritima</i>)	Western Columbine (<i>Aquilegia formosa</i>)
Blanket Flower (<i>Gaillardia varieties</i>)	Coneflower (<i>Echinacea purpurea</i>)	Heartleaf Bergenia (<i>Bergenia cordifolia</i>)	Sun Rose (<i>Helianthemum nummularium</i>)	Yarrow (<i>Achillea species</i>)
Chives (<i>Allium schoenoprasum</i>)	Coreopsis or Tickseed (<i>Coreopsis species</i>)	Lamb's Ear (<i>Stachys byzantina</i>)		

Border Zone — 4 feet from Wire Zone, shrubs should not exceed 48" in height at maturity

SHRUBS:

Beach or Sandhill Sage, Coastal Sagewort (<i>Artemisia pycnocephala</i>)	Creeping Boobiala (<i>Myoporum parvifolium</i>)	Creeping Holly (<i>Mahonia repens</i>)	Dwarf Mock Orange (<i>Fittosporum 'Wheeler's Dwarf'</i>)	Point Reyes Ceanothus (<i>Ceanothus gloriosus</i>)
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The above list includes plants suited for most California climate zones, however each location is different. PG&E makes no representation or guarantee that these plants are suitable for every location. Please consult your local nursery for more information.

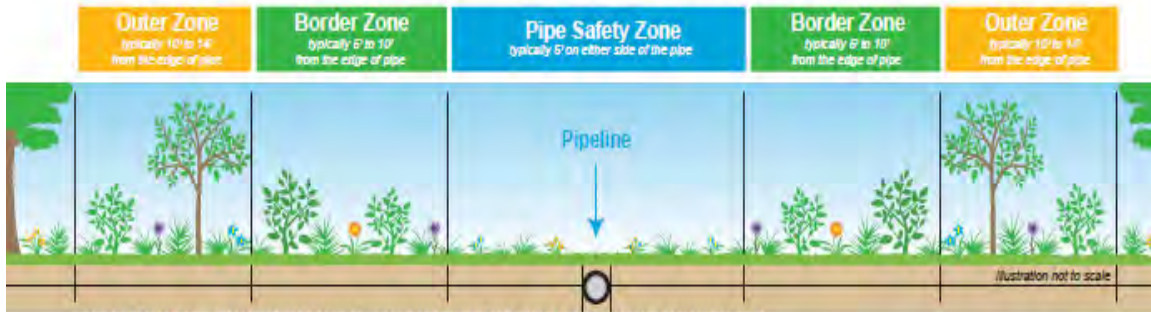
Visit us at pge.com/wildfiresafety to learn more about PG&E's Community Wildfire Safety Program. For more information and additional lists of potentially suitable, fire-resistant plants, visit readyforwildfire.org/Fire-Safe-Landscaping or firesafecouncil.org.

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Community Pipeline Safety Initiative Guide to Safe Landscaping Near Gas Pipelines

When planning new landscaping near underground utilities, it's important to remember that the right plant in the right location can both enhance the natural beauty of your home and help protect the safety of your community. Trees and plants located too close to gas transmission pipelines can delay emergency access for safety crews and damage pipes. Below is a list of ultra-drought tolerant plant types that are safe in certain locations around the pipeline. Please note the suggested list is not all-inclusive.



Please note easement widths can vary and the above represents best practices and guidance for safe landscaping near gas pipelines.

Pipe Safety Zone				
Lawns, flowers, low-profile grasses and low-growing herbaceous plants are permitted within the Pipe Safety Zone. See the list below for plant suggestions.				
azure penstemon* (<i>Penstemon azureus</i>)	California poppy* (<i>Eschscholzia californica</i>)	grama grass* (<i>Bouteloua</i> spp.)	purple needle grass* (<i>Stipa pulchra</i>)	stonecrop* (Sedum spp.)
belladonna lily (<i>Amaryllis belladonna</i>)	chalk lettuce (<i>Dudleya</i> spp.)	June grass* (<i>Koeleria macrantha</i>)	sea lavender* (<i>Limonium</i> spp.)	thyme* (Thymus spp.)
blue eyed grass* (<i>Sisyrinchium bellum</i>)	daffodil (<i>Narcissus</i> spp.)	kangaroo paw (<i>Anigozanthos</i> spp.)	showy milkweed* (<i>Asclepias speciosa</i>)	UC Verde buffalograss (<i>Buchloe dactyloides</i> UC Verde)
Bulbine (<i>Calylophus</i> spp.)	dymondia (<i>Dymondia margaretae</i>)	Monardella* (<i>Monardella</i> spp.)	silverbush (<i>Convolvulus cneorum</i>)	yarrow* (Achillea spp.)
				yellow sundrops (<i>Calylophus</i> spp.)
Border Zone				
Small to medium shrubs with a trunk or main branch less than 8" in diameter at full maturity are permitted within the Border Zone. Diameter is measured at chest height. See the list below for plant suggestions.				
Adam's needle (<i>Yucca filamentosa</i>)	California fuchsia* (<i>Epilobium canum</i>)	coyote brush* (<i>Baccharis pilularis</i>)	pipstem clematis* (<i>Clematis lasiantha</i>)	silver bush lupine* (<i>Lupinus albus</i>)
agave* (<i>Agave</i> spp.)	California lilac* (<i>Ceanothus</i> spp.)	island tree poppy* (<i>Dendromecon</i> spp.)	rockrose* (<i>Cistus</i> spp.)	sticky monkey flower* (<i>Mimulus aurantiacus</i>)
bear grass (<i>Nolina microcarpa</i>)	California native sage* (<i>Salvia</i> spp.)	manzanita* (<i>Arctostaphylos</i> spp.)	sacaton* (<i>Sporobolus</i> spp.)	westringia (<i>Westringia</i> spp.)
buckwheat* (<i>Eriogonum</i> spp.)	California sagebrush* (<i>Artemisia</i> spp.)	matilija poppy* (<i>Romneya coulteri</i>)	smoke tree (<i>Cotinus coccinea</i>)	wild rye grass* (<i>Leymus</i> spp.)
bush anemone* (<i>Carpenteria californica</i>)	coffeeberry* (<i>Rhamnus californica</i>)	mountain mahogany (<i>Cercocarpus betuloides</i>)	snowberry* (<i>Symphoricarpos</i> spp.)	wooly blue curls* (<i>Trichostema lanatum</i>)
Outer Zone				
Large shrubs and small trees with a trunk less than 36" in diameter at full maturity are permitted within the Outer Zone; however, if space allows, we recommend planting trees at an even greater distance from the pipeline. Diameter is measured at chest height. See the list below for small tree suggestions.				
bottlebrush (<i>Callistemon viminalis</i>)	chitalpa (<i>X Chitalpa tashkentensis</i>)	honey mesquite* (<i>Prosopis glandulosa</i>)	madrone/strawberry tree* (<i>Arbutus</i> spp.)	toyon* (<i>Heteromeles arbutifolia</i>)
Catalina cherry* (<i>Prunus ilicifolia</i> spp. lyonii)	desert willow (<i>Chilopsis linearis</i>)	lemonade berry (<i>Rhus integrifolia</i>)	Olive (Fruitless) (<i>Olea europaea</i> 'Swan Hill')	tree yuccas* (<i>Yucca</i> spp.)
Catalina ironwood* (<i>Lyonothamnus floribundus</i> ssp. <i>asplenifolius</i>)	flannel bush* (<i>Fremontodendron</i> spp.)	lilac chastetree (<i>Vitex agnus-castus</i>)	paloverde* (<i>Parkinsonia</i> spp.)	western redbud* (<i>Cercis occidentalis</i>)

* California native plants



Be Safe. Dig Safe.

Before you begin any landscaping work, always call 811 at least two business days in advance. With one free call to 811, PG&E will send a crew that can mark our underground gas and electric facilities before you begin work, helping you plan a safe project.

The above list includes water-wise plants suited for most California climate zones, however each location is different. PG&E makes no representation or guarantee that these plants are suitable for every location. Please consult your local nursery for more information. If there is an electric powerline on or near your property, there may be additional land use restrictions. Please take care to consult any easement agreement you may have for your property or call PG&E at 1-877-259-8314.

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5/26/16



Guide to Safe Landscaping Near Underground Electric Lines

When planning new landscaping near underground utilities, it's important to remember that the right plant in the right location can both enhance the natural beauty of your home or business and help protect your community. Trees and plants located too close to underground electric lines can delay emergency access for safety crews and damage lines. Below is a list of ultra-drought tolerant plant types that are safe in certain locations around the electric lines. Please note the suggested list is not all-inclusive.



Electric Safety Zone

Lawns, flowers, low-profile grasses and low-growing herbaceous plants are permitted within the electric Safety Zone. See the list below for plant suggestions.

azure penstemon* (<i>Penstemon azureus</i>)	California poppy* (<i>Eschscholzia californica</i>)	grama grass* (<i>Bouteloua</i> spp.)	purple needle grass* (<i>Stipa pulchra</i>)	stonecrop* (Sedum spp.)
belladonna lily (<i>Amaryllis belladonna</i>)	chalk lettuce (<i>Dudleya</i> spp.)	June grass* (<i>Koeleria macrantha</i>)	sea lavender* (<i>Limonium</i> spp.)	thyme* (Thymus spp.)
blue eyed grass* (<i>Sisyrinchium bellum</i>)	daffodil (<i>Narcissus</i> spp.)	kangaroo paw (<i>Anigozanthos</i> spp.)	showy milkweed* (<i>Asclepias speciosa</i>)	UC Verde buffalograss (<i>Buchloe dactyloides</i> 'UC Verde')
Bulbine (<i>Calylophus</i> spp.)	dymondia (<i>Dymondia margaretae</i>)	Monardella* (<i>Monardella</i> spp.)	silverbush (<i>Convolvulus cneorum</i>)	yarrow* (Achillea spp.)
				yellow sundrops (<i>Calylophus</i> spp.)

Border Zone

Small to medium shrubs with a trunk or main branch less than 8" in diameter at full maturity are permitted within the Border Zone. Diameter is measured at chest height. See the list below for plant suggestions.

Adam's needle (<i>Yucca filamentosa</i>)	California fuchsia* (<i>Epilobium canum</i>)	coyote brush* (<i>Baccharis pilularis</i>)	pipestem clematis* (<i>Clematis lasiantha</i>)	silver bush lupine* (<i>Lupinus albus</i>)
agave* (<i>Agave</i> spp.)	California lilac* (<i>Ceanothus</i> spp.)	island tree poppy* (<i>Dendromecon</i> spp.)	rockrose* (<i>Cistus</i> spp.)	sticky monkey flower* (<i>Mimulus aurantiacus</i>)
bear grass (<i>Nolina microcarpa</i>)	California native sage* (<i>Salvia</i> spp.)	manzanita* (<i>Arctostaphylos</i> spp.)	sacaton* (<i>Sporobolus</i> spp.)	westringia (<i>Westringia</i> spp.)
buckwheat* (<i>Eriogonum</i> spp.)	California sagebrush* (<i>Artemisia</i> spp.)	matilija poppy* (<i>Romneya coulteri</i>)	smoke tree (<i>Cotinus coggygria</i>)	wild rye grass* (<i>Leymus</i> spp.)
bush anemone* (<i>Carpenteria californica</i>)	coffeeberry* (<i>Rhamnus californica</i>)	mountain mahogany (<i>Cercocarpus betuloides</i>)	snowberry* (<i>Symphoricarpos</i> spp.)	wooly blue curls* (<i>Trichostema lanatum</i>)

Outer Zone

Large shrubs and small trees with a trunk less than 36" in diameter at full maturity are permitted within the Outer Zone; however, if space allows, we recommend planting trees at an even greater distance from the electric lines. Diameter is measured at chest height. See the list below for small tree suggestions.

bottlebrush (<i>Callistemon viminalis</i>)	chitalpa (<i>X Chitalpa tashkentensis</i>)	honey mesquite* (<i>Prosopis glandulosa</i>)	madrone/strawberry tree* (<i>Arbutus</i> spp.)	toyon* (<i>Heteromeles arbutifolia</i>)
Catalina cherry* (<i>Prunus ilicifolia</i> spp. 'Iyonii')	desert willow (<i>Chilopsis linearis</i>)	lemonade berry (<i>Rhus integrifolia</i>)	Olive (Fruitless) (<i>Olea europaea</i> 'Swan Hill')	tree yuccas* (<i>Yucca</i> spp.)
Catalina ironwood* (<i>Lyonothamnus floribundus</i> ssp. <i>asplenifolius</i>)	flannel bush* (<i>Freemontodendron</i> spp.)	lilac chastetree (<i>Vitex agnus-castus</i>)	paloverde* (<i>Parkinsonia</i> spp.)	western redbud* (<i>Cercis occidentalis</i>)

* California native plants



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The above list includes water-wise plants suited for most California climate zones, however each location is different. PG&E makes no representation or guarantee that these plants are suitable for every location. Please consult your local nursery for more information. If there is an electric powerline on or near your property, there may be additional land use restrictions. Please take care to consult any easement agreement you may have for your property or call PG&E at 1-877-259-8314.

5/28/16

■ Tree Planting Matrix Tables

Applicants *should not plant* trees either under or adjacent to power lines. IF applicants decide to plant trees or shrubs on their properties, attached is a list of low-growing, fire-resistant vegetation to consider for ground cover near facilities.

Table B-1 through Table B-6 list trees that are suitable for planting ***near*** (**not adjacent to or under**) power lines. The trees are listed by genus and species in each table. The list is limited and does not include all suitable trees; however, applicants can use this information as a **guideline** for choosing an appropriate tree for planting ***near*** power lines. The basic rule of thumb is to choose plants that grow to be 25 feet or less at maturity. For additional suggestions about appropriate trees, consult with nurseries, certified arborists, gardening books, and websites like [SelectTree](http://ecologycenter.org/directory/directory-entries/selectree/) at <http://ecologycenter.org/directory/directory-entries/selectree/> (maintained by the Urban Forest Ecosystems Institute at Cal Poly State University, San Luis Obispo).

PG&E urges applicants to consider planting shrubs, grasses, and flowers near and under power lines. By selecting low-growing vegetation, applicants ensure that trimming back intrusive growth is not an issue.

Table B-1 Plant Matrix for Stockton, Yosemite, Fresno, and Kern Divisions ¹

Botanical Name Genus and Species	Common Name	Evergreen vs. Deciduous	Height and Spread (in feet)	Drought Tolerant	Special Considerations	Climate Zones ²
<i>Acer buergeranum</i>	Trident Maple	D	25 s	No	Low spreading growth, red to yellow fall color.	4-9, 14-16, 20, 21
<i>Acer palmatum</i>	Japanese Maple	D	25 h	No	Green leaf varieties tolerate sun best, fire resistance favorable.	1-9, 14-24
<i>Cercis canadensis</i>	Eastern Redbud	D	25-40 h ³	No	Small rosy pink flowers in early spring, is easily killed by over-watering.	1-3, 7-20
<i>Cotinus coggygia</i> 'prupurea'	Smoke Tree	D	25 h	—	Branches droop but resist breakage, full sun, dramatic puffs of purple to lavender from fading flowers.	1-24
<i>Crataegus laevigata</i>	English Hawthorn	D	25 h 15 s	—	Thorny branches, need pruning to thin out excess twiggy growth, bright rose to red flowers.	1-11, 14-17
<i>Koelreuteria paniculata</i> 'Kew' or 'Fastigiata'	Golden Rain Tree	D	25 h	No	Branches susceptible to breakage, soil should be well drained, prune to shape.	2-21
<i>Lagerstroemia x faueri</i> cultivars with Indian names	Crape Myrtle (cultivar mentioned w/ Indian names are resistant to powdery mildew)	D	25 h 25 s	Yes	Attracts birds, plant in full sun, various flower colors available, white, red, pink, purple.	7-9, 12-14, 18-21
<i>Laurus saratoga</i>	Saratoga Laurel	E	25 h	—	Compact erect tree, takes pruning well, needs good drainage.	5-9, 12-24
<i>Pittosporum tobira</i>	Tobira	E	15 h	Yes	Small tree. Rarely grows to 30 feet, favorable fire resistance, takes pruning well, full sun or partial shade, clusters of creamy white flowers in spring.	8-24
<i>Prunus cerasifera</i> 'krauter vesuvius' 'thundercloud' and 'newport'	Flowering Plum	E	18 h 12 s	—	Profuse fragrant pink flowers early spring, leaves purple/black, no or little fruit, several cultivars to choose from.	2-22
<i>Syringa reticulata</i>	Japanese Tree Lilac	D	30 h ³	—	Large shrub easily trained as single-stemmed tree, useful as small shade and street tree, showy white flowers in spring.	1-12, 14-16

¹ Plant Matrix for Stockton Division (Amador, Calaveras, San Joaquin, Alpine) (Zones 7, 8, 9, 14), Yosemite Division (Stanislaus, Merced, Tuolumne, Mariposa, Madera) (Zones 1, 7, 8, 9), Fresno Division (Fresno, Kings) (Zones 1, 7, 8, 9) and Kern Division (Kern) (Zones 1, 2, 7, 8, 9).

² Refer to the climate zone map in *Sunset Western Garden Book* for the climate zone in your area.

³ Trees referenced as growing to 30 feet (or more) at maturity generally do not reach their maximum height except under optimum growing conditions.

Table B-2 Plant Matrix for San Francisco, Peninsula, and DeAnza Divisions ¹

Botanical Name Genus and Species	Common Name	Evergreen vs. Deciduous	Height and Spread (in feet)	Drought Tolerant	Special Considerations	Climate Zones ²
<i>Acer griseum</i>	Paperbark Maple	D	25 h	No	Late to leaf out in spring, narrow rounded crown, brilliant red fall color.	1-9, 14-21
<i>Arbutus unedo</i>	Strawberry Tree	E	35 h ³	—	Rarely exceeds 15-20 feet in coastal areas, fire resistance favorable, hanging pink/red flowers, fruit looks similar to strawberries.	4-24
<i>Cercis occidentalis</i>	Western Redbud	D	25 h	Yes	California native, attractive changing flower and foliage color, is easily killed by over-watering.	2-24
<i>Crateagus lavallei</i>	Carreiere Hawthorn	D	25 h 15-20 s	—	Dark green leaves, turn bronze red after sharp frost, white flowers in spring, red and orange fruit can be messy on walkways.	1-11, 14-17
<i>Eriobotrya deflexa</i> 'coppertone'	Bronze Loquat	E	25 h 25 s	No	Shrubby, easily trained to a tree, new growth is copper for long time before turning green.	8-24
<i>Garrya elliptica</i>	Coast Silktassel	E	25 h	Yes	California native, fire resistance favorable graceful yellowish/green catkins 3-inches to 8-inches long on males.	5-9, 14-21
<i>Koelreuteria paniculata</i> 'Kew' or 'Fastigiata'	Golden Rain Tree	D	25 h	No	Branches susceptible to breakage, soil should be well drained, prune to shape.	2-21
<i>Leptospermum laevigatum</i>	Australian Tea Tree	E	30 h ³ 30 s	Yes	Grows best near the coast, flowers in spring, needs full sun, it is quite frost sensitive.	14-24
<i>Rhus lancea</i>	African Sumac	E	25 h 20 s	Yes	Slow growing, takes high summer heat. Can be multi-stemmed or trained to one stem tree. Good screen.	8, 9, 12-24
<i>Prunus cerasifera</i> 'krauter vesuvius' 'thundercloud' and 'newport'	Flowering Plum	E	18 h 12 s	—	Profuse fragrant pink flowers early spring, leaves purple/black, no or little fruit, several cultivars to choose from.	2-22
<i>Prunus serrulata</i> 'Kwanzan'	Flowering Cherry	D	25 h	—	Spectacular spring flowers, needs moist protected site, good soil drainage and full sun.	2-7, 14-20

¹ Plant Matrix for San Francisco Division (San Francisco) (Zone 17), Peninsula Division (San Mateo) (Zones 14, 15, 16, 17) and De Anza Division (Santa Clara) (Zones 15, 16, 17).

² Refer to the climate zone map in *Sunset Western Garden Book* for the climate zone in your area.

³ Trees referenced as growing to 30 feet (or more) at maturity generally do not reach their maximum height except under optimum growing conditions.

Table B-3 Plant Matrix for San Jose, Central Coast, and Los Padres Divisions ¹

Botanical Name Genus and Species	Common Name	Evergreen vs. Deciduous	Height and Spread (in feet)	Drought Tolerant	Special Considerations	Climate Zones ²
<i>Acer griseum</i>	Paperbark Maple	D	25 h	No	Late to leaf out in spring, narrow rounded crown, brilliant red fall color.	1-9, 14-21
<i>Crateagus phaenopyrum</i>	Washington Thorn	D	25 h 20 s	—	Orange red fall foliage, shiny red fruit, light open limb structure, least susceptible to fireblight.	1-11, 14-17
<i>Eriobotrya deflexa</i> 'coppertone'	Bronze Loquat	E	25 h	No	Shrubby, easily trained to a tree, new growth is copper for long time before turning green.	8-24
<i>Laurus saratoga</i>	Saratoga Laurel	E	25 h	—	Compact erect tree, takes pruning well, needs good drainage.	5-9, 12-24
<i>Ligustrum ovalifolium</i>	California Privet	semi-deciduous	15 h	—	Inexpensive hedge plant, takes pruning well.	4-24
<i>Malus floribunda</i> 'adams', 'robinson'	Crabapple	D	25 h 30 s	—	Attracts birds and bees, good disease resistance, <i>several cultivars to choose from.</i>	1-11, 14-21
<i>Myoporum insulare</i>	Myoporum	E	30 h ³ 20 s	—	Fire resistant, takes full sun, it is quite frost sensitive.	8, 9, 15-17, 19-24
<i>Myrica californica</i>	Pacific Wax-myrtle	E	25 h	Yes	California native, fire resistance favorable.	4, 5, 6, 14-17, 20-24
<i>Olea europaea</i> 'Swan Hill'	Fruitless Olive	E	30 h ³ 25 s	—	Does well in areas with hot dry summers, full sun, withstands heavy pruning.	8, 9, 11-24
<i>Pittosporum tobira</i>	Tobira	E	25 h	Yes	Small tree. Rarely grows to 30 feet, favorable fire resistance, takes pruning well, full sun or partial shade, clusters of creamy white flowers in spring.	8-17, 19-24
<i>Prunus cerasifera</i> 'krauter vesuvius' 'thundercloud' and 'newport'	Flowering Plum	E	18 h 12 s	—	Profuse fragrant pink flowers early spring, leaves purple/black, no or little fruit, <i>several cultivars to choose from.</i>	2-22
<i>Tristania laurina</i> 'Elegans'	Elegant Brisbane Box	E	25 h	No	Can be trained to be a single or multi-stemmed trunk, excellent for screen and boundary planting.	15-18, 19-24

¹ Plant Matrix for San Jose Division (Santa Clara) (Zones 15, 16, 17), Central Cost Division (Santa Cruz, San Benito, Monterey) (Zones 7, 14, 15, 16, 17) and Los Padres Division (San Luis Obispo, Santa Barbara) (Zones 2, 3, 7, 14, 15, 16, 17, 18, 23, 24).

² Refer to the climate zone map in *Sunset Western Garden Book* for the climate zone in your area.

³ Trees referenced as growing to 30 feet (or more) at maturity generally do not reach their maximum height except under optimum growing conditions.

Table B-4 Plant Matrix for North Valley, Sierra, and Sacramento Divisions ¹

Botanical Name Genus and Species	Common Name	Evergreen vs. Deciduous	Height and Spread (in feet)	Drought Tolerant	Special Considerations	Climate Zones ²
<i>Acer ginnala</i>	Amur Maple	D	25 h	No	Multi-trunk large shrub or trained at nursery as one stem tree, striking red fall color.	1-9, 14-16
<i>Acer palmatum</i>	Japanese Maple	D	25 h	No	Green leaf varieties tolerate sun best, fire resistance favorable.	1-9, 14-24
<i>Cercocarpus ledifolius</i>	Curly Leaf Mountain Mahogany	E	20 h	Yes	Native to dry mountain slopes, attractive open branching pattern, OK in full sun.	1-3, 7-14, 18, 19
<i>Cornus kousa</i>	Kousa Dogwood	D	25 h	No	Needs ample water, big multi-stem shrub can be trained to a tree, white flowers.	3-9, 14, 15, 18, 19
<i>Crateagus phaenopyrum</i>	Washington Thorn	D	25 h 20 s	—	Orange red fall foliage, shiny red fruit, light open limb structure, least susceptible to fireblight.	1-11, 14-17
<i>Garrya elliptica</i>	Coast Silktassel	E	25 h	Yes	California native, fire resistance favorable, graceful yellowish/green catkins 3-inches to 8-inches long on males.	5-9, 14-21
<i>Lagerstroemia x faueri</i> cultivars with Indian names	Crape Myrtle (cultivar mentioned w/ Indian names are resistant to powdery mildew)	D	25 h 25 s	Yes	Attracts birds, plant in full sun, various flower colors available, white, red, pink, purple.	7-9, 12-14, 18-21
<i>Laurus saratoga</i>	Saratoga Laurel	E	25 h	—	Compact erect tree, takes pruning well, needs good drainage.	5-9, 12-24
<i>Sorbus aucuparia</i>	European Mountain Ash	E	30 h ³ 20 s	—	Stands winter cold, strong winds, low humidity and extreme heat, attractive to birds, bright fruit, clustered white flowers.	1-10, 14-17
<i>Styrax japonica</i>	Japanese Snowdrop Tree, Japanese Snowbell	D	30 h ³	No	Needs well drained soil, full sun or part shade, plenty of water. Prune to control shape, tends to be shrubby if lower branches left.	3-10, 14-21
<i>Syringa reticulata</i>	Japanese Tree Lilac	D	30 h ³	—	Large shrub easily trained as single-stemmed tree, useful as small shade and street tree, white showy flowers in spring.	1-12, 14-16

¹ Plant Matrix for North Valley Division (Shasta, Tehama, Glenn, Butte) (Zones 1, 7, 8, 9), Sierra Division (Sutter, Yuba, Nevada, Sierra, Placer, El Dorado) (Zones 1, 7, 8, 9) and Sacramento Division (Yolo, Colusa, Solano) (Zones 7, 8, 9, 14).

² Refer to the climate zone map in *Sunset Western Garden Book* for the climate zone in your area.

³ Trees referenced as growing to 30 feet (or more) at maturity generally do not reach their maximum height except under optimum growing conditions.

Table B-5 Plant Matrix for Diablo, Mission, and East Bay Divisions ¹

Botanical Name Genus and Species	Common Name	Evergreen vs. Deciduous	Height and Spread (in feet)	Drought Tolerant	Special Considerations	Climate Zones ²
<i>Aesculus californica</i>	California Buckeye	D	25 h needs room, very wide spreading	Yes	California native, grows best in cool, coastal foothills.	4-7, 14-19
<i>Acer truncatum</i>	"Truncatum" Maple	D	20 h	No	Adaptable tree, leaves are purplish red, summer green, dark purple in autumn.	1-9, 14-23
<i>Cercis canadensis</i>	Eastern Redbud	D	25-35 h ³	No	Small rosy pink flowers in early spring, is easily killed by over-watering.	1-3, 7-20
<i>Crateagus phaenopyrum</i>	Washington Thorn	D	25 h 20 s	—	Orange red fall foliage, shiny red fruit, light open limb structure, least susceptible to fireblight.	1-11, 14-17
<i>Laurus saratoga</i>	Saratoga Laurel	E	25 h	—	Compact erect tree, takes pruning well, needs good drainage.	5-9, 12-24
<i>Ligustrum ovalifolium</i>	California Privet	semi- deciduous	15 h	—	Inexpensive hedge plant, takes pruning well.	4-24
<i>Magnolia stellata</i>	Star Magnolia	D	10 h 20 s	No	Profuse bloom in late winter, early spring.	1-9, 14-24
<i>Malus floribunda</i> 'adams', 'robinson'	Crabapple	D	25 h 30 s	—	Attracts birds and bees, good disease resistance, <i>several cultivars to choose from.</i>	1-11, 14-21
<i>Prunus cerasifera</i> 'krauter vesuvius' 'thundercloud' and 'newport'	Flowering Plum	E	18 h 12 s	—	Profuse fragrant pink flowers early spring, leaves purple/black, no or little fruit, <i>several cultivars to choose from.</i>	2-22
<i>Prunus serrulata</i> 'Kwanzan'	Flowering Cherry	D	25 h	—	Spectacular spring flowers, needs moist protected site, good soil drainage and full sun.	2-7, 14-20
<i>Styrax japonica</i>	Japanese Snowdrop Tree, Japanese Snowbell	D	30 h ³	No	Needs well-drained soil, full sun or part shade, plenty of water, prune to control shape, tends to be shrubby if lower branches left.	3-10, 14-21

¹ Plant Matrix for Diablo Division (Alameda, Contra Costa) (Zones 15, 16, 17), Mission Division (Alameda) (Zones, 7, 14, 15) and East Bay Division (Contra Costa) (Zones 7, 14, 15, 16, 17).

² Refer to the climate zone map in *Sunset Western Garden Book* for the climate zone in your area.

³ Trees referenced as growing to 30 feet (or more) at maturity generally do not reach their maximum height except under optimum growing conditions.

Table B-6 Plant Matrix for North Coast and North Bay Divisions ¹

Botanical Name Genus and Species	Common Name	Evergreen vs. Deciduous	Height and Spread (in feet)	Drought Tolerant	Special Considerations	Climate Zones ²
<i>Acer truncatum</i>	"Truncatum" Maple	D	20 h	No	Adaptable tree, leaves are purplish red, summer green, dark purple in autumn.	1-9, 14-23
<i>Aesculus californica</i>	California Buckeye	D	25 h needs room, very wide spreading	Yes	California native, grows best in cool, coastal foothills.	4-7, 14-19
<i>Amelanchier alnifolia</i>	Mountain Serviceberry	D	20 h	—	Suited to mountainous parts of the west, attractive foliage changes color.	1-6, 15, 16, 17
<i>Callistemon citrinus</i>	Lemon Bottlebrush	E	25 h	Yes	Favorable fire resistance, attracts hummingbirds, shrub easily trained to a tree, it is quite frost sensitive.	8, 9, 12-24
<i>Cercis occidentalis</i>	Western Redbud	D	25 h	Yes	California native, attractive changing flower and foliage color, is easily killed by over watering.	2-24
<i>Cotinus coggygia</i> <i>'purpurea'</i>	Smoke Tree	D	25 h	—	Branches droop but resist breakage, full sun, dramatic puffs of purple to lavender from fading flowers.	1-24
<i>Crataegus laevigata</i>	English Hawthorn	D	25 h 15 s	—	Thorny branches, need pruning to thin out excess twiggy growth, bright rose to red flowers.	1-11, 14-17
<i>Eriobotrya deflexa</i> <i>'coppertone'</i>	Bronze Loquat	E	25 h	No	Shrubby, easily trained to a tree, new growth is copper for long time before turning green.	8-24
<i>Leptospermum laevigatum</i>	Australian Tea Tree	E	30 h ³ 30 s	Yes	Grows best near the coast, flowers in spring, needs full sun, it is quite frost sensitive.	14-24
<i>Myoporum insulare</i>	Myoporum	E	30 h ³ 20 s	—	Fire resistant, takes full sun, tough, fast growing, it is quite frost sensitive.	8, 9, 15-17, 19-24
<i>Styrax japonica</i>	Japanese Snowdrop Tree, Japanese Snowbell	D	30 h ³	No	Needs well-drained soil, full sun or part shade, plenty of water, prune to control shape, tends to be shrubby if lower branches left.	3-10, 14-21

¹ Plant Matrix for North Coast (counties Humboldt, Mendocino, Lake, Sonoma) (Zones 1, 2, 14, 15, 17) and North Bay Division (counties Napa, Marin) (Zones 7, 14, 15, 16, 17).

² Refer to the climate zone map in *Sunset Western Garden Book* for the climate zone in your area.

³ Trees referenced as growing to 30 feet (or more) at maturity generally do not reach their maximum height except under optimum growing conditions.

PG&E-Prohibited Trees

Applicants must **not** plant the trees listed in Table B-7, "Do Not Plant These Trees Under or Within 15 Feet of Overhead Power Lines," under or within 15 feet of overhead power lines. When mature, these trees affect PG&E's ability to provide and maintain safe and reliable service. Many species of trees are **not** appropriate for confined spaces under electric lines, although they may be appropriate for other locations within a development or building site. The list is limited and does not include all varieties of unsuitable trees; however, applicants can use this information as a **guideline** when choosing an appropriate tree for planting near power lines. Applicants should plant trees that grow higher than 25 feet at maturity **at least 15 feet to the side of overhead power lines**.

Under the botanical names of the trees, occasionally only the genus is listed. Applicants should not plant **any** types of trees within these genera **under or within 15 feet of overhead power lines.**

Table B-7 Do Not Plant These Trees Under or Within 15 Feet of Overhead Power Lines

Botanical Name (Genus and species)	Common Name	Evergreen vs Deciduous	Height and Spread (in feet)	Special Considerations	Climate Zones ¹
<i>Acacia baileyana</i>	Bailey Acacia	—	30 h	Most commonly planted. Fast growing, short lived.	7-9, 13-24
<i>Acacia mellanoxylon</i>	Blackwood Acacia	—	40 h 20 s	Fast dense upright growth. Roots aggressive, lifts sidewalks, splits easily and suckers (grows from the roots).	8, 9, 13-24
<i>Acer macrophyllum</i>	Bigleaf Maple	D	30-95 h	Native to California foothills, too big for small gardens and streets.	4-17
<i>Acer negundo</i>	Box Elder	D	60 h	Fast growing, seeds readily, subject to breakage.	1-10, 12-24
<i>Acer rubrum</i>	Red Maple	D	40+ h 20+ s	Fast growing, red twigs, branchlets and buds.	1-9, 14-17
<i>Acer saccharinum</i>	Silver Maple	D	40-100 h equal spread	Fast growth, weak wood.	1-9, 12, 14-24
<i>Ailanthus altissima</i>	Tree of Heaven	D	50 h	Fast growing, suckers and self seeds.	All zones
<i>Alnus spp.</i>	Alder Trees	D	40-90 h	Relatively fast growing, invasive roots, several native California species.	Various
<i>Eucalyptus</i>	Eucalyptus	E	30-200 h	Fast growing, invasive roots, many species.	8-24
<i>Fraxinus</i>	Ash Trees	D	35-80 h	Relatively fast growing.	
<i>Carya illinoensis</i>	Pecan Trees	D	70 h 70 s	Long tap root and leathery mature leaves.	8-9, 12-14, 18-20
<i>Catalpa spp.</i>	Catalpa	D	up to 70 h	Some litter from fallen flowers in summer and seed capsules in fall. Seldom develops dominate shoot without shaping.	All zones
<i>Juglans spp.</i>	Walnut Trees	D	30-100 h spreading	Various species, check <i>Sunset Western Garden Book</i> , English and Black Walnut notorious for hosting aphids, honeydew is inevitable.	Various
<i>Liriodendron tulipifera</i>	Tulip Tree	D	up to 80 h 40 s	Fast growing, straight columnar trunk. Spreading root system makes it hard to garden under.	1-12, 14-23
<i>Liquidambar styraciflua</i>	Sweetgum, Liquidambar	D	60 h 25 s	Moderate growth rate, upright, somewhat cone shaped, fruits are spiny balls that need raking in fall. Roots can be a nuisance in lawns or parking strips.	1-12, 14-24
<i>Metasequoia glyptostroboides</i>	Dawn Redwood	D	up to 90 h	Salt winds and hot sunlight cause foliage burn.	3-9, 14-24
<i>Phoenix Canariensis</i>	Canary Island Date Palm	Palm/E	60 h 50 s	Grows slowly until it forms trunk, then speeds up a little. Slow to develop new head after hard frost.	9, 12- 24

¹ Refer to the climate zone map in *Sunset Western Garden Book* for the climate zone in your area.

Table B-7 Do Not Plant These Trees Under or Within 15 Feet of Overhead Power Lines, continued

Botanical Name (Genus and species)	Common Name	Evergreen vs. Deciduous	Height and Spread (in feet)	Special Considerations	Climate Zones ¹
<i>Pinus spp.</i>	Pine Trees	D	30-100 h wide spreading	Some faster growing than other species. Many varieties.	various
<i>Platanus acerifolia.</i>	London Plane, Sycamore	D	40-80 h 30-40 s	Fast growing. Subject to anthracnose (causing early continuous leaf fall)	2-24
<i>Populus nigra italica</i>	Lombardy Poplar	D	40-100 h	Fast growing, invasive roots systems, suckers profusely.	All Zones
<i>Populus trichocarpa</i>	Black Cottonwood	D	150-180 h wide spreading	Heavy limbed, wood is very brittle. Native along mountain streams and wet lowlands west of cascades, California to Alaska.	1-7
<i>Pseudotsuga Menziesii</i>	Douglas Fir	E	70-250 h	Can't be maintained at a reduced height without butchering the tree. Native to Northwest America as far south as Fresno County.	1-10, 14-17
<i>Quercus lobata</i>	Valley Oak	D	70 h up to 70 s	Native to California. Limbs often twisted, long drooping outer branches can sweep ground.	1-3,6-16, 18-21
<i>Quercus spp.</i>	Oak Trees	D	up to 80 h 70 s	Various species, check Sunset Western Garden Book.	Various
<i>Robinia pseudoacacia</i>	Black Locust	D	75 h	Fast growth. Wood is brittle, roots aggressive, plants of spread by suckers.	All zones
<i>Salix babylonica</i>	Weeping Willow	D	50 h 50 s	Fast growing. Invasive root systems and are difficult to garden under.	All zones
<i>Sequoia sempervirens</i>	Coast Redwood	E	90 h 30 s	World's tallest tree! Optimum conditions to 350f. Fast growing. Can defeat lawns.	4-9, 14-24
<i>Ulmus spp.</i>	Elm Trees	D	100 h 70 s	Various species, check <i>Sunset Western Garden Book</i> . Root systems are aggressive. Branch crotches often narrow, easily split, Attracts leaf beetles, bark beetles, leafhoppers, aphids and scale. Care can be messy.	Various
<i>Washingtonia filifera</i>	California Fan Palm	Palm/ E	60 h	Fast growing, native to California.	8,9,11-24
<i>Washingtonia robusta</i>	Mexican Fan Palm	Palm/E	100 h	Very fast growing.	8,9,11-24
<i>Zelkova serrata</i>	Sawleaf Zelkova	D	60+ h 60 s	Moderate to fast growth.	3-21

¹ Refer to the climate zone map in *Sunset Western Garden Book* for the climate zone in your area.

Backfill Sand

Summary

This engineering material specification (EMS) defines the minimum requirements for imported sand used in bedding and embedment backfill around gas pipe in trenches.

This EMS is used for specifying this material in the contract procurement process, applicant design and installation, local maintenance and construction, and general construction.

Target Audience

Personnel involved in sourcing, engineering, construction, and supplier quality inspection.

Requirements

1 General

- 1.1 Backfill sand (sand) can be well or poorly graded material as determined in ASTM D2487-11, "Standard Classification of Soils for Engineering Purposes (Unified Soil Classification System)."
- 1.2 Sand must be free of organic and harmful materials that could cause adverse environmental impact.
- 1.3 Do not use blasting abrasives containing toxic elements that are at or above hazardous waste levels defined in [Code of Federal Regulations \(CFR\) Title 40, Protection of Environment, Part 261—Identification and Listing of Hazardous Waste](#) or [California Code of Regulations](#).
- 1.4 Sand must conform to the physical properties listed in this EMS.
- 1.5 The responsible engineer may specify additional requirements for specific project needs.

Backfill Sand

2 Grain Size Distribution Requirements

- 2.1 Sand must meet the soil gradation requirements listed in Table 1, "Grain Size Distribution Requirements," using ASTM C136-14, "Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates."

Table 1. Grain Size Distribution Requirements

Sieve	Sieve Size		% Passing
3/8"	0.375 in.	9.5 mm	100
No. 4	0.187 in.	4.75 mm	90–100
No. 200	0.00298 in.	75 µm	0–15

3 pH Value

- 3.1 Value of pH must be between 4.5 and 9, using ASTM G51-95, "Standard Test Method for Measuring pH of Soil for Use in Corrosion Testing," or ASTM D4972-13, "Standard Test Method for pH of Soils."

4 Resistivity

- 4.1 Resistivity must be greater than 3000 ohm-cm, using ASTM G57-06(2012), "Standard Test Method for Field Measurement of Soil Resistivity Using the Wenner Four-Electrode Method," or ASTM G187-12a, "Standard Test Method for Measurement of Soil Resistivity Using the Two-Electrode Soil Box Method."

1. IF Resistivity is less than 3000 ohms-cm,

THEN the following chemical content limits apply:

- a. Total chloride content: equal to or less than 500 parts per million, as determined by EPA Method 300.0 prepared by Parr O2 bomb combustion.
- b. Total sulfate content: equal to or less than 150 parts per million, as determined by EPA Method 300.0 prepared by Parr O2 bomb combustion.

5 Maximum Dry Unit Weight and Optimum Moisture Content

- 5.1 Supplier must provide the maximum dry unit weight and optimum moisture content of sand determined by using the standard or modified Proctor test (ASTM D698-12 or ASTM D1557-12) or equivalent.

Backfill Sand

6 Testing

6.1 Pacific Gas and Electric Company (PG&E) reserves the right to:

1. Request supplier to provide written documentation summarizing the test results and certify that the supplied sand meets the specifications in this EMS. The documentation must include the length of time for which the test results are valid (typically 12 months).
2. Request supplier to provide new test results when there is a change in the original approved source.
3. Obtain samples from the source for internal testing at any time.

7 Records

7.1 Retain records per the records retention schedule.

END of Requirements

Definitions

Soil Gradation: Classification of a coarse-grained soil that ranks the soil based on the different particle sizes.

pH: Measurement of the acidity or alkalinity of a solution or material.

Resistivity: Measurement of how strongly a material opposes electrical current.

Compliance Requirement/ Regulatory Commitment

[Code of Federal Regulations \(CFR\) Title 49, Transportation, Part 192—
Transportation of Natural and other Gas by Pipeline: Minimum Federal Safety
Standards, Section 192.319, "Installation of pipe in a ditch."](#)

[California Public Utilities Code, Article 3, Equipment, Practices, and Facilities,
Section 787](#)

Backfill Sand

Reference Documents

Developmental References:

American Association of State Highway and Transportation Officials (AASHTO)
M 145, "Soil Classification System".

A.W. Peabody, *Control of Pipeline Corrosion*, Second Edition (National
Association of Corrosion, 2001)

[California Department of Transportation \(Caltrans\) Corrosion Guidelines](#)

[Caltrans 2015 Standard Specifications](#)

[United States Bureau of Reclamation \(USBR\) Earth Manual Part 1, Third
Edition, 1998](#)

Supplemental References:

ASTM C136-14, "Standard Test Method for Sieve Analysis of Fine and Coarse
Aggregates"

ASTM D698-12, "Standard Test Methods for Laboratory Compaction
Characteristics of Soil Using Standard Effort"

ASTM D1557-12, "Standard Test Methods for Laboratory Compaction
Characteristics of Soil Using Modified Effort"

ASTM D2487-11, "Standard Classification of Soils for Engineering Purposes
(Unified Soil Classification System)"

ASTM D4972-13, "Standard Test Method for pH of Soils"

ASTM G51-95, "Standard Test Method for Measuring pH of Soil for Use in
Corrosion Testing"

ASTM G57-06(2012), "Standard Test Method for Field Measurement of Soil
Resistivity Using the Wenner Four-Electrode Method"

ASTM G187-12a, "Standard Test Method for Measurement of Soil Resistivity
Using the Two-Electrode Soil Box Method"

Appendices

NA

Backfill Sand

Attachments

NA

**Document
Revision**

EMS-4123, "Backfill Sand," Rev. 0

Approved By

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**Document
Contact**

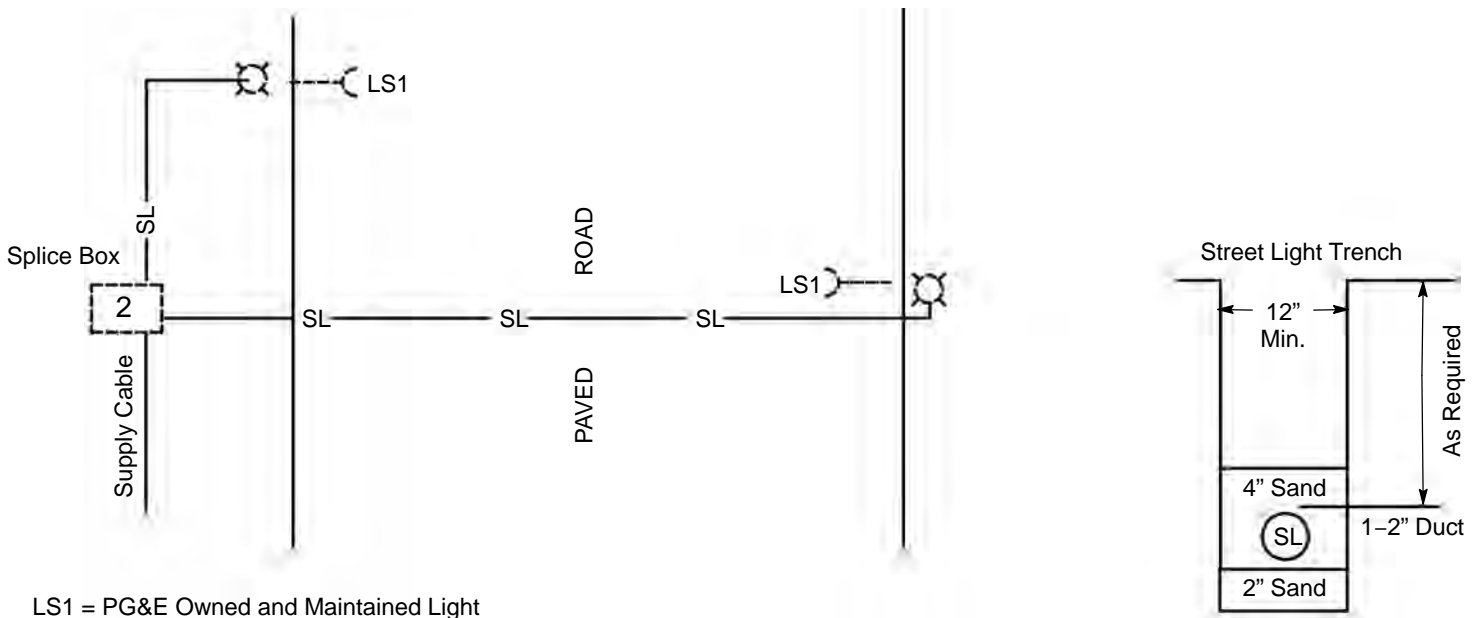
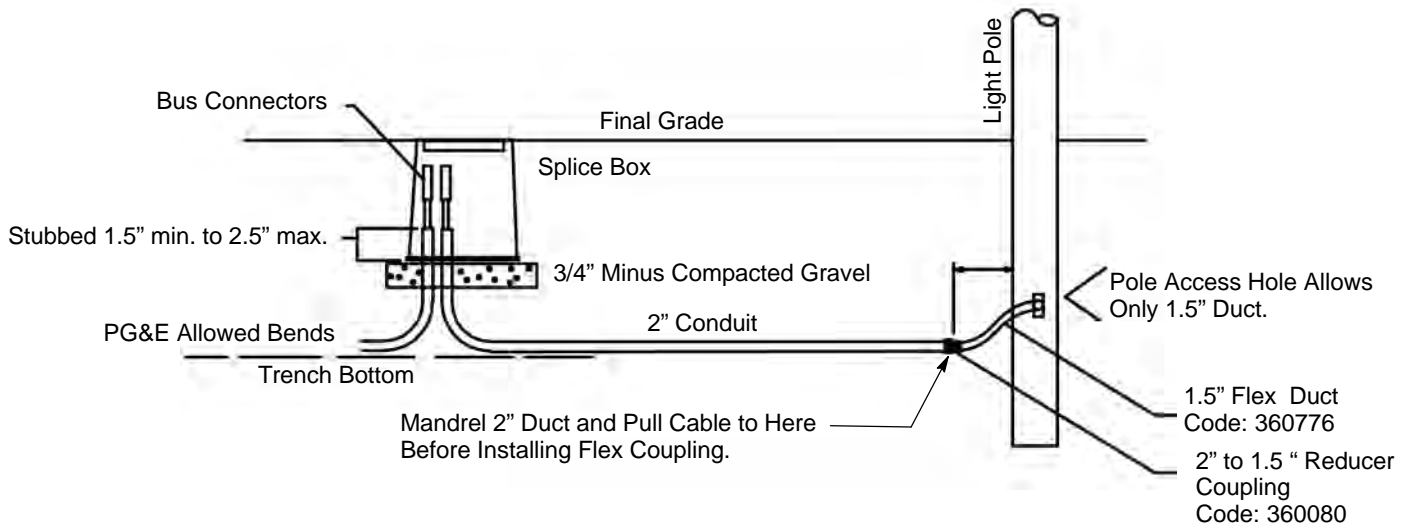
 Sean Mann, Senior Gas Standards Engineer, Gas Standards and Procedures -
Engineering & Design

Revision Notes

Where?	What Changed?
Revision 1a	
Section 7	Added section, including records retention statement.
Revision 1	
Entire Document	Updated entire document to current EMS template.
Section 2	Updated gradation requirements.
Section 3	Removed organic impurities requirement.
Section 3	Removed sand equivalency requirement.
Section 3	Removed "Coefficient of Uniformity" requirement.
Section 4	Updated resistivity requirements.
Section 5	Updated maximum dry unit weight and optimum moisture content.
Section 6	Updated testing requirements.

Street Light Conduit Detail

- Notes:
1. PG&E inspector to make all final decision about trench and duct installation.
 2. Do not exceed 300 degrees in any primary or secondary conduit run.
 3. PG&E to inspect all work performed by applicant.
Applicant to call PG&E inspector 48 hours in advance.
 4. Trench work buried without being approved by inspector will be re-opened by applicant.
 5. All conduits to be proven free by means of mandrel with PG&E inspector present.
 6. 2" conduit horizontal bends to be 3' radius minimum and 2' radius minimum vertical bends.
 7. All ducts to be temporarily capped by applicant with temporary caps or rigid unglued to prevent debris from entering duct.
 8. Polyester pull tape (code: 560154) shall be used for all primary and secondary ducts.
 9. All conduits to be terminated with belled ends.
 10. Use approved conduit for underground installations.



TYPICAL DISTRIBUTION TRENCH

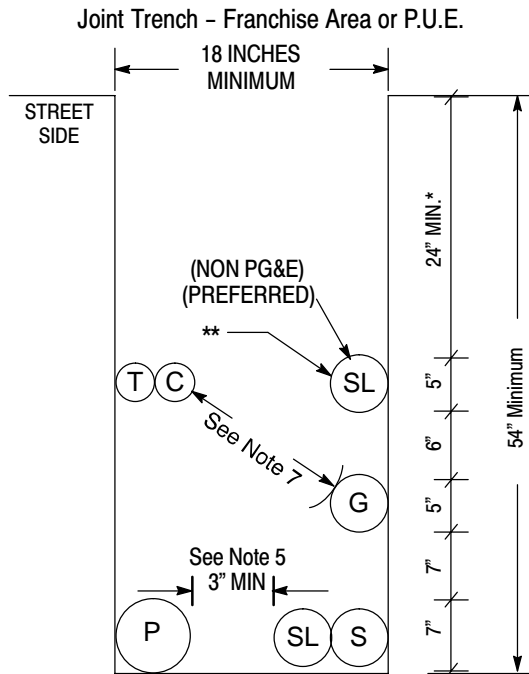


FIG. 1

Placement of the Distribution Trench within a P.U.E. is the preferred method. Trenching in the Franchise Area should only be used when a P.U.E. is unobtainable or otherwise infeasible.

* Increase cover to 30" in the street area (see Note 3).

** Separation must be 12" unless a reduction (6") is mutually agreed upon by affected utilities.

TYPICAL SERVICE TRENCH

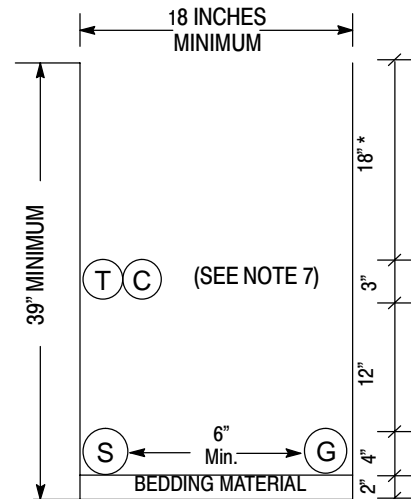


FIG. 2
(View facing Distribution Trench)

MINIMUM SEPARATION AND CLEARANCE REQUIREMENTS

		G	DUCT T	DB T	C	S	P
G	(GAS) SEE NOTES 4, 7 & 13	—	12"	12"	12"	6"	12"
T	(TELEPHONE) DUCT	12"	—	1"	1"	12"	12"
T	(TELEPHONE) DIRECT BURY	12"	1"	—	1"	12"	12"
C	(CATV)	12"	1"	1"	—	12"	12"
S	(ELECTRIC SECONDARY)	6"	12"	12"	12"	—	3"
P	(ELECTRIC PRIMARY)	12"	12"	12"	12"	3"	—
SL	(STREETLIGHT) SEE NOTE 5	6"	12"	12"	12"	1"	3"

SEPARATION AND CLEARANCE DEFINITIONS

Cover:

The term "cover" means the radial distance between the surface of an underground cable, conduit, pipe, or other substructure and the surface elevation (grade).

Backfill:

The term "backfill" refers to the materials used to refill a cut or other excavation, or the act of such refilling after any needed shading is performed.

Shading:

The term "shading" refers to the materials used to provide a measure of separation between facilities installed at different levels within an excavation or cut.

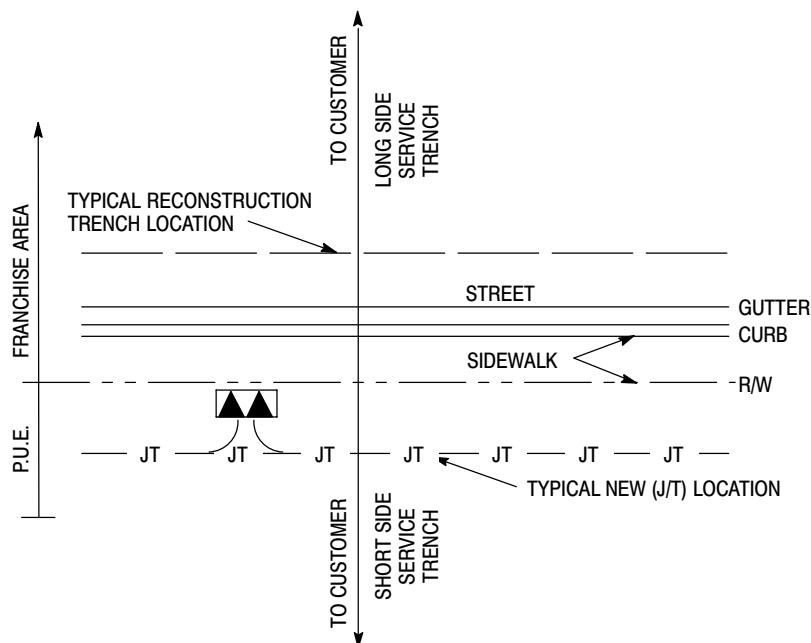
Lift:

The term "lift" is a layer of fill as spread or as compacted or a measurement of material depth that is the rated effective soil depth a compactor can achieve.

Bedding:

The term "bedding" refers to the materials installed beneath facilities at the bottom of a cut or other excavation and intended to provide support and/or protection for those facilities.

STANDARD TRENCH LOCATIONS



JOINT TRENCH CONFIGURATIONS & OCCUPANCY GUIDE

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OTHER TYPICAL PG&E DISTRIBUTION JOINT TRENCH CONFIGURATIONS

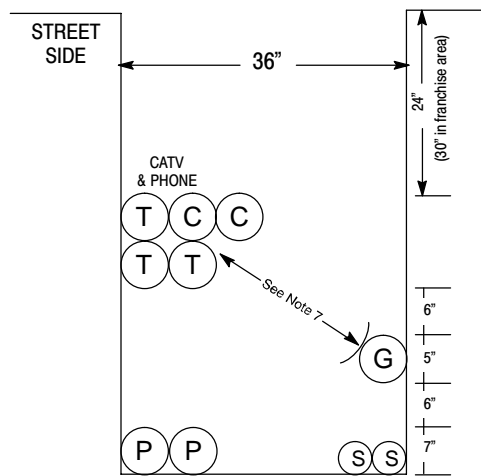


FIG. 3
36" Wide Joint Trench

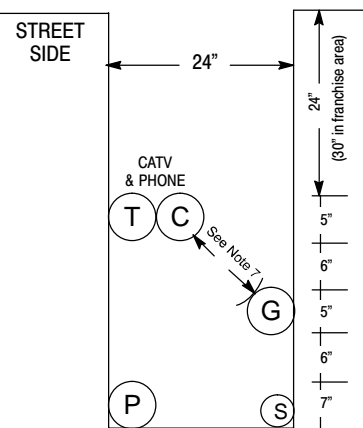


FIG. 4
24" Wide Joint Trench

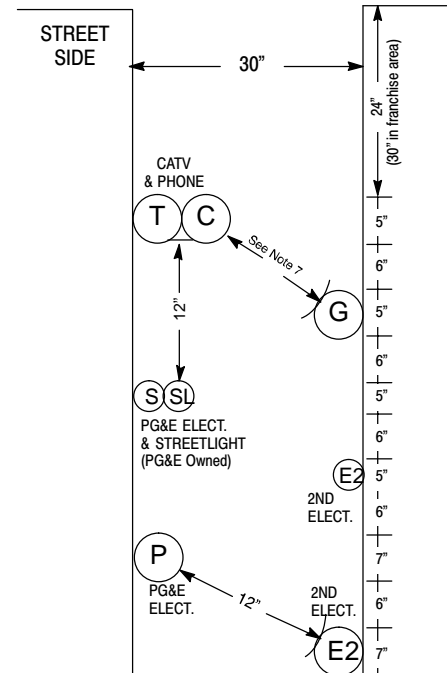


FIG. 5
Joint Trench With Second Electric Utility

Trench Configuration Notes

The trench configurations shown in this guide are to be considered "typical" only and that other trench widths, depths, as well as utility configurations (placement) may be used, provided all minimum requirements for separation, clearances, and cover are observed. In no case shall electric primary or secondary (excluding street lighting) be placed at a level higher than that of the gas and communications level. Gas shall be placed at the same level or below communications when gas is placed above the electric facilities.

Special Notes for Joint Trench With Second Electric Utility

- A. Refer to Sheet 3 for General Notes.
- B. A red 3-inch wide "PG&E Electric Line in Conduit" plastic marking tape, Code 375054, shall be installed, spiral wound in a manner that allows for the tape to be readily visible every 3 feet, with each conduit intended to be used for PG&E electric facilities. An equivalent red tape marked to identify the owner shall be installed with the conduit intended to be used for the second electric facility.
- C. Each utility shall ensure adequate grounding between electric facilities is provided (See [UO Standard S5453](#), "Joint Trench").
- D. Provide a minimum of 2 inches of compacted PG&E approved bedding material as a trench leveling concourse, where required. See General Notes Items 11 and 12 (on Page 3), in order to obtain proper compaction.

JOINT TRENCH CONFIGURATIONS & OCCUPANCY GUIDE

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General Notes

1. The preferred trench location is in a Public Utility easement (P.U.E.).
2. All depths and resulting cover requirements are measured from final grade.
3. Cover, clearances, and separation shall be as great as practicable under the circumstances, but under no circumstances shall be less than the minimum cover, clearance, and separation requirements set forth in [General Order 128](#) and [49CFR 192.321](#), [49CFR 192.325](#), and [49CFR 192.327](#). All facilities shall be anchored in place prior to compaction, or other means shall be taken to ensure no motion of the facilities. Dimensional requirements for shading, leveling, and backfilling shall be determined subsequent to compaction.
4. Trench dimensions shown are typical. Trench sizes and configurations may vary depending upon occupancy and/or field conditions. Trench size and configuration must at all times be constructed in a manner that ensures proper clearances and cover requirements are met. Any "change" to the trench width and configurations as shown in this exhibit must be designed to ensure this requirement.
5. It is preferred to have non-PG&E owned streetlights at a level other than the gas or electric level. Non-PG&E owned streetlights may be at the electric level of the trench as long as minimum clearances are provided and comply with all special notes for a joint trench with a second electric utility.
6. Non-Utility facilities are not allowed in any Joint Utility trench, e.g., irrigation control lines, building fire alarm systems, private telephone systems, outdoor electrical cable, etc.
7. When communication ducts are installed, a minimum of 12" radial separation shall be maintained from gas facilities. Exception: With mutual agreement, when 4-inch diameter or smaller gas pipe is installed, the separation may be reduced to not less than 6 inches.
8. Provide separation from trench wall and other facilities sufficient to ensure proper compaction.
9. Maintain proper separation between PG&E facilities and "wet" utility lines as described in [UO Standard S5453](#). The minimum allowable horizontal separation between Company facilities and "wet" facilities is 3' with a minimum 1' of undisturbed earth or the installation of a suitable barrier between the facilities.

If a 3' horizontal separation cannot be attained between "wet" utilities and Company dry facilities, a variance may be approved by the local Inspection Supervisor and submitted to the Service Planning Support Program Manager for approval. Separations of 1' or less are not permissible and will not be allowed. The Company may agree to waive the minimum 3' separation requirement at the request of an applicant if warranted and the need is justified. The request for a waiver must:

- Be made in writing and submitted to the Company ADE during the planning and design phase of the project,
- Clearly describe the conditions necessitating the waiver,
- Include a proposed design,
- And, include a design for a barrier between the "wet" utilities and Company dry facilities in the event 1' of undisturbed earth cannot be maintained.

Note: Drain lines connected to downspouts on buildings are considered a "wet" utility for the purposes of this standard.

10. Separations shall be maintained at aboveground termination points.
11. Procedures for approving native backfill for shading of PG&E gas facilities:
 - Random soil samples shall be taken from a minimum of 3 locations per 1,000' of trench. 100% of the sample must pass through a 1/2" sieve and 75% must pass through a #4 screen. Additional samples must be taken if existing soil conditions change and are to be taken at the discretion of the PG&E representative on site.
 - The soils must not contain any rocks that have sharp edges or that may otherwise be abrasive.
 - The soils must not contain clods larger than 1/2" if to be used as shading, bedding, or leveling materials.
 - Compaction requirements must meet any applicable PG&E, Federal, State, County, or local requirements.
 - At no time shall the over saturation of native soils be used to achieve these requirements.

The sieves and screens shall be:

- 1/2" Sieve: 8" diameter by 2" deep, stainless steel mesh screen.
- #4 Screen: 8" diameter by 2" deep, stainless steel mesh screen.

Notes continued on the next page

JOINT TRENCH CONFIGURATIONS & OCCUPANCY GUIDE

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General Notes, continued

12. Procedures for approving native backfill for shading at PG&E electric facilities:
 - Random soil samples shall be taken from a minimum of 3 locations per 1,000' of trench. Additional samples must be taken if existing soil conditions change and are to be taken at the discretion of the PG&E representative on site.
 - Shading material containing large rock, paving material, cinders, sharply angular substances, or corrosive material shall not be placed in the trench where such material may damage the conduits and/or prevent proper compaction over or around the conduits.
 - Native soils containing clods not to exceed 6" in diameter may be included in the shading material provided the clods are readily breakable by hand.

Note: Soils consisting primarily of adobe, hard compact (dense) clay, and bay muds shall not be used as shading material.
 - At no time shall the over saturation of native soils be used to achieve these requirements.
 - Refer to [Engineering Document 062288](#), Item 13 on Page 2.
13. Competent native soils are preferred to be used for shading, bedding, and backfilling throughout the trench.
 - Where native soils exceed 1/2" minus and/or where gas is to be placed at the bottom of a trench in areas that exceed 1/2" minus soil conditions, or where the bottom of a trench is considered to consist of hard pan, PG&E approved 1/2" minus import material shall be used for shading and/or bedding of gas facilities.
 - PG&E approved import material is per [CGT Engineering Guideline 4123](#).
 - If a leveling course is required for gas facilities, the use of native soils is preferred, but if 1/2" minus conditions are not attainable with the native soils, then the use of PG&E approved import materials is required. Bedding under gas facilities will be a minimum of 2" of compacted 1/2" minus native soils or PG&E approved import material.
 - For electric facilities, refer to Note 12. This applies to leveling courses as well as shading.
 - The minimum PG&E approved bedding material may be increased at the discretion of PG&E when warranted by existing field conditions (e.g., rocky soils, hard pan, etc.).
 - The use of any imported material for backfilling purposes shall be limited to those situations when native soils do not allow for required compaction.
14. The applicant is responsible for the removal of excess spoil and associated costs.
15. Separation between gas facilities and electric facilities may be reduced to 6" when crossing.
16. Service saddles are the preferred service fittings for use throughout the joint trench project. All projects will be designed and estimated using service saddles. However, service tees may be used if all clearances, separation, and coverage requirements are maintained.

Revision Notes

1. Revised Note 9 to clarify the minimum allowable horizontal separations requirements.
2. This document was revised on 09-27-2006.

JOINT TRENCH CONFIGURATIONS & OCCUPANCY GUIDE

09-27-06

New Trench, Backfill, and Warning Tape Requirements for Electric Distribution Only Trenches

SUMMARY

This utility bulletin communicates new trench, backfill, and warning tape requirements for electric distribution-only trenches. These changes increase the efficiency when installing undergrounding facilities using different equipment and techniques.

Level of Use: Informational Use

AFFECTED DOCUMENTS

[Numbered Document 038193, "Minimum Requirements for the Design and Installation of Electric Conduit, Insulated Cable and Facilities"](#)

[S5453, Exhibit B, "Joint Trench Configurations and Occupancy Guide"](#)

TARGET AUDIENCE

Electric operations employees and contractors who design, work on, install, or inspect electric distribution-only trench installations.

WHAT YOU NEED TO KNOW

1 Background Information

1.1 Figures 1 and 2 below show the current PG&E electric distribution-only trench requirements.

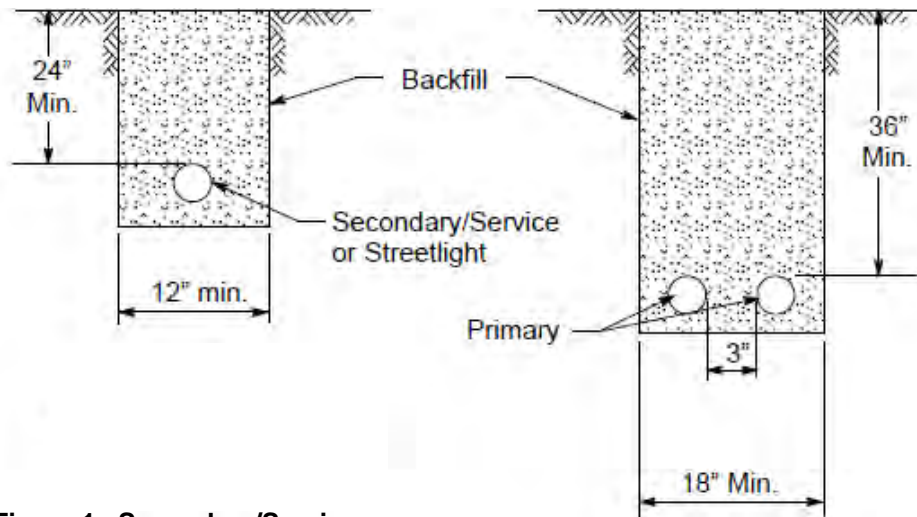


Figure 1. Secondary/Service or Streetlight Trench

Figure 2. Primary Trench

1.2 This bulletin communicates a revision to the requirements listed above and introduces the installation of a 6-inch-wide warning tape to be placed 12–18 inches over the center of electric conduits.

New Trench, Backfill, and Warning Tape Requirements for Electric Distribution Only Trenches

2 Required Action

2.1 Figures 3 and 4 below illustrate the new PG&E electric distribution-only trench backfill and warning tape requirements.

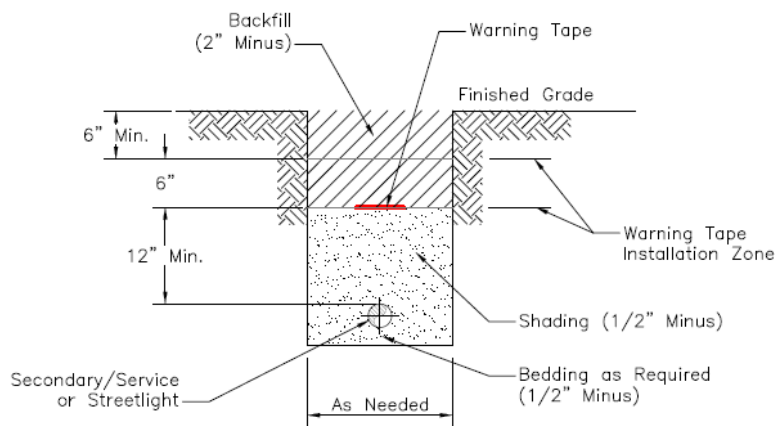


Figure 3. Secondary/Service or Streetlight Trench: Minimum Covered Depth from Top of Conduit is 24 Inches

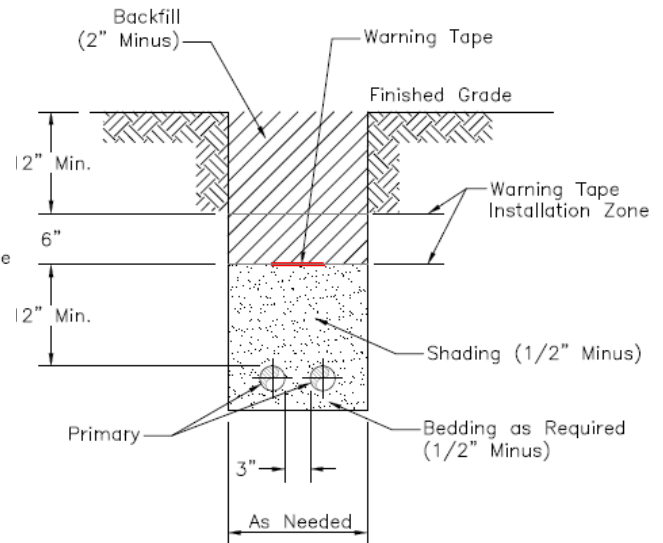


Figure 4. Primary Trench: Minimum Conduit Covered Depth from Top of Conduit is 30 Inches

2.2 The requirement illustrated in Figures 3 and 4 above and described in Sections 2.3 and 2.4 below superceeds General Note 12 in [S5453, Exhibit B, "Joint Trench Configurations and Occupancy Guide."](#)

2.3 Imported sand used for bedding and shading electric-only trenches must meet requirements in [Engineering Material Specification EMS-4123, "Backfill Sand."](#) The only exception to requirements in [EMS-4123](#) is the grain size distribution.

1. Imported sand can contain up to 20% of particles that do not pass through the #200 size sieves.
 - This change allows for better sand compaction and reduces seepage in the trench.
 - This newly approved sand composition requires only screening, with minimum or no wash.
2. Only ADD imported sand for bedding and shading electric-only trenches if native backfill contains any of the following:
 - Large rock

New Trench, Backfill, and Warning Tape Requirements for Electric Distribution Only Trenches

2.3 (continued)

- Paving material
- Cinders
- Large amounts of sharply angular substance
- Corrosive material that may damage conduits, prevent adequate compaction of the fill, or contribute to corrosion of the conduits.
- Native soils exceeding ½ inch minus soil conditions.
- Bottom of a trench consists of rock or hard pan.

- 2.4 INSTALL 6-inch-wide warning tape as shown in [Figure 3](#) and [Figure 4](#) on Page 2. [Figure 5](#) below shows a sample of the approved warning tape.



Figure 5. 6-Inch Warning Electrical Tape

1. USE 6-inch-wide warning tape for all electric-only distribution underground jobs that involve trenching or plow methods.
2. INSTALL tape along the length of the trench AND above the electric conduits, as shown in [Figure 3](#) and [Figure 4](#) on Page 2.
3. Warning tape must be brightly colored red and marked, "Caution: Buried Electric Line Below."
4. STORE warning tape in a manner that limits ultraviolet (UV) exposure.
5. [Table 2](#) on Page 5 provides ordering information for the electrical warning tapes.

NOTE

Above the warning tape, native soils can be up to 2 inches minus soil conditions.

New Trench, Backfill, and Warning Tape Requirements for Electric Distribution Only Trenches

- 2.5 The minimum depth requirement from finished grade to top of conduits for electric-only trenches only applies when requirements are allowed by federal, state, county, or local ordinances.
- 2.6 IF, **and only IF**, a qualified PG&E associate distribution electric engineer (ADE), construction inspector, AND appropriate external jurisdictions grant their approvals,
- THEN REDUCE the depth by adding adequate mechanical protection as follows (SEE [Figure 6](#)):
1. PLACE a cement-slurry cap over the conduit.
 - The width of the cap must be the same width as the electric-only trench.
 - The top of the cap must be a minimum of 8 inches below grade level.
 - POSITION the cap 6 inches above the conduit, so that the cap rests on rock-free sand and not the conduit.
 - The cap must be a minimum of 3-inches thick and consist of two-sack sand slurry, with red dye mixed in.

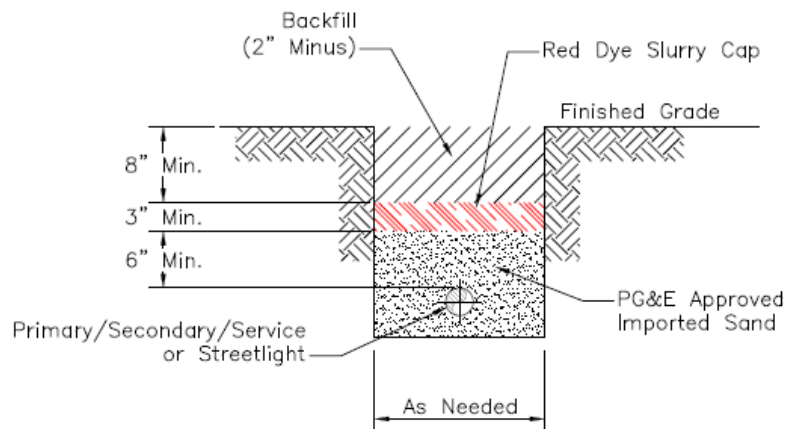


Figure 6. Shallow Trench: Minimum Depth Requirements

- 2.7 When backfilling trenches on slopes or grades, bags of concrete and red dye may be required on top of the conduit to prevent the backfill from moving down the slope or running out of the trench.
- 2.8 Soil compaction must meet PG&E's and any applicable federal, state, county, and local ordinances.
1. Trenches that run across or along public roads and streets OR in the franchise areas must have soil compacted to a minimum of 95% density.

New Trench, Backfill, and Warning Tape Requirements for Electric Distribution Only Trenches

2. Trenches that run across private properties AND in all other areas must have soil compacted to a minimum of 90% density.

2.8 (continued)

3. A Compaction Test Report may be required by PG&E. This report must include the testing company information: Name, Address, Contact information.

- 2.9 The new trench, backfill, and warning tape requirements for electric distribution-only trenches are effective on any PG&E design jobs for New Business and Work Request by Others (NB/WRO) AND on any Applicant Design jobs where Globals are issued **on or after July 05th, 2022**.

3 Application Criteria

- 3.1 [Table 1](#) below shows required field actions.

Table 1. Field Actions

Activity Type	Action
New Construction	FOLLOW the requirements listed in this utility bulletin when constructing electric only trenches.
Re-Construction Work	
Maintenance	
Emergency	

4 Ordering Information

- 4.1 SELECT the appropriate warning tape from [Table 2](#) below.

Table 2. Material Codes for Warning Tape

Description	Unit (feet)	Approved Manufacturers ¹	Material Code
Warning tape, 6-inch wide	1000	ALMETEK TAPE-CBEL	M621910
		PRESCO-D6105R6-457	

¹ ALMETEK is the preferred manufacturer. Presco is an alternative approved manufacturer.

DOCUMENT APPROVER

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Randy Royval, Principal Electric Distribution Standards Specialist

New Trench, Backfill, and Warning Tape Requirements for Electric Distribution Only Trenches

Al Valenzuela, Principal Electric Distribution Standards Specialist

INCLUSION PLAN

The information contained in this bulletin will be included in the next revision of [Numbered Document 038193, "Minimum Requirements for the Design and Installation of Electric Conduit, Insulated Cable, and Facilities."](#)

Updated Separation Requirements For Conduit in Joint Trench

SUMMARY

This utility bulletin updates [Electric Standard 062288, "Underground Conduits"](#) and [Utility Standard S5453, "Joint Trench"](#) with the requirements listed below:

The minimum separation requirement must be 1.5 inch (in.) between:

- Secondary to: Secondary, service, and streetlight conduit
- Service to: Service and streetlight conduit

The minimum separation requirement must be 3 in. between:

- Primary-to-primary conduit
- Primary to: Secondary, service, and streetlight conduit

This increase in separation is required to improve access to the conduits during future maintenance, re-routing and replacement of the facilities.

Note that the 3 in. requirement above is already included in [Electric Standard 062288](#) but **not** in [Utility Standard S5453](#).

Additionally, separation requirements between Pacific Gas and Electric Company (PG&E or Company) Joint Trench utilities and Non-PG&E owned Foreign Electric duct (e.g., non-PG&E Streetlight) have been added to the updated Table, "Minimum Separation and Clearance Requirements (Inches)", in this utility bulletin. These are not new requirements, but they were not previously located in the Exhibit B table.

The requirements of this bulletin apply to any PG&E job estimate and any PG&E design jobs for New Business and Work Request by Others (NB/WRO), and on any Applicant Design jobs where Globals are issued after the effective date of this bulletin (7/31/2015).

AFFECTED DOCUMENT

[Utility Standard S5453, "Joint Trench"](#)

[Utility Standard S5453, Exhibit B, "Joint Trench Configurations and Occupancy Guide"](#)

[Electric Standard 062288, "Underground Conduits"](#)

TARGET AUDIENCE

Personnel in: electric construction, electric distribution engineering, electric estimating, gas distribution estimating, gas distribution engineering, customer service delivery estimating, and gas construction management.

Updated Separation Requirements For Conduit in Joint Trench

WHAT YOU NEED TO KNOW

[Utility Standard S5453, "Joint Trench," Exhibit B](#), currently shows:

		MINIMUM SEPARATION AND CLEARANCE REQUIREMENTS					
		G	DUCT T	DB T	C	S	P
G	(GAS) SEE NOTES 4, 7 & 13	—	12"	12"	12"	6"	12"
T	(TELEPHONE) DUCT	12"	—	1"	1"	12"	12"
T	(TELEPHONE) DIRECT BURY	12"	1"	—	1"	12"	12"
C	(CATV)	12"	1"	1"	—	12"	12"
S	(ELECTRIC SECONDARY)	6"	12"	12"	12"	—	3"
P	(ELECTRIC PRIMARY)	12"	12"	12"	12"	3"	—
SL	(STREETLIGHT) SEE NOTE 5	6"	12"	12"	12"	1"	3"

[Utility Standard S5453, "Joint Trench," Exhibit B](#), is updated per this bulletin as follows:

MINIMUM SEPARATION AND CLEARANCE REQUIREMENTS (Inches)								
		G	DUCT T	DB T	C	S	P	SL
G	(GAS) SEE NOTES 4, 7, & 13	-	12	12	12	6	12	6
T	(TELEPHONE) DUCT	12	-	1	1	12	12	12
T	(TELEPHONE) DIRECT BURY	12	1	-	1	12	12	12
C	(CATV)	12	1	1	-	12	12	12
S	(ELECTRIC SECONDARY)	6	12	12	12	1.5	3	1.5
P	(ELECTRIC PRIMARY)	12	12	12	12	3	3	3
SL	(STREETLIGHT) SEE NOTE 5	6	12	12	12	1.5	3	1.5
FE*	(FOREIGN ELECTRIC SOURCES, NON-PG&E*) SEE NOTE 5	12	12**	12**	12**	12	12	12

*Must be considered a 'Utility' as defined in [Utility Standard S5453, "Joint Trench."](#)

Notes 4, 5, 7, and 13 are located in [Utility Standard S5453, Exhibit B, "Joint Trench Configurations and Occupancy Guide."](#)

**For exceptions, refer to G.O. 128 rule, Section B, Items (1) and (2).

Updated Separation Requirements For Conduit in Joint Trench

DOCUMENT APPROVER

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INCLUSION PLAN

This update will be included in the next revision of [Electric Standard 0662288 "Underground Conduits"](#) and [Utility Standard S5453, "Joint Trench," Exhibit B](#).

Enhanced Vegetation Management Pre-Inspection Procedure

SUMMARY

This procedure describes how to perform pre-inspection patrols specific to the Enhanced Vegetation Management (EVM) program in effort to reduce vegetation related risks to electric distribution and transmission facilities.

Level of Use: Informational Use

TARGET AUDIENCE

Vegetation management (VM) operational employees and contractors involved in pre-inspection (PI) activities.

SAFETY

NA

BEFORE YOU START

NA

TABLE OF CONTENTS

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1	General Expectations	2
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3	Primary Conductor Radial Clearance	2
4	Trees with Strike Potential.....	3
5	LIDAR Based Vegetation Points.....	3
6	Customer Refusal	4
	Appendix A, Diagram of EVM Tree Work Standards.....	6

Enhanced Vegetation Management Pre-Inspection Procedure

PROCEDURE STEPS

1 General Expectations

- 1.1 All overhead electric distribution and transmission facilities must be inspected for the following conditions:
 - Vegetation overhanging the conductors, per [Section 2](#).
 - Vegetation currently or potential to encroach within 4-ft. of the primary conductor before the next routine cycle, per [Section 3](#).
 - Vegetation tall enough to strike the facilities, per [Section 4](#).
- 1.2 IF there is any known risk to the electric facilities, THEN prescribe the tree for work.
- 1.3 IF the prescribed tree work will create a subsequent hazard, THEN prescribe tree for removal.
- 1.4 IF the tree is observed within the minimum distance requirements (MDR) (see [Utility Procedure TD-7102P-01, "Vegetation Management Distribution Routine Patrol Procedure"](#)) or the tree is failing,

THEN follow [Utility Procedure TD-7103P-09, "Vegetation Management Hazard Notification Procedure."](#)
- 1.5 WHEN an abnormal field condition is identified, THEN follow [Utility Procedure TD-7102P-09, "Reporting Abnormal Field Conditions Procedure."](#)

2 Overhanging Vegetation

- 2.1 The PI must prescribe clearance of any vegetation if:
 - The vegetation is currently within the 4-ft. vertical plane (see [Appendix A](#)) of primary conductor, or
 - The vegetation will enter the 4-ft. vertical plane before the next routine/compliance cycle.

3 Primary Conductor Radial Clearance

- 3.1 For vegetation with the potential to encroach within a 4-ft. radius of the primary conductor before the next routine/compliance tree work cycle, PRESCRIBE a minimum of 12-ft. radial clearance.

Enhanced Vegetation Management Pre-Inspection Procedure

3.2 Coastal redwoods and giant sequoias are not required to be removed or mitigated below conductor height (i.e. "topped") when the tree trunk occurs within the 4-ft. radius of the primary conductor, IF the tree has no indications of any of the following conditions:

- Re-sprouting from the bole of the tree resulting in annual non-compliance.
- Significant defects.
- Poor trunk attachments related to secondary re-growth from past trunk failures.

4 Trees with Strike Potential

4.1 INSPECT all trees tall enough to strike facilities.

4.2 IF the tree is tall enough to strike, CREATE a vegetation point. For LIDAR generated vegetation points, refer to [Section 5](#).

4.3 ASSESS the tree using the tree assessment tool (TAT) within GISArc Collector.

- For trees with an "abate" result, PRESCRIBE the tree work to remove the risk.
- For trees with a "do not abate" result, POPULATE fields as follows:
 - Status select "No Work Required under EVM."
 - Prescription select "NW_No Work."

5 LIDAR Based Vegetation Points

NOTE

Vegetation points based on LIDAR data are considered accurate. Physical validation is required before the inspection is considered complete. This will ensure all trees with strike potential are properly identified and mitigated.

5.1 All LIDAR based vegetation points must be validated by a PI.

5.2 The PI must assess each vegetation point, as specified in [Step 1.1](#).

5.3 IF a tree is does not exist (e.g. two vegetation points are listed but one tree was physically removed) or is clearly not tall enough to strike facilities at time of inspection, THEN populate the vegetation point fields as follows:

- Status select "Not Valid."
- TAT Result select "Not a Strike Tree."

Enhanced Vegetation Management Pre-Inspection Procedure

6 Customer Refusal

- 6.1 IF the customer refuses removal or pruning, THEN FOLLOW [Utility Procedure TD-7102P-04, "Distribution Vegetation Refusal Procedure."](#)

END of Instructions

DEFINITIONS

Facilities: Any electrical or non-electrical conductors or apparatus on a pole, the pole, or any pole supporting wires. Service drops are excluded.

LIDAR: Stands for Light Detection and Ranging. Data collected and generated by remote sensing technology using light detection.

Trees: Vegetation with a diameter at breast height (DBH) of 4-in. or more.

Vegetation point: A data point used to represent a tree in the VM inventory system.

Vertical plane: The area created by horizontally extending 4-ft. from both sides of the outer most conductor then vertically extending to the sky (i.e. football goal post).

IMPLEMENTATION RESPONSIBILITIES

The vegetation management document owner is responsible for the rollout, communication, and periodic review of this utility procedure. Vegetation management operations personnel are responsible for taking the applicable training and executing the procedure where applicable.

GOVERNING DOCUMENT

[Utility Standard TD-7102S, "Distribution Vegetation Management Standard \(DVMS\)"](#)

COMPLIANCE REQUIREMENT / REGULATORY COMMITMENT

[General Order \(G.O.\) 95, Rule 35](#)

[Public Resources Code \(PRC\), Section 4293](#)

REFERENCE DOCUMENTS

Developmental References:

Cal Fire Power Line Fire Prevention Field Guide, 2008 revision

Enhanced Vegetation Management Pre-Inspection Procedure

Supplemental References:

[Utility Procedure TD-7102P-01, "Vegetation Management Distribution Routine Patrol Procedure"](#)

[Utility Procedure TD-7103P-09, "Vegetation Management Hazard Notification Procedure"](#)

APPENDICES

NA

ATTACHMENTS

NA

DOCUMENT RECISION

NA

DOCUMENT APPROVER

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REVISION NOTES

Where?	What Changed?
NA	NA

Enhanced Vegetation Management Pre-Inspection Procedure

Appendix A, Diagram of EVM Tree Work Standards

Page 1 of 1

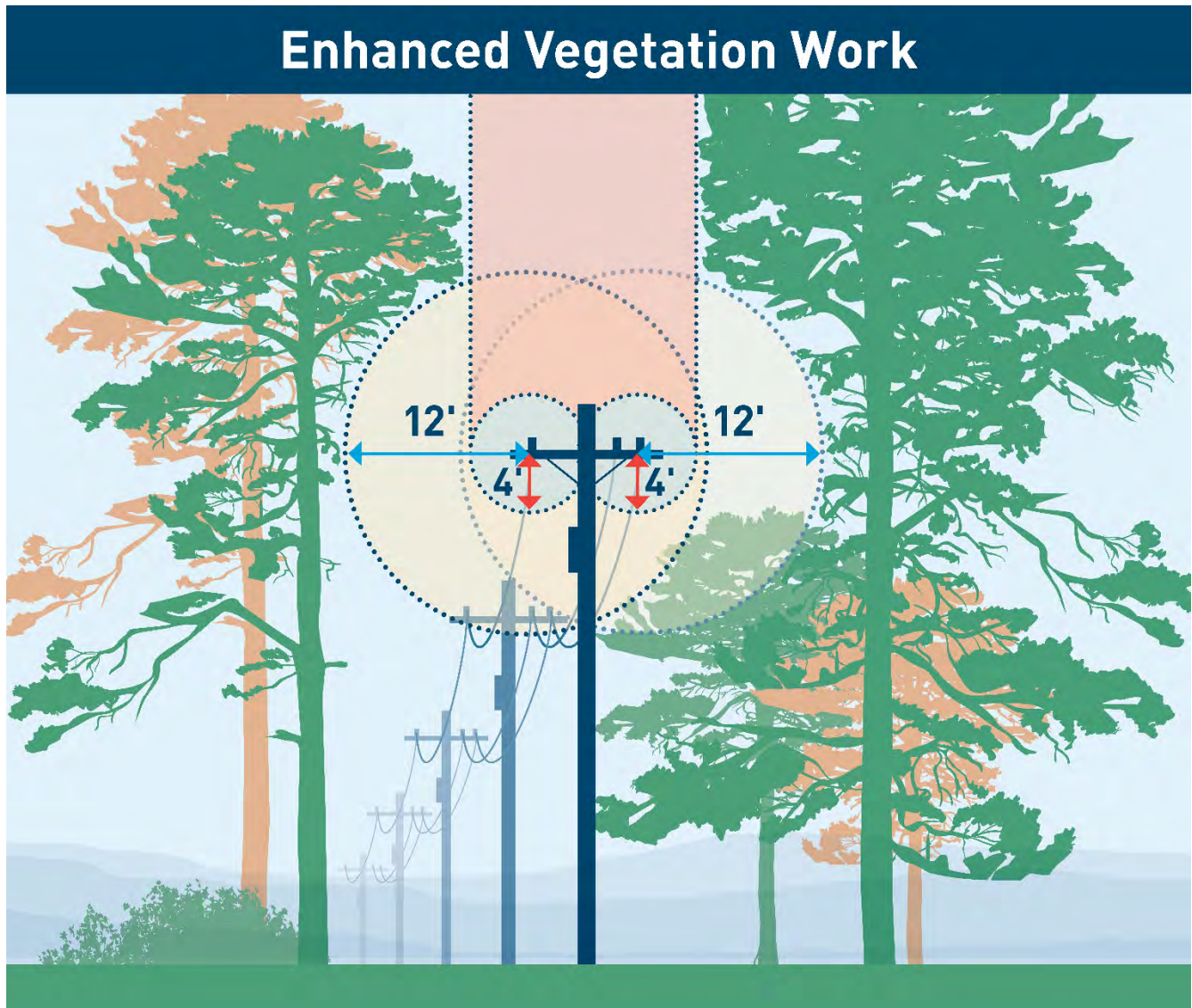


Figure 1. Diagram of EVM Tree Work Standards



**Know what's below.
Call before you dig.**

USA Color Coding	
Excavation Site & Underground Facilities	Marking Color
Proposed Excavation	White
Temporary Survey Markings	Pink
Electric	Red
Gas - Oil - Steam Chemical	Yellow
Communication CATV	Orange
Water	Blue
Reclaimed Water Irrigation Slurry	Purple
Sewer	Green
Call 811 Two (2) Working Days Before You Dig!	



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USA Identificadores del Código de Color	
Sitio de Excavación y de Instalaciones Subterráneas	Colored de Identificación
Excavación Propuesta	Blanco
Marcas Temporarias de Inspección	Rosa
Líneas de Energía Eléctrica, Cables, Conductos y Cables de Iluminación	Rojo
Gas, Aceite, Vapor, Petróleo o Materiales Gaseosos	Amarillo
Líneas, Cables o Conductos de Comunicaciones, Alarma o Señales	Naranja
Agua Potable	Azul
Líneas de Lodos, Irrigación y Agua Recuperada	Purpura
Líneas de Alcantarillado y de Drenaje	Verde
Llame 811 a dos (2) días hábiles antes de excavar!	



**Determina lo que está bajo tierra.
Llama antes de excavar.**



**Pacific Gas and
Electric Company™**

WE DELIVER ENERGY.™