Electric Service Requirements

ESR

January 2020

Portland General Electric
Utility Standards Engineering
3700 SE 17th Avenue
Portland, OR 97202

Cover image: Temporary service to a home under construction in southeast Portland. (Photo: Dan Loomis)

Preface

About This Book

This 2020 edition of the *Electric Service Requirements* (ESR) book was prepared to help you obtain electric service from Portland General Electric (PGE). The information in this book applies to new services, relocated services, rewired services, and temporary services.

This edition supersedes and replaces all earlier editions. All text changes in this book are highlighted in gray, like you can see in the paragraph above. If changes have been made in a figure, the entire title of the figure is highlighted.

We strongly recommend that you consult PGE to resolve any questions you have concerning the requirements in this book. We will do our best to meet your needs for electric service in an economical and acceptable manner.

The ESR book is meant to be read and interpreted in its entirety. Individual figures or pages do not represent the complete requirements for service and should not be cited out of their context.

IMPORTANT: ***Do not use figures in this book as construction plans by themselves****. The text that accompanies a figure often contains important information that is not contained in the drawing.*

This book may require different electrical equipment specifications than have been previously accepted in PGE service areas.

When you see a reference to any code—including the National Electrical Code, National Electrical Safety Code, or Oregon Electrical Specialty Code—it always refers to the most recent edition of that code.

Construction lead time varies with workload. Contact a PGE Service Coordinator as early in your design process as possible. You'll find PGE Contact Information on page v.

Accuracy of Information and Conflicting Requirements

IMPORTANT: ***PGE does not assume responsibility for keeping the ESR book current*** *and should be consulted when you have questions about the applicability of any of the book's content.*

The information in the *ESR* book is accurate at the time of publication, but it is subject to change without notice. While the requirements described are meant to comply with all governing codes, ordinances, and tariffs, these requirements may change if any of those codes, ordinances, and tariffs change. If information in this book conflicts with a code, ordinance, or tariff, the requirement(s) of the code, ordinance, or tariff are supreme.

While PGE may provide updates to the printed version of the *ESR* book from time to time, the online version always contains the most up-to-date and definitive information. You'll find instructions for downloading a PDF file of the entire book in the section "Accessing the Online Version of the ESR Book" on page v.

Preliminary Information

TOPICS IN THIS SECTION

- *PGE Contact Information*
- *Accessing the Online Version of the* ESR *Book*
- *Errors That May Cause PGE to Turn Down a Request for Electric Service*
- *Terms Used in the* ESR *Book*
- *Maps of PGE's Service Territory*

PGE Contact Information

Phone Numbers

Contact	Phone Number		
	Toll-Free	Local	Fax
Service Coordination	800-542-8818	503-323-6700	503-612-3501
Customer Service	800-542-8818	503-228-6322	—
Tree Trimming	800-544-1794	503-736-5460	—
Oregon Utility Notification Center (For locating underground utility cables)	8-1-1 or 800-332-2344	503-246-6699	—
Emergencies and outages, 24 hours	800-544-1795	503-464-7777	—
Light Out (streetlights)	800-544-1795	503-464-7777	—

Email Addresses

Contact	Email Address
Service Coordination	service.coordinators@pgn.com
Tree Trimming	trees@pgn.com
Light Out (streetlights)	LightOut@pgn.com

Accessing the Online Version of the ESR Book

To access the *ESR* book online:

1. Open a web browser and go to PortlandGeneral.com/esr.
2. Click **Current ESR book**.

Errors That May Cause PGE to Turn Down a Request for Electric Service

The table below lists common errors existing in new construction that may prevent PGE from approving a request for electric service until errors are corrected.

Error	Requirement
Overhead	
The weatherhead or point of attachment (POA) is too low.	See **Table 3** on page 42 for the minimum clearances for service drops.
No mast guy.	Guying is required for a mast that extends more than two feet above the roof. See **Table 14** on page 88 for guy requirements by mast size.
The service drop is attached to the fascia board.	A service drop is not allowed to be attached to a fascia board.
The meter socket or weatherhead is in the wrong location.	The meter socket and location must be approved by PGE before installation. See Section 5.2, "Meter Clearances and Location Criteria."
The wrong style meter socket is installed.	PGE only accepts the ring-style meter socket. A ringless-style meter socket is not approved.
Underground	
There is no pull string in the underground conduit.	Pull strings are required in all PGE conduits.
The trench is shallow.	PGE requires a minimum trench depth of 3 feet. See Section 6.2, "Trenches Provided by the Customer."
The conduit connects to the wrong knockout on the meter socket.	Only the left knockout can be used on a 200 A meter socket. However, any of the bottom knockouts can be used on a 320 A meter socket.
The underground kick pipe must be straight and plumb.	No bends are allowed between the meter socket and the ground.
The meter location is unapproved.	The meter ***must*** be in an approved location. Call PGE for meter location before starting any work. See Section 5.2, "Meter Clearances and Location Criteria."
The meter socket is too close to the gas meter.	The minimum distance between the meter socket and a gas meter is 3 feet.
The wrong style meter socket is installed.	PGE only accepts the ring-style meter socket. A ringless-style meter socket is not approved.
Rewires of an Existing Structure	
Service is not brought up to current PGE requirements.	PGE requires that the meter socket, the weatherhead, and the meter and weatherhead locations be brought up to current requirements when service is being upgraded. Call PGE for the correct meter location before starting any work.
Multiple-Meter and Nonresidential Services	
The three-phase high-leg is not in the correct position or is not marked with orange tape.	PGE requires that the high-leg conductor be on the right side of the meter socket. The high-leg terminal must be marked with orange tape in both the meter socket and in the panel, CT, or terminal cabinet.
Not using a safety-socket–type meter socket.	All nonresidential meter sockets, including required services, must be the safety-socket type (with a few exceptions).
No lockbox.	A lockbox must be installed near the electrical room.
A panic bar for the electrical room door is not on site.	PGE requires that electrical room doors open outward and be equipped with a panic bar.
There are no permanent engraved labels on multiple-meter sockets.	PGE requires that all multiple-meter installations have a permanently engraved metal or hard plastic label on each meter socket. Letters on each label must be at least 3/8-inch high.

Terms Used in the ESR Book

The following list provides definitions for terms used in the ESR book.

ANSI	American National Standards Institute.
ASME	American Society of Mechanical Engineers.
Backfill	Materials such as sand, crushed rock, or soil that are used to fill a trench.
Bushings	Plastic or nylon rings that attach to the ends of conduit to protect the electrical cable from sharp edges.
Bypass	A method that allows for service continuity to the customer while the meter is removed for test or inspection.
Chamfered	The smoothing of internal rough edges of factory- or field-cut conduits to prevent damage to PGE underground conductors when pulled into the conduit.
Current transformer	A transformer that reduces the customer's load current by a known ratio to a secondary metering current that is within the capacity of the meter.
Current transformer meter	A meter that requires current transformers because its current capacity is not as large as the customer's current load.
Customer	The individual responsible for requesting electric service from PGE.
Direct-burial cable	Electrical cable that is suitable (approved by a recognized testing laboratory) for direct burial in the ground without using a conduit system.
Direct-connect meter	A meter that is energized to line voltage and carries all the load current. No current transformer or voltage interface is used. Also called a *self-contained meter*.
Drip loop	The loop formed by the customer conductors that connects to the PGE service drop. The conductors are formed in a downward loop so water will not enter the customer's service mast (weatherhead).
Elbow	A bend in a conduit having a small radius change in direction, also referred to as a standard radius. Small or standard radius bend elbows are not allowed for PGE conductors. See *Sweep*.
EMT	Electrical metallic tubing.
EUSERC	Electric Utility Service Equipment Requirements Committee. An association of utilities and manufacturers that creates standard designs for the interface between an electric utility's service and a customer's facility. PGE is an active member of EUSERC.
Fault current	Maximum available current under bolted short-circuit conditions.

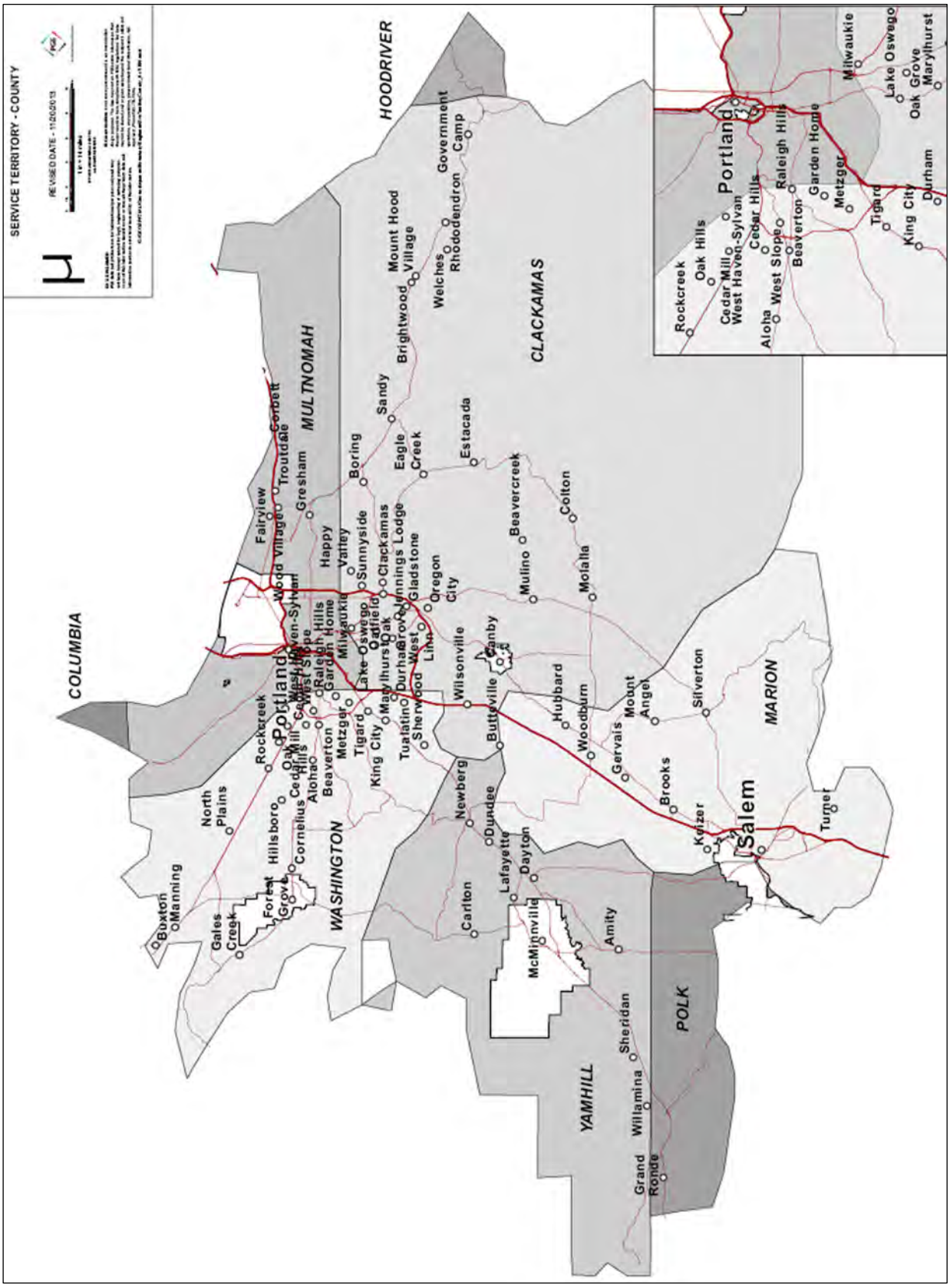
Field heat bend	Creating an on-site bend or sweep in a duct by heating the duct with a conduit heat blanket, propane torch, or other heating appliance. *Note:* Field heat bends are not allowed.
Field bend	A straight section of duct mechanically bent to achieve an angle in the duct. *Note*: Field bends are not allowed.
Grounding	Grounding of customer equipment must be in accordance with the latest version of *NEC 250*. Code enforcement agencies may require that the ground connection be visible when an inspection is made. For safety reasons, the top of the ground rod should be flush with or below ground level in permanent application.
High leg	On a 4-wire, three-phase delta connection, the conductor having the phase-to-ground voltage of 208 V on a 120/240 V service is called a *high leg* or *wild leg*. The high leg must be located on the right side and identified with an orange dot or tape.
IMC	Intermediate metallic conduit.
Lead	The horizontal distance from the surface of the pole to the point of entry of the anchor into the ground.
Manual link bypass	Bypass facilities requiring the physical act of placing links across line and load bypass studs provided in the meter socket. See *Bypass*.
Manufactured home	A factory-assembled structure or structures, site specific, and transportable in one or more sections. These structures are designed to be used as a dwelling with a permanent foundation. See Section 9, *Manufactured and Mobile Home Services*.
Meter	A device that measures and records the summation of electrical energy over time.
Meter base	See *Meter socket*.
Meter base ring	A metallic ring that secures the meter to the meter socket and which can be sealed by PGE
Meter pedestal	A commercially built pedestal that contains a meter socket and customer disconnect switches
Meter socket	A mounting device for socket-type meters that consists of jaws, connectors, and an enclosure. Sometimes called a *meter base*.
Meter spot	Process in which PGE does a site visit and identifies the approved location for a meter. Customers are required to call for a meter spot to establish any new service and/or do a rewire to upgrade service.

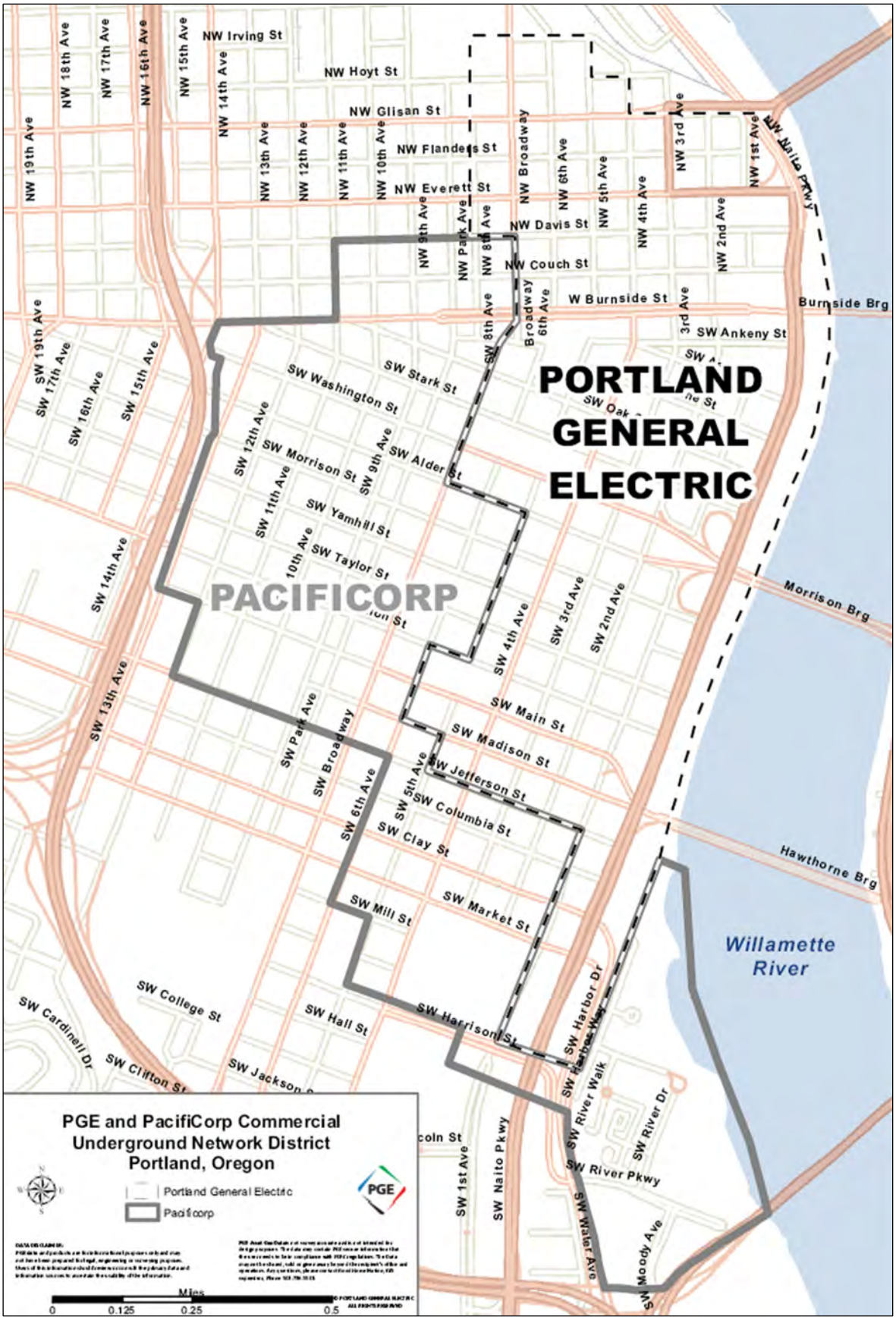
Mobile home/Modular home	A factory-assembled structure or structures that is transportable in one or more sections, and which is built on a permanent chassis and designed to be used as a dwelling without a permanent foundation.
NEC	National Electrical Code.
NEMA	National Electrical Manufacturers Association.
NESC	National Electrical Safety Code.
NFPA	National Fire Protection Association. The NFPA publishes the National Electrical Code (NEC).
OESC	Oregon Electrical Specialty Code.
Open wire secondary	Three conductors individually supported on insulators on a pole or crossarm.
Oregon Utility Notification Center (OUNC)	Oregon state agency that administers Oregon's excavation laws and handles statewide underground utility locate requests.
OSHA	Occupational Safety and Health Administration. Both the federal government and Oregon have OSHAs.
OUCC	Oregon Utility Coordinating Council.
OUNC	See *Oregon Utility Notification Center*.
Overhead service	Electric service supplied from PGE to the customer utilizing overhead conductors.
Plastic conduit	See *PVC conduit*.
Plumb	To have the sides and front of customer-installed equipment and conduit perfectly vertical from both the front and side views.
Point of attachment	The location where the PGE overhead service lateral attaches to the customer's structure.
Point of delivery	The point where a power company's circuit connects to the customer's system. Also referred to as a *service point*.
Power factor	The cosine of the angle between voltage and current, expressed as a percentage. Also, the ratio of the active power to the apparent power.
Primary	Over 600 volts.
PVC conduit	A gray, schedule 40 PVC conduit approved for use in electrical installations. Commonly referred to as *plastic conduit*.

Qualified	Refers to a person who has been trained in and has demonstrated adequate knowledge of the installation, construction, or operation of lines and equipment and the hazards involved. This knowledge includes identification of and exposure to electric supply and communications lines and equipment in or near the workplace.
Readily accessible	According to NESC, a roof or other area is considered readily accessible if a person on foot can casually accessed it via a doorway, window, stairway, or permanently mounted ladder without extraordinary physical effort or the use of special tools or devices.
Rewire	A rewire occurs when a meter base, meter socket, or weatherhead is upgraded or the location of these parts is changed.
Secondary	600 volts and lower.
Safety socket	Device consisting of a manual link bypass facility and a circuit-closing nut-and-bolt assembly that will de-energize the meter socket while the meter is removed for test or inspection.
Self-contained meter	See *Direct-connect meter*.
Select backfill	Material used to bed and cover conduit or direct-buried cable. Select backfill consists of material that passes through a 3/4-inch sieve, with no more than 15% of that material passing a No. 200 mesh sieve. In addition, the material must be reasonably free of organic and otherwise undesirable materials, and it must contain no sharp or foreign objects.
Service entrance conductors	Customer-owned conductors that connect to the customer's service equipment from the service drop or service lateral.
Service point	The point where PGE's circuit connects to the customer's system. Also referred to as the *point of delivery*.
Service trench	A customer-provided trench for the service lateral.
Service lateral	Conductors from the PGE system to the customer's house or customer-owned service pole. These conductors can include a pole, pedestal, vault, or transformer.
Single-family service	Service furnished to customers for domestic purposes in single-family dwellings.
Single-phasing	The loss of a single phase on a three-phase service (in other words, running on two phases).
Socket	A mounting device consisting of jaws, connectors, and enclosure for socket-type meters.
Sweep	A bend in a conduit that has a factory-formed, large-radius change in direction.
Switchboard	A large panel (or assembly of panels) that contain buses, current transformers, meter switches, and protective devices.

Switchgear	This term was used in earlier versions of the *ESR* book. It has been replaced by *switchboard.* See *Switchboard*.
Temporary service	Electrical service provided for residential and commercial construction, seasonal sales lots, rock crushers or paving plants, and other limited-duration applications. Normally limited to 12 months.
Test block facility (TBF)	An assembly used to de-energize a self-contained meter socket without disconnecting electric service to the customer.
Test switch	A device used by PGE to isolate a meter from current transformers.
UL	Underwriters Laboratory.
Underground service	See *Service lateral*.

Maps of PGE's Service Territory





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1 General Requirements

TOPICS IN THIS SECTION

- *You, Our Customer (including definition and responsibilities)*
- *Additional Load for Existing Customers*
- *Maximum Available Fault Current*
- *Work Activity Near High-Voltage Overhead Power Lines Over 600 V*
- *Temporary Shutdown*
- *Power Factor*
- *Time-of-Use Metering*
- *Call Before You Dig*
- *Power Quality*
- *Meters*
- *Customer Generation*
- *Main Disconnect (Six-Disconnect Rule)*

1.1 You, Our Customer

1.1.1 *Definition of Customer*

The *customer* is the individual who is requesting electric service from Portland General Electric (PGE). The customer may be the electrical contractor, developer, or homeowner installing the electric service. This book sometimes uses the word *you* to refer to the customer, too.

IMPORTANT: *When you see the words* Consult PGE *or* Consult with PGE *in this book, it means that you (the customer)* ***must*** *obtain PGE approval before installation. This applies to* ***every*** *installation. Failure to receive approval before installation will result in denial of service until the installation meets PGE's requirements. For more information, see the section "Errors That May Cause PGE to Turn Down a Request for Electric Service" on page v.*

1.1.2 *Customer Responsibilities*

1.1.2.1 Safety

The customer must comply with federal, state, and local laws and regulations concerning activities in the vicinity of PGE electrical lines and equipment. By complying with these laws and regulations, customers protect themselves, their family, and their employees—as well as PGE and its employees, contractors, and third parties—from injury, loss, or damage.

If PGE serves a customer by means of primary voltage or transmission voltage circuits on the customer's premises, or if a customer resells power and energy furnished by PGE, PGE requires them to obtain and maintain insurance coverage that PGE deems adequate to satisfy the duty of indemnification. PGE requires a separate indemnification, hold harmless, and/or additional named insured agreement.

1.1.2.2 Installing and Maintaining Switchboards

The customer is responsible for the proper installation and periodic maintenance of customer-owned metering equipment including:

- Overcurrent devices.
- Cable and bus connections and terminations.
- All other electrical equipment.

1.1.2.3 Grounding and Bonding

Grounding and bonding are critical for safety and electrical reliability. The customer is responsible for ensuring that the electrical wiring and service equipment is grounded and bonded in accordance with applicable National Electrical Code (NEC) requirements.

1.1.2.4 Protecting PGE Equipment with Barrier Posts

The customer must provide barrier posts for protecting PGE electrical equipment. When vehicles or other equipment can be near or around PGE facilities, barrier posts are required. For more information, see Section 6.4.6, "Barrier Posts."

1.1.2.5 Temporary Covers on All Openings

Where the customer provides openings for PGE equipment (such as a pad-mounted transformer) the customer must also provide and install a temporary cover. This cover must be 3/4-inch marine- or exterior-grade plywood that is 6 inches larger than the opening and secured without damaging the concrete. PGE will remove the temporary cover during installation of the electrical equipment.

1.1.2.6 Landscaping

The customer must install and maintain landscaping in a way that prevents trees, shrubs, and other vegetation from interfering with the access, proper operation, or maintenance of PGE facilities. For more information, see Section 5, *Clearances*.

Bark dust or other landscape materials must not cover a vault lid or other below-ground PGE facilities, and covers—such as fake rocks—must not be placed over electrical equipment. Consult PGE for clearance requirements of your specific installation. For easements and rights of way, see Section 2, *Permits and Applications*.

1.1.2.7 Protecting Monuments and Property Markers

In accordance with Oregon law (ORS 92.004), utility infrastructure owned and maintained by PGE (such as vaults, ducts, and road crossings) must have a minimum separation of one foot from all monuments or property markers. The customer is responsible for ensuring that this requirement is met before any PGE infrastructure is installed.

1.1.3 *Additional Load for Existing Customers*

The customer must give PGE prior written notice before adding load or modifying existing electrical equipment. This notice gives PGE an opportunity to determine whether changes are needed to its distribution facilities. See PGE tariff Rule C, Conditions Governing Consumer Attachment to Facilities.

PGE provides service conductors and transformers to accommodate existing or calculated demand load. New and existing customer service equipment may have a larger load rating than the calculated or existing demand. PGE may provide a placard (PGE part number 39558) that

indicates the need to verify service source capacity before adding load, and to require that the placard be installed on the customer's service termination equipment.

1.1.4 *Maximum Available Fault Current*

The maximum available fault current depends on the characteristics of the service being provided. The customer must furnish service equipment that is capable of interrupting and withstanding the maximum available fault current. Upon request, PGE will provide the calculated maximum available fault current at the PGE point of delivery.

1.1.4.1 Single-Family Residential 200 A or Lower

For single-family residences with services that are 200 A or lower, the customer must furnish equipment that will withstand a minimum 10,000 A fault current. Where conditions such as short-service lengths or larger service transformers exist, the maximum available fault current may exceed 10,000 A. PGE will provide the calculated maximum available fault current to the customer upon request.

1.1.4.2 Single-Family Residential, 201 A and Higher

For single-family residences with services that are 201 A to 400 A (320 A continuous), the customer must furnish equipment that will withstand a maximum 22,000 A fault current.

For services higher than 400 A (320 A continuous), PGE will provide the calculated maximum available fault current to the customer upon request.

1.1.4.3 Commercial, Industrial, Agricultural, and Multiple-Family Services

For these services, the customer must furnish equipment that will withstand the maximum fault current available from PGE. PGE will provide the calculated maximum available fault current to the customer upon request.

1.1.4.4 Network Services

Due to the electrical design of network services, customers should expect fault current levels to be significantly higher than with non-network services. The customer must furnish equipment that will withstand the maximum fault current available from the PGE network service. PGE will provide the calculated maximum available fault current to the customer upon request.

1.1.5 *Doing Work Near High-Voltage Overhead Power Lines Over 600 V*

IMPORTANT: *State law and federal OSHA rules require forbid non-qualified persons from entering, working, or otherwise moving equipment such as ropes, booms, poles, stages, or scaffolding within 10 feet of a high-voltage overhead power line. Some lines require greater clearance.*

If work needs to be done near high-voltage overhead lines, these requirements apply:

- The party responsible for carrying out the work must notify PGE of the intended work activity at least five working days before the work is to be done. More lead time may be required depending on the nature of the work.
- The responsible party and PGE must agree to a mutually satisfactory method to accomplish the work activity safely.

1.1.6 Temporary Shutdown

A temporary shutdown of a customer's service may be required to safely maintain or upgrade PGE facilities. These shutdowns will normally be scheduled for a time that is mutually convenient for the customer and PGE.

1.1.7 Power Factor

The current PGE tariff specifies a charge for low power factor for certain commercial and industrial customers. Low power factor may cause inferior performance of the customer's electrical system. PGE recommends that the customer install corrective devices to make the most effective use of the electrical system. PGE can provide a copy of the tariff if the customer would like to determine potential savings during the design. A second meter socket is not required to meter power factor.

1.1.8 Time-of-Use Metering

PGE's tariff may require time-of-use metering for certain commercial and industrial loads. Contact PGE for special requirements.

Time-of-use metering is available as an option for residential customers. Contact PGE for further information.

1.1.9 Call Before You Dig

IMPORTANT: *Before you dig, call 8-1-1 or 800-332-2344 for the location of underground utilities; or visit callbeforeyoudig.org. In the Portland metro area, call 503-246-6699.*

Oregon law requires a customer or excavator to call to determine the location of underground utilities two full working days (48 hours) before beginning excavation. The excavation must not be started until utility locations have been marked or the utilities have informed the excavator that they have no facilities in the area.

1.1.10 Power Quality

The characteristics of the customer's electrical equipment and devices must allow the PGE distribution system to operate efficiently without undue interference to PGE service or to other customers. Whenever a customer's equipment has characteristics that cause undue interference with PGE service or to other customers, that customer must make changes in that equipment or provide—at their own expense—additional equipment to eliminate the interference. Where practical, PGE will furnish additional equipment in accordance with the present tariff.

PGE reserves the right to inspect and test any equipment connected to its lines and to obtain any information necessary to determine the operational characteristics of that equipment. Before purchase, a customer must submit information to PGE regarding any equipment that might cause interference with service to other customers and/or require additional PGE facilities for its satisfactory operation.

1.1.11 Voltage Disturbances and Fluctuations

Electric service supplied by PGE may be subjected to voltage disturbances that will not normally affect the performance of typical electrical equipment. However, these disturbances may result in the improper operation of voltage-sensitive equipment, such as computers or micro-

processors. The customer must provide any power conditioning devices needed to obtain the quality of power necessary for optimum performance of voltage-sensitive equipment.

The customer may use additional facilities (such as a separate PGE transformer and a separate service) to minimize voltage fluctuations on secondary-voltage circuits for devices such as welders, induction heating equipment, and X-ray machines. If the operation of these types of equipment causes undue voltage fluctuations on PGE primary voltage lines, the additional equipment required may include a separate primary voltage line. Where practical, PGE will furnish additional equipment in accordance with the present tariff.

1.1.12 *High-Frequency Equipment and Harmonic Distortion*

The effects of the design and operation of high-frequency equipment—such as electronic heating systems, spark discharge devices, radio transmitting equipment, and equipment that generates harmonics, such as an induction furnace—must not create disturbances on the PGE electrical system that interfere with any other customer's proper operation of communication, radio, television, remote control, or other equipment.

Devices that can produce harmonic distortion—such as adjustable speed drives, electronic ballasts for fluorescent lighting, and switching power supplies for computers and electric vehicles—must be filtered so that the harmonic distortion that results from these devices is kept within the limits specified in IEEE 519-2014, Section 10. Compliance with this requirement is determined by PGE measurement at the point of change of ownership between PGE and the customer, otherwise known as the point of delivery. PGE limits the maximum voltage distortion present on our distribution system to 5% for any one frequency and the total harmonic distortion (THD) to 8%.

1.2 Motors

1.2.1 *Protection*

To assure adequate safety for personnel and to prevent damage to equipment, the customer must provide and maintain code-approved protective devices to protect all motors against overloading, short circuits, ground faults, and low voltage.

The customer is responsible for protecting three-phase motors against single-phasing system events. Primary single phasing occurs when at least one of the primary sides of the transformer phases is open and no longer delivers electricity. Single phasing may occur for numerous reasons and it cannot be fully eliminated. However, risk to the customer's equipment may be mitigated by protection schemes as determined by the customer.

1.2.2 *Starting*

Motors may require reduced-voltage starters or adjustable-speed drives if either of the following is the case:

- The motor is rated in excess of 10 horsepower (hp) and normally starts more than four times an hour, or
- A motor is rated in excess of 35 hp.

PGE will furnish information regarding permitted starting currents. The starting currents permitted depend on the following:

- Frequency of motor starting.
- The size and character of a customer's load, and

- The design of the PGE distribution system in the area.

Permitted starting currents will generally be equivalent to the maximum starting current, which—in the opinion of PGE—can be supplied without undue interference with service to other customers.

PGE will not normally invest in additional facilities to reduce voltage fluctuations on an individual customer's service caused by the starting of that customer's motors until after the customer completes installation of all approved reduced-voltage starters. If the customer still requires additional facilities, these facilities will be installed at the customer's expense.

1.2.3 *Adjustable-Speed Drive Controller*

With prior permission from PGE, irrigation pumps or other equipment featuring an adjustable-speed drive (ASD) controller that normally require three-phase service, may be served with single-phase service. This single-phase service is limited to a direct-connect, safety-socket meter base that is rated 200 A or lower, 120/240 V or 240/480 V. An ASD controller must meet harmonic distortion requirements described in Section 1.1.10, "Power Quality." Contact PGE for further information.

Note: When installing an ASD controller, contact PGE to determine whether the controller is affected by the pole-top reclosers.

1.3 Customer Generation

IMPORTANT: *Contact PGE before installing any generation equipment.*

1.3.1 *Emergency or Standby Generator*

Any permanently installed emergency or standby generator must be connected to the customer's wiring system using a permanently installed, open-transition ("break-before-make") transfer switch intended for that purpose. The transfer switch must be used to disconnect all ungrounded conductors connected to the PGE system ***before*** connecting the generator to the customer's electrical system. The transfer switch must be designed and installed to prevent connection of the generator to the PGE system during any mode of operation.

If you want to use a closed transition ("make-before-break") transfer switch, you must notify PGE before installation for review.

Customers ***must*** comply with these requirements to prevent an accident:

- A portable generator may be connected to a permanent-wiring system only if the interconnection uses a permanently installed transfer switch. Failure to use such a switch can produce a hazardous situation for PGE or other service personnel.
- Electrical inspectors from the local jurisdiction must approve all transfer switches and/or transfer operating schemes.

1.3.2 *Parallel Generation*

IMPORTANT: *Contact PGE before installing any parallel generation equipment. For information on parallel generation equipment call PGE at 503-464-8100.*

Parallel generation is defined as the parallel production of electrical energy by customers or consumers where their sources of generation connect with the PGE system for distribution. Such sources, when customer-owned, may provide all or a part of a customer's requirements,

or the customer may sell directly to PGE all or part of the output. Customer-owned sources include wind turbines, wheels, steam turbines, solar conversion, and geothermal devices. PGE will handle each proposal for parallel generation on an individual basis and a special contract between the customer and PGE is required.

PGE must approve operation of the customer's parallel generation system. PGE will also designate the metering type and location, and PGE will determine the method of interconnection between the customer system and the PGE system.

All parallel generation with production capabilities that will affect the service conductors by more than 30 A requires a lockable disconnect switch located within 10 feet of the interconnection meter (unless another location has been approved by PGE). This disconnect switch must be accessible 24 hours a day.

1.3.3 *Cogeneration*

Cogeneration is defined as the joint production of electric energy and useful thermal energy in a combined process. It typically includes a gas turbine or diesel-driven generator with waste heat recovery and a steam or back-pressure turbine. PGE will handle each proposal for cogeneration on an individual basis by means of a special contract between the customer and PGE.

PGE must approve the operation of the customer's cogeneration system. PGE will also designate the metering location, type of metering, and the method of interconnection between the customer system and the PGE system.

1.3.4 *Net Metering*

Net metering power production is a type of parallel generation made available to PGE from a customer that owns and operates a facility with a generating-installed capacity of 25 kW or lower for residential customers or 2 MW for commercial customers. This facility can be powered by solar, wind, fuel cell, hydroelectric, landfill or digester gas, low-emission or renewable dedicated energy, or specific biomass fuel.

Net metering facilities are intended to offset the customer's load first and then export excess generation to the grid. Net metering measures the difference between the electricity supplied by PGE and the electricity generated by the customer's generator.

Both PGE electricity and the excess generation pass through a bidirectional meter that is provided free of charge to the customer. Customers may choose to install their own generation meter to measure their total generation. **Figure 1** shows a typical residential installation. A warning label must be mounted on, or adjacent to, each meter base.

Systems greater than 7.2 kW require a manual disconnect that must be located either within 10 feet of the meter or in the line of sight, unless PGE approves a variance. If a variance is approved, a warning label and map showing the location of the disconnect must be mounted at the meter.

A written agreement with PGE and proof of a passed city/county electrical inspection is required before interconnection. See the PGE tariffs at PortlandGeneral.com.

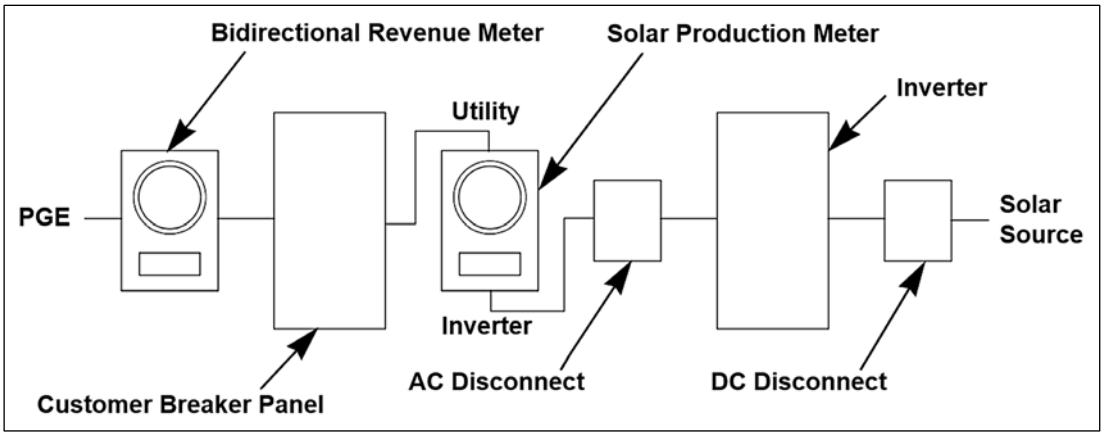

Figure 1: Typical Residential Solar Metering

1.3.5 *Small Power Production*

Small power production is a parallel generation arrangement for customer-owned facilities that:

- Have generation capacities of 10 MW or lower, and
- Meet the qualifying facility (QF) requirements outlined by the Federal Energy Regulatory Commission (FERC).

Unlike net metering, small power production generation does not require generation to first offset a customer's load. The QF generation—in full or in part—is sold to PGE at avoided cost. A written agreement with PGE is required before interconnection. (See the PGE tariffs at PortlandGeneral.com.)

Some installations will require metering on the primary side. PGE will designate the metering location and type of metering. Consult PGE before designing the power production system.

1.3.6 *Solar Payment Option*

IMPORTANT: *This pilot program closed in 2015 and new enrollments are not possible. Existing SPO customers are eligible to remain in the program for the 15-year life of their agreement. SPO systems are **not** eligible for any type of upgrades, battery or renewable.*

Solar payment option (SPO) power production—also known as the *Oregon feed-in tariff*—is a parallel generation arrangement for customer-owned solar electric facilities with a maximum dc nameplate of 100 kW (small- and medium-scale systems) or a dc nameplate of over 100 kW to a maximum of 500 kW (large-scale system).

Like net metering, SPO generation first offsets the customer's load before exporting excess generation to the grid. Electricity generated in excess of the customer's load passes through a PGE-owned bidirectional meter provided free of charge. Unlike net metering, a second PGE-owned bidirectional generation meter is also installed. The second meter (solar production meter) measures all solar generation and is subject to a monthly service charge. The solar production meter socket ***must*** be wired the same as other PGE meter sockets, and the inverter conductors must be terminated in the lower section of the meter.

The solar production meter must be installed outside, within 10 feet of the other PGE-owned meter. Contact PGE for further information. **Figure 1** above shows a typical residential installation. A warning label must be mounted on, or adjacent to, each meter base.

A written agreement with PGE is required before interconnection. For more information, see the PGE tariffs at PortlandGeneral.com.

1.3.7 *Warning Label*

A clearly legible, hard-plastic label must be mounted on (or adjacent to) each meter base. The label must have 3/8-inch–high white lettering on a red background.

The label must contain the following language: *WARNING: Customer-owned generation interconnected to PGE. Two sources may be present.*

Note: PGE may require additional labels for parallel generation.

1.4 Main Disconnect (Six-Disconnect Rule)

PGE requires a main disconnect in front of all meter banks that contain more than six meters. The main disconnect must be in the same location as the meter bank (as shown in **Figure 51** on page 92).

2 Permits and Applications

TOPICS IN THIS SECTION

- *Codes and Ordinances*
- *Permits, Rights of Way, and Easements*
- *Applying for Service*
- *Emergency Connects and Reconnects*

2.1 Codes and Ordinances

The construction of new or remodeled installations must conform to PGE requirements and to the applicable provisions of the following:

- National Electrical Code (NEC).
- National Electrical Safety Code (NESC).
- State rules and regulations.
- City and county ordinances and codes.
- Rules on file with or issued by regulators.
- Occupational Safety and Health Administration (OSHA) rules (during construction and maintenance).

2.2 Permits, Rights of Way, and Easements

The customer is responsible—without cost to PGE—for all permits, rights of way, and easements required for the installation and maintenance of the electrical facilities that serve the customer. A permit from the local jurisdiction is required before any work in the right of way may be performed.

Only PGE-approved excavation contractors and contractors who have made other special agreements with PGE will be allowed to work under a PGE street-operating permit. The contractor must notify the local jurisdiction before work is to begin according to the terms of the permits required to complete the work. Jurisdictions within the PGE service territory have varied requirements regarding the amount of time needed to give notification. A copy of the permit must be on site.

2.3 Applying for Service

IMPORTANT: *The customer will be held liable for any personal injury or property damage if inadequate notice was not provided to PGE and/or approval by PGE was not granted.*

The customer must provide PGE with the requested service date and accurate load information in a timely manner.

Requests for service to commercial and industrial customers normally require considerable advance planning by PGE in order to serve the load. All applicants should give a 60-day minimum lead time. Commercial and industrial customers—and other installations requiring special transformers or other equipment not in stock—may require a six-month lead time or longer.

All customers requesting service must include a site plan that shows the preferred service and meter location. Commercial or industrial site plans must also show a single-line diagram of the electrical layout. Commercial or industrial applicants must provide all load information including lighting, water heating, cooking, space heating, air conditioning, and motor load. The request for service should include information on equipment operations that estimate the kilowatt demand of the load. See the service request forms in Appendix B and Appendix C at the end of this book.

Upon request, PGE will provide help to customers regarding service requirements and problems related to electric energy utilization for new, existing, and reconstructed installations. If changes in the service agreement are required, immediately contact PGE to set up alternative arrangements.

Local ordinances and/or state laws require that a customer obtain appropriate permits before PGE establishes service. This may include approval of an electrical installation by the electrical inspection authority. Approval for service will be granted only after all service requirements have been met. This includes all the requirements referenced in this section of the *ESR* book, as well as the requirements in the rest of the book and in other PGE standards.

2.4 Emergency Connects or Reconnects

A request for an emergency connect or reconnect can be made by an electrical contractor during emergency conditions, such as when a tree limb or storm takes down a service drop and damages a customer's service entrance equipment, or when a farmer's irrigation equipment is damaged and water pumping service is needed immediately.

Under these emergency conditions an electrical contractor must fill out the Request to Energize an Electrical Installation form available on the State of Oregon Building Code Division website here: https://www.oregon.gov/bcd/Formslibrary/0948.pdf. The request must be signed by a supervising electrician and submitted to PGE with a copy of the temporary electrical permit (if required). The electrician must also send a copy of this request to the customer and inspecting authority. For contact information, see "PGE Contact Information" on page v.

PGE's Service Coordinator will determine the appropriate process for getting the service connected or reconnected. During normal working hours, a PGE Service Inspector may be requested to inspect the service, or PGE may send a crew to connect or reconnect the service.

IMPORTANT: *PGE may refuse to connect or reconnect the service if it is determined to be unsafe to do so.*

3 Services

TOPICS IN THIS SECTION

- *Types of Service Furnished*
- *Permanent Service Connection*
- *Point of Delivery*
- *General Meter Installations*
- *Connecting and Disconnecting a Service*
- *Theft of Service or Unmetered Electric Service*
- *Relocation of Services and Facilities*
- *Customer-Owned Equipment*
- *Load Requirements*
- *Services to Mixed-Use Facilities (Residential and Commercial)*

3.1 Types and Sizes of Service Furnished

Available electric service is 60 hertz, alternating current (ac), single-phase or three-phase. (See Section 3.9, "Load Requirements" for more information.) The nominal secondary voltages and maximum allowable services are listed in **Table 1** and **Table 2** below. If you require service voltages other than those listed the tables, you must request those voltages—and PGE must approve them—before service can be provided.

If you are requesting primary voltage service, see Section 3.4.7, "Primary Voltage Service" and then contact PGE.

IMPORTANT: *All services are limited to the maximum available transformer size that can be provided on the PGE system. Even so, some services listed in **Table 1** and **Table 2** exceed what PGE can provide and will require the customer to placard their service. Consult PGE for more information.*

3.1.1 *Underground Service*

An underground service is a service accepting underground conduit for which PGE has terminated underground cables. In other words, PGE's circuit connects to a customer's system via underground cables inside a conduit. The maximum allowable service size available at each voltage depends on the transformer configuration.

You can find detailed requirements for underground services in Section 6, *Underground Requirements*.

IMPORTANT: *Consult PGE if you are requesting an overhead transformer to feed underground service—this may not be allowed.*

Table 1 lists the underground services that PGE can supply.

Table 1: Underground Service Types

Service Type	Secondary Voltage	Transformer Configuration	Maximum Allowable Service Size	
			Padmount Transformer	Overhead Transformer
Single-Phase	120/240	3-wire, grounded	800 A	800 A
	240/480	3-wire, grounded	100 A	400 A
Three-Phase	208Y/120	4-wire, grounded wye	3000 A	1600 A
	480Y/277	4-wire, grounded wye	3000 A	800 A
	120/240	4-wire, grounded delta	Consult PGE	1200 A
	240/480	4-wire, grounded delta	Consult PGE	600 A

3.1.2 *Overhead Service*

An overhead service is a service terminating on a customer's weatherhead for which PGE has terminated with overhead conductors. Or, to describe it another way, overhead wires bring PGE's circuit to its connection with the customer's system at a weatherhead.

Table 2 lists the overhead services that PGE can supply.

Table 2: Overhead Service Types

Service Type	Secondary Voltage	Transformer Configuration	Maximum Allowable Service Size
Single-Phase	120/240	3-wire, grounded	800 A
	240/480	3-wire, grounded	400 A
Three-Phase	208Y/120	4-wire, grounded wye	1600 A
	480Y/277	4-wire, grounded wye	800 A
	120/240	4-wire, grounded delta	1200 A
	240/480	4-wire, grounded delta	600 A

3.2 Permanent Service Connection and Disconnection

Only authorized PGE employees are permitted to make the permanent connection or disconnection of PGE electric service. In addition:

- Services must not be jumpered before inspection by the local jurisdiction and permanent connection by PGE.
- Services must not be energized without NEC-approved covers properly secured.

For more information, see Section 2.4, "Emergency Connects or Reconnects."

3.3 Point of Delivery

IMPORTANT: *Written approval from PGE is required* **before** *the point of delivery can be located anywhere except on the exterior of a building.*

The *point of delivery* for commercial and industrial customers refers to the location where the PGE circuit connects to the customer's system. The point of delivery must be on the outside of the building. For more information, see Section 5.3, "PGE Electrical Equipment Room" and the Electrical Equipment Room Checklist on page 44.

PGE will install service connections to the customer's meter equipment at the main-floor or entry-floor level only.

For residential customers, the point of delivery must be no more than 10 feet from the corner of the house closest to PGE lines. The customer must contact PGE to determine an appropriate location of the customer's meter equipment.

Note: For residential overhead services, the house siding must be installed before service will be provided.

3.4 Meter Installations

IMPORTANT: *Meter locations* ***must*** *be approved by PGE.*

PGE's tariff and rate schedules require the delivery of each class and type of electrical service through one meter to one customer at one location.

Meters must be accessible during normal work hours for meter reading and testing, except where a separate service is used to minimize voltage fluctuations on secondary voltage circuits. For more information, see Section 1.1.8, "Time-of-Use Metering."

Metering equipment (such as a meter base or CT cabinet) ***must not*** be installed on the drive-through service entrance side of a commercial building. Existing drive-through locations where PGE equipment is installed on the drive-through service entrance side are subject to temporary closure of drive-through lane(s) when PGE needs to access metering equipment.

IMPORTANT: *Customers are not authorized to relocate any meter belonging to PGE or interfere in any way with the meter or its connection. The person responsible for the electrical work must contact PGE for any work that involves relocation, rewiring, or new installation of a meter.*

Licensed electricians are authorized to remove single-phase 120/240 V residential meters. The person responsible for electrical work must notify PGE before re-energization.

The customer must promptly notify PGE upon completion of repairs or modifications so PGE can inspect, install, and seal the meter. For more information, see Section 3.4.2, "Sealing Provisions" and Section 1.1.2.1, "Safety."

⚠ WARNING

With some types of meter sockets, removing the meter from the sockets ***does not*** *de-energize the service. Before performing any electrical work, test the service with a voltmeter or other appropriate instrument to verify that it is de-energized.* ***Death or serious injury may result*** *if anyone performs work on a service that is still energized.*

3.4.1 Acceptable Meter Sockets

Acceptable meter sockets are manufactured in accordance with the current Electric Utility Service Equipment Requirement Committee (EUSERC) requirements, and ANSI C12 and UL 414 standards for safety meter sockets. The customer must provide and install the following:

- Meter socket complete with terminal lugs.
- Meter jaws.
- Manual link bypasses or safety sockets (when required).
- Sealing means for all sections.

Consult PGE for meter socket types.

IMPORTANT: *Ringless-style meter sockets are **not** approved.*

When a meter socket is installed in a switchboard, it must be wired by the switchboard manufacturer in accordance with EUSERC Drawing 300: Section II.E—Meter Sockets, General. The load side of the meter must be wired to the breaker or disconnect position. PGE will not provide service to a switchboard that has been wired or altered by the customer.

3.4.2 Sealing Provisions

PGE places seals on meter rings and associated service equipment to prevent injury and/or tampering. Sealing provisions for associated service equipment must use a stud/wing nut assembly or a clip suitable for use with a seal.

IMPORTANT: *All cabinets and gutters containing unmetered conductors—other than mainline switches required by applicable codes—must have sealing provisions.*

Removable sections of conduit may only be installed when approved by PGE and must be sealed by PGE. Unmetered conductors passing through a service disconnect compartment for a mobile home service pedestal must be in conduit and arrangements must be made for sealing.

3.4.3 Mounting of Meter Sockets

Verify that clearances for meter sockets meet the requirements shown in **Figure 13** and **Figure 14** in Section 5.2, "Meter Clearances and Location Criteria." Plumb sockets in all directions and securely mount them to a rigid surface. Securely fasten conductors to their respective terminals and arrange them in a manner that will not interfere with the installation of PGE conductors, the meter, or the cover; or with the operation of manual link bypasses.

If the meter cabinet will be recessed in the wall, install a flush-type box or meter cabinet designed specifically for that purpose so that the face of the meter cabinet projects outward beyond the building surface as approved by PGE.

PGE requires 48 inches of clear working space in front of live parts and 78 inches of clear headroom. Do not install a barrier post that is within 48 inches of the front of the meter panel when the meter is removed and energized parts are exposed. For information on barrier posts, see Section 6.4.6, "Barrier Posts," or contact a PGE Service Coordinator.

Locate meter sockets and other metering equipment at least 36 inches horizontally from a gas meter, gas valve, or nearest gas component (outlet elbow or flange) of the meter set. For meter clearances, see **Figure 16** on page 41, and for clearances around pad-mounted electrical equipment, see **Figure 22** on page 52 and **Figure 23** on page 53.

The unmetered service conductor and the metered service conductor must not be run in the same conduit, raceway, or gutter. This does not apply to minor repair jobs if coordinated with PGE before repair.

Make sure that adequate protection exists for meters that could be subject to physical damage. Barrier posts are required when metering equipment is exposed to vehicle traffic. See **Figure 30** on page 67 for barrier post locations, and see **Figure 31** on page 68 for barrier post dimensions.

3.4.4 *Access to the Meter Socket*

The meter socket must be mounted in a way that does not hinder removing the meter and/or cover from the base. The meter base panel, ring, and/or lid must not be sealed or obstructed in any way other than those methods allowed under the National Electrical Code (NEC) and this *ESR* book. Any hindrance—including but not limited to siding, caulking, enclosures, and landscaping—must be removed by the property owner in order to allow unrestricted access to the meter base.

3.4.5 *Meters in Corrosive Areas*

Meter sockets and other metering cabinets to be installed in highly corrosive areas (such as dairy farms, fertilizer plants, or chemical plants) must be constructed of stainless steel.

3.4.6 *Meter Socket Adapters*

Customer-owned meter socket adapters and meter collars used for purposes such as providing a power source are not allowed on PGE services.

3.4.7 *Primary Voltage Service*

PGE's tariff requires high-voltage instrument transformers and transformer-rated meters for customers taking service at primary voltage. The customer must consult PGE to establish a mutually satisfactory location for the service point and metering details before construction begins.

PGE will not accept some transformer configurations because they have disruptive operating characteristics. The customer must submit specifications for protective devices and transformers (including core types and winding configurations with associated wiring) for written approval by PGE. Contact PGE for details and limitations before installation.

PGE will provide primary voltage delivery to qualified customers directly—without transformation—from the high-voltage or primary distribution system (standard for the location in which service is requested) if the following conditions apply:

- The service at primary voltage will not—in the judgment of PGE— adversely affect the operation of the PGE distribution system or service to other customers.
- The service supplied is distributed in a safe and reliable manner.
- The customer provides switching devices with appropriate overcurrent protection to isolate the utility system from disturbance on the customer-owned primary facility. Since fuses at the customer-owned facility may be unable to provide the necessary coordination, circuit breakers with relays may be required.
- The customer is responsible for the operation and maintenance of all customer-owned equipment. PGE does not provide replacement parts for customer-owned equipment.

PGE requires the customer to install a disconnecting means on the load side of the medium voltage (primary) metering equipment. This equipment is in addition to any disconnecting means, overcurrent protective devices, or switches existing on customer facilities for customer use.

The load-side disconnecting means separates the customer's system from the PGE system. It is intended for PGE's use only and serves as a visible open as part of PGE line crew lockout/ tagout procedures. This disconnecting means does not include overcurrent protection.

Figure 2 shows the disconnecting means that are required by PGE.

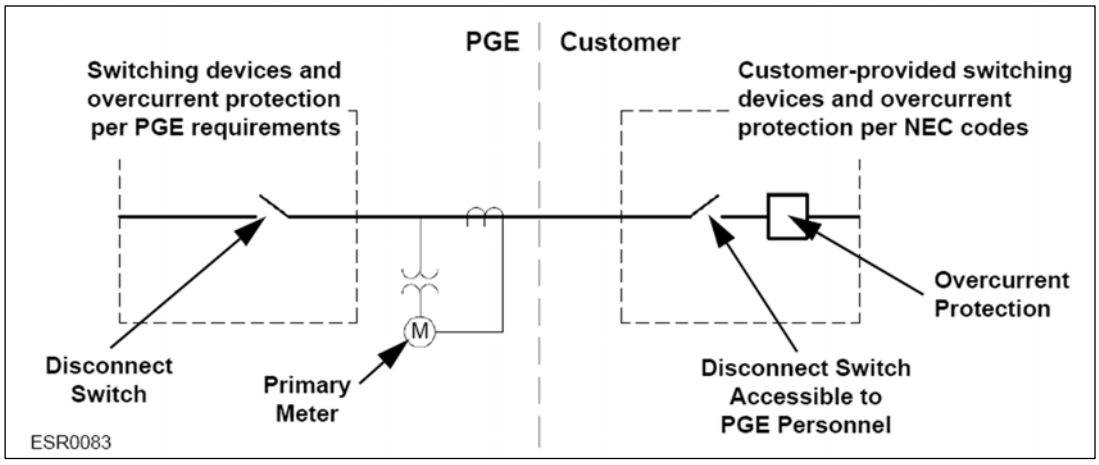

Figure 2: Disconnecting Means Required by PGE

3.4.7.1 Switchboard Enclosure for Primary Metering

Before construction, the customer must consult with PGE regarding primary services greater than 600 V. Customers must meet the requirements of EUSERC 400 when switchboard enclosures are required to meter medium-voltage delivery services. Ten feet of clear workspace is required in front of access doors.

The customer must submit approval drawings of the metering equipment to PGE before fabrication. These drawings must indicate the company name, the job address, the contact address, and the phone number of the manufacturer's representative.

The customer must provide and install:

- All necessary hardware (EUSERC 400-compliant).
- The load-side disconnect switch.
- A clear working space 78 inches high, 48 inches deep, and as wide as the PGE metering equipment (including load-side disconnect switches).
- A concrete mounting vault (with a minimum 4-inch thick concrete pad) for the switchboard metering enclosure.

  IMPORTANT: *Before ordering the meter enclosure, the customer must consult PGE for specifications on instrument transformers, the meter test switch, and secondary wiring of instrument transformers. Enclosure drawings (including a site plan and electrical room detail) must be provided to PGE for approval before installation.*

PGE will provide:

- The meter.
- A meter test switch.
- Instrument current and voltage transformers and secondary metering wiring.
- The primary disconnecting means.

3.5 Connecting and Disconnecting a Service

Connection and disconnection of any service will be done by PGE. The customer will be billed a charge according to the fee schedule in effect.

A permit and inspection by the local code-enforcing agency and approval by PGE are required before reconnection for the following:

- All services that have been disconnected longer than six months.
- Any service that has had customer electrical equipment modified in any way. All work must be scheduled with PGE for connection and disconnection of service.

No permit or inspection is required if an overhead drop is disconnected temporarily to allow felling of a tree or to provide safe working clearances for roofing, painting, or siding.

For more information about emergency connects or reconnects, see Section 2.4, "Emergency Connects or Reconnects."

3.6 Theft of Service or Unmetered Electric Service

Any unauthorized connections or wiring attached ahead of the meter that allow unmetered electric service—whether intentional or unintentional—should be immediately reported to the PGE Energy Recovery Unit. All calls will be treated in the strictest confidence and callers will remain anonymous.

The Energy Theft Hotline is 1-800-962-8184. The hotline is available 24 hours a day, 7 days a week.

3.7 Relocation of Services and Facilities

A fee may be charged if the customer requests or requires relocation of existing PGE facilities.

3.8 Customer-Owned Equipment

3.8.1 *Customer-Owned Equipment on PGE Poles*

Customer-owned metering equipment, switching devices, conduits, conductors, or luminaires ***must not*** be mounted on a PGE pole.

3.8.2 *Customer-Owned Poles and Guying*

All customer-owned and customer-installed poles for overhead mobile home service, farmyard service, or irrigation service must meet PGE requirements for height, depth of setting, pole class, and guying.

- All poles must be at least 24 feet long and be set no less than 5 feet below the ground level, with gravel backfill. Consult PGE for proper setting depths for poles longer than 24 feet.

- The size of the pole is to be Class 6 or better. (Class 6-inch poles have a minimum top diameter and a 7-inch diameter at 6 feet from the butt.) Poles must be full-length and commercially treated.
- A 6- x 6-inch treated post can be used if the post is located within 25 feet of an unobstructed drivable surface.
- All customer-owned poles must be guyed and anchored unless prior permission is obtained from PGE. Guys must be minimum 5/16-inch galvanized steel cable with a lead-to-height ratio of 1:2.

3.8.3 *Customer-Owned Transformers Beyond the Point of Delivery*

Any transformer furnished and owned by the customer beyond the point of delivery (POD) that is normally used for step-up or step-down of delivery voltages (such as 208 V stepped up to 480 V) must conform to the transformer types acceptable to PGE.

The use of grounded wye-delta transformers installed with the grounded wye towards the POD is allowed only with protection and relaying acceptable to PGE. This requirement reduces the chance that a fault on the grounded-wye side of the customer's transformer will:

- Damage customer-owned transformer and/or electrical equipment.
- Cause improper operation of PGE protection equipment.
- Present a safety hazard for customer employees, PGE personnel, and the public.

3.9 Load Requirements

3.9.1 *Single-Phase Service*

Equipment having a capacity of 2 kilowatts (kW) or more must be operated at 208 V or higher.

Customers connecting any individual motor larger than 5 horsepower (hp) must obtain prior approval from PGE. In addition, air conditioners and heat pumps larger than 5 tons require prior PGE approval. Single-phase motors larger than 3 hp may cause voltage dips that are objectionable to some customers.

Space heating or water heating must be designed and controlled so that no more than 48 A of load at 240 V switches on or off at any one time.

PGE limits the maximum single-phase, 120/240 V load served through one point of termination to the capacity of a 167 kVA, single-phase transformer.

PGE requires the customer to use three-phase service instead of single-phase service if—in the judgment of PGE—the customer's connected load is excessive for single-phase service.

Single-phase service over 320 A requires current transformer metering. See as Section 10.7, "Current Transformer Metering, 800 A Maximum" for more information.

3.9.2 *Three-Phase Service*

Three-phase service will be provided upon request to residential and nonresidential customers in accordance with the current PGE tariff.

Three-phase service over 200 A requires current transformer metering as described in Section 10.7, "Current Transformer Metering, 800 A Maximum" or Section 10.5, "Customer's Responsibility for Maintaining Switchboards."

The customer's connection of single-phase loads to three-phase services must follow these guidelines in order to reduce the likelihood—or eliminate a common cause—of overloading or single-phasing condition that could damage the customer's three-phase equipment:

- On a 208Y/120 V or 480Y/277 V, three-phase service, all single-phase loads should be split evenly among the three phases.
- On a 240/120 V, delta, three-phase service, single-phase loads (both 120 V and 240 V) must not utilize the high leg (wild leg). The exception is resistance heating equipment, which should be balanced across all three phases.

The high-leg (wild-leg), 4-wire deltas must be marked with orange and be on the right side of the meter base or current transformer (CT) cabinet.

PGE chooses the voltage supplied to a customer depending on that customer's electrical needs and the characteristics of the PGE distribution system in the area. PGE limits service at 208Y/120 V to a maximum demand of 500 kVA and 480Y/277 V to 2000 kVA. The customer must obtain a prior agreement from PGE for service to three-phase loads larger than 500 kVA at 208Y/120 V and 2000 kVA at 480Y/277 V.

Three-phase, 480 V service may not be supplied where the total load to be served is less than 50 kW except when:

- The load consists of a single motor (such as for irrigation pumping) with nameplate rating of at least 20 hp, or
- An existing 480 V transformer bank has capacity for the additional load.

Typically, three-phase, 4-wire, closed-delta service will not be supplied from underground primary systems.

New three-phase, 3-wire service is not available from PGE. Conversion of an existing three-phase, 3-wire service is required when:

- The customer adds load.
- Electric work or repair is required in the meter base or meter socket.
- The meter base or meter socket is replaced.
- The service entrance conductors and/or the weatherhead is replaced.

3.10 Services to Mixed-Use Facilities (Residential and Commercial)

Services to mixed-use facilities with both residential and commercial customers are usually complex. These services require that the customer consult PGE for availability of service voltages, overhead or underground service options, transformer locations, and service entrance requirements ***before*** plans are completed or electrical equipment purchased.

Where underground service is requested, the customer must provide the necessary space on their premises for the installation of PGE transformers and associated electrical equipment. This type of service may require a transformer pad and/or vault, or a Class A vault.

4 Temporary Service

TOPICS IN THIS SECTION

- *Basic Requirements*
- *Typical Structures for Temporary Service for Construction Work*
- *Construction Prerequisites for Temporary Service*
- *Construction Requirements for Temporary Service*
- *PGE Gold Temporary Service for Residential Applications*

4.1 Basic Requirements

Note: Upon request, PGE will supply temporary service at a location adjacent to PGE facilities as provided in the appropriate electric service schedules. Consult PGE for information regarding temporary construction service programs.

A temporary service for construction work must be located so that the meter is protected from accidental damage. Where practical, place the temporary service in a location that is usable throughout the construction period. If PGE must relocate a temporary service, the customer must pay the relocation cost in accordance with the PGE schedule of charges.

The service pole (round) and service post (square) for the temporary service must be sound and in good condition for the duration of its use. PGE will not energize a temporary service if the customer-provided service pole is not safe, or if the service post is not suitable for supporting the tension of the service conductor.

Overhead temporary services must meet the clearance requirements provided in this section and in Section 5, *Clearances*. Underground temporary cables must be placed in a trench that meets the requirements of Section 6, *Underground Requirements*. Temporary service cables laid on the ground are not permitted, even with mechanical protection.

IMPORTANT: *PGE must do a meter spot—a site visit to identify an approved location for a meter—before service can be established. Make sure to call PGE for a meter spot on all temporary services.*

4.2 Typical Structures for Temporary Service for Construction Work

Temporary service for construction work can be set up in one of four typical structures.

- A 6- x 6-inch overhead service post in a non-road crossing.
- A 6- x 6-inch overhead service post in a road or traffic crossing.
- An overhead service pole.
- An underground service mounted on a 6- x 6-inch post.

4.3 Construction Prerequisites for Temporary Service

IMPORTANT: *PGE has the right to refuse connection if height, strength, bracing, or other prerequisites in this section are not met.*

Temporary structures must meet ***all*** of these construction prerequisites before PGE can provide service:

- The pole and posts must be pressure-treated or thermally treated by the manufacturer with an American Wood Preservatives Association-approved standardized preservative.
- All posts and poles must be one continuous piece.
- To ensure strength, all lumber must be free of sucker knobs and have spike knots no larger than one-third of any face. Checks greater than 0.5-inch wide are not permitted. No visible wood decay is allowed.
- Only steel stakes may be used. Wood stakes are no longer acceptable.
- The stakes must be set in undisturbed soil. Each stake must be attached to the brace using three 16-penny (16d) or greater nails, and the brace must be attached to the post with at least three 16d or greater nails. If a steel stake is used, a U-bolt may be substituted for the three 16d nails.
- To provide stability, use tamped, 3/4-inch minus crushed rock at a depth that equals the required depth of the pole or post.
- A service post for temporary construction power requirements cannot be in use for more than 180 days. If temporary construction power service is needed beyond 180 days, the customer must provide an overhead service pole.
- If a service conductor crosses a road or traffic area, the National Electrical Code (NEC) and the National Electrical Safety Code (NESC) require a higher aboveground clearance than is required in other situations. These crossings require the installation of an overhead service pole or an overhead service post as specified in Section 4.4.1.2, "Overhead Service Post in a Road Crossing or Traffic Crossing."
- The distance between the electric utility point of attachment and the temporary service pole or 6- x 6-inch post must be 60 feet or less. If this distance is greater than 60 feet, a 4- x 4-inch overhead clearance post must also be used to ensure adequate clearance. For more information, see Section 4.4.2, "Overhead Clearance Post (4- x 4-Inch)."
- An electrical permit and inspection by the local code enforcement agency is required for all temporary services.
- The code enforcement agency may require that the grounding connection be visible when the electrical inspection is made. For safety reasons, however, the top of the ground rod should be flush with or below the ground level.

4.4 Construction Requirements for Temporary Service

These requirements apply to the construction of all types of overhead and underground temporary service:

- The meter socket must be NEMA type 3R (rainproof), and must be in good condition with no holes, bends, or damage. The meter socket must be plumb in all directions.
- Service equipment must be NEMA type 3R (rainproof), and must be in good condition with no holes, bends, or damage. NEC-approved covers must be properly secured.
- The center of the meter socket must be at least 42 inches and no more than 72 inches from the ground level.

- The electrical label or permit must be attached to the meter base.
- Service drop and (where applicable) drip loop clearances must be in accordance with the requirements in Section 5, *Clearances*.

4.4.1 *Overhead Service Post, 6- x 6-Inch*

Note: These requirements are in addition to the construction prerequisites in Section 4.3 and the construction requirements in Section 4.4.

Figure 3 shows an overhead service in a non-road crossing, and **Figure 4** shows an overhead service in a road or traffic crossing.

Note: Additional requirements for non-road crossings are discussed in Section 4.4.1.1, and those for road or traffic crossings are discussed in Section 4.4.1.2.

Figure 5 shows a typical overhead service post installation.

Figure 6 shows a detail of the attachment point and connection point.

Figure 7 shows front and side views of a typical temporary weatherhead installation.

These requirements apply when installing an overhead service post:

- Use a #2 AWG aluminum triplex conductor suitable for tensioned overhead service. This conductor must be long enough to reach the ground. Use an eyebolt and a wedge grip to attach the triplex conductor to the top of the post.
- All internal wire must be jacketed up to the end of the 24-inch tails where it will be connected to the triplex conductors.
- The braces must not block the working space around the meter or service equipment.

IMPORTANT: *The customer is responsible for the conductor from the meter base to where it reaches the ground.*

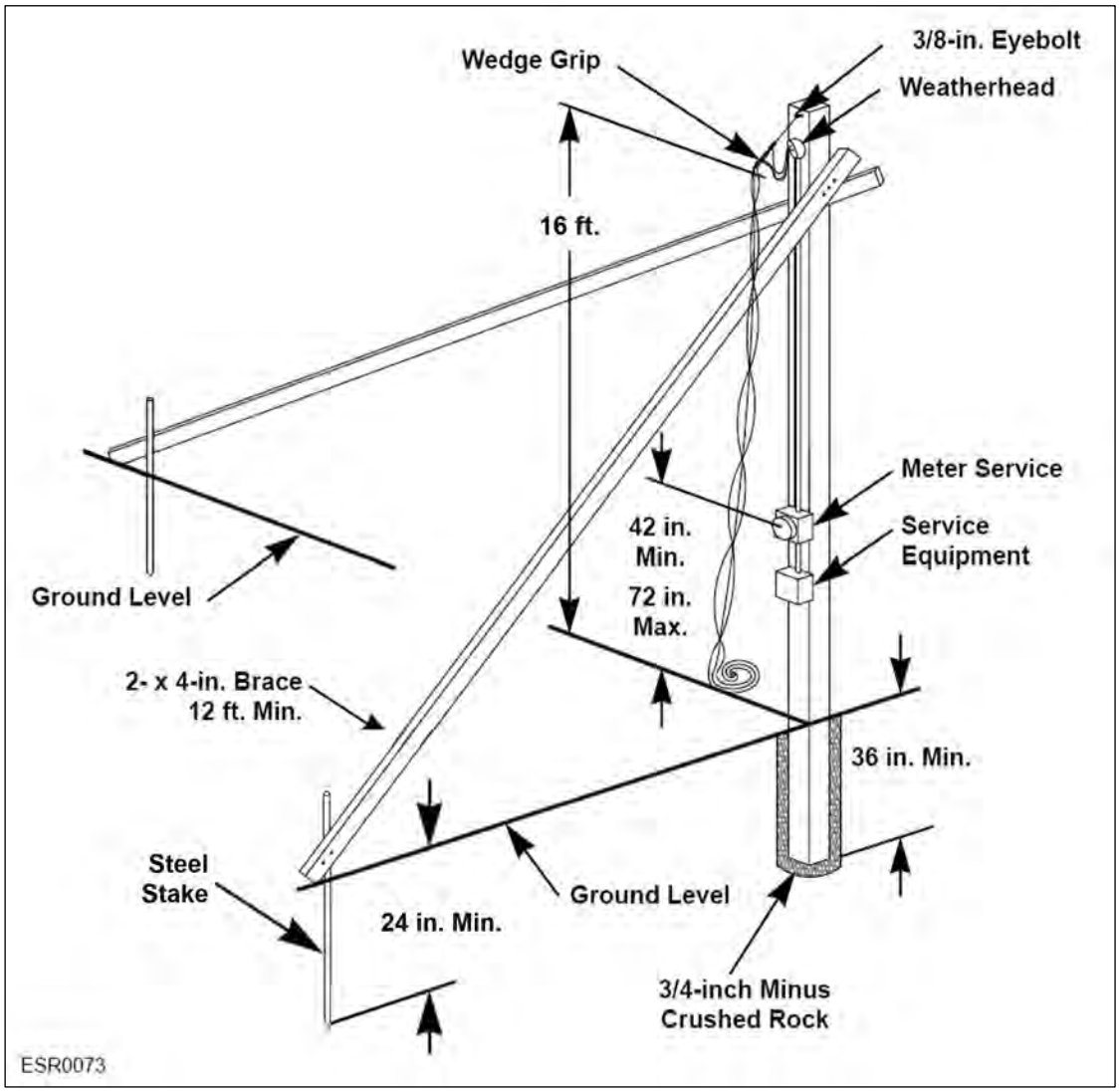

Figure 3: 6- x 6-inch Overhead Service Post in a Non-Road Crossing

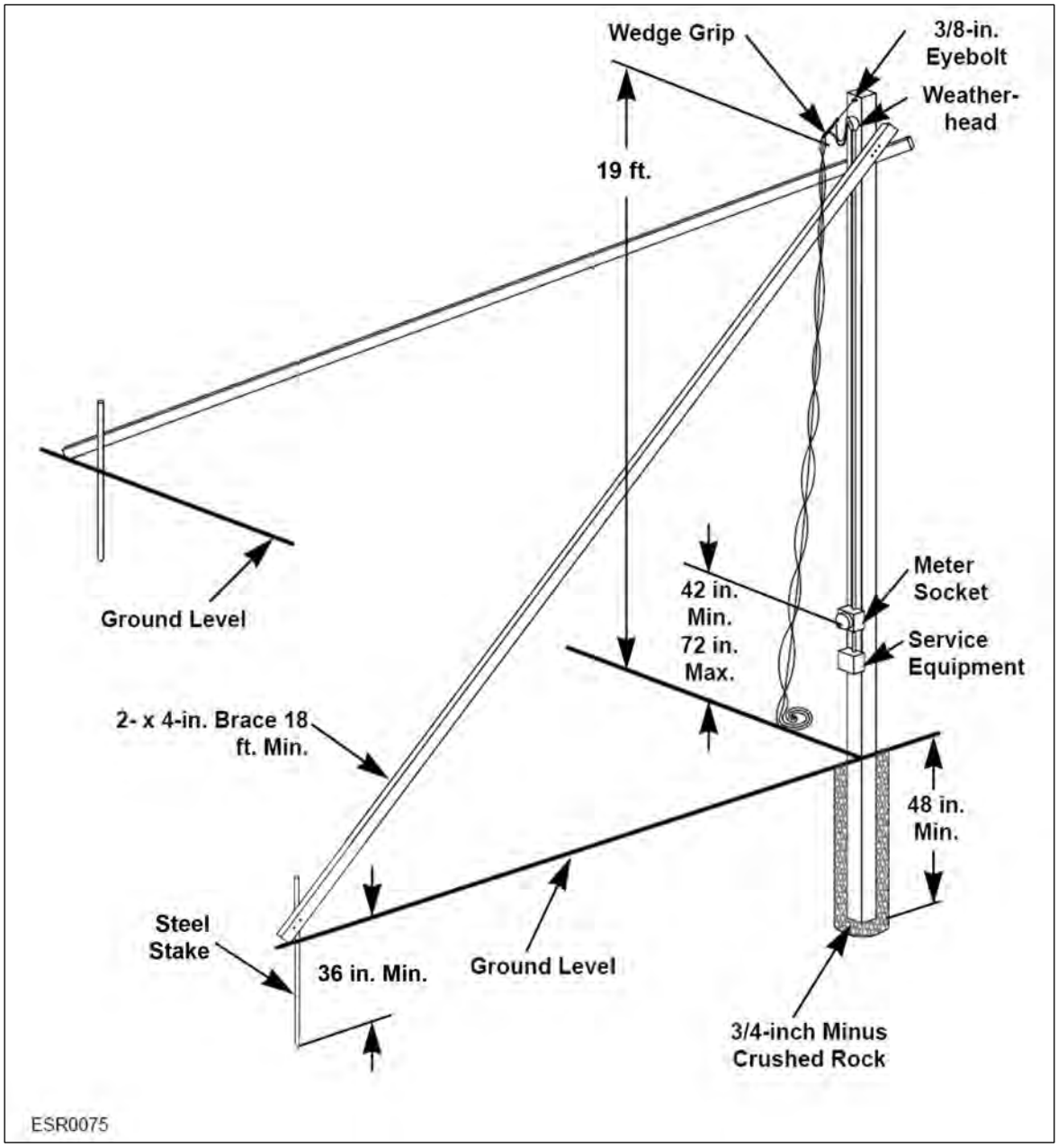

Figure 4: **6- x 6-inch Overhead Service Post in a Road or Traffic Crossing**

Figure 5: Typical Overhead Service Post

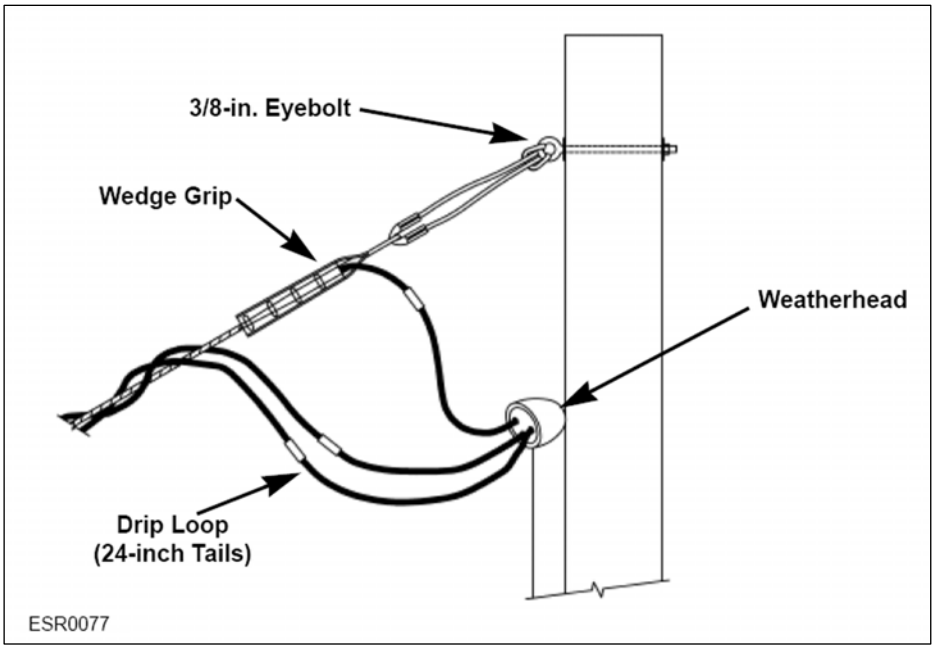

Figure 6: Detail of Attachment Point and Connection Point

Figure 7: Typical Temporary Weatherhead Installation
(Front view on left, side view on right)

4.4.1.1 Overhead Service Post in a Non-Road Crossing

Note: These requirements are in addition to the construction prerequisites in Section 4.3 and the construction requirements in Section 4.4.

Figure 3 above shows an overhead service post in a non-road crossing, and **Figure 6** above shows a detail of the attachment point and connection point.

These requirements apply when installing a service post in a non-road or traffic-free crossing:

- The post must be 6- x 6-inch square and at least 16 feet in length. Set the post in the ground at least 36 inches.
- The braces must be 2- x 4-inches and at least 12 feet in length.
- The stakes must be 0.75-inch round steel, and be set in the ground at least 24 inches. **Figure 8** shows a steel stake, brace, and U-bolt. **Figure 9** shows a typical steel stake installation.

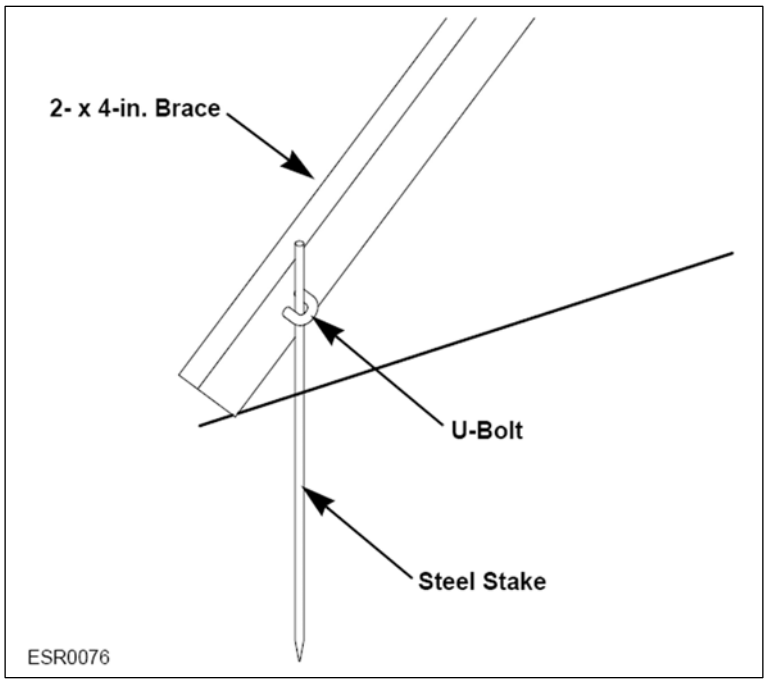

Figure 8: Required Steel Stake

Figure 9: Typical Steel Stake and Brace Installation

4.4.1.2 Overhead Service Post in a Road Crossing or Traffic Crossing

Note: These requirements are in addition to the construction prerequisites in Section 4.3 and the construction requirements in Section 4.4.

Figure 4 above shows an overhead post in a road or traffic crossing. **Figure 6** above shows a detail of the attachment point and connection point.

These requirements apply when installing an overhead service post when the service drop crosses a road or traffic crossing:

- The post must be 6- x 6-inch square, at least 24 feet in length, and set in the ground at least 48 inches.
- The braces must be 2- x 4-inches and at least 18 feet in length.
- The stakes must be 0.75-inch round steel, and be set in the ground at least 24 inches. **Figure 8** above shows a steel stake, brace, and U-bolt. **Figure 9** above shows a typical stake installation.

4.4.2 *Overhead Clearance Post (4- x 4-Inch)*

Note: These requirements are in addition to the construction prerequisites in Section 4.3 and the construction requirements in Section 4.4.

A 4- x 4-inch overhead clearance post (shown in **Figure 10**) is required when the distance between the electric utility point of attachment and the temporary service pole or post is greater than 60 feet.

These requirements apply when installing an overhead clearance post:

- The post must be a minimum 4- x 4-inch square and set in the ground at least 3 feet.

- The braces must be 2- x 4-inches and at least 18 feet in length. They must face the power source.
- The stakes must be 0.75-inch round steel, and be set in the ground at least 24 inches. **Figure 8** above shows a steel stake, brace, and U-bolt. **Figure 9** above shows a typical stake installation.
- Maintain a maximum of 60 feet between the posts.
- Maintain at least 8 feet between the post and the stake.

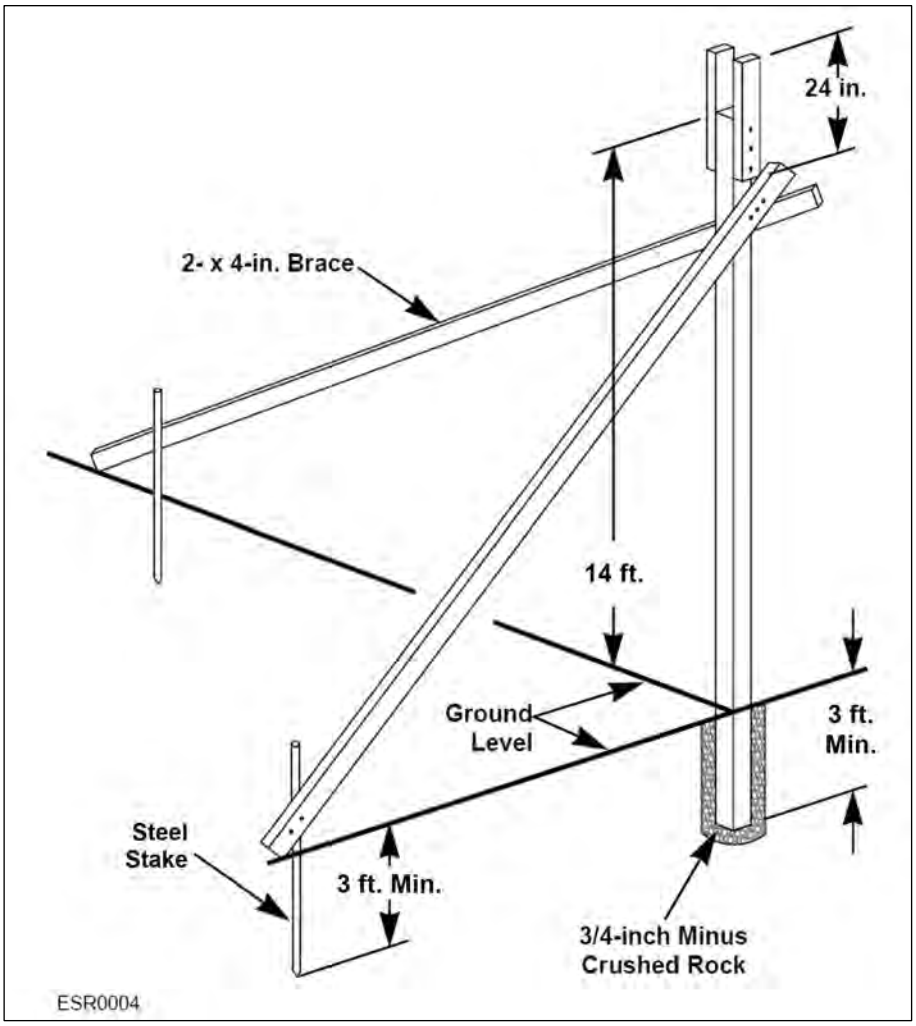

Figure 10: 4- x 4-inch Overhead Clearance Post

4.4.3 *Post-Mounted Underground Service (6- x 6-Inch)*

Note: These requirements are in addition to the construction prerequisites in Section 4.3.

A temporary underground service (shown in **Figure 11**) is available only in areas where the permanent service is from an underground facility. See Section 6, *Underground Requirements*, for underground and conduit requirements.

These requirements apply when installing a temporary underground service:

- The wood post must be a minimum 6- x 6-inch square and be owned by the customer.
- The post must be set in firmly tamped, 3/4-inch minus crushed rock, with the earth domed to allow for settling.
- The conduit must be rigidly fastened to the wood post.
- Maintain a 36-inch minimum straight section of conduit between sweeps.

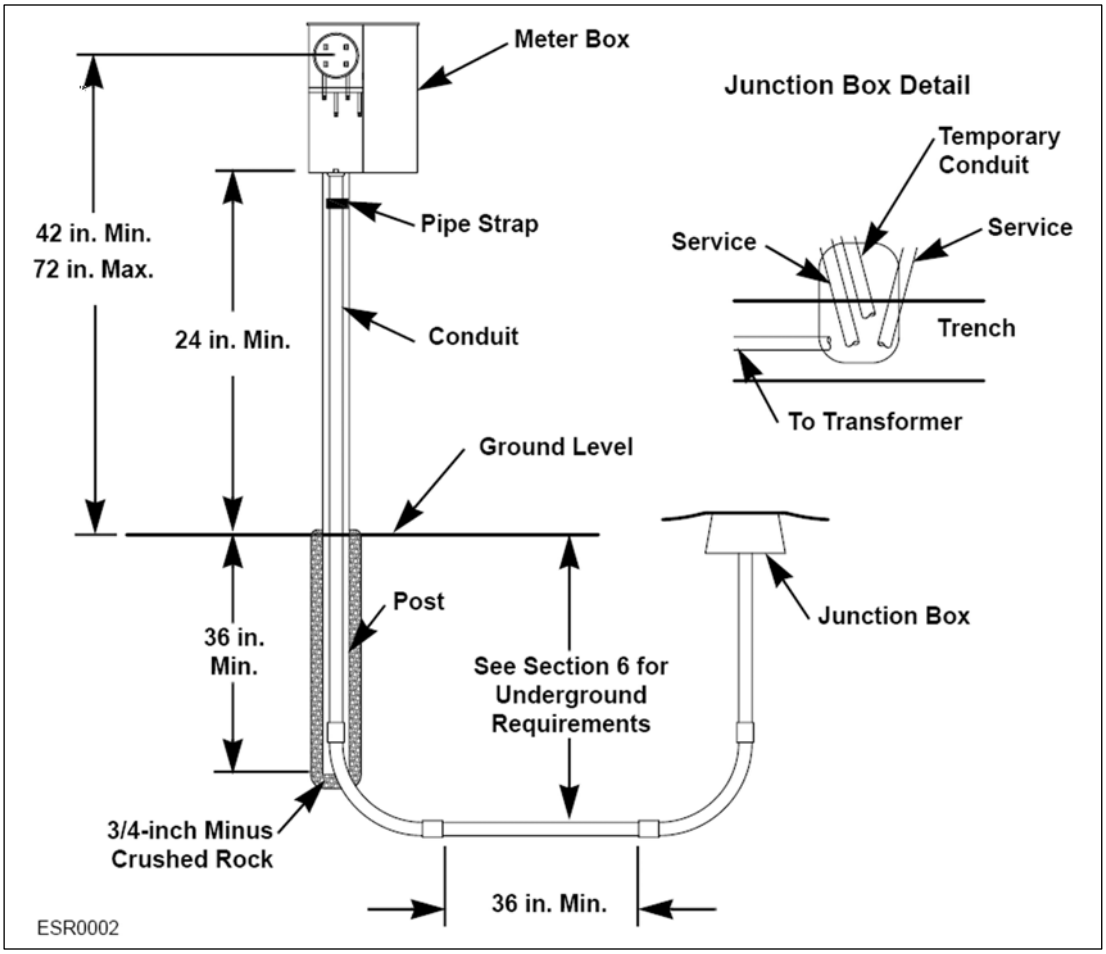

Figure 11: Underground Service Mounted on 6- x 6-inch Post

4.5 PGE Gold Temporary Service for Residential Applications

PGE Gold Temporary Service is an enhanced service that provides an unmetered, flat-rate, temporary service for residential construction.

Gold Temporary Service may only be used to power lights and tools, as well as any equipment of less than or equal to 5 horsepower (hp) that is necessary for the construction and final inspection of the associated residential dwelling(s). This includes testing of a domestic well pump and septic pump.

Gold Temporary Service may not be used to operate permanently installed appliances, equipment, or construction trailers; or to heat or dry structures that are under construction.

When using a PGE Gold Temporary Service, the customer must use electrical extension cord sets (or other devices) that incorporate ground fault interrupters (GFIs) to comply with local codes.

PGE installs the Gold Temporary Service and no permits are required. The cost and installation of the temporary service will be provided according to all current PGE and tariff regulations. Contact PGE for availability and further information.

If a request for a Gold Temporary Service involves installation at an existing PGE pad-mounted transformer, it may be necessary for a PGE crew to provide excavation. The customer will be responsible for the additional costs associated with that excavation.

If no transformer is present, a PGE construction drawing will be required.

5 Clearances

TOPICS IN THIS SECTION

- *Basic Requirements*
- *Meter Clearances and Location Criteria*
- *PGE Electrical Equipment Room*
- *Electrical Room Checklist*
- *Clearances from Pools and Spas*
- *Clearance from an Underground Fuel Storage Tank*
- *Separation of Oil/Fluid-Filled Transformers from Structures and Other Oil/Fluid-Filled Equipment*
- *Working Clearances*
- *Separation of Electrical Equipment and Meter from a Gas Meter Set*
- *Separation of PGE Electrical Equipment from a Liquefied Petroleum Gas Container*

5.1 Basic Requirements

The customer must provide suitable space and provisions for mounting a meter socket at a location acceptable to PGE. It is in the mutual interest of the customer and PGE for this location to be convenient to both parties for reading, testing, and replacing meters.

If, in PGE's opinion, a customer makes a meter inaccessible, such as by installing a fence or enclosure, the customer must—at their own expense— provide access acceptable to PGE or move the meter socket to a location acceptable to PGE. If a meter is located behind a fence, see the requirements in Section 5.2.3, "Residential Meter."

Where the point of delivery is located inside the customer’s building, PGE will only install service connections to customer’s metering equipment at the main or entry floor level.

The customer is responsible for obtaining base flood plain elevation requirements from the local jurisdiction, and for ensuring that all customer-owned switchboards and metering equipment are installed in accordance with these requirements.

PGE will not install a meter on a mobile structure, such as a trailer, barge, crane, dredge, dragline, or any mobile pumping equipment; or on a floating dwelling unit, such as a houseboat.

5.2 Meter Clearances and Location Criteria

Meter clearances and locations must meet ***all*** the following criteria.

- PGE requires the minimum unobstructed workspace in front of a meter to be 72 inches high, 48 inches wide, and 48 inches deep. These clearances are shown in **Figure 12**.
- A meter installed in a cabinet requires a minimum space of 48 inches deep to allow the cabinet door to open.
- All meters and metering equipment must be located at least 36 inches horizontally from a gas meter.
- In a single-meter socket installation, the center of the meter socket cannot be more than 72 inches from the finished grade or floor immediately in front of the meter, or lower than 42 inches from that grade or floor.

- In a multiple-meter socket installation or switchboard installation, the center of the uppermost meter socket must be no higher than 78 inches and the lowermost meter socket must be no lower than 36 inches. No more than five meters are allowed in a single vertical gang meter stack. See **Figure 51** on page 92.
- The customer must provide a minimum 4- by 4-foot level workspace in front of all metering equipment.

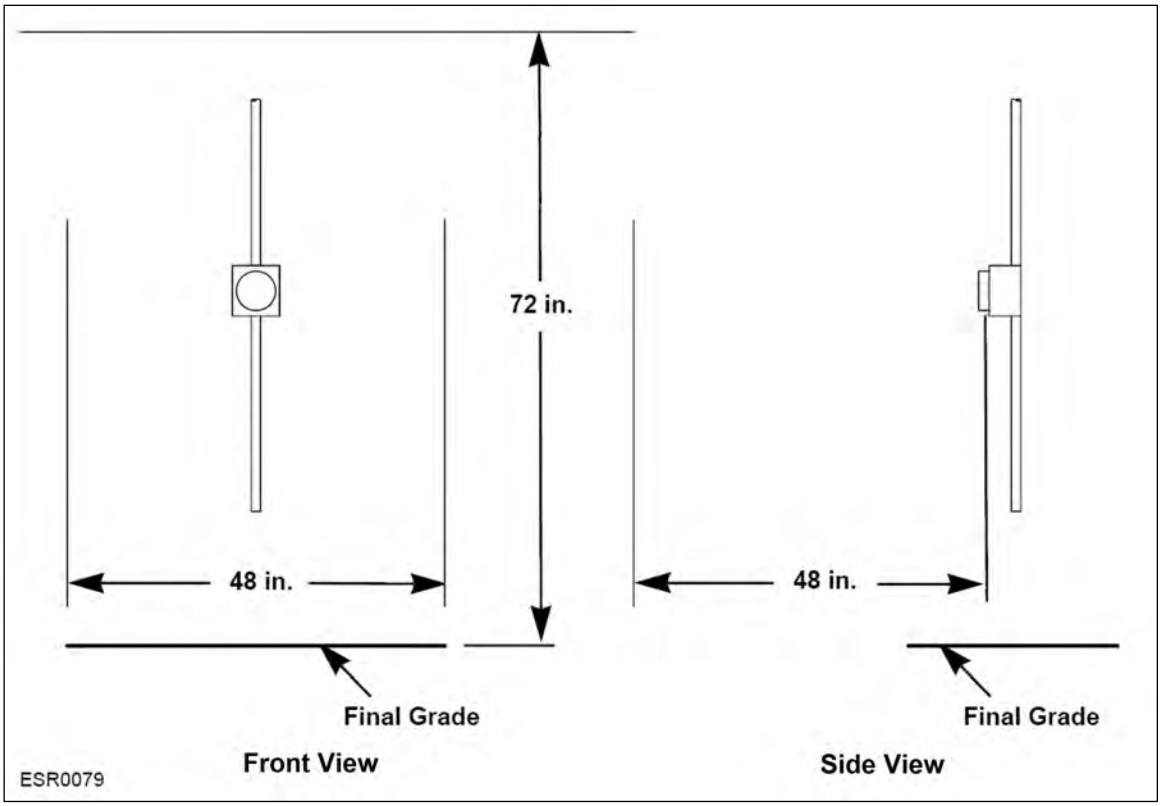

Figure 12: Minimum Unobstructed Workspace Around Metering Equipment

5.2.1 *Single-Meter Installation*

Follow these additional clearance requirements for single-meter installations, both flush-mount and surface-mount, as shown in **Figure 13**:

- The minimum horizontal clearance from the center of the meter to a wall or obstruction is 10 inches.
- The minimum vertical clearance from the center of the meter to a ceiling or obstruction is 9 inches.

5.2.1.1 Single-Meter, Flush-Mount Installation

Follow these additional clearance requirements for a single-meter, flush-mount installation.

- A minimum 3/4-inch plywood backing is required.
- The building face must not extend beyond the face of the meter box, as shown in **Figure 13**.

5.2.1.2 Single-Meter, Surface-Mount Installation

Follow this additional clearance requirement for a single-meter, surface-mount installation.

- A surface-mount meter must have at least two 2- x 4-inch back supports, as shown in **Figure 13**.

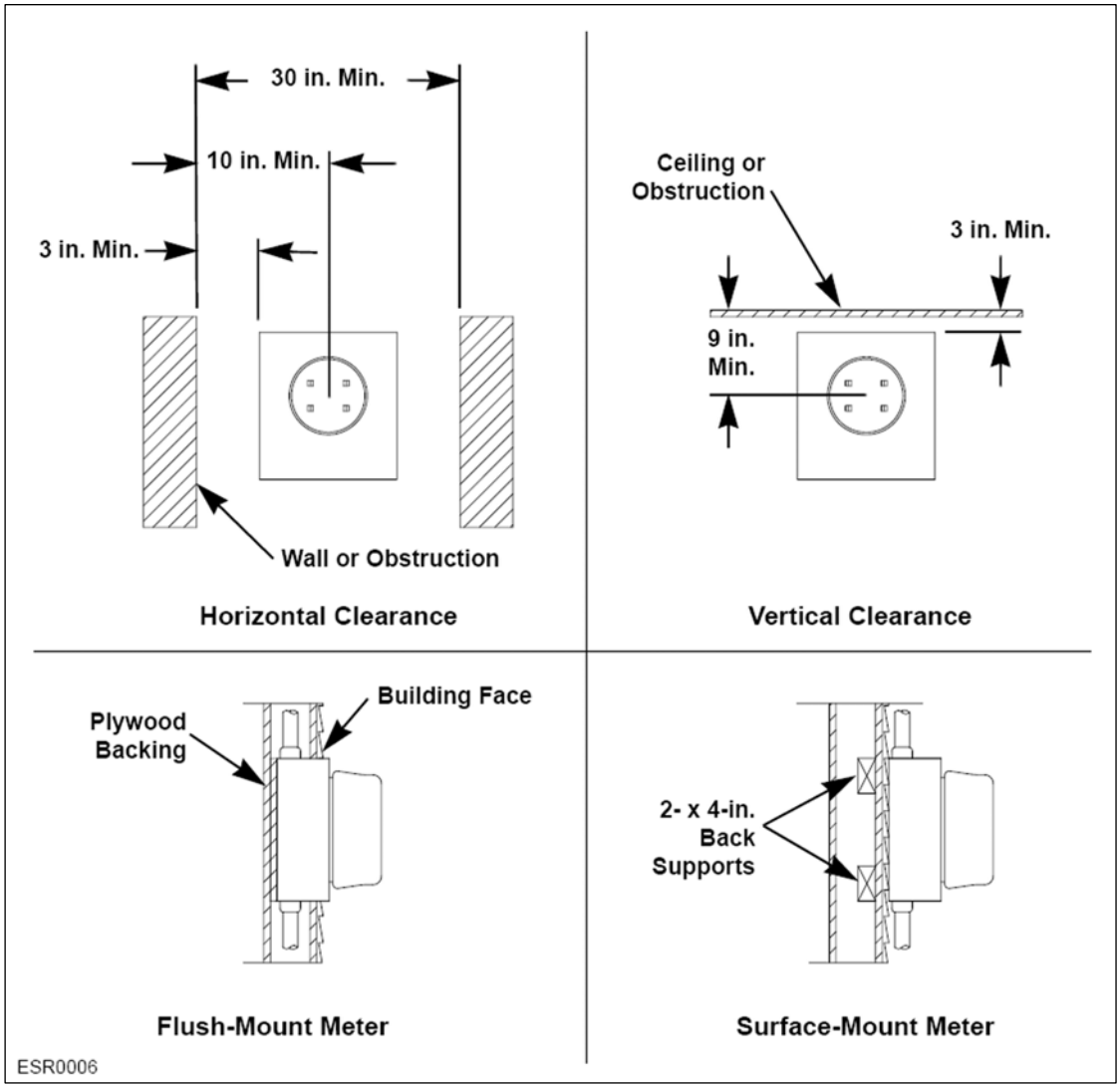

Figure 13: Meter Clearances for Single-Meter Installations

5.2.2 *Multiple-Meter Installation*

Follow these additional clearance requirements for a multiple-meter installation in a room or on adjacent walls. All these requirements apply to the drawings shown in **Figure 14**.

- All doors to a room that contains PGE metering and termination equipment of 120 V or higher must open out. These doors must be equipped with a panic bar before service will be provided.
- Open cabinet doors on a piece of utility equipment must not block the exit.
- A minimum 90-degree clear open space is required when the CT cabinet door is open.

- The minimum horizontal clearance from the open door of a CT cabinet to a wall or obstruction is 4 inches.
- The minimum horizontal clearance from the center of the meter to a wall or obstruction is 10 inches.
- The minimum horizontal clearance from the side of a current transformer (CT) cabinet to a wall or obstruction is 30 inches.
- The minimum horizontal clearance from the front of a CT cabinet to a wall or obstruction is 48 inches.
- When there are multiple meters on adjacent walls, a 16-inch minimum horizontal clearance is required from the side of the meter box to a wall or obstruction.
- No more than five meters are allowed in a single vertical gang meter stack.

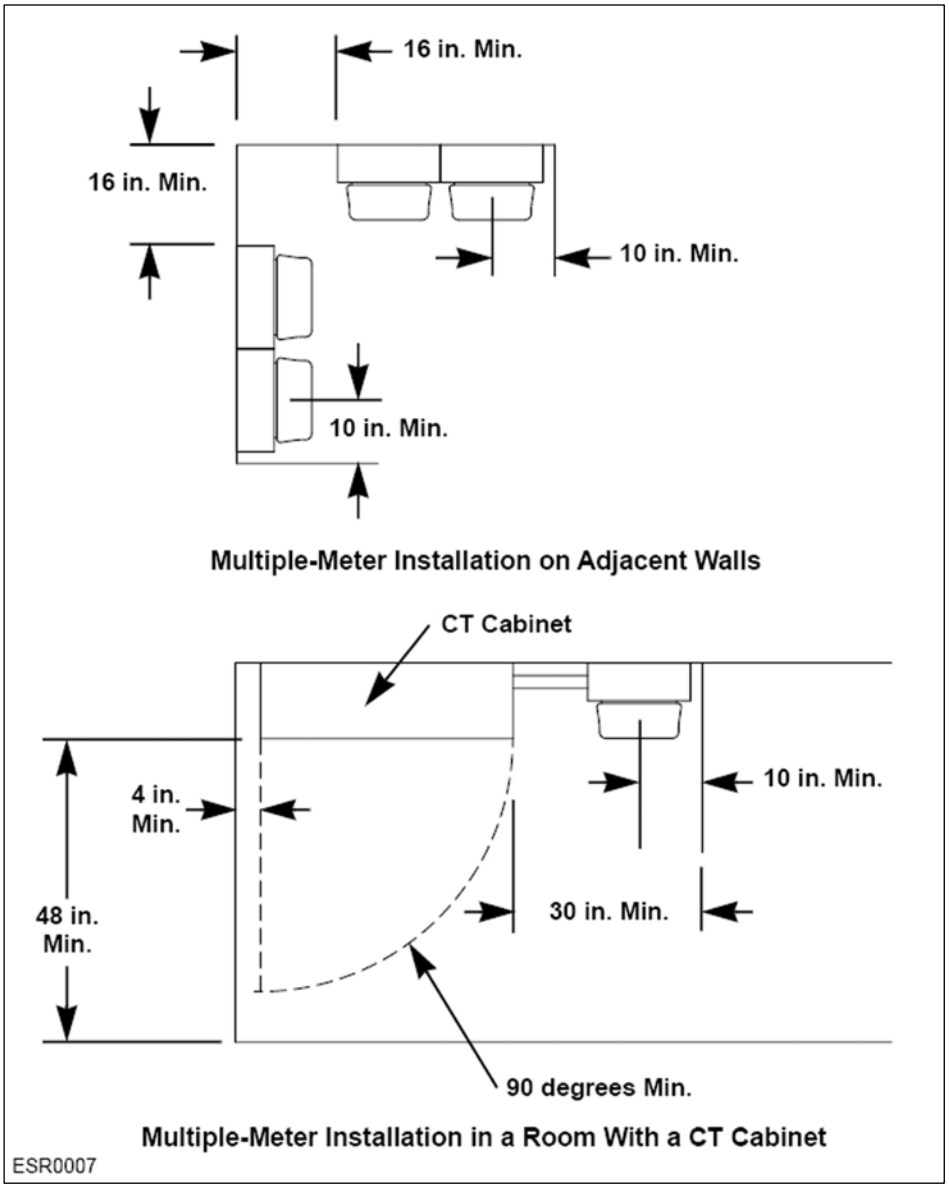

Figure 14: Meter Clearances for Multiple-Meter Installations

5.2.3 Residential Meter

IMPORTANT: *The meter socket and location must be approved by PGE before meter installation.*

Install a residential meter and current transformer (CT) cabinet outdoors at a location acceptable to PGE. As a general guideline, locate the meter on the side of the structure closest to the PGE line or—to prevent the meter from being located behind a fence—within 10 feet of the front (or street) side of the structure. Avoid installing a meter on an exterior bedroom or bathroom wall or patio, as well as on exterior walls that are likely to be fenced in the future.

If a meter must be located behind a fence, a gate must be installed in one of these places:

- On the same side of the house where the meter is located, or
- On the side the house that will result in the shortest distance from the street to the meter.

Never install a meter over a window well or steps in a stairway, or in any other unsafe or inconvenient location. Keep shrubs and plants from obstructing access to metering equipment.

Typical locations of meters for overhead services are shown in **Figure 15**.

Follow these clearance requirements for overhead service:

- Clearances for service drops and drip loops are listed in **Table 3**.
- The cable and drip loop must be at least 18 inches above an inaccessible roof as defined by NESC.
- Buildings should not be constructed under or adjacent to lines.
- Locate the weatherhead at least 24 inches above the roof and within 48 inches of the roof edge. See Section 7.3.2, "Service Mast Guy and Anchor Requirements" for guying requirements.
- The maximum length of a service cable over the roof surface is 6 feet.
- The maximum distance between the meter base and the corner of the house closest to a PGE line is 10 feet (120 inches).
- The minimum distance between a gas meter and the PGE meter is 36 inches as shown in **Figure 16**.
- To maintain customer privacy, avoid locating a meter within 36 inches of a window or door with a view of living spaces.
- At least 30 inches of clear workspace is required from the edge of a window well.
- The point of attachment for the cable must be a 3/8-inch eyebolt or 3/8-inch eye lug that is within 24 inches of the weatherhead as shown in **Figure 16**.

  IMPORTANT: *Do not attach the cable to the eave on the house.*

  Note: You must get PGE approval before installing a service drop on the gable side of a residence.

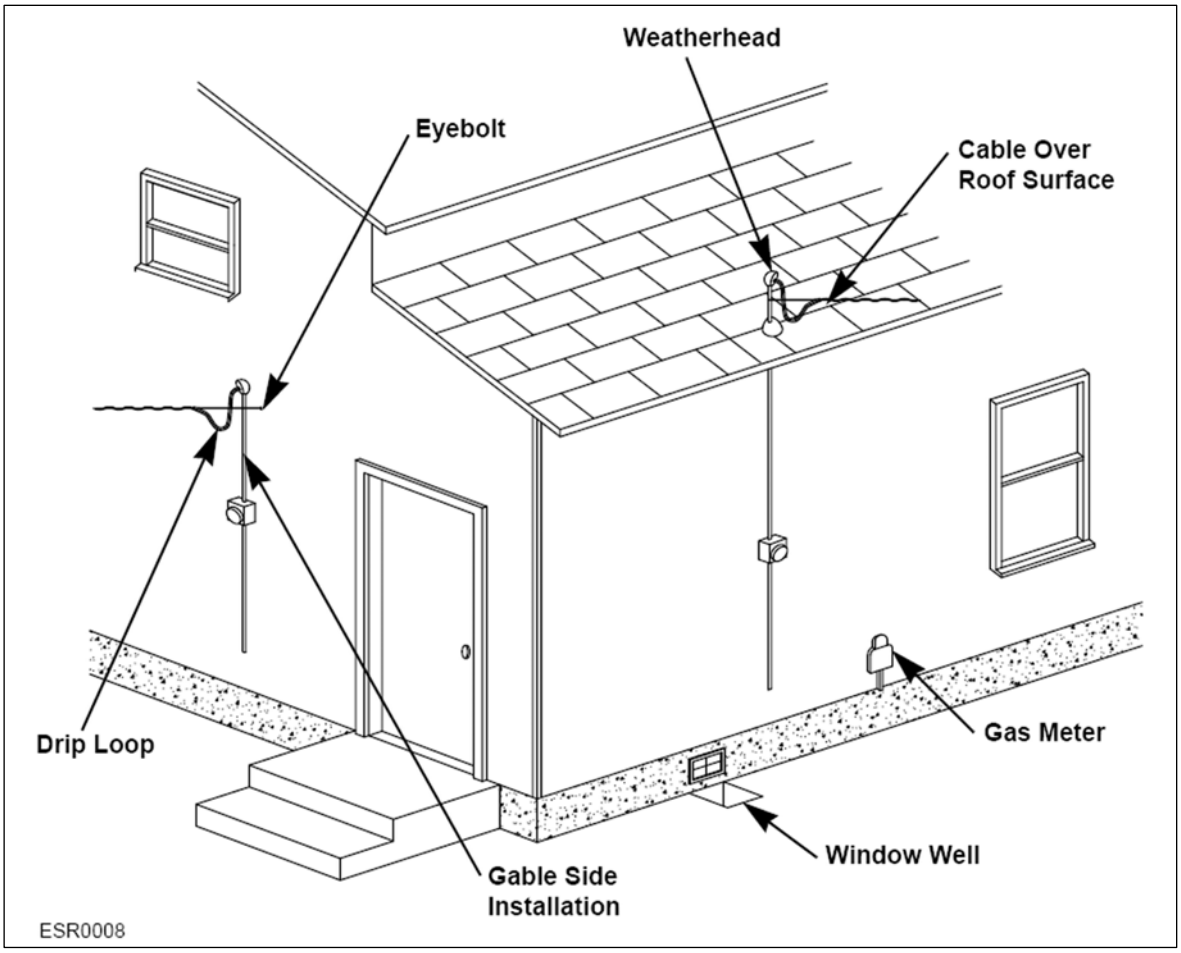

Figure 15: Metering Equipment for Overhead Service

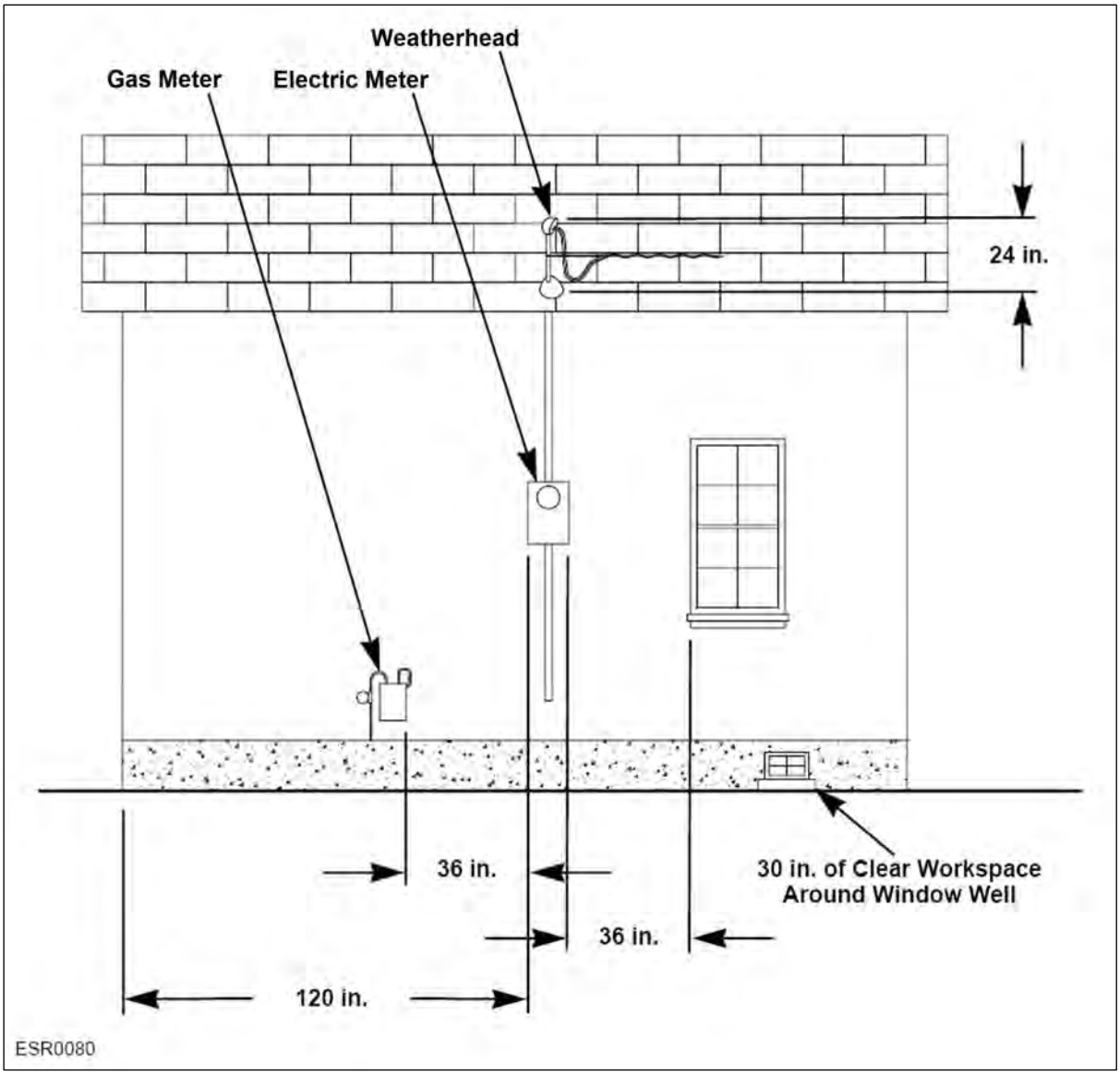

Figure 16: Residential Meter Clearances for Overhead Service

The clearances in **Table 3** are in accordance with the *National Electrical Safety Code (NESC)* or PGE standards. While NESC and PGE standards often align, PGE sometimes requires an additional buffer.

Table 3: Minimum Clearances for Service Drops, 750 V and Lower

Type of Clearance	Type of Structure or Feature	Clearance (feet)
Minimum service drop clearance. * (NESC Table 232-1)	Over roads, streets, and other areas subject to truck traffic	17 **
	Over alleys, parking lots, and driveways	17 **
	Over land traveled by vehicles	17
	Over state highways (ODOT may require greater clearances	19
	Over spaces and way accessible to pedestrians	12
Minimum clearances at the point of attachment. (NESC Table 232-1)	At height of attachment	14 †
	Drip loops of service drops for 120/240 V, 208Y/120 V, and 480Y/277 V	12 †
Minimum clearances from buildings for service drops not attached to the building. (NESC Table 234-1)	Vertical clearance over or under balconies and roofs accessible to pedestrians	12 ††
	Vertical clearance over or under balconies and roofs not accessible to pedestrians	3.5 ††
	Horizontal clearance to walls, projections, windows, balconies, and areas accessible to pedestrians	5 ††
	Radio and television antennas not accessible to pedestrians	3 ††
Minimum clearances from service drops (including drip loops) attached to a building or other installation over or along the installation to which they are attached. (NESC 234C-3 and Figure 234-2)	Vertical clearance from the highest point of readily accessible roofs, balconies, decks, fire escapes, or other attached structures over which they pass or to which they are attached. Refer to NESC 234C-3d for exceptions and more information.	11 ††
	From the highest point of roofs, decks, or balconies over which they pass above a not-readily–accessible roof and terminating at a through-the-roof service conduit or approved support, the service and its drip loops set not less than 18 inches above the roof; not more than 6 feet of the service cable over the roof located not more than 4 feet from the edge of the roof	1.5 ††
	From the highest point of roofs, decks, or balconies over which they pass in any direction from doors, windows that are designed to open (except from above), porches, or fire escapes	3

* Service drop is defined as a multiplex insulated conductor cabled on and supported by a bare neutral messenger (TX/QX).

** The PGE recommended clearance is based on meeting clearances over the life of the installation.

† The clearance is measured from any permanently climbable surface, such as a planter box or built-in air conditioner.

†† NESC considers a roof, balcony, or area to be readily accessible to pedestrians if it can be casually accessed using a doorway, ramp, window, stairway, or permanently mounted ladder by a person on foot who neither exerts extraordinary physical effort nor uses special tools or devices to gain entry. NESC does not consider a permanently mounted ladder to be a means of access if the bottom rung is 8 feet or more above the ground or other permanently installed accessible surface.

5.2.4 *Nonresidential Meter*

Locate a nonresidential meter and current transformer (CT) cabinet outdoors unless PGE confirms—before installation—that no acceptable outdoor location exists. Any indoor location must have prior written approval by PGE. PGE requires access to all meter locations during the hours of 8:00 a.m. to 4:30 p.m.

Do not locate an indoor meter in a show window, closet, bathroom, over a sink or laundry tub, or in any location that is not safe, convenient, or readily accessible.

5.3 PGE Electrical Equipment Room

IMPORTANT: *An electrical equipment room **must not** be used for storage.*

The PGE electrical equipment room must be located on an outside wall with a door leading directly to the outside. A meter or electrical equipment room must contain only PGE equipment, telecommunications equipment and required conduit, and security and fire alarm systems. At a minimum, the room's walls must be finished with drywall and taped.

Any room that contains PGE electrical equipment must be illuminated and accessible to PGE personnel. A room is considered accessible only if one (or more) of the following is true:

- The access door is keyed for a PGE lock.
- A keypad is installed.
- The room is equipped with a PGE-provided lockbox that contains a key to the door of each meter room.

  Note: PGE will provide the bottom portion of the lockbox to the electrician or customer at the time of the initial inspection. The customer is then responsible for installing it. PGE will install the top portion of the lockbox after the final inspection is complete.

Doors to a meter room or electrical equipment room must open outward and—before service will be provided—be equipped with a panic bar. The door must be at least 36 inches wide and 78 inches high.

Whenever a service equipment change is made to an existing electrical or meter room—such as installing a new service or doing a rewire—the room must be retrofitted and/or brought up to the requirements specified both in this section and in the *Electrical Equipment Room Checklist* on page 44.

5.3.1 *General Workspace Requirements*

5.3.1.1 Requirements for All Workspaces

These workspace requirements apply to all PGE electrical equipment rooms regardless of how many enclosures they have:

- The width of the workspace in front of electrical equipment must be 48 inches.
- No obstructions are permitted in the workspace.
- In all cases, the workspace must permit at least a 90-degree opening of equipment doors or hinged panels.
- When live parts that are normally enclosed are exposed for inspection or servicing, a workspace that's in a passageway or general open space must be suitably guarded.

- There must be 4 feet of working clearance between any three-phase transformer pad or vault edge and any aboveground obstacle or facility (such as a transformer, switchboard, or obstacle wall)

Follow the workspace requirements in Section 5.3.1.2 through Section 5.3.1.5 for PGE electrical equipment rooms that have one or two enclosures.

Note: When there are two enclosures in a room, it is assumed that live parts are exposed on both sides of the workspace.

Electrical Equipment Room Checklist

Room Location and Access Door

- ☐ The electrical room must be on an outside wall. The door must open to the outside of the building.
- ☐ The door must have a keypad installed or be keyed for a PGE lock, or a door key must be provided and stored in a PGE-provided lockbox. See Section 5.3.
- ☐ The door must be installed, open outward, and be equipped with a panic bar before receiving electric service. See Section 5.3.
- ☐ The door must be at least 36 inches wide x 78 inches high. See Section 5.3.
- ☐ There must be 36 inches of clear space in front, back, and to the sides of the access door.

Workspace

- ☐ There must be 48 inches of clear space in front of electrical cabinets with door. Doors must not block egress.
- ☐ Minimum workspace of 78 inches high x 48 inches wide x 48 inches deep in front of meter equipment as required by PGE. See Section 5.3.1.
- ☐ There must be 4 feet of working clearance between a three-phase transformer pad or vault edge and any aboveground obstacle or facility (such as a transformer, switchboard, or obstacle wall).

Storage

- ☐ The electrical room must not be used for storage.

Electrical Panels, Switchboards, Transformers, and CT Cabinets

- ☐ Review by PGE engineer, Design Project Manager, and/or Meter Services.
- ☐ The switchboard must rest on a reinforced concrete slab on grade.

Miscellaneous

- ☐ The electrical room must be illuminated. See Section 5.3.
- ☐ At a minimum, the walls must be finished with dry wall and taped. See Section 5.3.
- ☐ The switchboard and metering equipment must be installed in accordance with the floodplain requirements of the local jurisdictions, if applicable. See Section 5.1.

5.3.1.2 Workspaces with One Enclosure

Note: These requirements are in addition to those in Section 5.3.1.1.

When a PGE electrical equipment room has one enclosure, there must be at least 48 inches between the front of the enclosure and a wall or obstruction when equipment in the enclosure is 600 V or less to ground. See **Figure 17**.

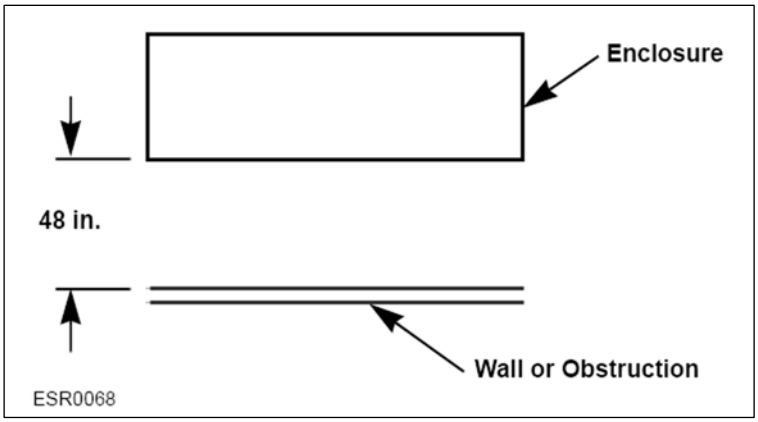

Figure 17: Workspace with One Enclosure

5.3.1.3 Workspaces with One Enclosure and One Doorway

Note: These requirements are in addition to those in Section 5.3.1.1.

These workspace requirements apply to PGE electrical equipment rooms that have one enclosure and one doorway, as shown in **Figure 18**:

- There must be at least 48 inches is between the front of the enclosure and the closest doorway opening when the equipment in the enclosure is 600 V or less to ground.
- There must be at least 96 inches between the front of the enclosure and a wall or obstruction when the equipment in the enclosure is 600 V or less to ground.

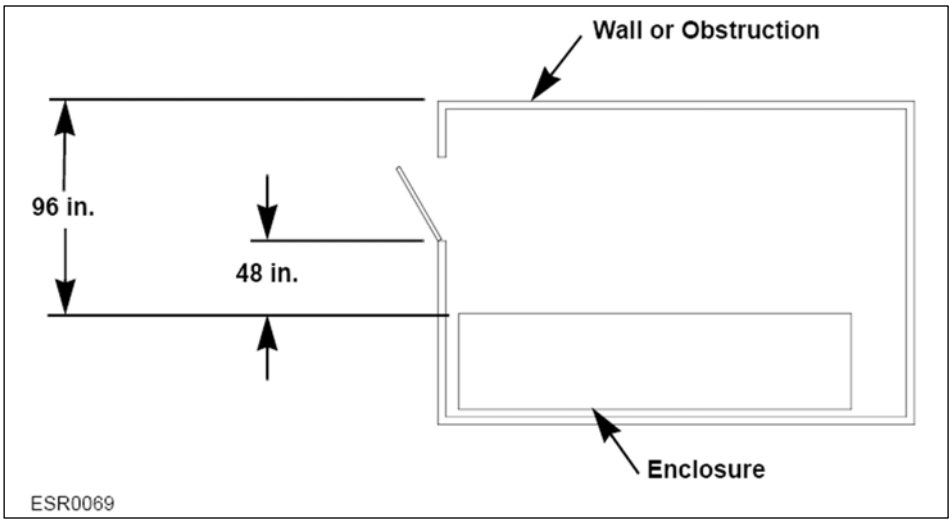

Figure 18: Workspace with One Enclosure and One Doorway

5.3.1.4 Workspaces with Two Enclosures

Note: These requirements are in addition to those in Section 5.3.1.1.

When a PGE electrical equipment room has two enclosures, there must be at least 48 inches between enclosures when the equipment in the enclosures is 600 V or less to ground, as shown in **Figure 19**.

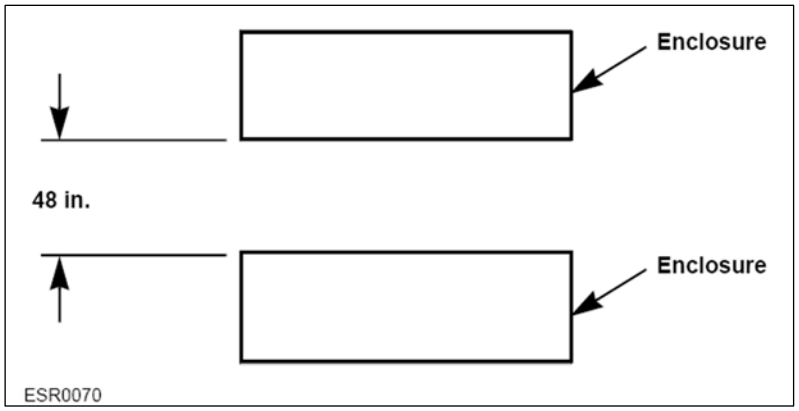

Figure 19: Workspace with Two Enclosures

5.3.1.5 Workspaces with Two Enclosures and Two Doorways

Note: These requirements are in addition to those in Section 5.3.1.1.

These workspace requirements apply to PGE electrical equipment rooms that have two enclosures and two doorways, as shown in **Figure 20**:

- There must be at least 48 inches between enclosures when the equipment in the enclosures is 600 V or less to ground.
- There must be at least 48 inches between the front of the enclosure and the closest doorway opening when the equipment in the enclosure is 600 V or less to ground.
- The doorway width must be at least 36 inches.

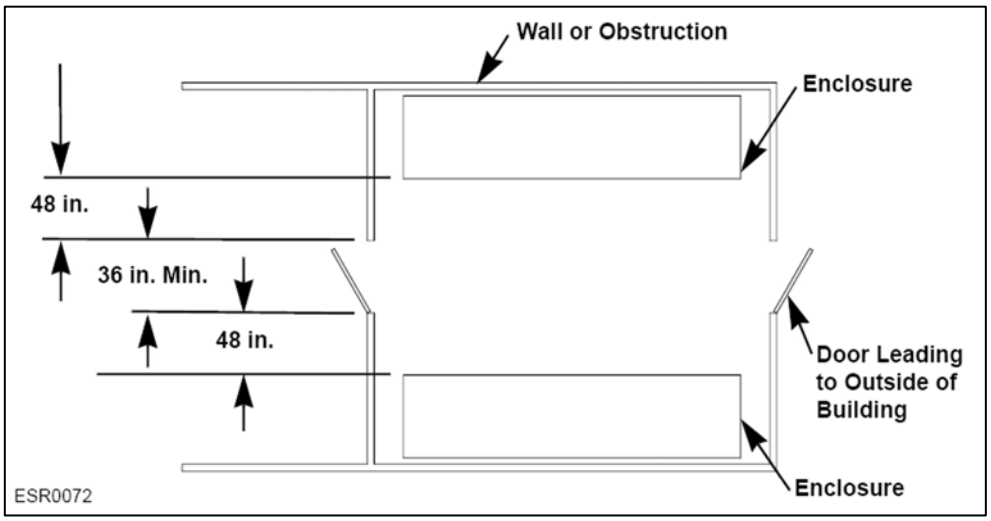

Figure 20: Workspace with Two Enclosures and Two Doorways

5.3.2 *Workspace Entrance Requirements*

These workspace entrance requirements apply to all PGE electrical equipment rooms:

- Access to workspace around the electrical equipment must be provided by at least one entrance that is of sufficient size, and which offers a continuous and unobstructed exit.
- For equipment rated 1200 A or more that contains overcurrent devices, switching devices, or control devices, there must be one entrance that is at least 36 inches wide and 78 inches high at each end of the workspace. If the entrance has a personnel door (or doors), the door(s) must open in the direction of egress and be equipped with panic bars, pressure plates, or other devices that are normally latched but open under simple pressure.
- A single entrance is permitted where the depth of the workspace is twice that required by NEC Table 110.26(A)(1) or PGE specifications—whichever is greater. In these cases, the minimum clear distance from the nearest edge of the entrance must be at least the minimum specified in Table 110.26(A)(1) or PGE specifications—whichever is greater—for equipment operating at that voltage and in that condition.

5.4 Clearances from Pools and Spas

5.4.1 *Overhead Clearances to a Pool and Diving Structure*

The clearance in any direction from the water level, edge of pool, base of diving platform, or anchored raft must be at least 23 feet from TX, QX, or open supply lines. The clearance in any direction to a diving platform must be at least 15 feet from TX, QX, or open supply lines.

5.4.2 *Underground Clearances*

Underground conductors must not be within 5 feet of the inside wall of an in-ground pool, either under the pool or horizontally. See Section 6, *Underground Requirements*, for trench depth, cover, and conduit requirements.

5.5 Clearance from an Underground Fuel Storage Tank

Underground service conduits must have at least 10 feet of separation between the conduit run and the nearest point to a buried fuel storage of any construction (including metal or fiberglass).

5.6 Separation of Oil/Fluid-Filled Transformers from Structures and Other Oil/Fluid-Filled Equipment

Oil/fluid-filled electrical equipment must be located a certain distance from a combustible structure in order to comply with local requirements and national codes. The amount of separation depends on the flammability of both the insulating oil or fluid and that of the nearby structure. Reductions in the minimum separation distance can be achieved by using a less-flammable dielectric fluid and/or a fire barrier.

5.6.1 *Combustibility of Building Material*

The combustibility of a building is evaluated in two ways:

- By the building structure only, or
- By the building structure in combination with the finish surface material applied to its inside or outside.

The National Fire Prevention Association (NFPA) lays out these requirements for a noncombustible material:

> *The material, in the form in which it is used, and under the conditions anticipated, will not ignite, burn, support combustion, or release flammable vapors when subjected to fire or heat. of which no part will ignite and burn when subjected to fire. (*NFPA 5000*, Section 7.1.4.1.1)*

Coatings placed the surface of a building can also affect combustibility. PGE has these requirements for surfacing materials used on a noncombustible material:

- No surfacing material may be more than 1/8-inch thick.
- All surfacing materials must have a flame-spread rating of 50 or less.

Table 4 provides flame-spread characteristics for some common materials.

Table 4: Flame-Spread Ratings of Selected Materials

Material	Flame-Spread Rating
Aluminum siding (with baked enamel finish on one side)	5–10
Brick or concrete block	0
Gypsum board (with paper on both sides)	10–25
Northern pine (treated)	20
Southern pine (untreated)	130–190
Plywood paneling (untreated)	75–275
Plywood paneling (treated)	10–25

To be considered a noncombustible structure, a building's design must use structural members made of steel (with fire coatings approved by local fire authorities); brick; or concrete. In addition, the building's outside surface must have a flame spread rating of 50 or less. All other designs require increased clearances between the structure and the oil/fluid-filled unit.

Note: Installing metal siding or a brick/stone facing on a wall constructed of wood studs ***does not*** meet the requirements for a noncombustible structure.

5.6.2 *Separation of Oil-Filled Transformers*

IMPORTANT: *These separations apply to oil-filled transformers only. For separation for fluid-filled transformers, see Section 5.6.3, "Separation of Fluid-Filled Transformers."*

5.6.2.1 Separation from Buildings

Locate oil-filled transformers away from buildings wherever possible. When it is not possible to locate an oil-filled transformer away from a building, you must apply the minimum separation distances shown in **Figure 21** and listed in **Table 5**. The separations provided in **Table 5** apply to both pad-mounted and submersible transformers.

IMPORTANT: *Transformer oil quantity may vary by manufacturer. The oil capacity is available on the transformer nameplate.*

Note: Locate transformers at least 5 feet and no more than 15 feet from a maintained drivable surface.

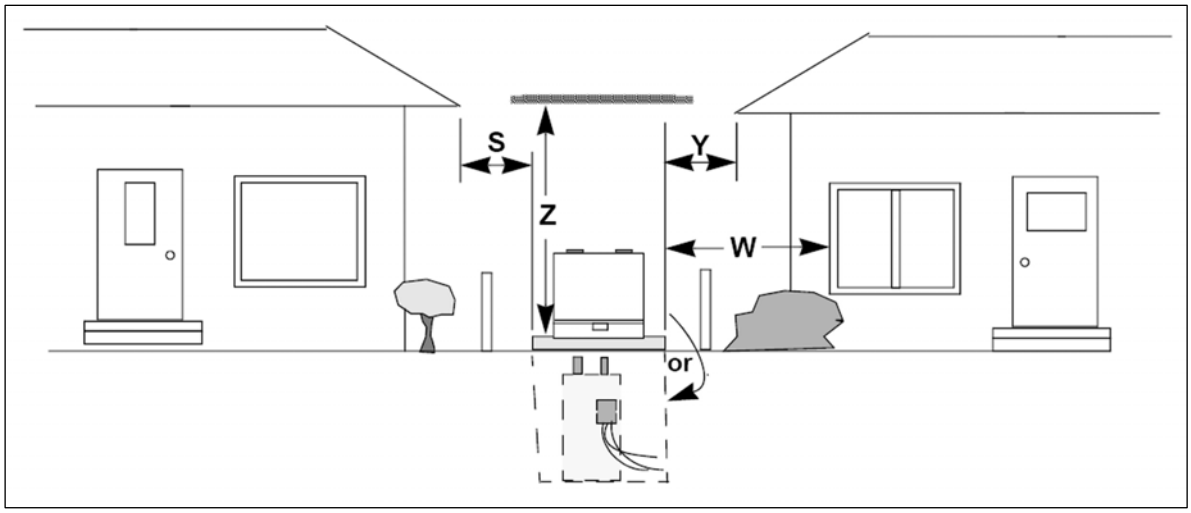

Figure 21: Minimum Separation of Oil-Filled Transformers from Buildings

Table 5: Minimum Separation of Oil-Filled Transformers from Buildings

Oil Capacity (gallons)	Separation			
	To Noncombustible Structure (S) (feet)	To Combustible Structure (Y) (feet)	To Any Opening in Structure (W) (feet)	Vertical Distance (Z) (feet)
0–499	3 *	8 **	8 †	20 ††
500–5000	25 *	50 **	50 †	50 ††
5001 or more	50 *	100 **	100 †	100 ††

* Separation to the nearest component if the structure is noncombustible and there are no openings closer than 8 feet.

** Separation to the nearest component (wall or overhang) if the structure is combustible.

† Opening in structure does not include windows that are not designed to be opened.

†† Separation measured from the top of the cabinet to any barrier which is not a living space or workspace. This separation is for working clearance only.

5.6.2.2 Separation from Other Oil-Filled Equipment

Locate oil-filled transformers away from other oil-filled equipment, such as electrical equipment and fuel storage tanks, wherever possible. Where it is not possible to locate an oil-filled transformer away from oil-filled equipment, the minimum separation distances shown listed in **Table 6** must be applied. The distances in the table apply to both pad-mounted and submersible transformers.

Note: Minimum separation distances between oil-filled transformers and structures or other oil-filled equipment may be reduced by constructing a fire barrier. Consult PGE for more information.

Table 6: Minimum Separation of Oil-Filled Transformers from Other Oil-Filled Equipment

Oil/Fluid Capacity of Either Container (gallons)	Horizontal Distance (feet)
0–499	5
500–5000	25
5001 or more	50

Source: FM Global, *FM Data Sheet 5-4, Transformers*.

5.6.3 *Separation of Fluid-Filled Transformers*

Where the separation distances between oil-filled transformers and combustible structures or other oil-filled equipment given in **Table 5** and **Table 6** cannot be attained, FM Approved transformers filled with high flash point fluid may be installed with reduced separation distances. FM Approved transformers have high flash point fluid as an integral component of their design, and they are produced under strict design and manufacturing controls with rigorous material tracking.

Note: FM Approved transformers are certified by FM Approvals, the equipment testing arm of FM Global.

5.6.3.1 Separation from Buildings

Table 7 provides the minimum separation distances required when locating fluid-filled (FM Approved) transformers next to buildings.

Table 7: Minimum Separation of Fluid-Filled (FM Approved) Transformers from Buildings

Fluid Capacity (gallons)	Minimum Separation (feet)				
	To Noncombustible Structure (S)		To Combustible Structure (Y)	To Any Opening in Structure (W)	Vertical Distance (Z)
	Single-Phase	3-Phase			
All sizes	3 *	3 *	3 **	8 †	20 ††

* Separation to the nearest component if the structure is noncombustible and no openings are closer than 8 feet.

** Separation to the nearest component (wall or overhang) if the structure is combustible.

† Opening in structure does not include windows that are not designed to be opened.

†† Separation measured from the top of the cabinet to any barrier which is not a living space or workspace. This separation is for working clearance only.

Source: FM Global, *FM Data Sheet 5-4*, *Transformers*.

5.6.3.2 Separation from Other Oil/Fluid-Filled Equipment

Table 8 provides the minimum separation distances required when locating fluid-filled (FM Approved) transformers next to other oil/fluid-filled equipment.

IMPORTANT: *The other equipment must also be fluid-filled (FM Approved) for the reduced separation in **Table 8** to apply. Otherwise, the distances from oil-filled equipment listed in **Table 6** must be used.*

Table 8: Minimum Separation of Fluid-Filled (FM Approved) Transformers from Other Oil/Fluid-Filled Equipment

Oil/Fluid Capacity of Either Container (gallons)	Horizontal Distance (feet)	
	Single-Phase	3-Phase
All sizes	3	5

Source: FM Global, *FM Data Sheet 5-4, Transformers*.

5.7 Working Clearances

The work performed by PGE line crews requires that a working clearance be maintained around electrical equipment. The minimum amount of clear space may vary on any side of pad-mounted or submersible electrical equipment. For example, the clear space required in front of doors or access panels is greater than the clear space on a non-opening side of an enclosure.

The working clearance requirements impose a clearance to any structure, such as a wall or a fire barrier, constructed close to the oil/fluid-filled equipment to reduce the separation distance from a combustible building. The clearance also applies to shrubs and trees.

This section provides the required working clearances around pad-mounted electrical equipment and submersible equipment.

5.7.1 *Clearances Around Pad-Mounted Electrical Equipment*

Pad-mounted equipment requires the following working clearances, as measured from the edge of the pad or vault:

- 10 feet of horizontal separation in front of, and extending parallel to:
  - The front of the equipment enclosure *and*
  - Any side of the enclosure that has a door or access panel.
- At least 3 feet of horizontal separation on any non-opening side of the electrical equipment. For three-phase pad-mounted equipment, 4 feet is required.
- At least 25 feet of vertical clearance above the electrical equipment.

Figure 22 shows the required separation for pad-mounted electrical equipment adjacent to a noncombustible structure. **Figure 23** shows the required separation for pad-mounted electrical equipment adjacent to a combustible structure.

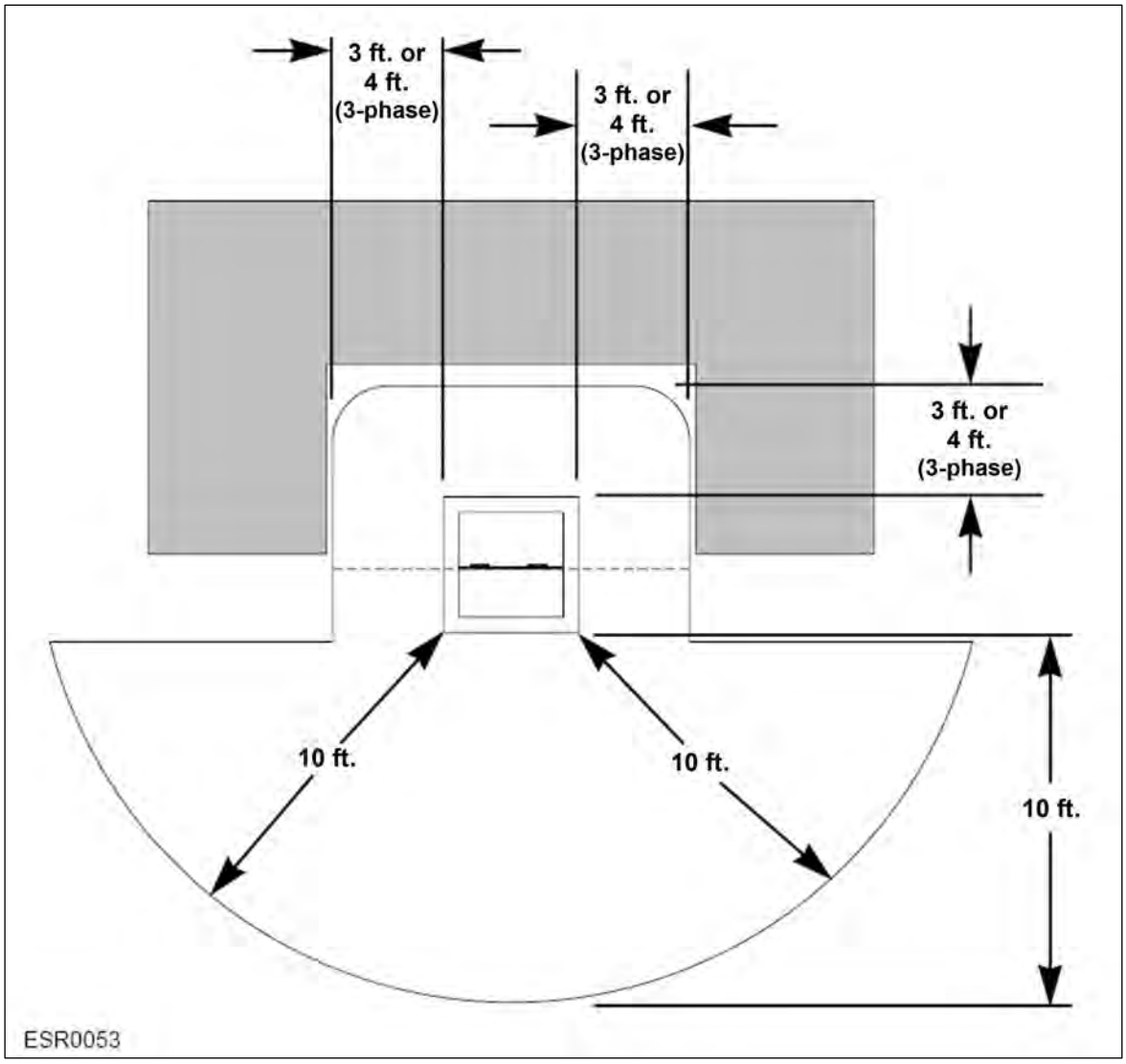

Figure 22: Working Clearances Around Pad-Mounted Electrical Equipment Adjacent to a Noncombustible Structure

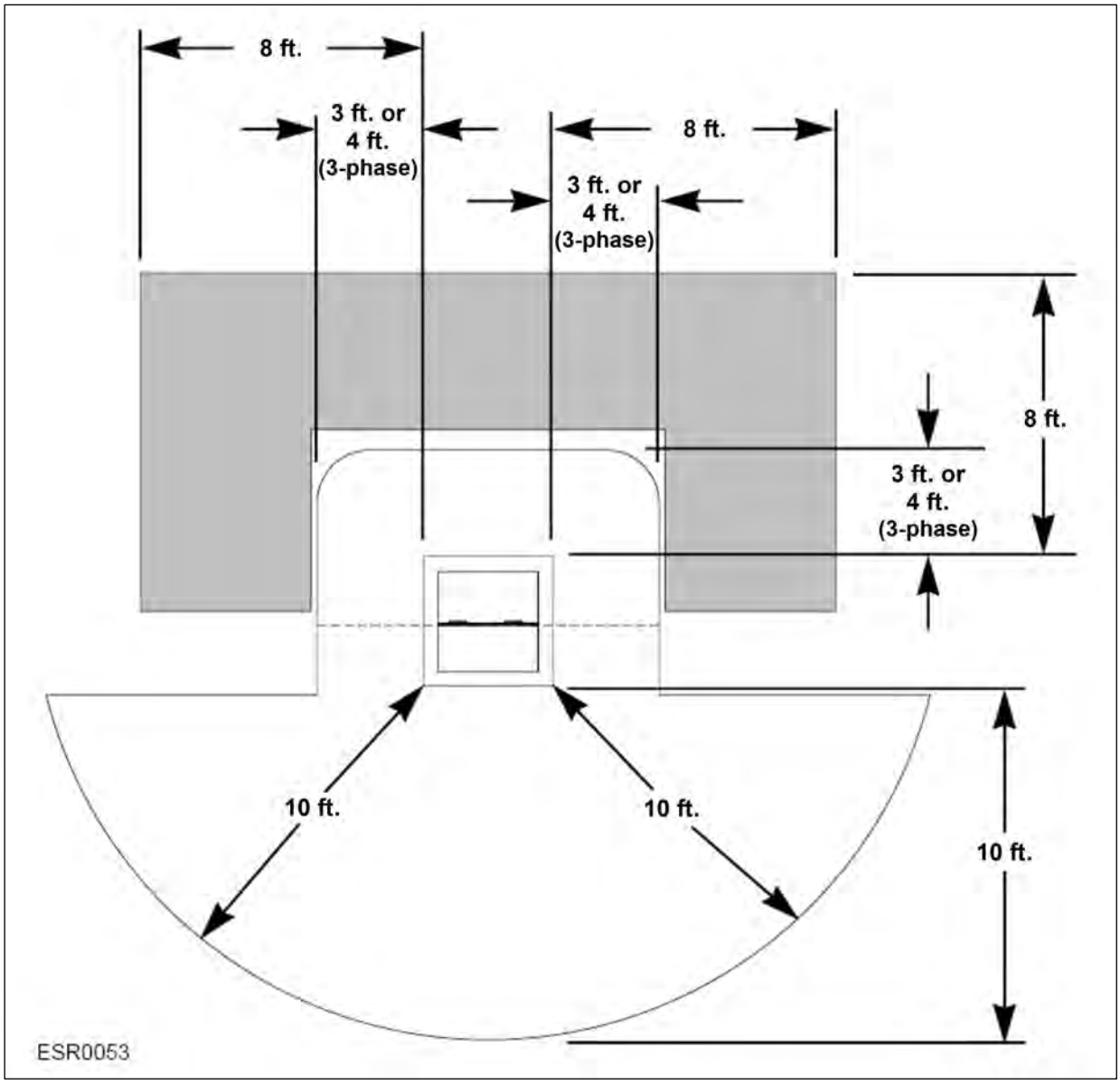

Figure 23: Working Clearances Around Pad-Mounted Electrical Equipment Adjacent to a Combustible Structure

5.7.2 Clearances Around PGE Submersible Equipment

Submersible equipment requires at least 8 feet of horizontal separation in front of and on the sides of the enclosure lid. (The front of an enclosure lid is the side opposite the lid's hinges.) At least 3 feet of horizontal separation is required behind the enclosure lid and 20 feet of vertical separation is required above the lid.

Figure 24 shows the separation requirements for submersible electrical equipment.

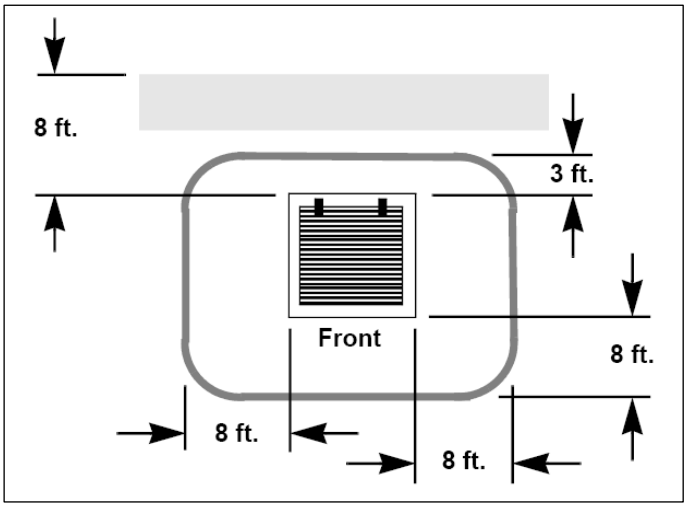

Figure 24: Working Clearances Around PGE Submersible Equipment

5.8 Separation of Electrical Equipment and Meter from a Gas Meter Set

Figure 25 and **Figure 26** show the separation requirements between electrical equipment and a meter and a gas meter set.

IMPORTANT: *The minimum separation between a gas meter, gas meter regulator, or gas meter flange and an electrical meter is 3 feet.*

The design of the gas meter set varies. Differences include:

- The regulator is not always the farthest component in the gas meter set.
- The nearest gas component could be an outlet elbow or flange.
- The customer gas line may extend beyond the last component.
- The length of the gas meter set—dimension X in **Figure 25**—varies with the number of meters and associated equipment.

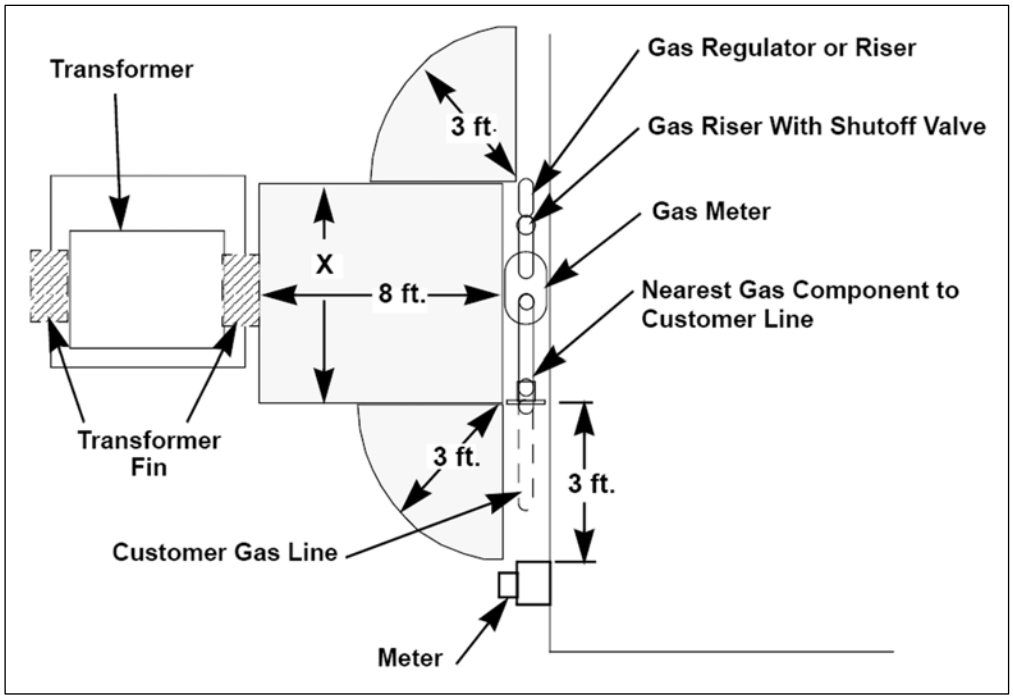

Figure 25: **Separation of Electrical Equipment and a Meter from a Gas Meter Set**

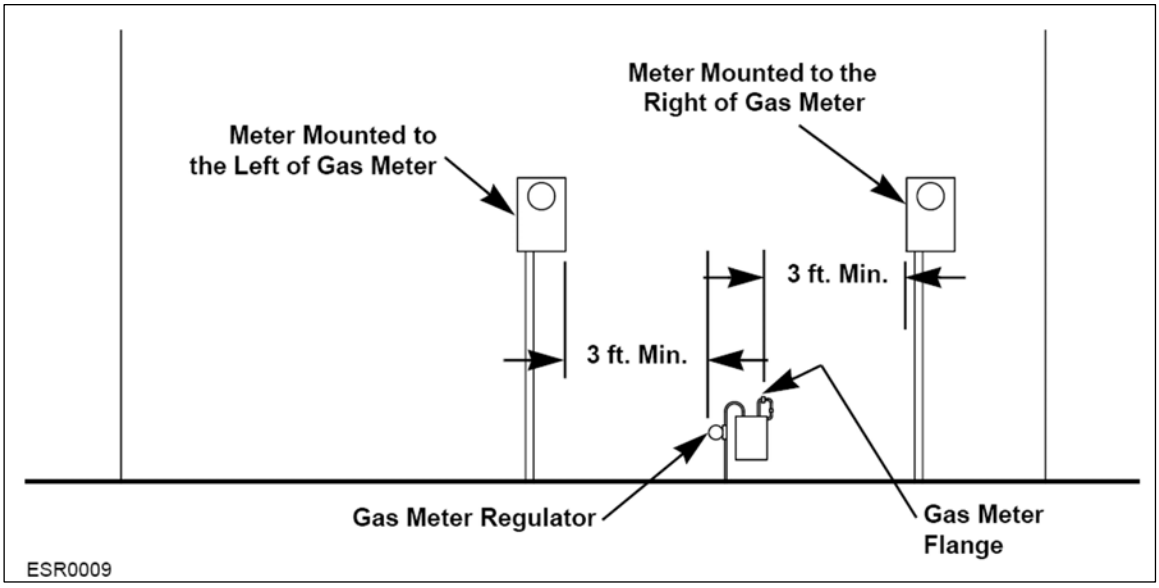

Figure 26: **Separation of a Meter from a Gas Meter Regulator and Gas Meter Flange**

5.8.1 *PGE Secondary Voltage Pedestal and Handhole*

A PGE pedestal and handhole must have 3 feet of horizontal separation from the gas meter set. Since there are no switches inside the pedestal or handhole, their placement is not a concern of the gas company—this separation is a PGE requirement for workspace only.

5.9 Separation of PGE Electrical Equipment from a Liquefied Petroleum Gas Container

Electrical equipment—such as a transformer, switch, vault, or pedestal—is considered a source of ignition and must be separated from a liquefied petroleum (LP) gas container. LP gas is also known as propane or butane.

As shown in **Figure 27**, the separation distance for an LP gas container is either:

- The distance between the electrical equipment and the pressure-relief valve or filling connection(s) on any portable container, or
- The distance between the electrical equipment and the vent valve(s) for a container filled on site from a bulk truck.

The separation distances listed in **Table 9** must be applied to installation of electrical equipment on customer property with an LP container.

Note: In some installations the conduit fitting into the customer's equipment may have to be designed to be gas-tight or to allow the required separation distance from LP gas containers. In all such cases, the customer is responsible for resolving this issue with the local code-enforcement authority and to provide, install, and maintain the necessary materials under its approval.

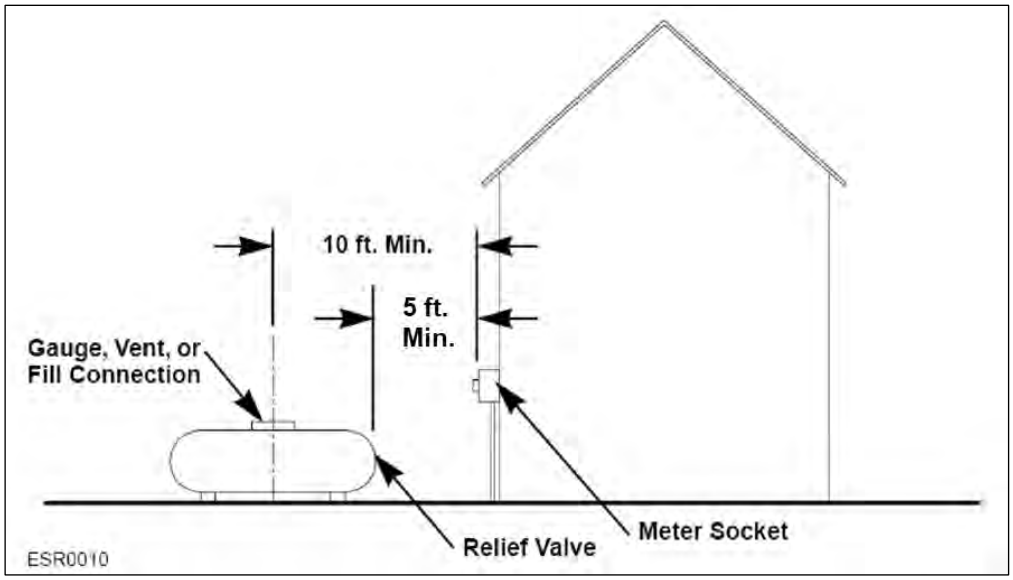

Figure 27: Minimum Distances from an Aboveground LP Storage Tank

Table 9: Minimum Separation of a Less-Flammable-Rated Transformer from Other Oil-Filled Equipment

Container Type	Tank Location	Container Size	Minimum Separation from Electrical Equipment (feet)	
			From Relief Valve of Container Not Filled on Site	From Fill Tubes or Relief/Vent Valves of Containers Filled on Site
DOT *	Aboveground	All sizes **	5 †	10 †
ASME *			— †	10 †
ASME *	Belowground	0 to 2000 **	— †	10 †
		2001 to 120,000 **	— †	50 †

* US Department of Transportation (DOT) rating.

** Container sizes are rated in gallons-of-water capacity (WC) in the US Customary System.

† Separation distance in any direction as specified in NFPA 58, *Liquefied Petroleum Gas*.

6 Underground Requirements

TOPICS IN THIS SECTION

- *Basic Requirements*
- *Trenches Provided by the Customer*
- *Conduit*
- *Concrete Pads and Vaults for a Pad-Mounted Transformer*

6.1 Basic Requirements

The customer is responsible for trenching; backfilling; compaction; the installation of conduit and conduit markers; transformer pads or vaults; ground rods; and any other construction requirements for completion of underground service.

- The customer must provide space for equipment (such as a transformer or vault) within the public utility easement (PUE) or on private property with a PGE easement.
- For all trenching and transformer installations, the customer must meet any requirements of governmental authorities—including excavation permits—as well as those of PGE.

Conduit markers, ground rods, and secondary pedestals (PF-300s) can be picked up at a PGE yard by providing a job number.

For more information, see Section 6.2, "Trenches Provided by the Customer."

All primary and secondary cables ***must*** be in conduit. To avoid damage to underground conductors and service equipment caused by soil settling, all service conduit riser elbows must be backfilled at least 4 inches deep with tamped 3/4-inch minus crushed rock.

- If a customer's service conduit riser extends vertically through a paved or concrete surface adjacent to the service entrance, a sleeve is required around the conduit to prevent it from direct contact with the pavement.
- If a pad-mounted transformer and other equipment is exposed to motor vehicles, the customer must install and maintain a PGE-approved barrier to protect them.

For more information, see Section 6.3, "Conduit."

In most cases PGE will install, maintain, and own the underground service tap line from the PGE distribution line or transformer in the customer’s conduit to the point of delivery.

6.2 Trenches Provided by the Customer

The customer must comply with Occupational Safety and Health Administration (OSHA) rules and Oregon Utility Coordinating Council (OUCC) standards.

IMPORTANT: *All PGE trenches and conduit must be inspected by PGE before backfilling.*

6.2.1 Customer Responsibilities

When providing a trench, customer responsibilities include:

- Consulting PGE to determine the route and the point of attachment for:
  - Underground service laterals.
  - Meter locations.
  - Service outlet locations.
  - Current transformers.
  - Terminal cabinet enclosures.

  Routing conduit under buildings or other permanent obstructions is not permitted. PGE may grant exceptions if alternative routes are not available.
- Locating the service entrance to make the meter and service easily accessible from PGE distribution lines and convenient for the installation, operation, and maintenance of PGE meters and equipment.
- Obtaining a permit from the local jurisdiction before any work in the right of way is performed. *Only PGE-approved excavation contractors and contractors who have made special arrangements with PGE will be allowed to work under a PGE permit.* The contractor must notify the local jurisdiction 48 hours before the work is to begin. A copy of the permit must be on site.
- Ensuring that spoil (excavated material) is placed at least 24 inches back from the edge of the trench as shown in **Figure 28** and **Figure 29**. If this is not possible, shoring may be required to comply with OSHA rules. Spoil may be placed in the street if approval is received from the local jurisdiction.

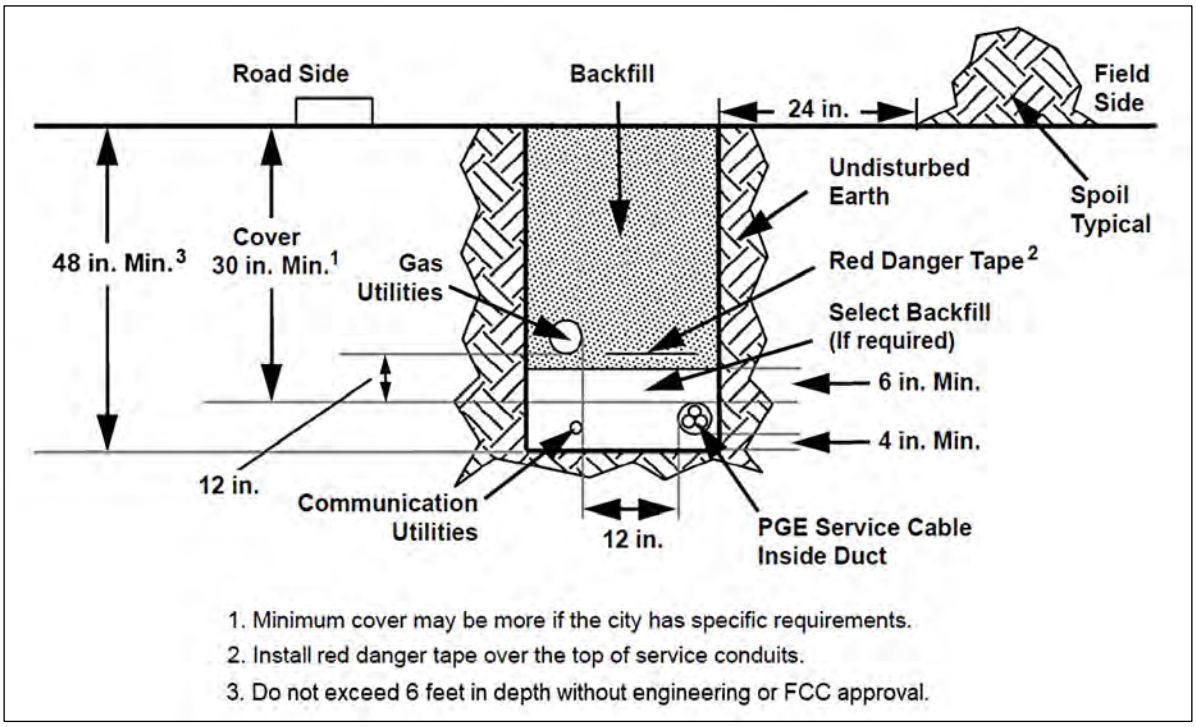

Figure 28: Service Cable Trench for Joint Use With Gas

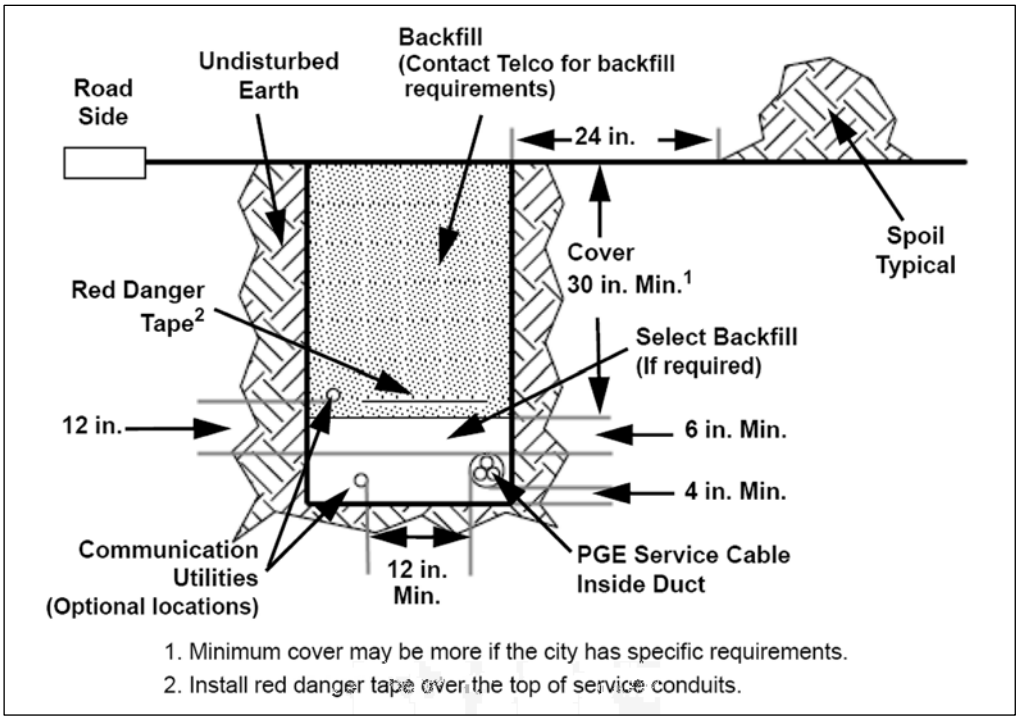

Figure 29: Service Cable Trench for Joint Use Without Gas

6.2.1.1 Call Before You Dig

IMPORTANT: *Before you dig, call 8-1-1 or 800-332-2344 for the location of underground utilities; or visit callbeforeyoudig.org. In the Portland metro area, call 503-246-6699.*

Oregon law requires a customer or excavator to call to determine the location of underground utilities two full working days (48 hours) before beginning excavation. The excavation ***must not*** be started until utility locations have been marked or the utilities have informed the excavator that they have no facilities in the area.

6.2.2 *Trench Dimensions and Cable Separation*

Trench designs must provide suitable protective earth cover and separation between PGE-energized cables and other joint trench utilities along the entire trench length. **Figure 28** and **Figure 29** list the minimum requirements for trench depth and cable separation. Greater depths may be required by local jurisdictions.

Customer-owned water lines on private property are allowed in trenches adjacent to PGE-approved conduit. If the PGE service is not directly buried, the customer's water line must have at least a 1-foot vertical and 2-foot horizontal clearance from PGE conductors.

IMPORTANT: *For single-family and duplex, residential subdivision, industrial, and commercial projects, finished grade must be established **before** trench excavation to ensure that minimum cover requirements for cables and conduits are met. Minimum cover requirements for cables are measured from the trench surface to the top of the cable or conduit.*

6.2.3 Select Backfill

When on-site backfill contains rocks larger than 4 inches or rocks with sharp corners, select backfill must be used. Select backfill must be placed at least 4 inches below and 6 inches above the conduit or cable configuration.

Select backfill material is granular material that meets these standards:

- 100% of the material passes a 3/4-inch sieve.
- No more than 15% of the material passes a No. 200 mesh sieve.
- The material is reasonably free of organic and otherwise undesirable materials.

Backfill in the remainder of the trench must be free of rocks larger than 4 inches in diameter.

6.2.4 Mechanical Protection

For extremely adverse ground conditions—such as solid rock formations or conflicts with other utilities—conduit may be installed at a minimum depth of 12 inches if one of these mechanical protection methods is used:

- Rigid steel.
- A layer of concrete directly above the conduit. This layer must be at least 2 inches thick and have a horizontal coverage of at least 6 inches beyond the end of the duct, high-density polyethylene (HDPE) duct, or PVC Schedule 40 duct.

6.2.5 Controlled Density Fill

Use a controlled density fill (CDF) where physical protection of the conduit system is necessary. CDF may be necessary for critical feeders or where the conduit system may be exposed to future excavation. CDF may also be used where the heat of the cable must be dispersed at a greater rate than the native soil backfill will allow. Install CDF for 6 inches on all sides of the conduit.

CDF must have a maximum compressive strength between 200 and 500 psi in 28 days, and have an allowable slump of 4 inches at the time of batching. CDF must also be dyed red.

6.2.6 Mitigating Potential Surface and Subgrade Water Flows

The customer is responsible for recognizing and mitigating potential surface and subgrade water flows that may let water enter into the customer's electrical equipment. Measures taken may include a second junction box for water mitigation.

6.3 Conduit

All conduit routes must be approved by PGE before any conduit is installed by the customer. Customer-installed conduit must be inspected by PGE before backfilling.

IMPORTANT: *PGE will not install a conductor if the conduit system is improperly constructed. The customer is responsible for repairing—or for the costs associated with repairing—any conduit problems **before** installation of a PGE conductor. PGE will own and maintain the conduit system once a PGE conductor has been installed.*

The customer must install either rigid steel or electrical-grade Schedule 40 gray PVC conduit. Sweeps of PVC, rigid steel, and fiberglass are acceptable. All PVC joints must be glued. All factory-cut and field-cut conduits must be chamfered to prevent damage to PGE cables.

Note: PGE allows the use of HDPE duct for horizontal directional boring applications. For more information on HDPE duct, see Section 6.3.5, "HDPE Duct and Connectors."

If rock or other obstructions are encountered, consult PGE. When the conduit terminates at a PGE pole, consult PGE for the exact conduit location. See **Table 10** for conduit requirements for secondary voltage conductors.

Additional conduit requirements for secondary voltage conductors include:

- 4-inch conduit may be substituted for 3-inch conduit.
- Large conduit size, additional conduits, or a larger bend radius may be required for longer runs, 4-wire full neutral, or direct connection to utility conduit. Consult PGE for specific requirements.
- Conduit spacers are required for any multiple-conduit installations where a horizontal configuration in the trench cannot be obtained. Contact PGE for approved conduit spacers.

For safety reasons, all duct must be black with three equally spaced extruded red stripes. Connections to PVC duct must use straight couplings with barbed threads on one end and NPT on the other end.

IMPORTANT: *The conduit requirements listed in **Table 10** are for **reference only**. Requirements for a specific situation depend on the design and requirements of the service.*

Table 10: Conduit Requirements for Secondary Voltage Conductors (Reference only)

Service Entrance Ampacity	Single-Phase, 3-Wire		Three-Phase, 4-Wire	
	Conduit Size	# of Conduits	Conduit Size	# of Conduits
200 A or lower	3-inch	1	3-inch (min.) *	1 *
320 A continuous	3-inch	1	—	—
400 A to 600 A	3-inch	2	3-inch (min.) *	2 *
800 A	3-inch	3	3-inch (min.) *	3 *
1000 A	—	—	3-inch (min.) *	4 *
1200 A	—	—	3-inch (min.) *	5 *
1201 A to 1300 A	—	—	3-inch *	6 *
	—	—	5-inch or 6-inch *	4 *
1301 A to 1500 A	—	—	3-inch *	7 *
	—	—	5-inch or 6-inch *	4 *
1501 A to 1600 A	—	—	3-inch *	8 *
	—	—	5-inch or 6-inch *	5 *
1601 A and larger	—	—	Consult PGE	
	—	—		

* Where space allows, 4-inch conduit may be substituted for 3-inch conduit, and 6-inch conduit may be substituted for 5-conduit conduit. The PGE Designer must confirm that enough space is available at vault penetration, sweeps, and building penetration, and in the customer's equipment. Consult PGE for conduit sizes for all three-phase services.

6.3.1 *Customer-Owned Conductors*

The customer's service conductors must be in a separate conduit system from PGE conductors.

6.3.2 Conduit Sweeps and Pull Lines

IMPORTANT: *All bends **must** be factory made. Field bends or field heat bends are **not** acceptable.*

Bends must have the following formed sweep radius:

- 36-inch minimum for a 2- to 4-inch conduit.
- 60-inch minimum for a 5- to 6-inch conduit.

Rigid steel or PGE-approved fiberglass bends are required for runs of 150 feet or longer, or a run of any length that has more than 180 degrees in bends. PVC Schedule 40 bends are acceptable for runs of less than 150 feet. When all the bends in a conduit are added up, the sum must not exceed 270 degrees.

Sweeps must be separated by a straight section at least 5 feet long. There must be a straight section at least 3 feet long from a vault. **Table 11** provides fiberglass sweep specifications.

Table 11: Fiberglass Sweep Specifications

Diameter (inches)	Sweep Radius (inches)	Minimum Wall Thickness (inches)
2–4	36	0.095
5–6	60	0.110

If a customer's conduit extends to a PGE pole, the customer must provide the sweep. Consult PGE for the exact location on the pole.

Cap all conduits at *both* ends during installation to keep them free of dirt and debris.

IMPORTANT: *All conduits must have a 500-pound–rated nonconductive pull line or 400-pound woven polyester pull tape (such as Mule Tape® or Herculine®) line with 6 feet of line/tape extending from each end of the conduit. The pull line/tape must be installed after the conduit is joined and the glue is dry.*

Where a new conduit and/or pull line will be entering an existing PGE secondary vault or transformer, the installer is required to contact PGE before installation. A PGE crew will be scheduled to meet the installer at the site to assist with the installation.

Additional sweep requirements include:

- Each sweep must have two extra-deep, fabricated PVC couplings.
- Each sweep must meet the requirements for iron pipe size (IPS) design in NEMA TC 14, *Reinforced Thermosetting Resin Conduit (RTRC) and Fittings*.

6.3.3 Duct Proofing

Duct proofing is a process used to ensure that a duct is clear of obstructions and grit, and that no portion of the duct is collapsed or out of round. The customer is responsible for duct proofing all ducts installed for PGE jobs before the job is completed and before the installation of PGE conductors.

To test for obstructions and out-of-round ducts, a wood test mandrel (or equivalent plastic and/or hard rubber mandrel) configured for the installed duct's inner diameter (ID) must be pulled through the ducts.

The customer must furnish the appropriate duct-proofing tool, such as a duct brush or steel or polyurethane duct checker.

6.3.4 *Conduit Locations*

During construction, the customer must mark conduit locations with white paint or other marker, such as a plastic strip in accordance with Oregon Administrative Rules (OAR) 952-001-0070.

6.3.5 *HDPE Duct and Connectors*

HDPE duct may be used for horizontal directional boring applications. The duct must meet the requirements of PGE. Contact PGE's Field Construction Coordinator (FCC) when using HDPE duct.

All HDPE direct-bore installations (regardless of length) must use 2500-pound woven polyester pull tape (such as Mule Tape® or Herculine®) for all brushing and mandrel proofing of the conduit. (Potholing and a bore log are required.) A single continuous non-spliced run of tape must remain within the conduit.

For safety reasons, all duct must be black with three equally spaced extruded red stripes. HDPE duct sections must be joined by mechanical fittings or by a 9-inch swedge coupler with two-part conduit adhesive (such as BonDuit).

6.4 Concrete Pads and Vaults for a Pad-Mounted Transformer

6.4.1 *Pad*

Every pad-mounted transformer must have a precast concrete pad. Consult PGE for transformer dimensions and installation requirements. Pads must be flush with the finished grade within 12 inches of a sidewalk or other paved area.

The customer must install a 5/8-inch OD x 8-foot ground rod inside the transformer. (PGE will provide this ground rod.) The ground rod must be at least 4 inches above final grade and at least 4 inches on the field side of the primary source.

6.4.2 *Vault*

PGE requires a vault under a cable compartment. Consult PGE for transformer vault dimensions. The vault lid must be installed 2 inches above the finished grade in landscaped areas and flush with the finished grade within 12 inches of a sidewalk or other paved area.

6.4.3 *Clearances*

For the required clearances from a pad-mounted transformer, see **Figure 24** on page 54.

6.4.4 *Excavation and Backfill*

Excavate the entire area beneath the pad or vault to a depth of 18 inches below final grade. To prevent settling, all soil beneath the pad site must be compacted and level before setting or pouring the pad or vault. Backfill with compacted 3/4-inch minus gravel within 5 feet of the pad or vault.

6.4.5 *Temporary Cover on All Openings*

Where the customer provides openings for PGE equipment (such as a pad-mounted transformer), the customer must provide and install a temporary cover. This cover must be

3/4-inch marine grade or exterior grade plywood that is 6 inches larger than the opening and secured without damaging the concrete. PGE will remove the temporary cover during installation of the electrical equipment.

6.4.6 *Barrier Posts*

IMPORTANT: *Barrier posts must be installed **before** service is energized.*

Install one or more barrier posts around all electrical equipment (such as a transformer, switchboard, CT cabinet, or sectionalizing cabinet) in areas where that equipment is exposed to vehicle traffic. The barrier post design and location must be approved by PGE.

Figure 30 shows barrier post locations for a pad-mounted installation, and **Table 12** lists barrier post dimensions for specific locations. **Figure 31** shows the required dimensions for a barrier post installation.

6.4.6.1 Barrier Post Placement

Follow these requirements when installing a barrier post.

- Install barrier posts on all sides of the equipment that are exposed to vehicles.
- Barrier posts must be no more than 6 feet apart.
- **Figure 30** shows an overhead view of typical barrier post locations around electrical equipment.
- Install a barrier post off-center of the equipment to allow the door to open.
- Do not install a barrier post closer than 4 feet to the front edge of a concrete pad or vault if an equipment door is (or will be) located on that side of the pad or vault.
- When installing a barrier post by a side of a concrete pad or vault that ***does not*** have a door, locate the post at least 3 feet away from that side. See **Figure 30.**
- If a barrier post needs a smaller clearance than those described here, PGE approval is required.

6.4.6.2 Barrier Post Installation

- In general, a barrier post is a 6-inch diameter, Schedule 40 galvanized steel post.
- All concrete must have a minimum compressive strength of 3000 psi after 28 days and be domed at the top of the steel post. The concrete must have a 2-inch dome above the final grade to prevent water pooling.
- Install barrier posts in undisturbed earth. However, the area between the vault wall and the barrier post hole may be filled with 3/4-inch minus compacted gravel if 3 feet of undisturbed area is not available after the vault is set.
- Provide 3 inches of concrete below the bottom of the post.
- Steel reinforcement is required when a barrier post is located at a loading dock. Use 6 x 6 W2.9/2.9 welded wire fabric (WWF), placed around the outside of the galvanized steel post. Overlap the welded wire fabric 6 inches and use a wire tie to secure the fabric. See **Figure 31** for more details.

  Note: Steel reinforcement is not required in an area that has car traffic only.

- Paint all barrier posts safety yellow and apply two 3-inch-wide reflective bands near the top of each post, as shown in **Figure 31**.

- Where a barrier post interferes with opening the equipment door or inhibits the workspace, a removable barrier post must be installed. PGE approval is required before installation.

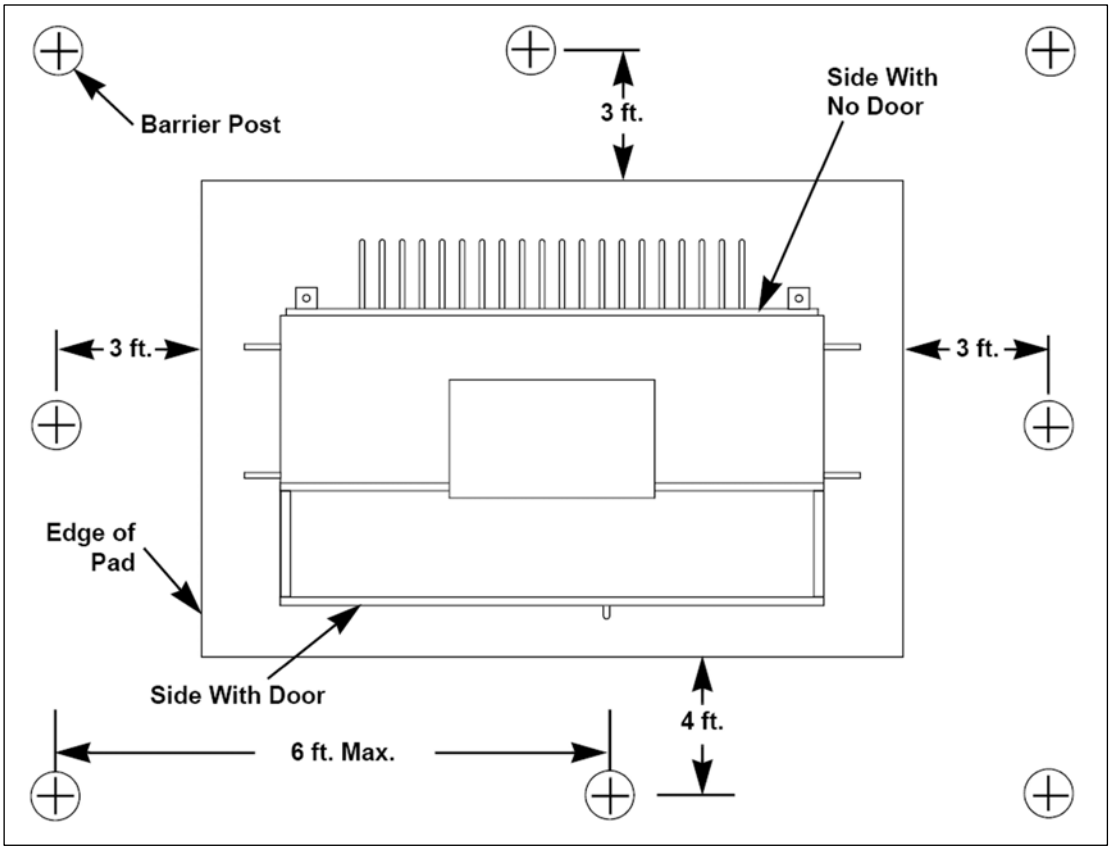

Figure 30: Overhead View of Barrier Post Locations at a Pad-Mounted Installation

In the table below, dimensions A and B apply to **Figure 31**.

Table 12: Barrier Post Dimensions For Specific Locations

Location	Dimension (inches)		
	Length of Galvanized Steel Post	A Hole Diameter	B Height Above Final Grade
Loading dock	108	30	54
Car traffic area	96	24	42

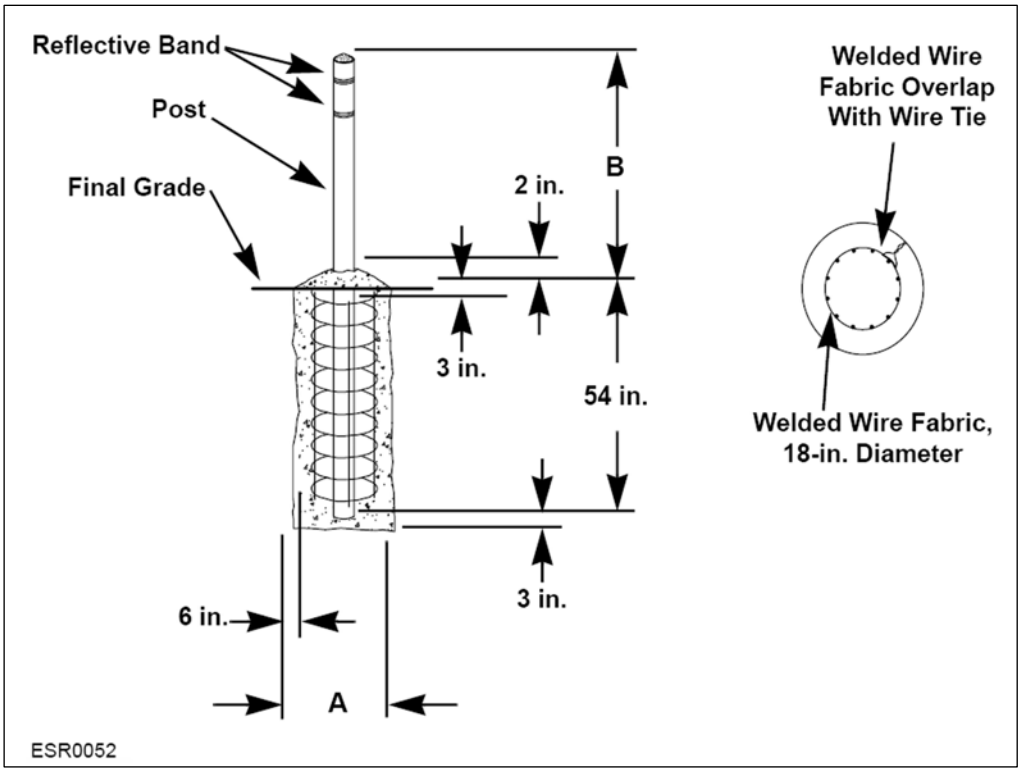

Figure 31: Required Dimensions for a Barrier Post

7 Single-Family Service

TOPICS IN THIS SECTION

- *Basic Requirements*
- *Underground Service*
- *Overhead Service*

7.1 Basic Requirements

IMPORTANT: *Call PGE for a meter spot before building any new service.*

The customer must provide, install, and maintain all service equipment, including service entrance conductors for overhead service, conduit, enclosures, and meter sockets. The customer must also provide rights of way and space for the installation and maintenance of PGE facilities.

The location of the service entrance on the customer's premises is an important consideration. Locate the service entrance and meter to make them more accessible from the PGE distribution line and convenient for the installation and maintenance of PGE meters. For clearance and location criteria, see Section 5.2, "Meter Clearances and Location Criteria." Consult PGE to determine the point of attachment for overhead service drops, underground service laterals, and meter locations.

See Section 6, *Underground Requirements* for underground and conduit requirements. For conduit requirements, see **Table 10** on page 63.

These additional basic requirements also apply:

- The customer must not terminate the principal grounding conductor in the PGE sealed termination compartment.
- Customer wires installed in the meter socket must allow working space for the installation of PGE wires. Panel covers must be secured before inspection and energizing.
- The meter socket must not be used as a junction box.

7.1.1 *Residential Sockets*

A single-phase, direct-connect residential socket that has a maximum current capacity of 125 A, 200 A, or 400 A (320 A continuous) and is approved by ANSI, UL, and/or EUSERC may be used. The socket must also be approved by PGE.

All single-phase, 400 A (320 A continuous) sockets must have an approved manual link bypass.

Code-calculated loads greater than 320 A require current transformer metering. Contact PGE for information and requirements. For more information, see Section 10, *Commercial, Industrial, and Large Residential Services, 800 A or* Lower.

Note: For a 200 A service, a bypass meter socket is approved—but not required—for single-family residential services. Consider a bypass meter socket if power interruptions during routine meter service would be a problem in the residence.

7.2 Underground Service

Before preparing for underground service, the customer must obtain specifications and approval from PGE for the proposed installation.

The customer is responsible for identifying potential surface and subgrade water flow that may let water enter into the customer's electrical equipment. PGE will coordinate with the customer help prevent this water entry.

Customers who are adequately served by existing overhead distribution facilities, but still want underground service, should contact PGE for details of its policy regarding conversion. Special rules may apply in areas where local ordinances require underground service.

PGE underground conductors for providing underground service to residential premises must be installed as specified in Section 6.2, "Trenches Provided by the Customer" and Section 6.3, "Conduit." The customer must furnish and install PGE-approved conduit.

The customer is responsible for the cost of all trenches, conduits, vaults, excavation, backfill, and site restoration on the residential premises. This includes costs for work done outside the project to permit connection to PGE facilities.

PGE will install, own, and maintain the underground service lateral from its distribution line to the customer's point of delivery.

7.2.1 *Underground Service Extension*

Figure 32 shows a residential underground-approved combination meter socket for 100 and 200 A maximum, single-phase service (EUSERC 301). The variable dimensions indicated in this figure are listed in **Table 13**.

Figure 33 shows a residential underground-approved meter socket for 200 A maximum, single-phase service (EUSERC 301A). The variable dimensions indicated in this figure are listed in **Table 13**.

Figure 34 shows a residential underground approved meter socket for 400 A maximum (320 A continuous), single-phase service (EUSERC 302B).

Figure 35 shows a typical installation of an underground service extension to the house.

Figure 36 shows a PGE-installed standoff bracket on the pole.

Figure 37 shows a surface-mount installation, and **Figure 38** shows the optional seismic footing design. **Figure 39** shows a flush-mount installation.

Figure 40 shows an underground conduit system for long-side service.

Figure 42 shows a PGE-installed standoff bracket that uses 2 x 4 framing and a swedge reducer. **Figure 41** shows a 3 inch-to-2.5 inch swedge reducer.

Follow these basic construction requirements for all underground service extensions:

- The customer is responsible for the trench, backfill, compaction, surface restoration, and conduit as required for service extensions.
- Hubs are not approved for use on the concentric knockout of underground socket enclosures. Approved bushings, box adapters, or other conductor protection are required for these enclosures.
- The service entrance riser must be in line with the left side of the entrance knockout. (See **Figure 35**.) For detailed clearance requirements, see Section 5, *Clearances*.

- Customer-owned conductors cannot enter or pass through the PGE compartment in the meter socket except in a 320 A meter socket.
- The customer must provide and install a PGE-approved meter socket. The point of delivery for residential customers must be located on the front of the building or no more than 10 feet back from the front corner. The customer must contact PGE to determine the exact location of the meter socket.
- Ringless meter sockets are not approved.
- Services of 320 A or lower can use 3-inch PVC Schedule 40 electrical conduit, with up to 270 degrees of bends. All bends must be factory-made, with a 36-inch long sweep radius. Field heat bends are ***not*** acceptable.
- When the conduit extends to a PGE pole or handhole, consult PGE for the exact conduit location. PGE will then install a bracket on the pole or mark the location on the pole for the conduit. There must be at least 8 inches between the pole and the backside of the conduit, as shown in **Figure 36**.
- The electrical label or permit must be attached to the meter base.
- The meter socket and conduit must be rigidly attached to the structure as shown in **Figure 37**. 2- x 4-inch back supports are required. The meter socket and conduit must be plumb when inspected. PGE will determine the exact location of the meter.
- Sleeves are required around conduit that passes through a paved area adjacent to a building foundation. These sleeves prevent ground settling from pulling the conduit down.
- The riser elbow must be backfilled with a minimum 4-inch depth of 3/4-inch minus crushed rock that is tamped to avoid soil settling.
- Use factory bends with no more than 90 degrees of total bend to obtain a minimum depth of 36 inches while keeping the conduit flush against the house.
- No bends are allowed in the conduit riser between the meter socket and the underground sweep. If local codes do not allow conduit in the foundation or footing, a surface-mount meter must be installed. See **Figure 37**.

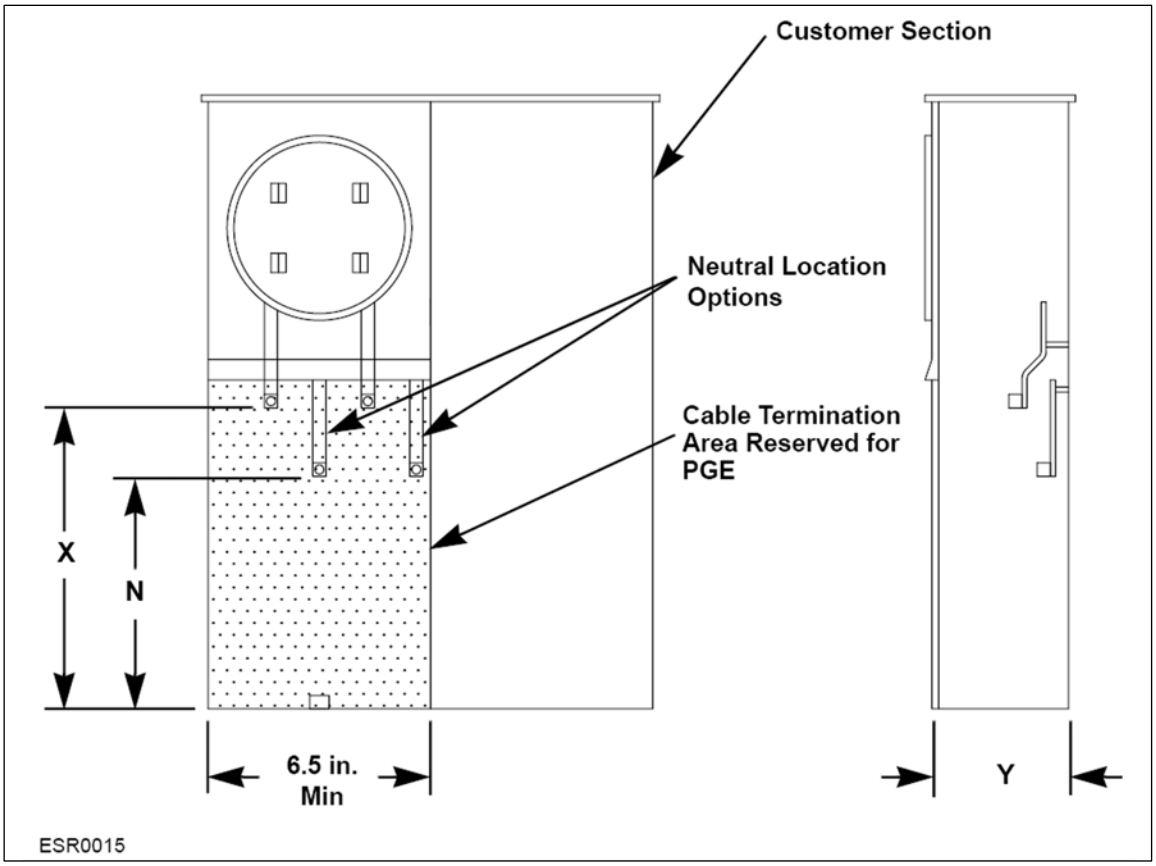

Figure 32: Residential Underground Approved Combination Meter Socket for 100 A and 200 A Maximum Single-Phase Service (EUSERC 301)

The variable dimensions shown in the table below apply to **Figure 33**.

Table 13: Dimensions for Residential Underground Approved Meter Sockets for 100 A and 200 A Maximum Single-Phase Service

Amperes	Dimension (inches)		
	N	X	Y
125	6.0	8.0	4.0
225	8.5	11.0	5.0

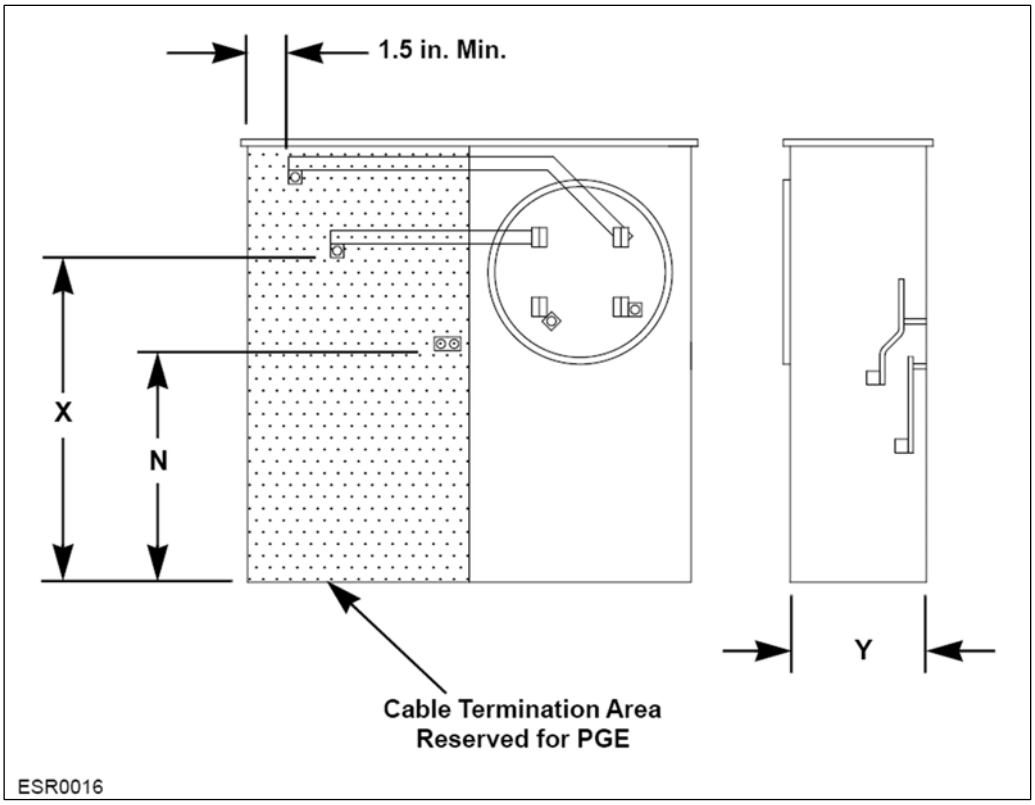

Figure 33: Residential Underground Approved Meter Socket for 200 A Maximum Single-Phase Service (EUSERC 301A)

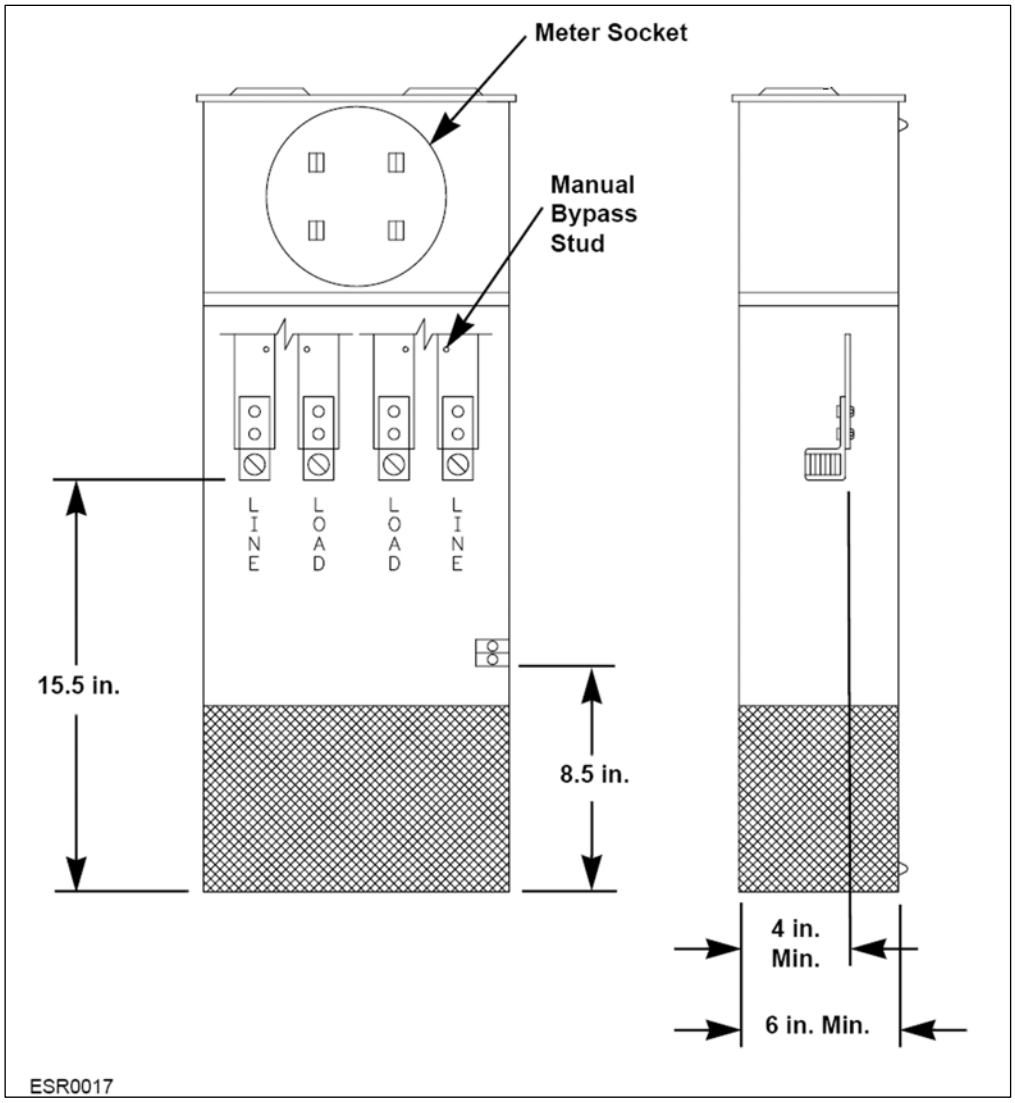

Figure 34: Residential Underground Approved Meter Socket for 400 A (320 A Continuous) Maximum Single-Phase Service (EUSERC 302B)

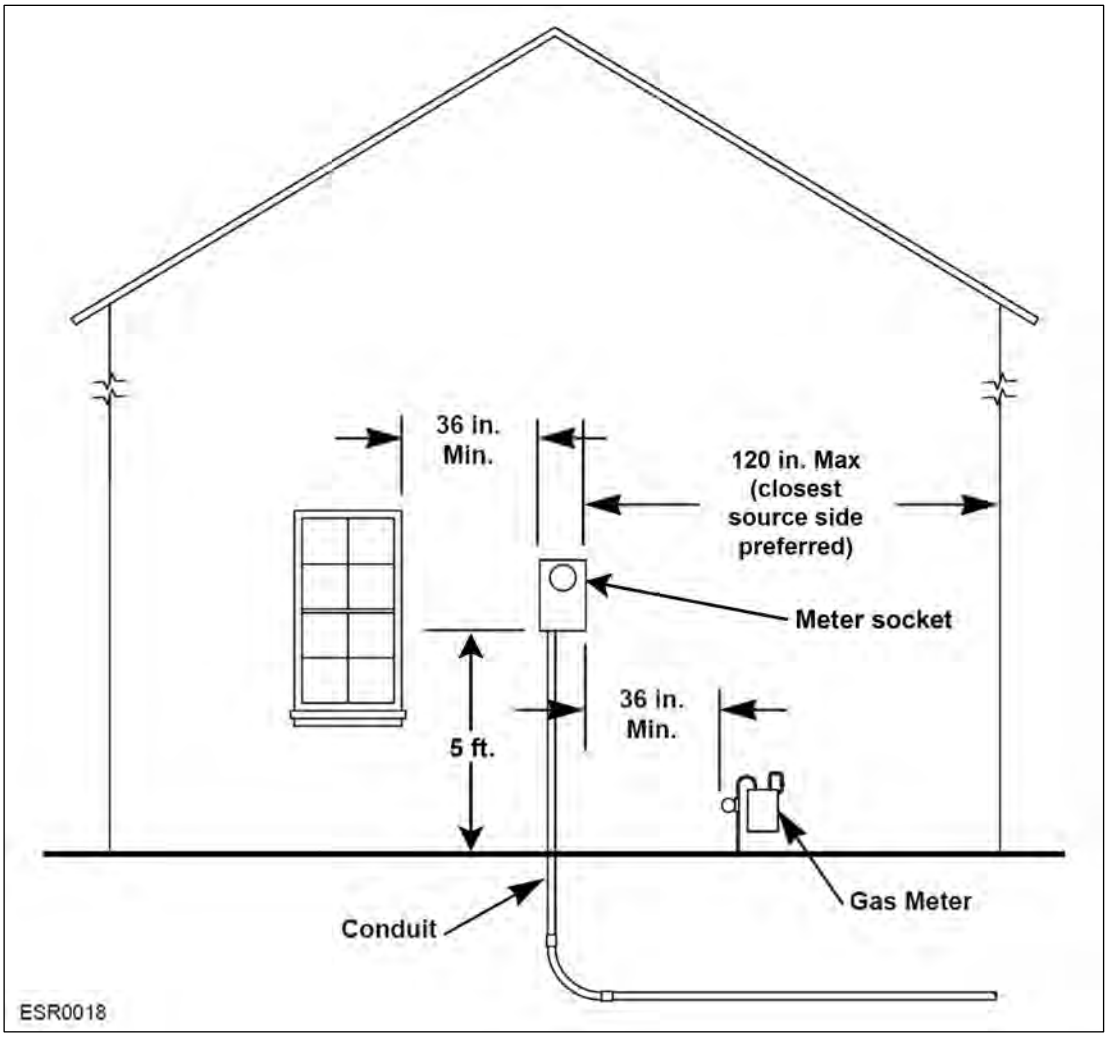

Figure 35: Underground Service Extension

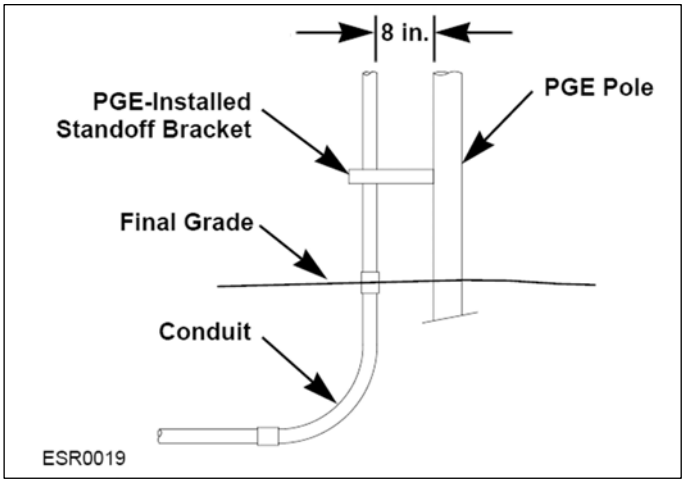

Figure 36: PGE-Installed Standoff Bracket

7.2.1.1 Surface-Mount Installation

Note: The requirements in this section are in addition to those in Section 7.2.1.

The customer must furnish and install the following for a surface-mount installation:

- An underground-type meter socket enclosure.
- Conduit.
- Utility easement (when required).
- Long-radius sweep.

These requirements apply to a surface-mount installation such as the one shown in **Figure 37** and to the optional seismic footing design shown in **Figure 38**:

- No bends are allowed in the conduit riser between the meter socket and the underground sweep. If local codes don't allow conduit in the foundation or footing, a surface-mount meter must be installed.
- On a brick or concrete block siding, use a 1/4–20 x 3.25 lead sleeve expansion bolt in joint in place of a lag screw on an anchor strap.
- The conduit riser must be in line with the left side of the entrance knockout.
- For 2 x 4 framing, it's permitted to use a 3 inch-to-2.5 inch smooth-wall swedge reducer installed as close as possible to the meter socket. You can find more information in Section 7.2.1.4, "2 x 4 Framing with Reducing Swedge Couplers for Meter Base Applications."

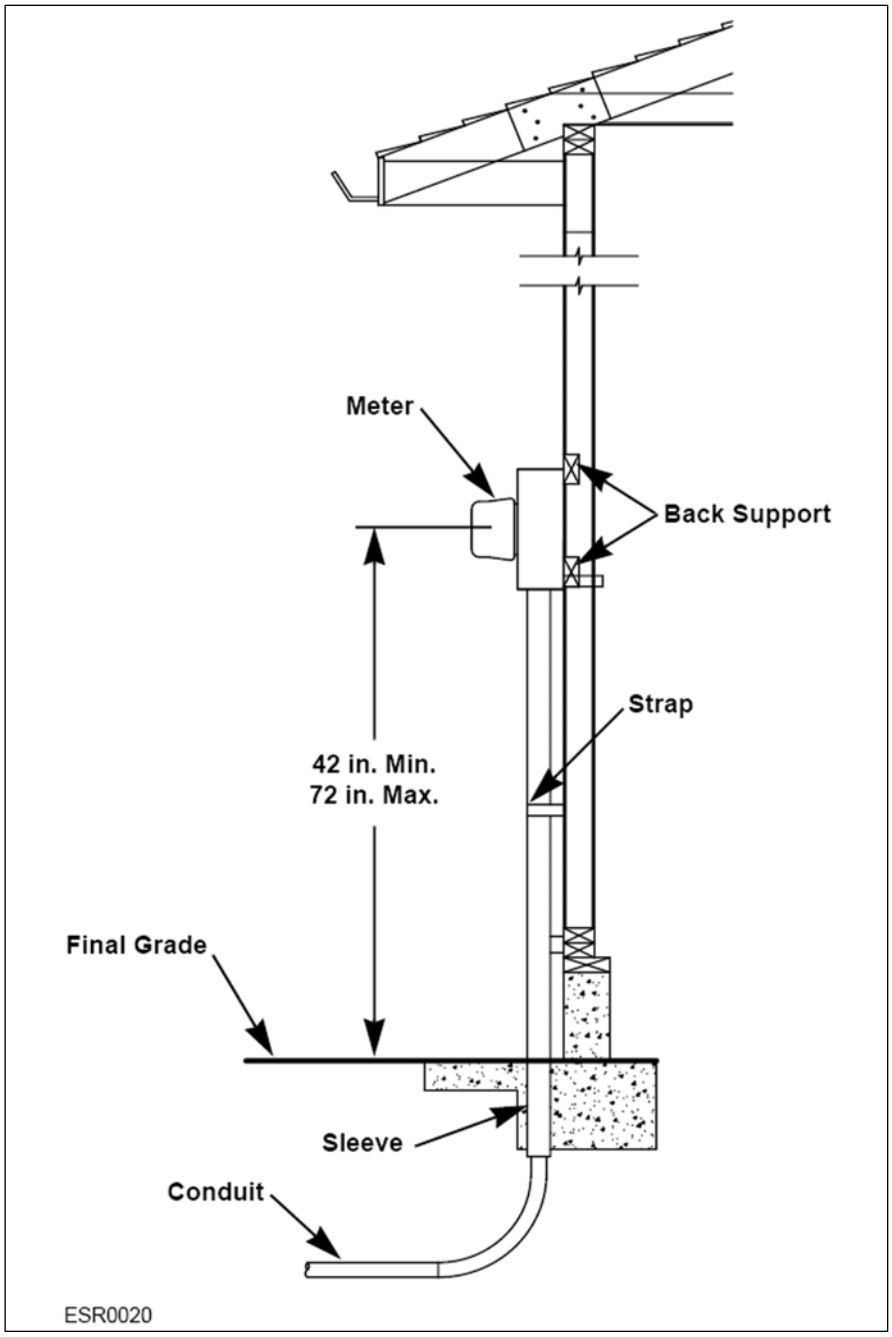

Figure 37: Surface-Mount Installation

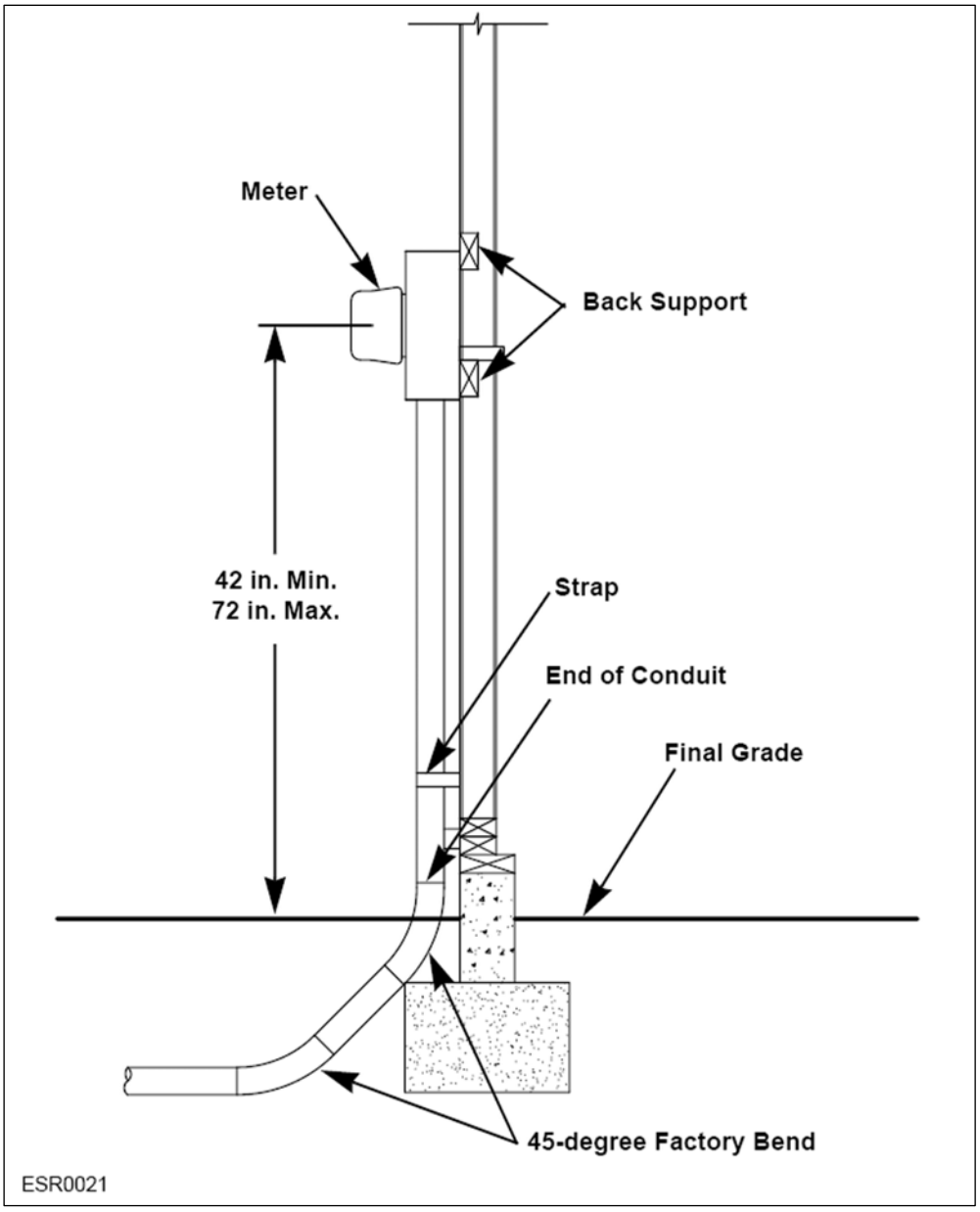

Figure 38: Seismic Footing Design

7.2.1.2 Flush-Mount Installation

Note: The requirements in this section are in addition to those in Section 7.2.1.

These requirements apply to a flush-mount installation, such as the one shown in **Figure 39**:

- No bends are allowed in the conduit riser between the meter socket and the underground sweep. **Figure 39** shows an installation with conduit in the foundation and footing.
- The conduit riser must be in line with the left side of the entrance knockout.

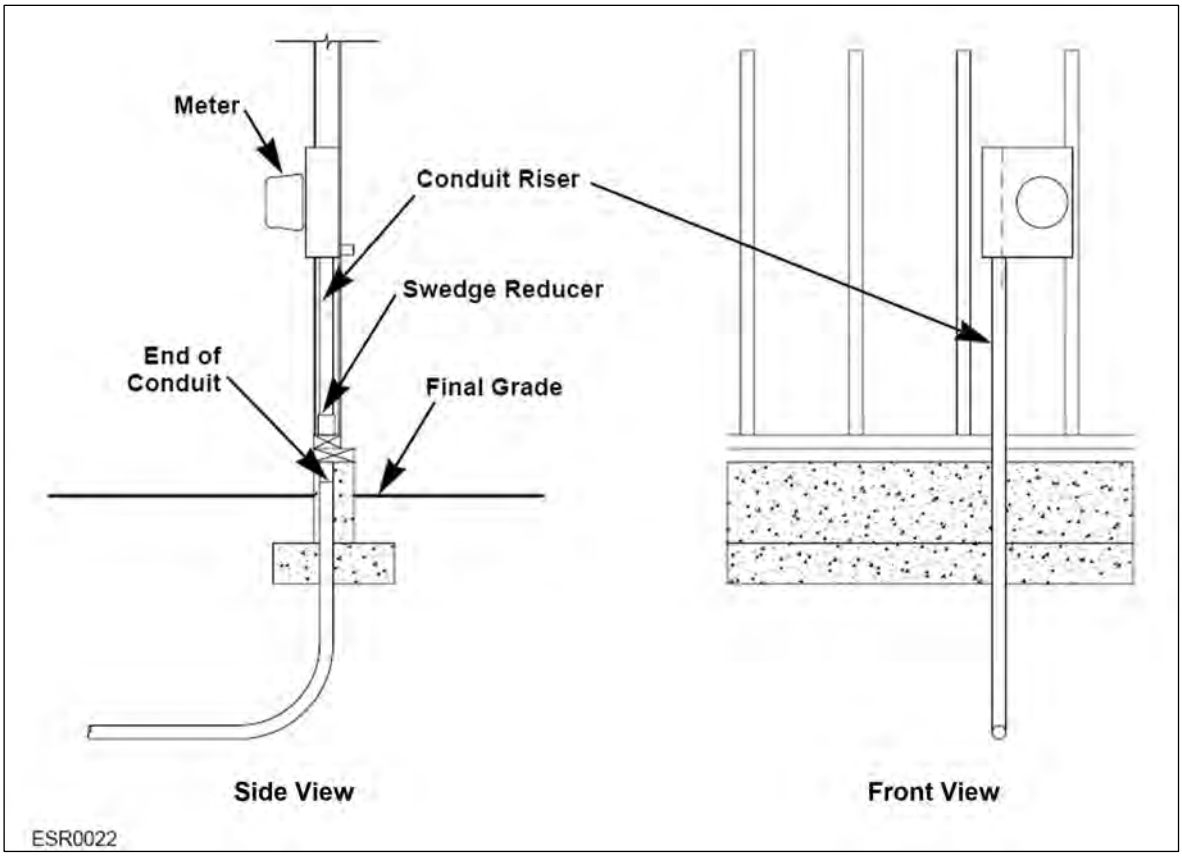

Figure 39: Flush-Mount Installation

7.2.1.3 Underground Conduit System for Long-Side Service

Note: The requirements in this section are in addition to those in Section 7.2.1.

These requirements apply to an underground conduit system for long-side service, such as the one shown in **Figure 40**:

- The customer must provide a continuous electrical conduit with a pull string in the conduit from the meter socket to the pedestal or handhole. The pull string must be rated for 500-pound service.
- If the pedestal is energized, consult PGE before installing the conduit.

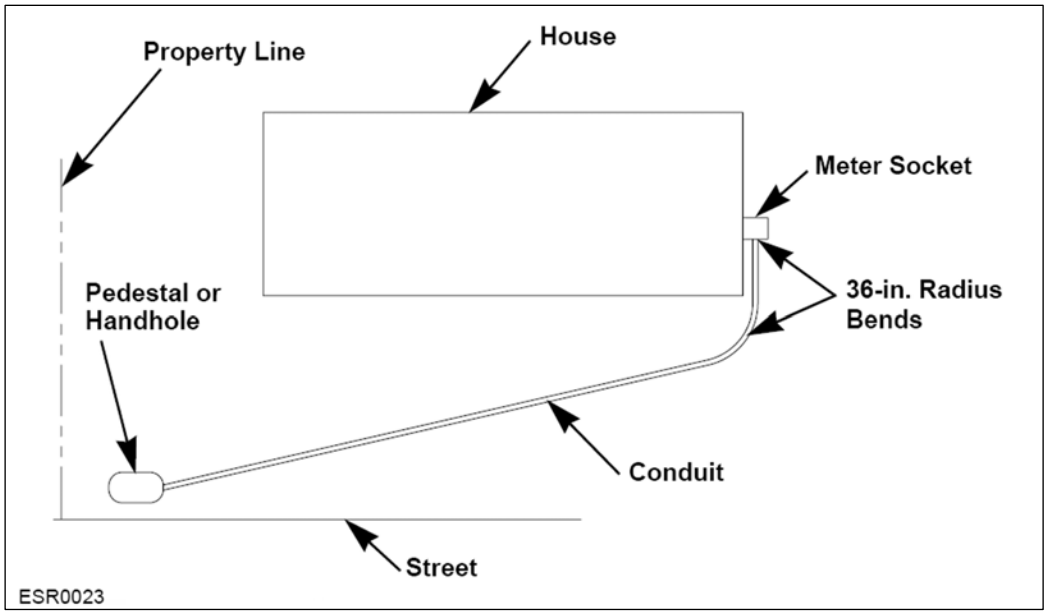

Figure 40: Overhead View of An Underground Conduit System for Long-Side Service

7.2.1.4 2 x 4 Framing with Reducing Swedge Couplers for Meter Base Applications

A 3 inch-to-2.5 inch smooth-wall swedge reducer (shown in **Figure 41**)—installed as close as possible to the meter socket—may be used to reduce conduit size for 2 x 4 framing.

Figure 41: Reducing Swedge Coupler

When a conduit extends to a PGE pole or handhole, consult PGE for the exact conduit location. PGE will install a bracket on the pole or mark the location on the pole for the conduit. As shown in **Figure 42**, there must be at least 8 inches between the pole and the backside of the conduit.

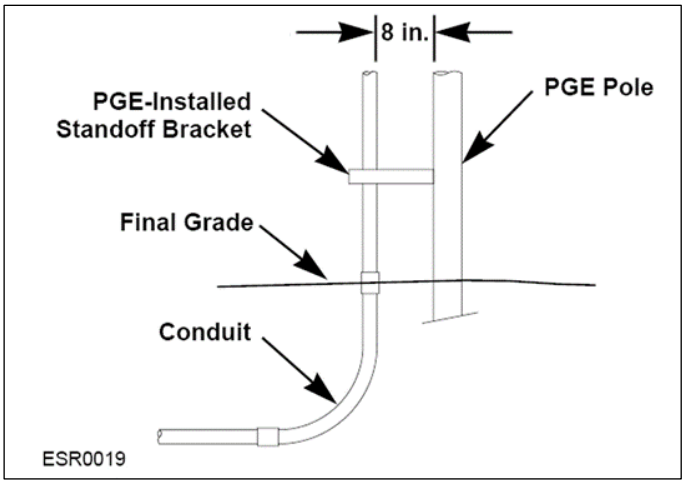

Figure 42: PGE-Installed Standoff Bracket

7.2.2 *Secondary Splice Pedestal*

Note: The requirements in this section are in addition to those in Section 7.2.1.

Follow these requirements when installing a secondary splice pedestal, such as the PF-300 secondary splice pedestal shown in **Figure 43**:

- Install the pedestal so that the ground level marker on the case is at final grade.
- The pedestal must be installed level with the horizon.
- The latch on the lid must face toward the street.
- The lid must be secured with a five-sided Penta-head bolt.
- Use at least 6 inches of 3/4-inch minus well-compacted crushed rock around and inside the base of the pedestal.
- The conduit stubs should be at least 2 inches above the inside grade to prevent rocks and debris from falling into the conduit.
- Cover conduits and mark them as follows:
  - *S* for source.
  - *SVC* for service.
  - *ST* for streetlight.
- Install 500-pound-rated pull string in the source conduit so that 6 feet of pull string extends beyond each end of the conduit.
- The source conduit must be on the field side of the pedestal.
- Elbows must be 36-inch radius.
- The customer must install a 5/8-inch OD x 8-foot-long ground rod inside the secondary splice pedestal. (PGE will provide this ground rod.)

Install the ground rod as follows:

- Bury it at least 7 feet, 9 inches deep.
- Make sure that the rod extends at least 9 inches below the neutral bus behind the source conduit.
- Locate it as close to the back of the pedestal as possible.

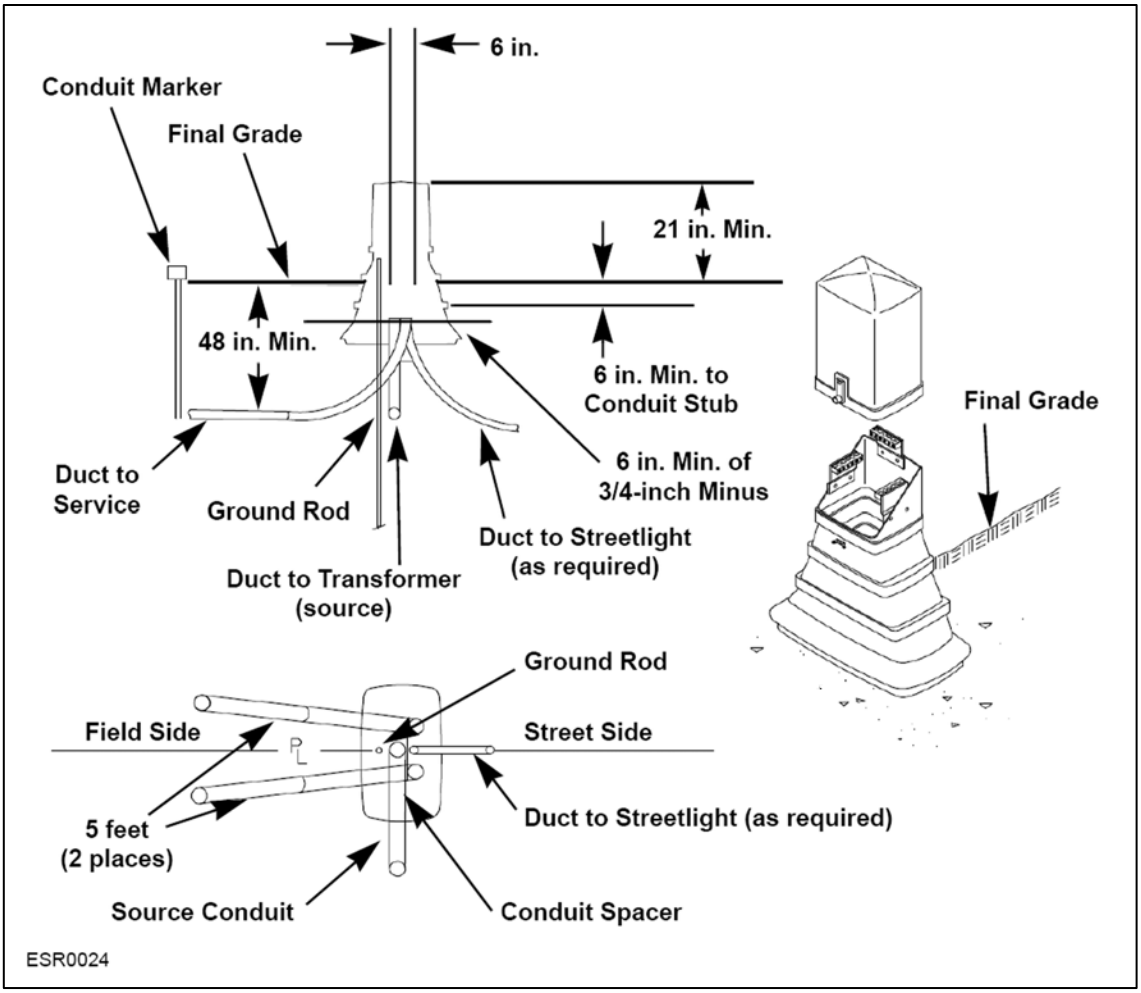

Figure 43: PF-300 Secondary Splice Pedestal

7.2.3 *Secondary Handhole*

Note: The requirements in this section are in addition to those in Section 7.2.1.

Follow these requirements when installing a secondary handhole, such as the 17- x 30- x 18-inch deep secondary handhole shown in **Figure 44**:

- Contact PGE for approved manufacturers of secondary handholes.
- Before capping the conduit, mark it and install 500-pound-rated pull string so that 6 feet of additional pull string extends beyond each end.
- The trench depth at the handhole location must be appropriate for the sweep being used. Cutting of sweeps ***is not*** allowed.
- Use at least 6 inches of well-compacted 3/4-inch minus backfill under the splice box, and use exactly 6 inches around the outside base.
- All secondary vaults (1730 vaults) must be installed on property lines within the utility easement, and the handhole must be set 2 inches above final grade or on the high side of the slope. Handholes on a sidewalk must be set to grade. Alternate locations must be approved by PGE and noted on the drawing.

- The cost for relocation or adjustment of a secondary vault will be the responsibility of the builder or developer requesting the move. PGE approval of the installation will be based on final grade and location criteria set by the developer and his or her agent.
- For permanent service, use 3-inch Schedule 40 or fiberglass, 90-degree elbows with a 36-inch radius. Install to the proper depth for the sweep being used.
- The customer must install a 5/8-inch OD x 8-foot-long ground rod inside the handhole. (PGE will provide this ground rod.)

Install the ground rod as follows:

- Locate the rod behind the feed conduit.
- Bury the rod at least 7 feet, 9 inches deep.
- Ensure that the rod extends at least 3 inches above grade inside the handhole.
- The lid must be installed with five-sided Penta-head bolts.

Note: The handhole shown in **Figure 44** has a 21.75- x 34.75-inch polymer cover marked *ELECTRIC*. This size may vary with the manufacturer.

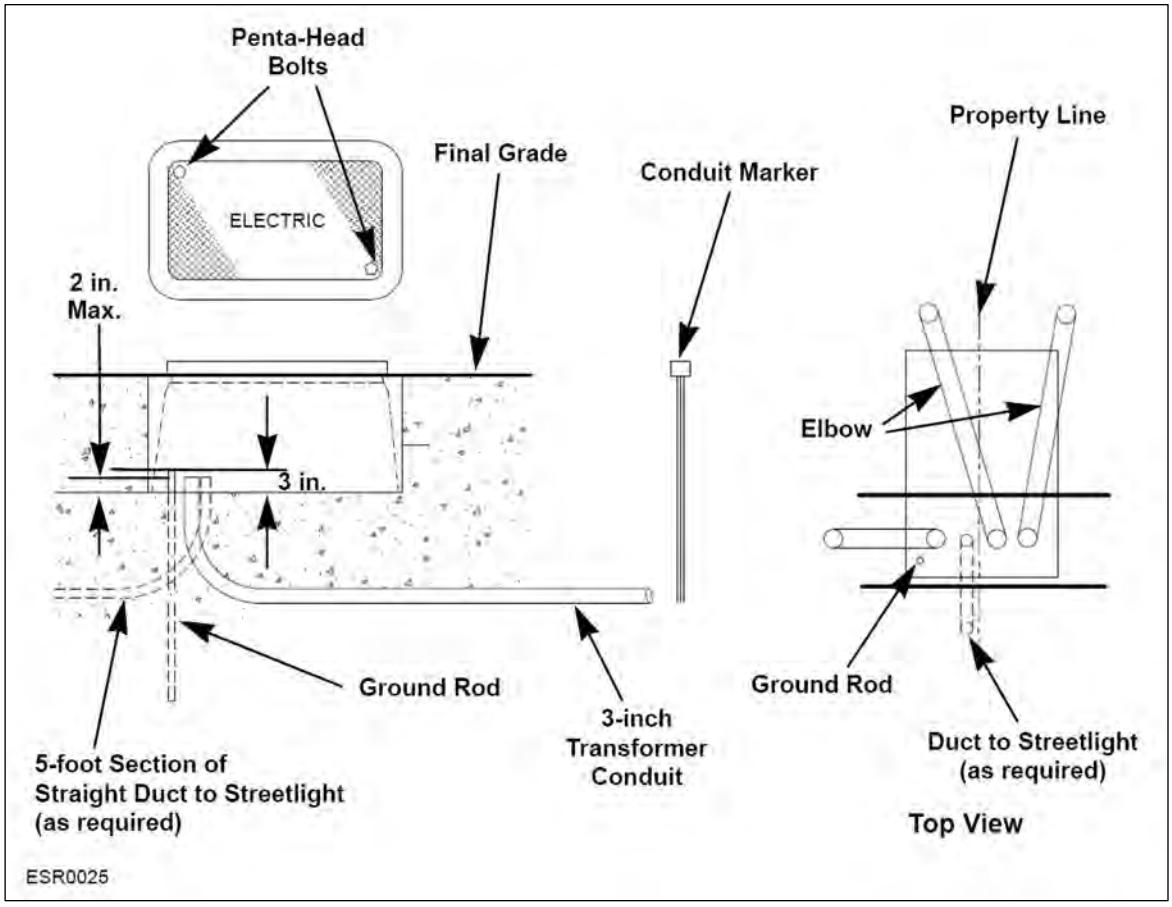

Figure 44: Secondary Handhole

7.2.4 Post-Mounted, Freestanding Residential Meter Pedestal

Note: The requirements in this section are in addition to those in Section 7.2.1.

Before a pedestal can be installed, the customer must and/or install the following:

- An underground-type meter socket.
- Hardware for the 6- x 6-inch post.
- Conduit with pull string.
- Utility easement.
- A trench.
- A 5/8-inch OD x 8-foot-long galvanized ground rod. (PGE can provide this ground rod.)

Follow these requirements when installing a post-mounted, freestanding residential meter pedestal such as the one shown in **Figure 45**:

- A minimum 6- x 6-inch pressure-treated wood post owned by the customer must be installed. Firmly tamp the earth around the post and dome the earth to allow for settling.

  IMPORTANT: ***Do not*** *use a railroad tie instead of a 6- x 6-inch pressure-treated wood post.*

- Use a strap to secure the conduit to the post.
- PGE will determine the exact location of the meter.
- The post must be installed at least 7 feet from the service post.
- An electrical label or permit must be displayed on the meter base.

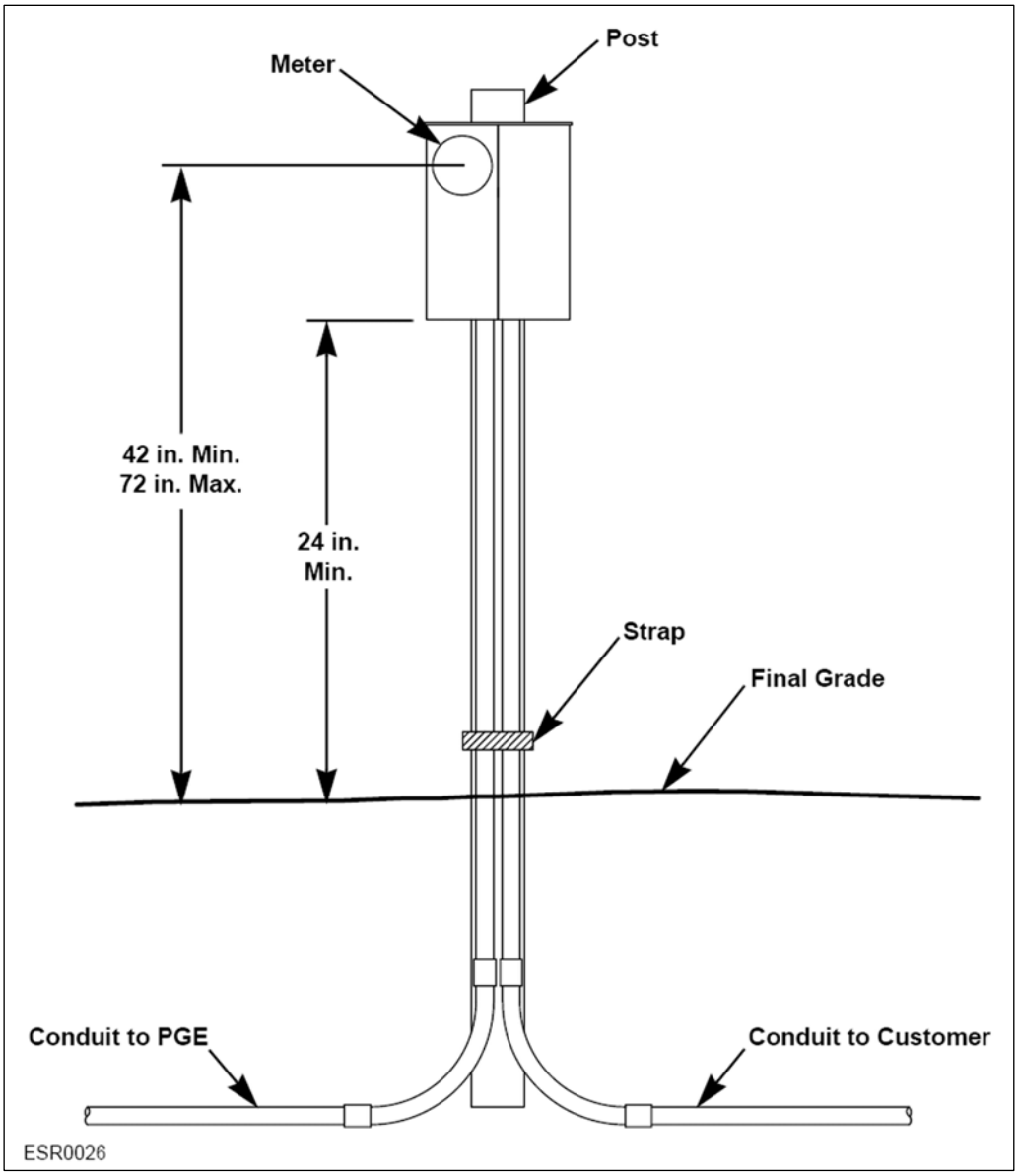

Figure 45: Post-Mounted Freestanding Residential Meter Pedestal

7.3 Overhead Service

If a customer is in an overhead service area, PGE will install an overhead service drop from the PGE distribution lines to the service entrance on the customer's residence, building, or structure. PGE will also install underground service in an overhead area. (See Section 7.2, "Underground Service," for requirements.)

IMPORTANT: *PGE requires all new services to be located such employees can use full fall protection when installing and maintaining the service. To meet this requirement, the service must be accessible using a bucket truck or a ladder whose base can be positioned on level ground, rested upon a flat pitch, and secured. In addition, the service cannot be in a location where PGE employees must step out onto a roof when installing or maintaining that service. Contact PGE for a meter spot to ensure your service will meet this requirement.*

Consult PGE for location of the meter socket before rewiring the service. For more information, see **Figure 13** on page 37.

The customer must provide a single attachment point within 2 feet of the weatherhead that can be reached from an adjacent PGE line using a single span of service drop cable. If a service is mounted on a customer-owned pole, locate the weatherhead within 2 feet of the pole top. In all cases, the point of attachment must be high enough above the finished grade and in a proper position to provide minimum clearances as specified in **Table 3** on page 42.

It is important to avoid overhang of a service drop above adjacent property, and to provide a service drop route without obstruction by buildings, trees, or other objects. Locate the point of attachment on the building wall that faces the nearest PGE line, or on a service mast capable of withstanding the tension of the service drop.

Extend and tie supports for service drops from and into the main structural members of the building. Extend the service mast through the roof on a typical single-story building unless adequate clearance exists at the gable end of the building. (See **Figure 15** on page 40 for illustrations of roof and gable-side service drops.) The service entrance riser conduit for overhead installations must be a minimum Schedule 40 PVC.

Use a rigid metal pipe clamp for the point of attachment for a service mast. For attachment to a building, use a 3/8-inch eyebolt connected to a significant structural member, such as a rafter or roof plate. For a single-story building, the attachment must not be below the downhill slope of the roof or the rain gutters.

IMPORTANT: ***Do not*** *attach the service to a fascia board.*

If you encounter a problem in meeting these clearances, PGE will help you to determine specific requirements that will comply with the codes.

Note: For residential overhead services, the house siding must be installed before energizing the service.

Figure 46 shows a residential overhead approved meter socket for 100 A, 200 A (EUSERC 301 or 301A), and 400 A (320 A continuous) maximum, single-phase service (EUSERC 302B).

Figure 47 shows a residential overhead approved meter socket for 100 and 200 A maximum, single-phase service.

See Section 7.3.1, "Surface-Mount and Flush-Mount Installations" for information on overhead service for surface-mount and flush-mount metering.

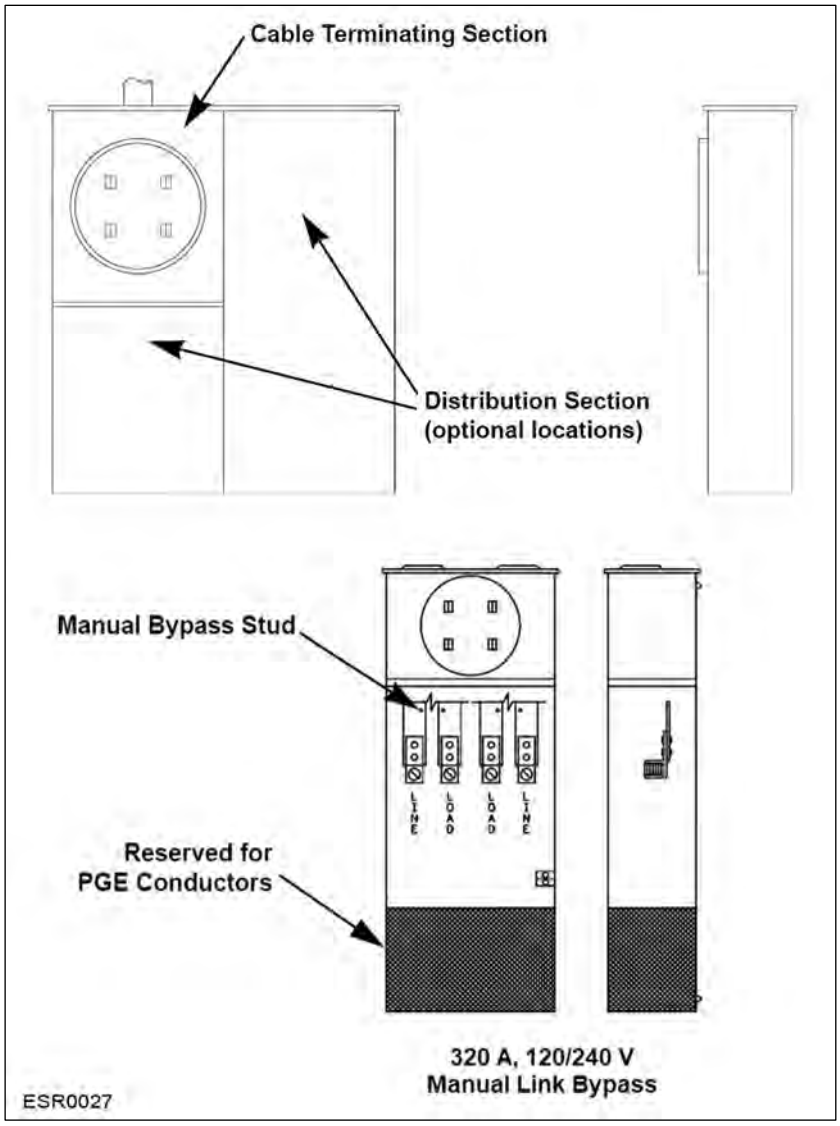

Figure 46: Residential Overhead Approved Meter Socket for 100 A, 200 A, and 400 A

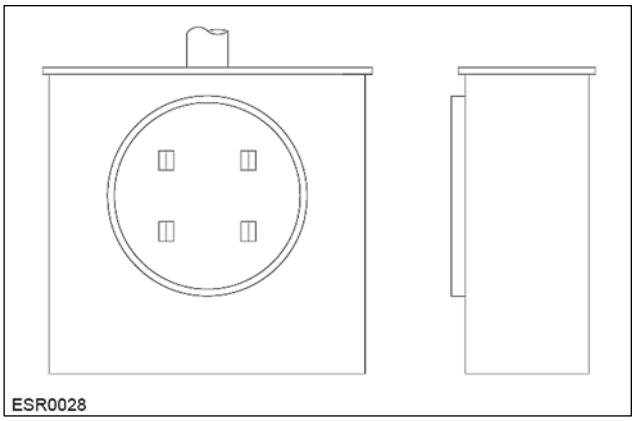

Figure 47: Residential Overhead Approved Meter Socket for 100 A and 200 A

7.3.1 *Surface-Mount and Flush-Mount Installations*

Note: The requirements in this section are in addition to those in Section 7.3.

These requirements apply to surface-mount and flush-mount installations, such as the ones shown in **Figure 48**:

- Allow 24-inch conductor leads for connection to the service drop.
- The guy must be 1/8-inch galvanized steel strand or larger.
- The service mast must be continuous rigid steel conduit and securely attached. See **Table 14** for guy requirements by mast size and for maximum height without guys.
- Mount the service mast on the side nearest the distribution pole. See Section 5, *Clearances*, for clearance requirements between the roof and the service line.
- On a brick or concrete block siding, use a 1/4–20 x 3.25 lead sleeve expansion bolt in the joint instead of a lag screw on an anchor strap.
- PGE will determine the exact location of the meter socket for new and rewire installations.
- *The customer must provide a **minimum** 4- by 4-foot level workspace in front of all metering equipment.* PGE will assist in determining the location of metering equipment.
- An electrical label or permit must be displayed on the meter base.
- Conduit coupling must not be installed above the roof line.
- The maximum distance between the center of the service mast and the edge of the roof or outer edge of the gutter is 4 feet.
- On a flush-mount installation, the building face must not extend beyond the meter box face.

Table 14: Guy Requirements by Mast Size

Service Mast Rigid Steel Conduit Size	Service Size	Utility Service Length	Length of Unsupported Mast
2-inch	200 A or less	Less than 100 feet	24 inches
3-inch	201 A to 400 A	Less than 80 feet	

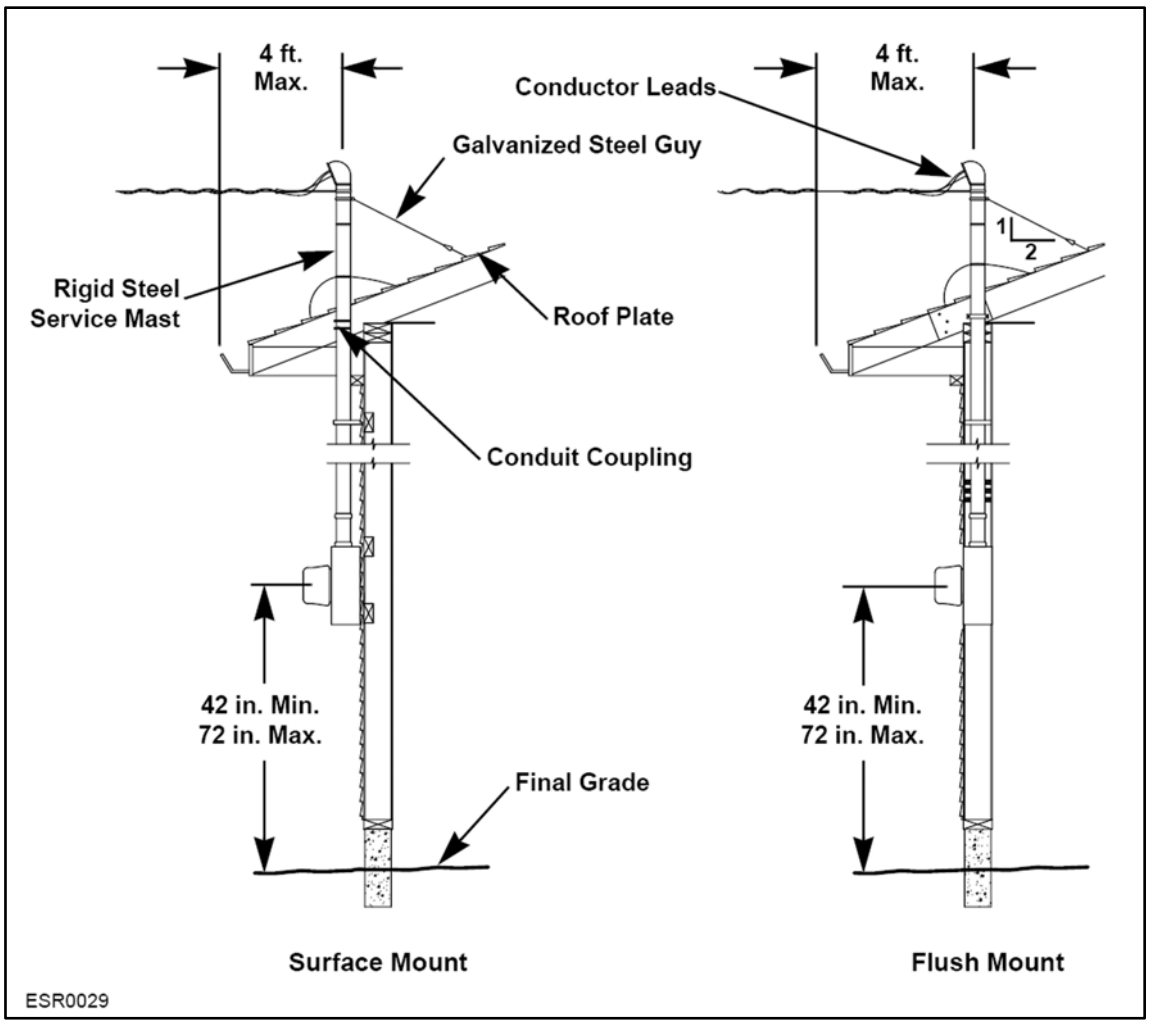

Figure 48: Overhead Service for Surface-Mount and Flush-Mount Metering

7.3.2 *Service Mast Guy and Anchor Requirements*

Note: The requirements in this section are in addition to those in Section 7.3.

These requirements apply to mast guys and anchors (see **Figure 48** and **Figure 49**):

- The roof plate must be fitted between the shingles, and then secured to the rafter using 1/4–20 bolts.
- The roof plate must be installed so that the service alignment extension falls between the guys.
- When using anchor strap 1, a 3/8-inch eyebolt and washer with a header block between the rafters is acceptable. An eye lag is not acceptable.
- Anchor strap 1 and anchor strap 2 must accommodate a 2-3/8-inch diameter service mast.
- Anchor strap 1 is made from 3/16- x 1-inch galvanized steel.
- Anchor strap 2 is made from two 2 x 4 studs, 3/16- x 1-inch galvanized steel, and two 1/4–20 x 3 lag screws or 1/4–20 bolts.
- Both anchor strap 1 and anchor strap 2 have a set screw.

- The maximum distance between the push brace and the weatherhead is 18 inches.
- When using a push brace, two braces are required.

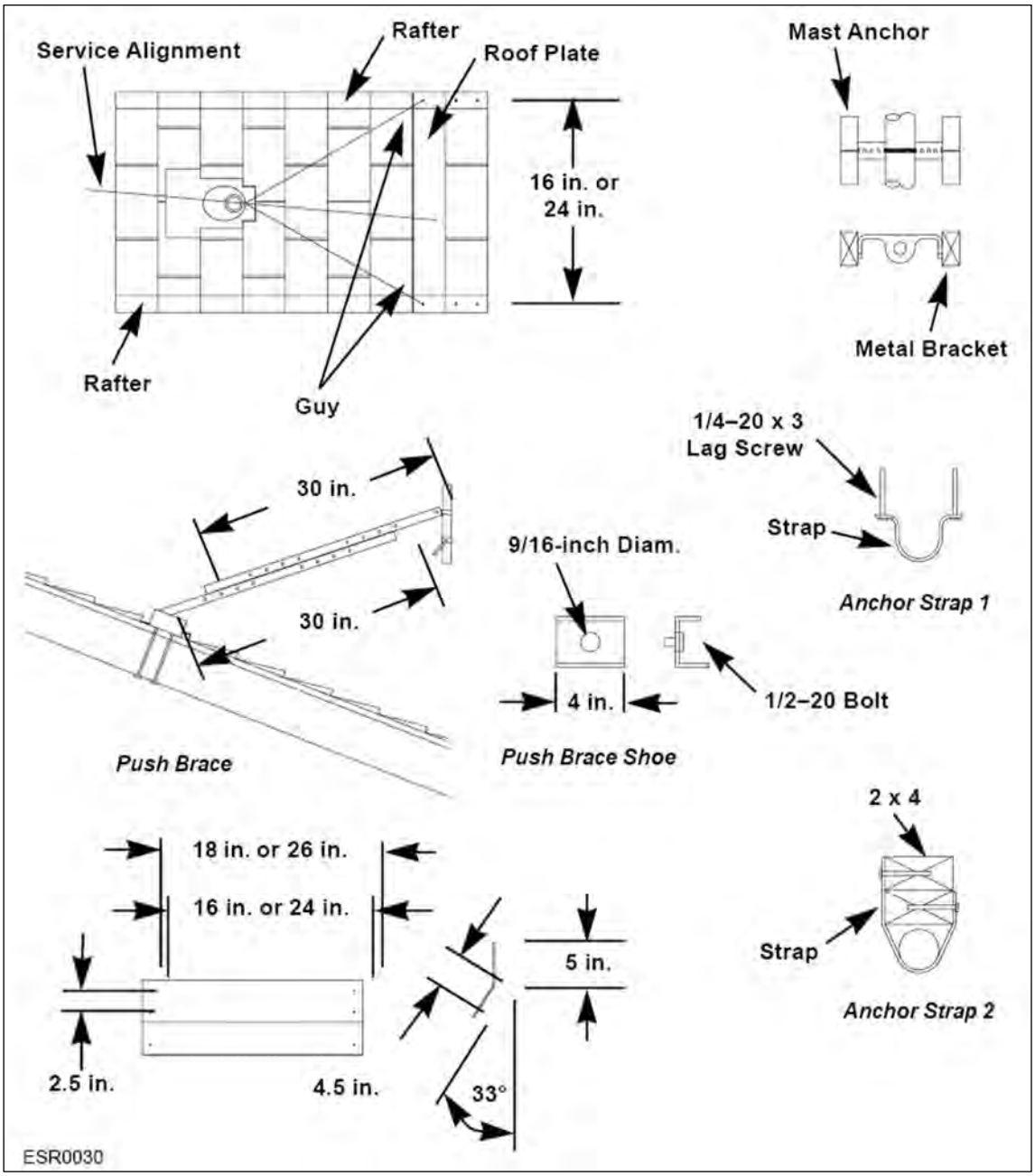

Figure 49: Service Mast Guys and Anchors

8 Multiple-Family Service

TOPICS IN THIS SECTION

- *Basic Requirements*
- *Grouping Service Entrances*
- *Underground Service*
- *Service Terminating Arrangements*
- *Overhead Service*

8.1 Basic Requirements

These requirements apply to a multiple-family service:

- An electrical label or permit must be displayed on the meter socket.
- The customer must provide a conduit with pull string.
- The conduit must be rigidly attached to the building and be straight and vertical to the sweep in the trench.
- The customer is responsible for providing a minimum 4- x 4-foot level workspace in front of all PGE electrical equipment.
- The customer is responsible for recognizing potential surface and subgrade water flows that may create an entry of water into the customer's electrical equipment. PGE will work with the customer to assist in preventing this entry of water.
- The service conduit riser must be backfilled at least 4 inches deep with 3/4-inch minus crushed rock that is tamped to avoid soil settling.
- Before power is connected, each meter on a structure with multiple service must have a permanently engraved metal or hard plastic label with letters at least 3/8-inch high to identify each customer service address (as shown in **Figure 50**). Consult PGE for further label requirements.

Figure 50: Meter Label with Service Address

IMPORTANT: *The customer must ensure that each meter socket is correctly labeled. PGE may check meter installations to verify that all labels are correct and* ***charge the customer a fee*** *if a meter socket is incorrectly labeled. See PGE Schedule 300 and Tariff Rule M, Section 1.D.*

- The house meter must be the safety-socket type. Where the meter serves lighting only, a bypass or safety socket is not required (as **Figure 51** shows).

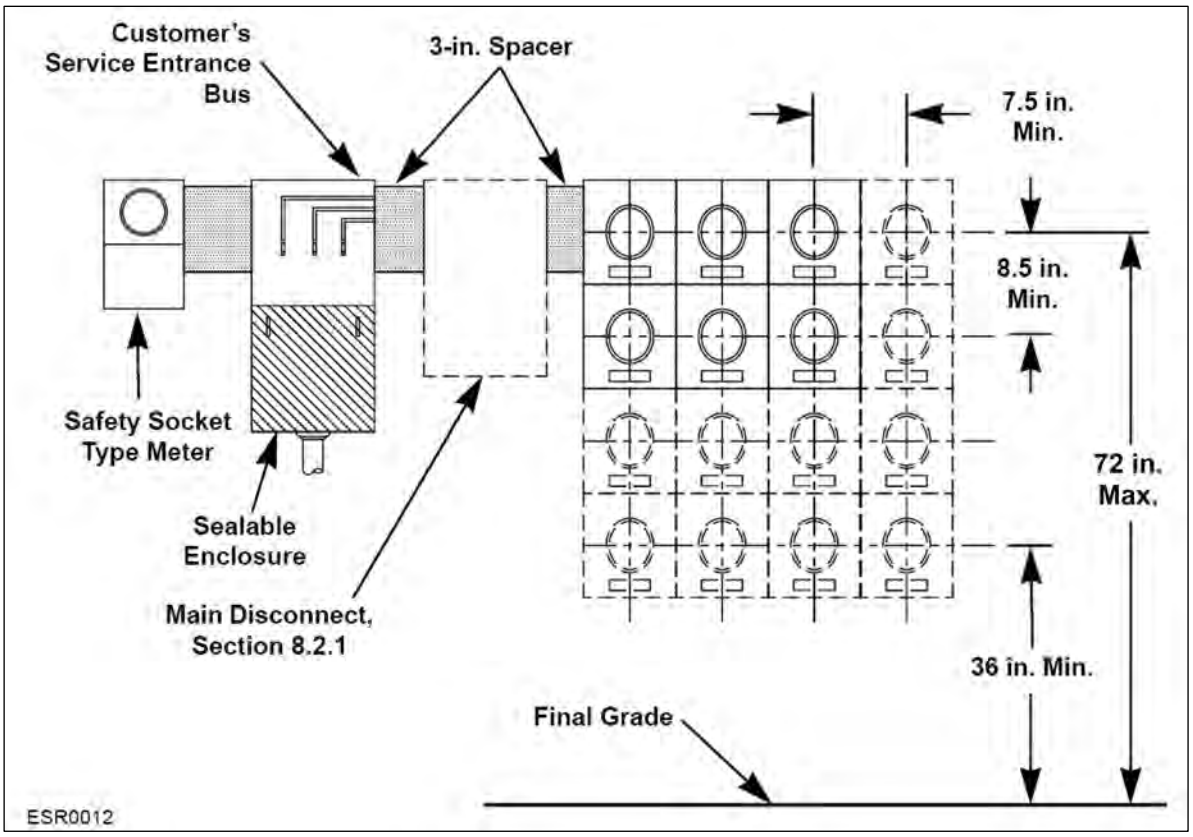

Figure 51: Meter Socket Installation for Underground and Overhead Multiple-Family Services

8.2 Grouping Service Entrances

PGE requires that service entrances be grouped at a common point for multiple-family units such as duplexes, apartments, or accessory dwelling units (ADUs). For ADUs, PGE additionally requires that the two meters be located on the existing main structure with a single point of entrance.

Figure 52 shows a typical grouping.

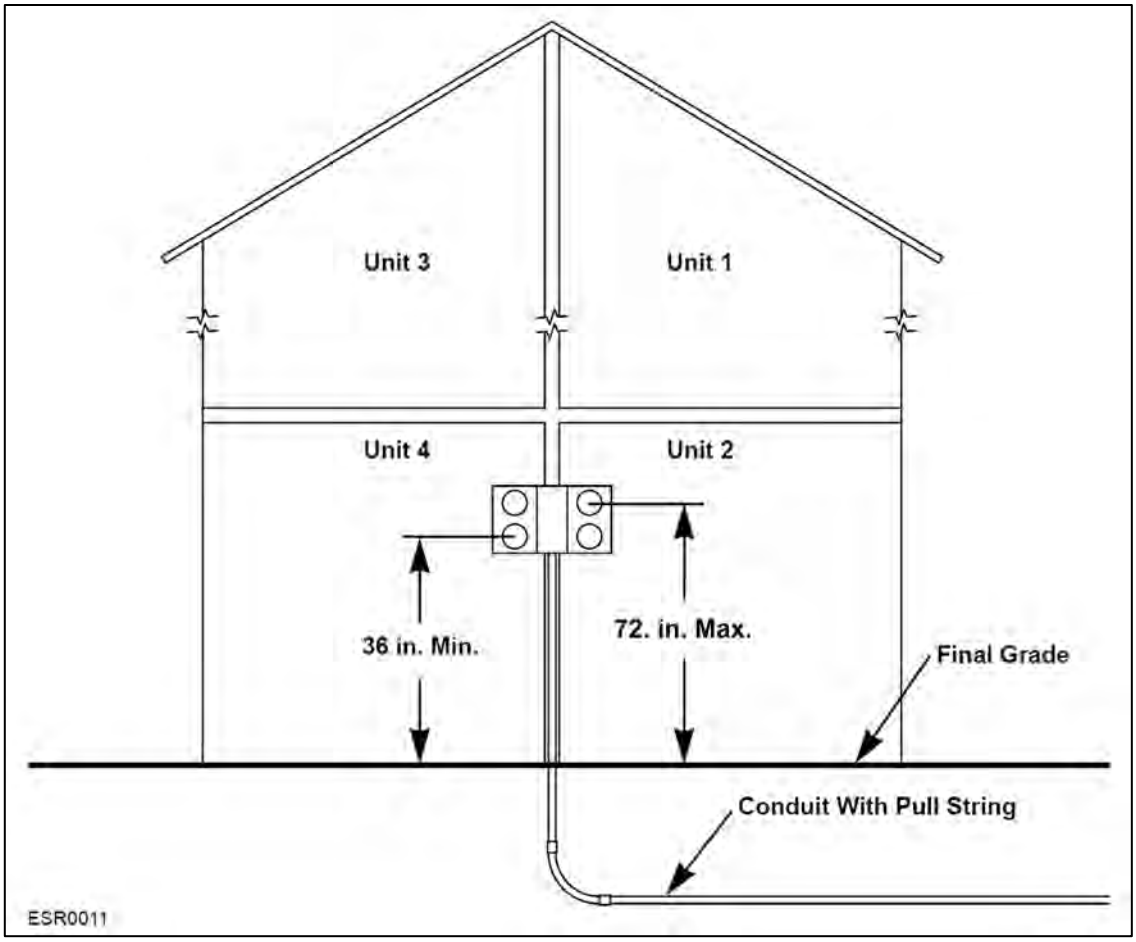

Figure 52: Underground Service for a Multiple-Family Dwelling

8.2.1 *Main Disconnect (Six-Disconnect Rule)*

PGE requires a main disconnect in front of all meter banks that contain more than six meters. The main disconnect must be in the same location as the meter bank as shown in **Figure 51** above.

8.2.2 *Accessory Dwelling Units (ADUs)*

Accessory Dwelling Units (ADUs) must be metered at the same location as the primary residence meter. An exception may be made if the ADU is closer to PGE lines than the primary residence. The metering equipment must consist of a single 2-pack meter enclosure or separate meter mains. Both meter sockets must have the address identified as described above. Contact PGE and the local jurisdiction for location-specific situations and requirements.

8.3 Underground Service

Follow the basic locational requirements for underground multiple-family service as described by the Electric Utility Service Equipment Requirement Committee (EUSERC) and National Electrical Code (NEC).

For more information, see Section 5, *Clearances*, and Section 6, *Underground Requirements*.

8.3.1 *Locational Requirements*

These requirements apply to underground service:

- PGE will determine the exact location of the meters.
- The center of the lowest meter in a bank of meters must be at least 36 inches from final grade. The highest meter in a bank of meters must be no more than 72 inches from the final grade. **Figure 52** above shows these distances.
- A minimum 3-inch spacer is required between the disconnect or pull section and the meter socket panel, as shown in **Figure 51** above.

8.3.2 *EUSERC Requirements*

These EUSERC requirements apply to underground service:

- The cable-pulling section must be sized for PGE service termination ampacity in accordance with EUSERC 343, and it must have bus extension drilled for landing lugs.
- EUSERC 347 requires that cross-busing installed below or behind a termination position must be fully insulated, or that a barrier must be installed.
- Refer to EUSERC 353 for minimum and maximum dimensions needed to meet spacing and stacking requirements.

8.4 Service-Terminating Arrangements

Figure 53 shows typical service-terminating arrangements for a two-meter socket module that is rated 0 to 200 A.

Figure 54 shows typical service-terminating arrangements for a three-meter to six-meter socket module that is rated 201 to 600 A.

Table 15 lists the dimensions of the terminating section for meter socket modules rated 0 to 600 A in accordance with EUSERC 342.

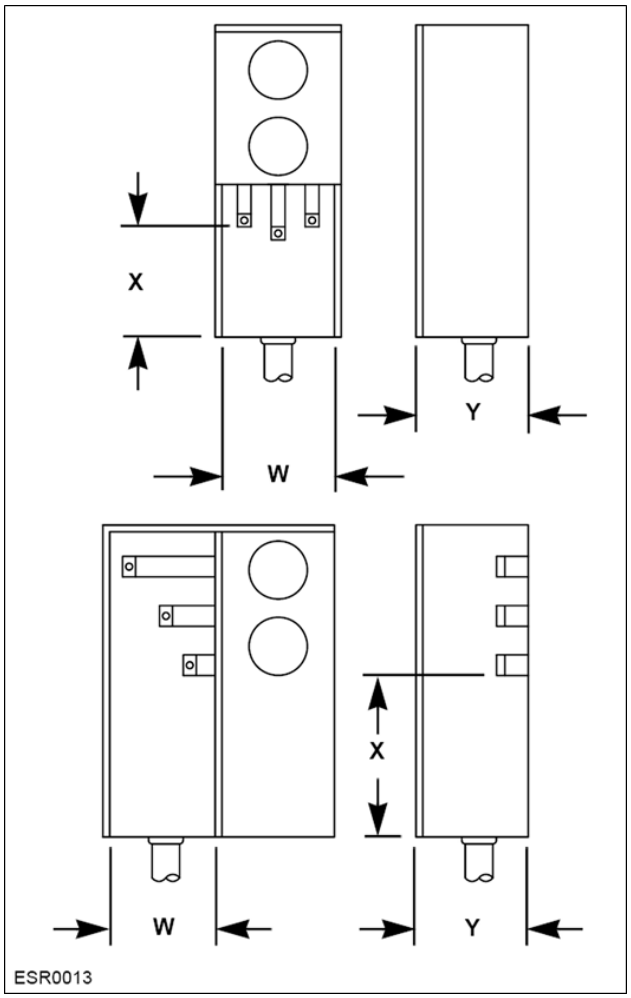

Figure 53: Service-Terminating Arrangements for Two Meters Rated 0 to 200 A (EUSERC 342)

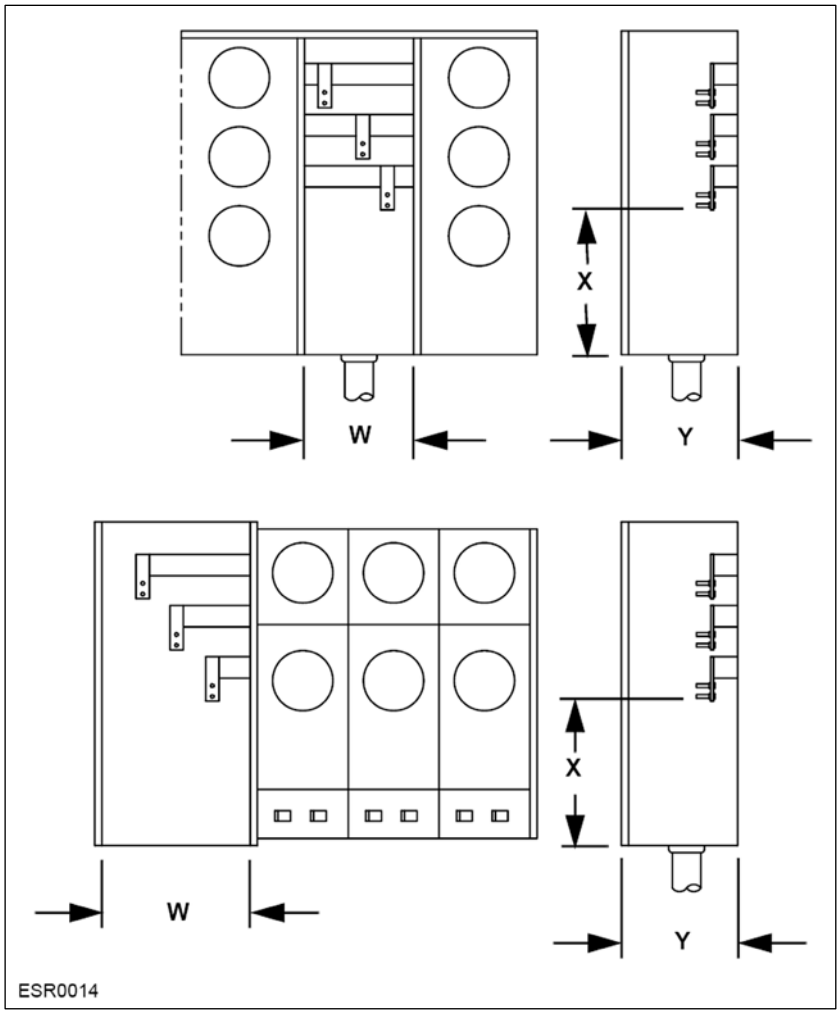

Figure 54: Service-Terminating Arrangements for Three to Six Meters Rated 201 to 600 A

Table 15: Dimensions of Terminating Section for Meter Socket Modules (EUSERC 342)

Equipment Rating (amperes)	Minimum Dimension (inches)		
	W	X	Y
0 to 200	6.5	11	5.5
201 to 600	10.5	22	6
601 to 800	Consult PGE		

8.5 Overhead Service

The customer must extend service entrance conductors from the service head to the PGE point of attachment. PGE will not extend conductors from the point of attachment to individual service heads. The customer must obtain the necessary permits from the electrical code enforcing authority that has jurisdiction.

9 Manufactured and Mobile Home Services

TOPICS IN THIS SECTION

- *Underground Service*
- *Trenches Provided by the Customer*
- *Conduit*
- *Concrete Pads and Vaults for a Pad-Mounted Transformer*

9.1 Underground Service

For requirements that apply to installation of underground secondary service, see Section 6, *Underground Requirements* and Section 7, *Single-Family Service*

9.1.1 *Manufactured Home*

PGE will provide underground service to a manufactured home under the same requirements as single-family service if the home meets these requirements:

- The home is site-specific.
- It occupies a private lot.
- It has a permanent foundation as defined by the local jurisdiction.

For more information, see the meter height and position requirements in Section 5.2, "Meter Clearances and Location Criteria."

IMPORTANT: *The location of a factory-installed meter socket must be approved by PGE **before** manufacture of the home. If the meter socket is incorrectly located, the customer is responsible for all modifications to relocate the meter to PGE requirements.*

9.1.2 *Mobile Home*

For underground service to a mobile home, the customer's service entrance must be on an approved pedestal or mounted on a wood post.

9.1.2.1 General Requirements

The location of the pedestal is specified by PGE. Other applications for the pedestal must be approved by PGE.

The customer must furnish, install, and maintain the pedestal or wood post. The customer must also furnish and install the following:

- An underground-type meter socket enclosure
- A 6- x 6-inch pressure-treated or thermally treated post and hardware (for post service only).
- A conduit with a pull string.
- A utility easement.
- A trench for conductor and conduit.

Figure 55 shows installation details for pedestal service, and **Figure 56** shows details for a post-mounted service.

The bottom of the enclosure containing the service equipment must be at least 24 inches above the finished grade.

For a meter that is subject to physical damage, the customer must install and maintain a barrier post or other suitable protection approved by PGE. See Section 6.4.6, "Barrier Posts" for requirements.

If the home is in a mobile home park, a permanent label showing the space number must be placed on the meter socket enclosure.

Locate PGE conductor trenches and conduits in mobile home parks away from—never underneath—the pad, foundation, or area provided for the manufactured home.

9.1.2.2 Installing a Pedestal Service

Follow these requirements when installing a pedestal service to a mobile home (as shown in **Figure 55**:

- Additional corrosion-resistant protection must be provided to the bottom of the pedestal that contacts the soil. Use electroplate galvanizing under the paint or use a paint with coal tar coating.
- The pedestal must be installed at least 7 feet away from the service pole.
- The bottom of the pedestal must be 18 to 24 inches below final grade.
- There must be at least a 6-inch clearance between the final grade and the bottom of the access door to PGE connections. The access door must have a sealable provision for PGE.
- The pedestal must not be placed in a location that makes the front pedestal door inaccessible for PGE connections. In addition, the metal seal that PGE uses to secure the door must remain accessible.
- The bottom of the access door must be at least 6 inches above final grade.
- Customer conduit ***must not*** be installed across the front of the PGE access door on a pedestal.
- The center of the meter must be at least 42 inches above final grade and no more than 72 inches above final grade.
- The electrical label or permit must be displayed on the meter socket.
- Two 0.125- x 1- x 1-inch steel angles must be driven into the ground on each side of the pedestal. Attach the steel angles to the side of the pedestal using 1/4-inch or larger bolts.
- Corrosion inhibitor must be used on all aluminum connections.

After approval, PGE will provide service to the meter pedestal compartment for a permanent mobile home. Each mobile home must have a separate pedestal compartment approved by PGE for termination of the PGE service lateral.

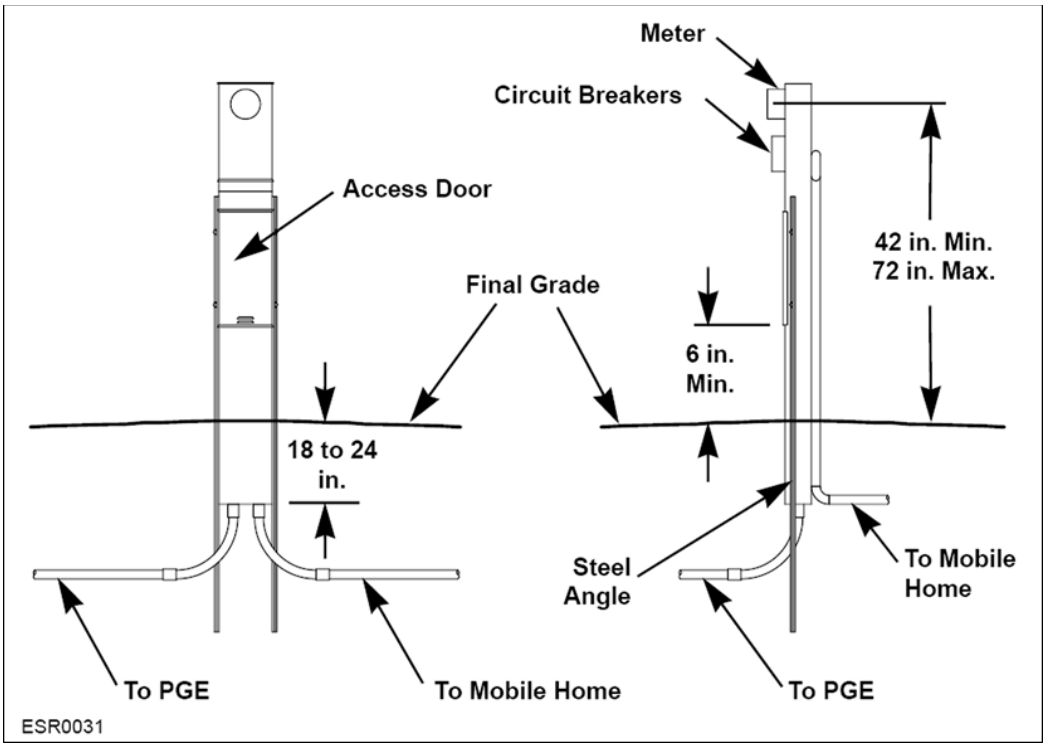

Figure 55: Underground Pedestal Installation Service for a Mobile Home (EUSERC 307)

9.1.2.3 Installing a Post-Mounted Service

The wood post for a post-mounted underground service must measure at least 6- x 6 inches and be pressure-treated or thermally treated by the manufacturer using an approved American Wood Preservative Association standardized preservative. The use of railroad ties is not acceptable.

Follow these requirements when installing a post-mounted service to a mobile home (as shown in **Figure 56**):

- The customer must install a minimum 6- x 6-inch pressure-treated wood post. Firmly tamp the earth around the post and mound the earth to accommodate settling.
- An electrical label or permit must be displayed on the meter socket.
- Use a strap to secure the conduit to the post.
- PGE will determine the exact location of the meter.
- The post must be installed at least 7 feet from the service pole.
- The bottom of the meter enclosure must be at least 24 inches above the final grade.
- For trench requirements, see Section 6.2, "Trenches Provided by the Customer."

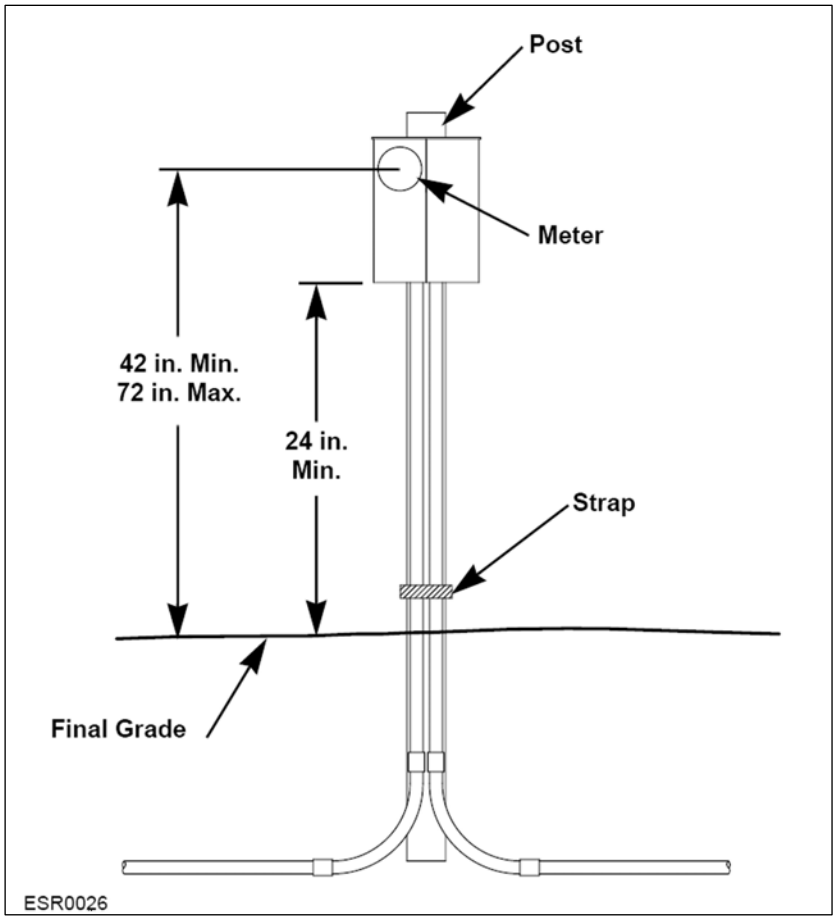

Figure 56: Underground Post-Mounted Service for a Mobile Home

9.2 Overhead Service

PGE will supply new overhead service to any building or premises that is not located in an area that the local governmental jurisdiction and/or PGE has designated as an underground district restricted to underground service.

9.2.1 *Manufactured Home*

PGE will provide overhead service to a manufactured home using the same requirements as a residential occupancy listed in Section 7, *Single-Family Service*. The customer must make provisions for meter height and placement as described in Section 5.2, "Meter Clearances and Location Criteria."

IMPORTANT: *The location of a factory-installed meter socket must be approved by PGE **before** the home is manufactured. If the meter socket is incorrectly located, the customer is responsible for all modifications required to relocate the meter to PGE requirements.*

9.2.2 *Mobile Home*

The customer must install the meter socket and service equipment on a wood pole. The pole must be pressure-treated or thermally treated by the manufacturer using an American Wood

Preservative Association standardized preservative. The pole height must be tall enough to provide all required clearances for the PGE service drop and any telephone, cable, or other attachments. For more information, see Section 5, *Clearances*.

IMPORTANT: *PGE **will not** energize the service if the customer-provided service pole is not safe to climb.*

The following requirements apply to both overhead service to a mobile home with a customer underground service lateral (shown in **Figure 57**) or a customer overhead service drop (shown in **Figure 58**):

- The customer must provide and install a new PGE-approved pole that has a minimum length of 20 feet and a minimum diameter of 5.5 inches at the top. The pole must be pressure-treated or thermally treated by the manufacturer. (A 6- x 6-inch treated square post is an option.) The pole must be set at least 5 feet below the level of the ground with gravel backfill.
- If the service drop crosses a road or traffic area, the pole must have a minimum length of 24 feet and a minimum diameter of 5.5 inches at the top. The pole must be set at least 5 feet below the level of the ground with gravel backfill.
- A pole longer than 24 feet must be set more than 5 feet below the level of the ground. Consult PGE for the proper depth.
- A longer pole may be required to accommodate overhead communication lines. Contact the telephone utility and the cable company for their required clearances.
- An electrical label or permit must be displayed on the meter socket.
- The customer must provide a 3/8-inch eyebolt where the service attaches to the pole.
- The customer must provide the drip loop and a minimum 5/16-inch galvanized steel cable down guy and anchor.
  - The guy attachment must be at the height of the weatherhead.
  - Allow 24 inches of cable to create the drip loop.
- PGE will determine the exact location of the meter.

This additional requirement applies only to a mobile home with a customer overhead service drop.

- Install the pole at least 7 feet from the service pole.

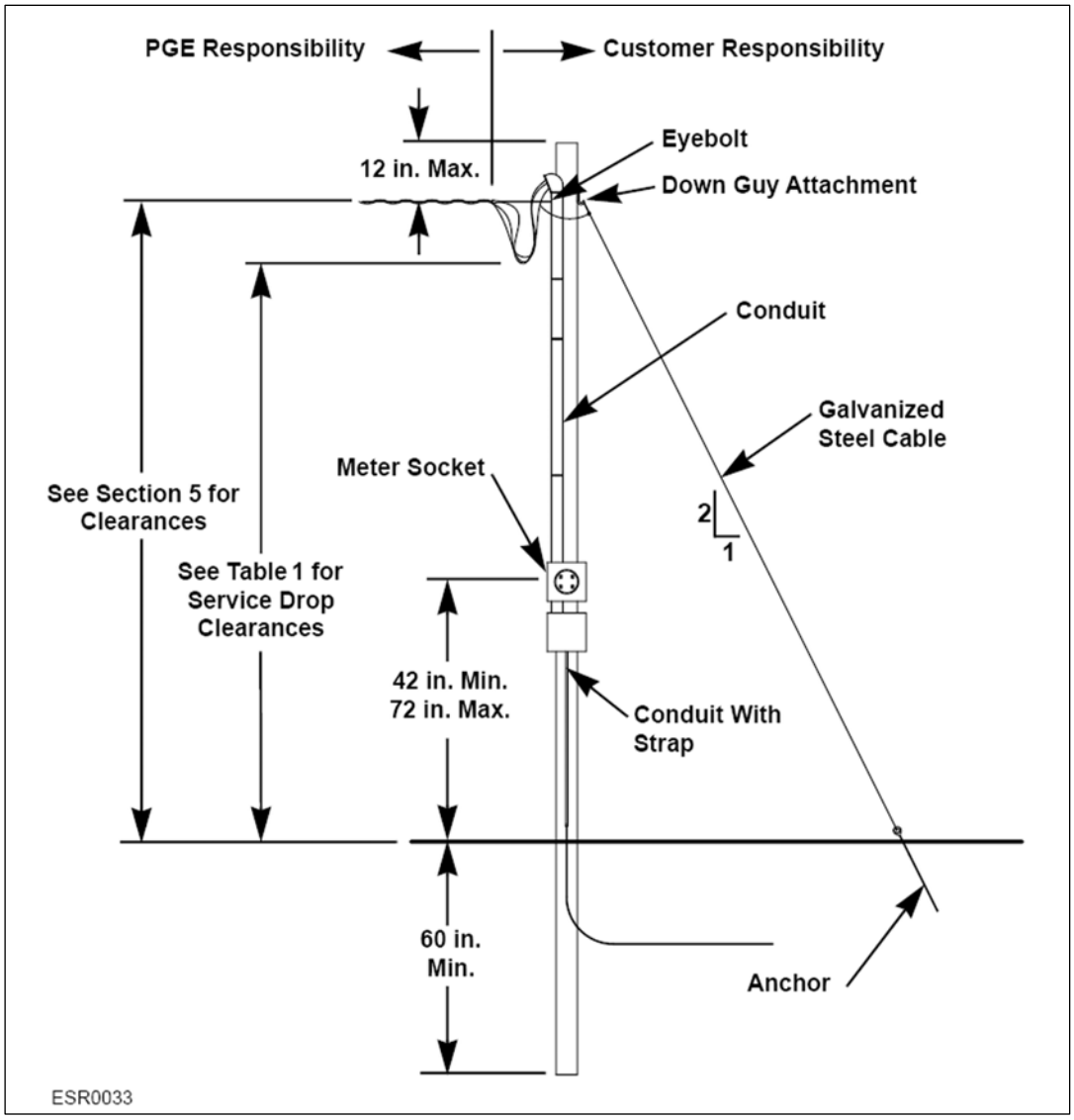

Figure 57: Overhead Service to a Mobile Home with a Customer Underground Service Lateral

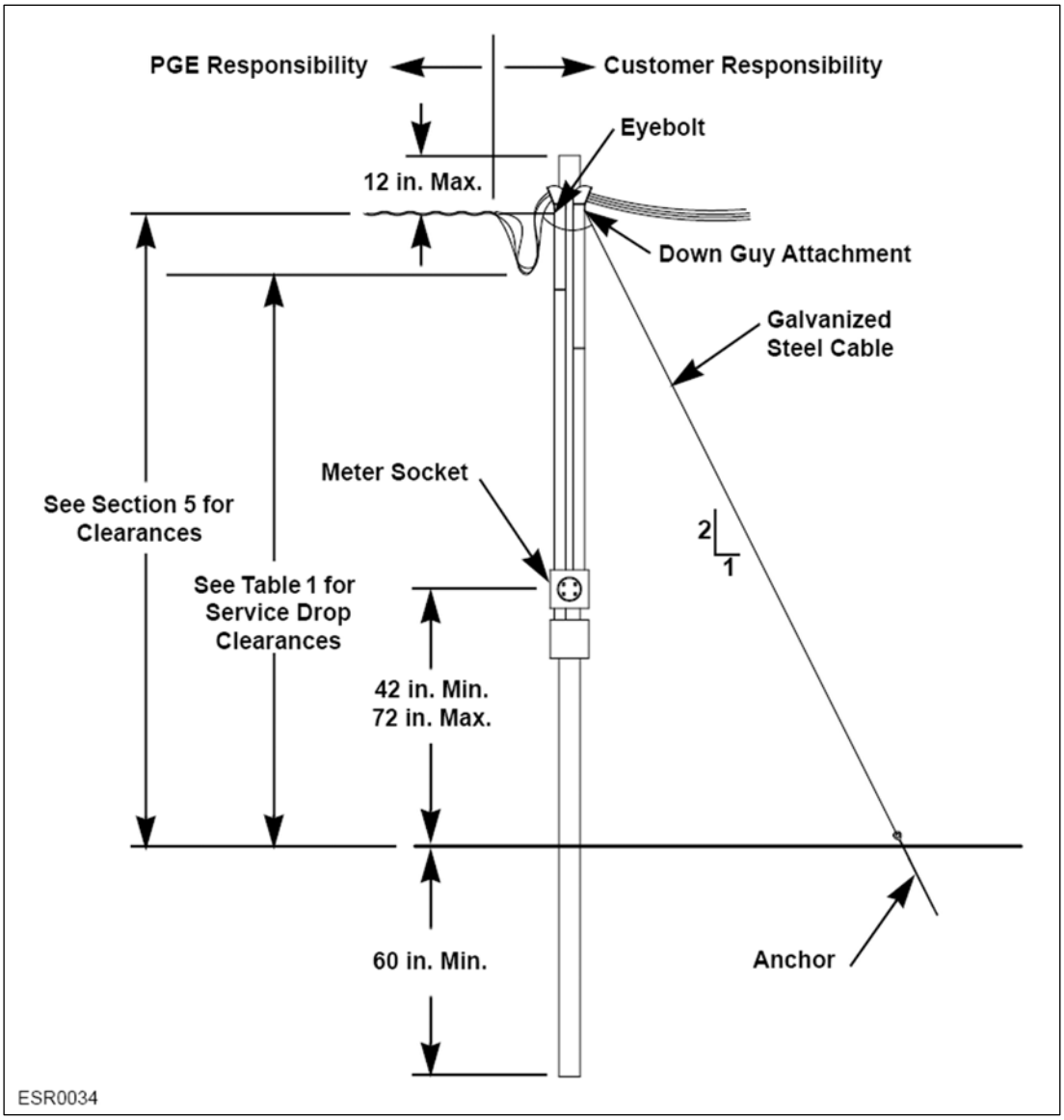

Figure 58: **Overhead Service to a Mobile Home with a Customer Overhead Service Drop**

10 Commercial, Industrial, and Large Residential Services, 800 A or Lower

TOPICS IN THIS SECTION

- *Basic Requirements*
- *Meter Location*
- *Direct-Connect Meter*
- *Termination Compartment Requirements*
- *Customer's Responsibility for Maintaining Switchboards*
- *Commercial Service, 0 to 800 A*
- *Current Transformer Metering, 800 A Maximum*

10.1 Basic Requirements

IMPORTANT: *This section provides PGE's requirements for commercial, industrial, and large residential services up to 800 A and lower than 600 V, including single-phase and three-phase services for self-contained and current transformer (CT) meters. Consult PGE Meter Services for requirements and equipment for services higher than 600 V.*

All commercial, industrial, and large residential customers must coordinate their service requirements with PGE. They must provide factory-produced submittal drawings of switchboards before any equipment is purchased or installed.

Single-residential services over 320 A continuous and all three-phase residential services are considered large residential services. Residential meters must meet the meter clearances and location criteria covered in Section 5.2, "Meter Clearances and Location Criteria."

Single-phase services over 320 A continuous and three-phase services over 200 A require CT metering except as indicated in Section 10.3, "Direct-Connect Meter."

10.2 Meter Location

Meters must comply with accessibility and location requirements in Section 5, *Clearances*. If commercial or residential meters are located outdoors, there must be at least a 4- x 4-foot level area in front of the meters.

Where the permanent final grade (or the final platform landing) cannot be provided in front of the meter(s) or service termination equipment at the time of connection, the customer must supply and install a temporary minimum 4- x 4-foot platform that is strong enough to support PGE personnel. Steps to the platform must be provided as needed.

Where meter equipment is installed in a location subject to vehicle traffic, the customer is required to install and maintain a PGE-approved barrier post. (See **Figure 31** on page 68 for barrier post dimensions.) Meter sockets, terminal cabinets, current transformer cabinets, and transformers should be located away from landscape irrigation sprinklers.

Doors to a meter or termination equipment room must open outward and be equipped with a panic bar. A PGE lockbox must be installed near the door. For more information, see Section 5.3, "PGE Electrical Equipment Room."

Before power is connected, each meter on a structure with multiple service must have a permanently engraved metal or hard plastic label that identifies the customer service address in letters at least 3/8-inch high (as shown in **Figure 59**.

Figure 59: Meter Label with Service Address

All 480 V service must be permanently and visibly labeled as such. PGE requires a red label with white lettering that reads: *SINGLE-PHASE 480 V*. Place the label in an easy-to-see location for safety. Consult PGE for further label requirements.

IMPORTANT: *The customer must ensure that each meter socket is correctly labeled. PGE may check meter installations to verify that sockets are correctly labeled and* ***charge the customer a fee*** *if one or more of the labels is incorrect. See PGE Schedule 300 and Tariff Rule M, Section 1.D.*

10.3 Direct-Connect Meter

PGE requires a direct-connect (self-contained), socket-type meter when:

- The ampacity of a single-phase service entrance is 400 A maximum (320 A continuous) or lower, *or*
- The ampacity of a three-phase service is 200 A continuous or lower.

See **Table 16** for direct-connect meter socket requirements.

Figure 60 shows direct-connect meter sockets for a single-phase service. **Figure 61** shows direct-connect meter sockets for a three-phase service.

Note: With prior permission from PGE, an adjustable-speed drive (ASD) controller may be served with single-phase service using a direct-connect, safety-socket meter socket rated 200 A or lower, 120/240 V, or 240/480 V. Contact PGE for further information.

Note: A three-phase main breaker is required for a 120/208 V, single-phase service.

Table 16: Direct-Connect Meter Socket Requirements

Type of Service	Socket Type
120/240 V, single-phase, 3-wire	4-jaw
120/208 V, single-phase, 3-wire (Contact PGE for information)	5-jaw
208/120 V, three-phase, 4-wire	7-jaw
480/277 V, three-phase, 4-wire	
240/120 V, three-phase, 4-wire *or* 480/240 V, three-phase, 4-wire	

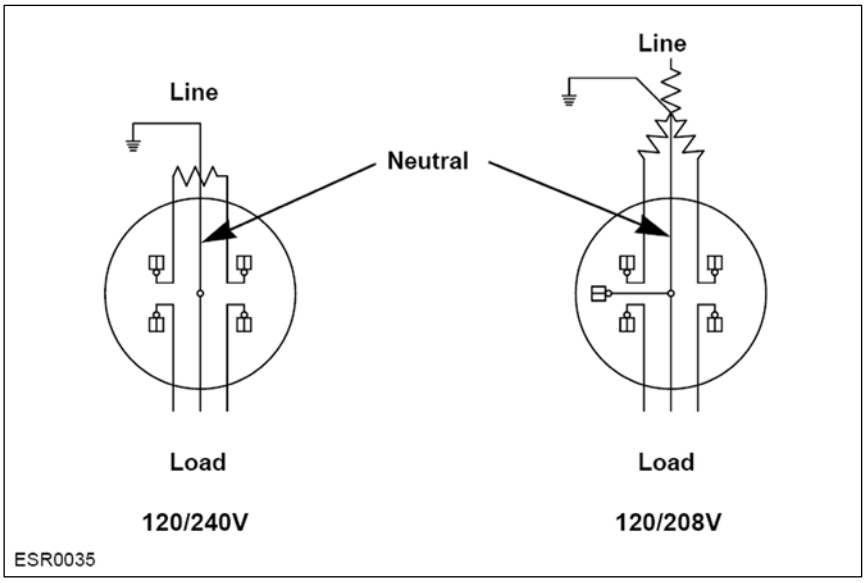

Figure 60: Direct-Connect Meter Sockets, Single-Phase, 3-Wire Service

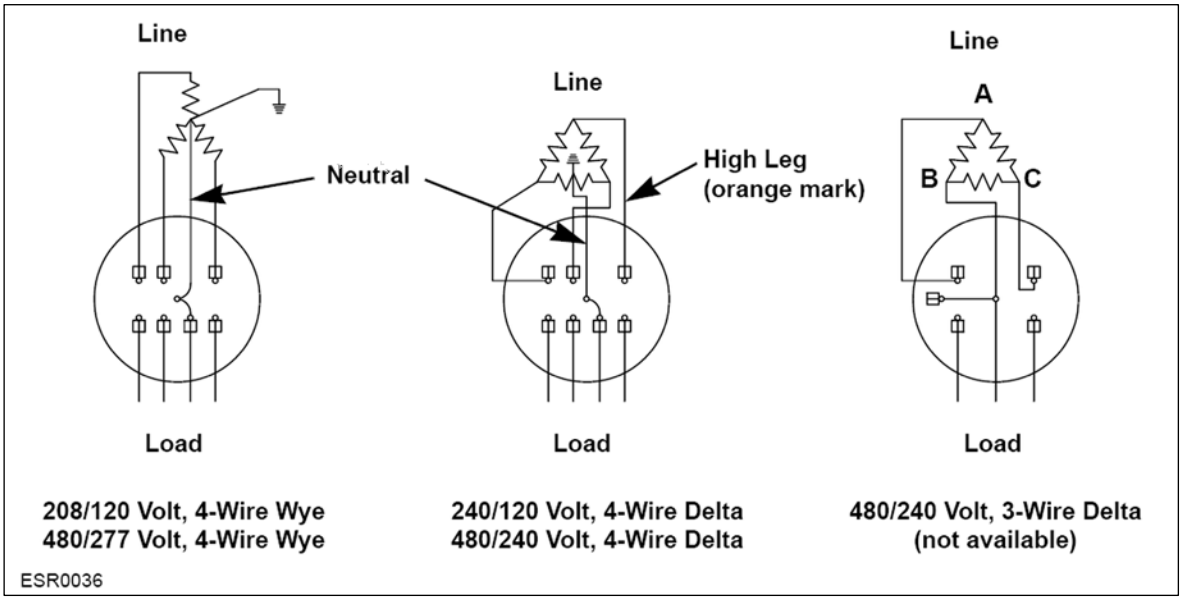

Figure 61: Direct-Connect Meter Sockets, Three-Phase Service

10.3.1 *Direct-Connect Meter Safety Socket*

IMPORTANT: *Contact PGE before installing a direct-connect meter safety socket.*

Figure 62 shows available direct-connect meter options. 120 V service is no longer offered.

Follow these requirements when installing a direct-connect meter safety socket.

- Wires installed in the meter base by the customer must have clear space for PGE to install conductors.
- A EUSERC safety socket with a test link bypass is required for all 120/240 V services rated 100 A and 200 A, and for 480 V services rated up to and including 200 A.
- A manual link bypass is required for all 120/240 V, single-phase services with a nominal rating of 400 A (320 A continuous).
- No safety socket is required for service equipment rated 200 A or lower for the following uses:
  - Temporary construction
  - Residential pumps, gates, outdoor lighting, barns, and outbuildings.

Contact PGE for more information on these requirements.

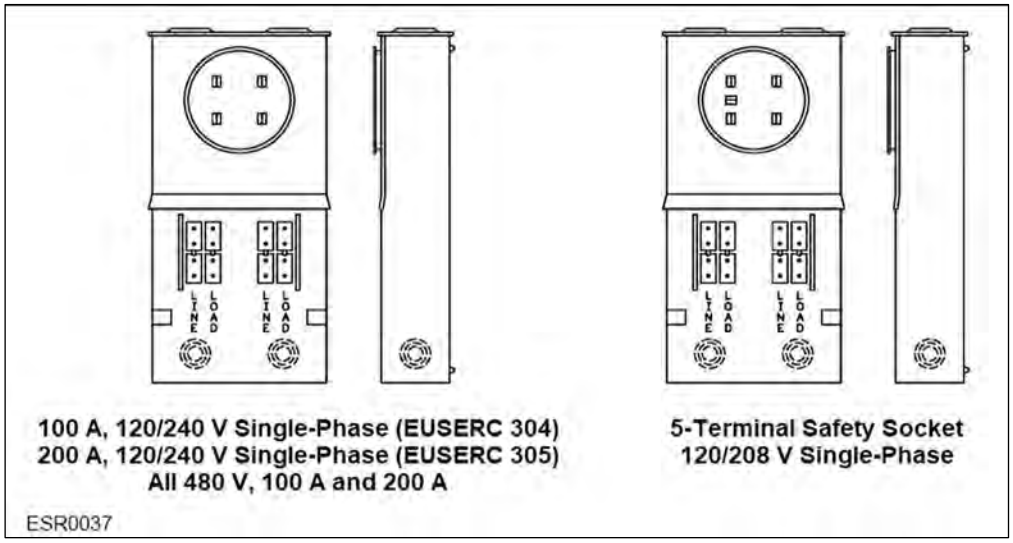

Figure 62: Commercial and Large Residential Single-Phase, Direct-Connect Meter Safety Sockets

10.4 Termination Compartment Requirements

All compartments for termination of PGE service laterals must be located—and made accessible— on an entry level or main floor, as close as possible to where the conductors enter the building. When connecting two or more sets of service equipment to a single-service lateral, the customer must provide a sealable terminal box complete with terminating positions.

The customer must also provide an approved method in which to make multiple taps. Customer-owned devices such as limiters or fuses ***must not*** be installed in terminal boxes.

The customer must not terminate the principal grounding conductor in the PGE sealed termination compartment.

The termination compartment for PGE conductors must meet EUSERC 342 requirements. For more information, see **Table 15** on page 96 or EUSERC 343 in **Figure 63** below.

Follow these requirements when installing a pull box with terminating facilities.

- **Table 17** lists the minimum dimensions for pull boxes that have terminating facilities (EUSERC 343). These dimensions are for the PGE portion of the pull box only.
- The cable-pulling section must be sized for PGE service termination in accordance with EUSERC 342 and 343 and must have a bus extension drilled for landing lugs.
- The NEC requires a main disconnect when more than six services are connected. (See Section 1.4, "Main Disconnect (Six-Disconnect Rule]," for more information.) When the sum of the distribution section ampacities exceeds that of the pulling section ampacities, the customer must provide NEC-approved load calculations.
- The termination compartment for a large residential (0 to 800 A) modular metering section must meet size requirements shown in **Table 15**.

  Note: PGE will not terminate directly on the customer breaker.

- **Figure 14** on page 38 shows the meter clearances for multiple-meter installations.
- If a cross bus is installed below or behind a terminating position, the cross bus must be fully insulated and barricaded.
- Bus stubs must be anchored to prevent turning.
- Customer service entrance conductors must exit above the lugs.
- Cable entry through the back of the cabinet generally does not meet PGE requirements for minimum cable bend radius.

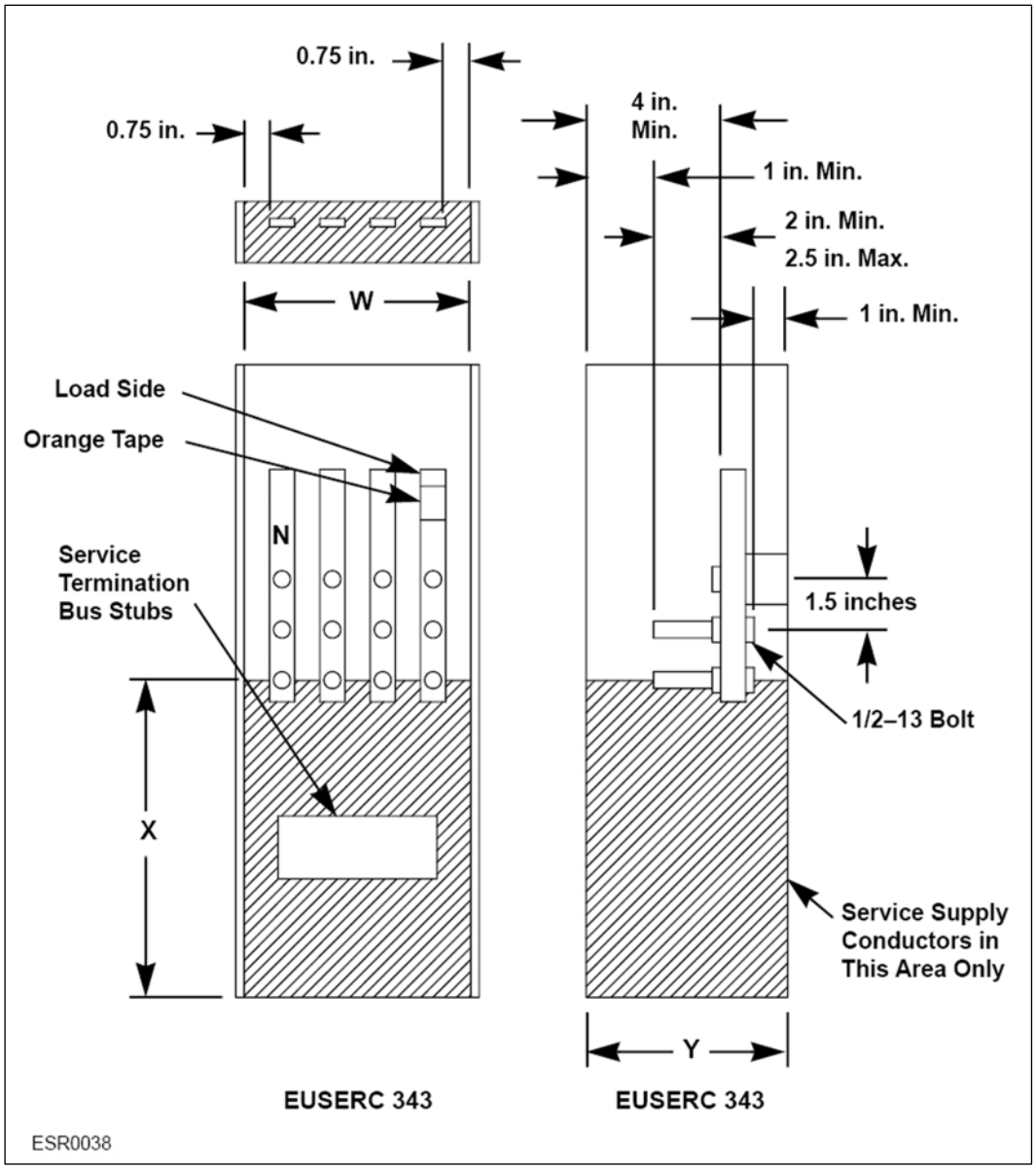

Figure 63: **Pull Box with Terminating Facilities, 0 to 600 V, 0 to 1200 A (EUSERC 343, 347)**

Table 17: **Minimum Dimensions for Pull Boxes with Terminating Facilities (EUSERC 343)**

Total Service (amperes)	Dimensions (inches)			
	W		X	Y
	3-Wire	4-Wire	Lug Height	Depth
0 to 200	10.5	14	11	6
201 to 400	10.5	14	22	6
401 to 800	16.5	22	26	11

10.5 Customer's Responsibility for Maintaining Switchboards

The customer is responsible for the proper installation and periodic maintenance of customer-owned switchboards including overcurrent devices, cable and bus connections and terminations, and all other electrical equipment.

To ensure that bolted connections have a long service life, there must be a clean contact surface and proper clamping pressure between the terminal lug and the terminal pad. Use of a torque wrench will result in more consistent clamping forces on bolted connections. PGE recommends that bolted connections be torqued to the values in **Table 18**.

Note: For set screw connections, torque to manufacturer recommendations.

Table 18: Maximum Torque Values for Bolted Connections

Bolt Size	Aluminum (ft·lb)	Everdur (ft·lb)	Stainless Steel (ft·lb)
3/8–16	12	18	20
1/2–13	25	40	45

10.6 Commercial Service, 0 to 800 A

Follow these basic requirements for commercial services of 0 to 800 A.

- The NEC requires a main disconnect when more than six services are connected. (See Section 1.4, "Main Disconnect (Six-Disconnect Rule]," for more information.) When the sum of the distribution section ampacity ratings exceeds that of the pulling section ampacity ratings, the customer must provide NEC-approved load calculations.
- Meters and equipment must be accessible during normal working hours for meter reading and testing. If a lockbox is needed, it must be installed outside the meter room.
- Before power can be connected, each multiple-meter service must have a permanently engraved metal or hard plastic label with letters at least 3/8-inch high to identify the customer's service address (as shown in **Figure 59** on page 106).
- If a cross bus is installed below or behind a terminating position, the cross bus must be fully insulated and barricaded (EUSERC 347).

10.6.1 *Commercial Pedestal, 0 to 200 A*

Note: The requirements in this section are in addition to those listed in Section 10.6.

Figure 64 shows a 0 to 200 A commercial pedestal. **Table 19** lists minimum pedestal dimensions.

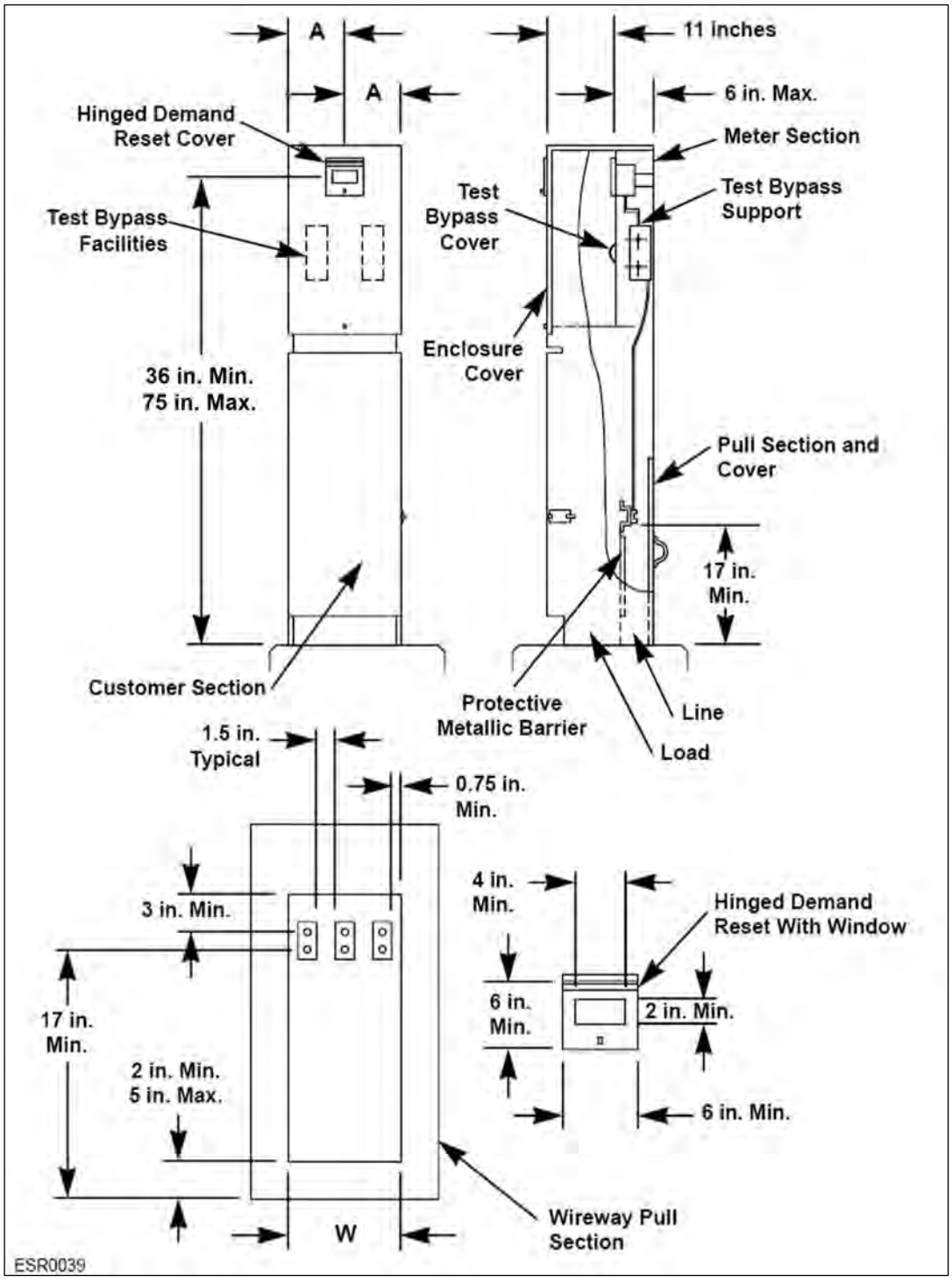

Figure 64: Commercial Pedestal, 0 to 200 A (EUSERC 308)

Table 19: Minimum Dimensions for Pedestals

Service	A (inches)	W (inches)
Single-phase	10	10.5
Three-phase	10	12.5

Follow these additional requirements when installing a 0 to 200 A commercial pedestal.

- Consult PGE for pad requirements.
- The barrier between the meter section and the pull section must extend to the edge of the test block barrier.
- Refer to EUSERC 308 for additional requirements.

10.6.2 *Commercial Three-Phase, Direct-Connect Meter Safety Socket*

Note: The requirements in this section are in addition to those listed in Section 10.6.

Figure 65 shows a 100 A commercial, three-phase pedestal (EUSERC 304), and **Figure 66** shows a 200 A commercial, three-phase pedestal (EUSERC 305).

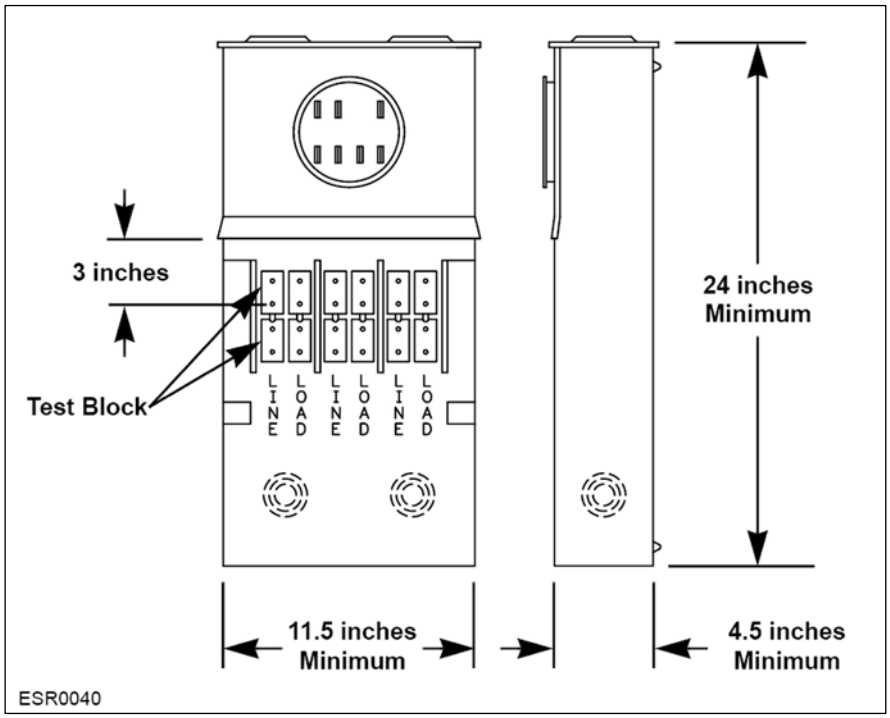

Figure 65: 100 A Commercial, Three-Phase, Direct-Connect Meter Safety Socket (EUSERC 304)

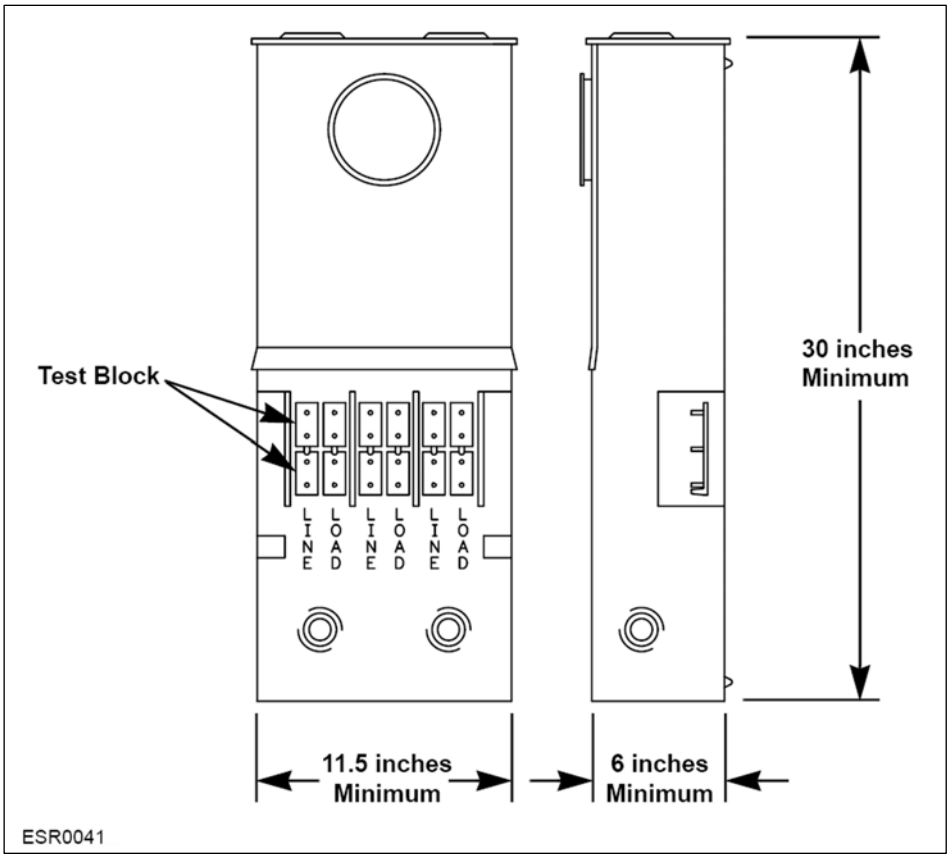

Figure 66: 200 A Commercial, Three-Phase, Direct-Connect Meter Safety Socket (EUSERC 305)

Follow these additional requirements when installing a commercial three-phase, direct-connect meter safety socket.

- The socket must be a EUSERC-approved safety socket with test blocks that maintain service to the customer while the meter is removed for testing or inspection.
- A three-phase, 320 A, direct-connect meter socket is ***not*** approved for commercial use.
- For a 4-wire delta service, the high-leg (wild-leg) terminal must be located on the right side of the test blocks and identified by an orange mark. The test block must be factory-marked and readily identified.

10.6.3 *Commercial Ganged Meter Sockets*

Note: The requirements in this section are in addition to those listed in Section 10.6.

Follow this additional requirement when installing commercial ganged meter sockets, such as the one shown in **Figure 67**.

- PGE terminates service conductors only in the cable pulling section on bus extensions—not on the customer's disconnect. Cable entry through the back of the pulling section ***is not*** allowed. The cable pulling section must be sized for PGE service termination (EUSERC 343) and the bus extension must be drilled for landing lugs.

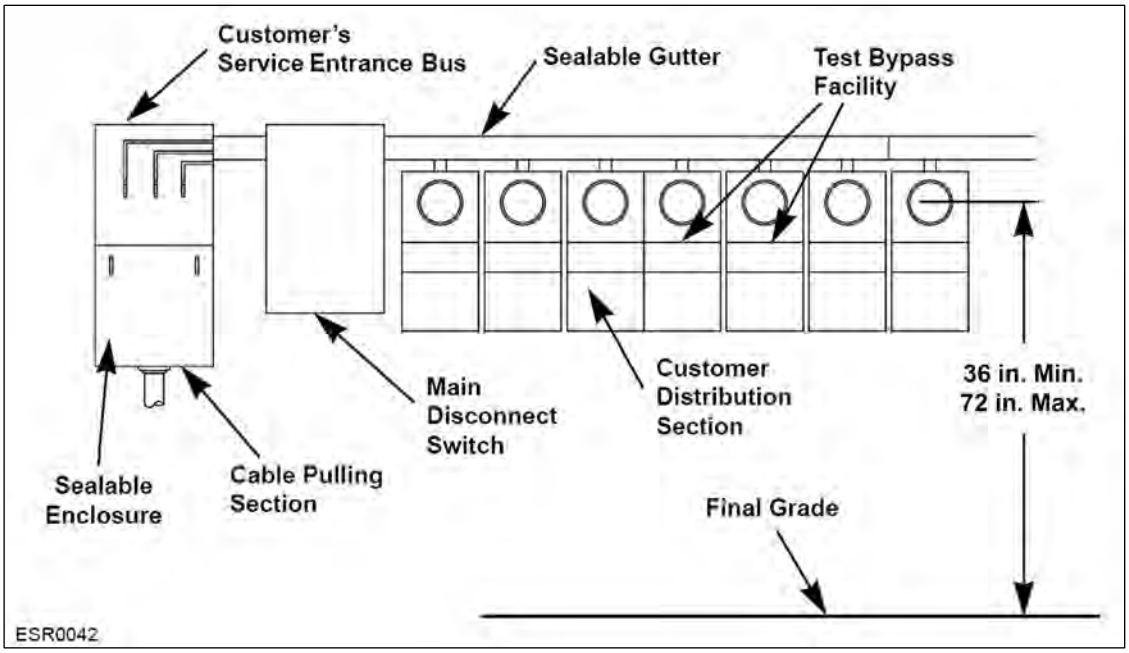

Figure 67: Commercial Ganged Meter Sockets

10.6.4 *Commercial Module Meter Sockets*

Note: The requirements in this section are in addition to those listed in Section 10.6.

Figure 68 shows a commercial module meter socket installation (EUSERC 304, 305, and 347), and **Figure 69** shows a typical double-stacked module meter socket installation.

Follow this additional requirement when installing commercial ganged meter sockets.

- A minimum 3-inch spacer is required between the pull section and the meter socket panel.

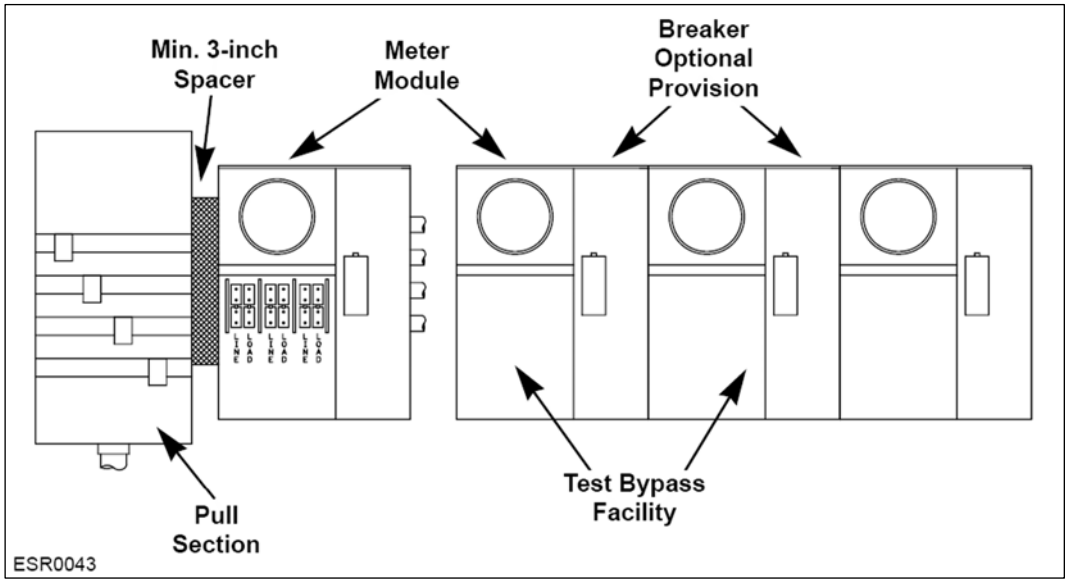

Figure 68: Commercial Module Meter Sockets (EUSERC 304, 305, 347)

Figure 69: Typical Double-Stacked Module Meter Sockets

10.6.5 *Combination Current Transformer/Direct-Connect Wall-Mount Metering*

Note: The requirements in this section are in addition to those listed in Section 10.6.

Figure 70 shows a combination current transformer (CT)/direct-connect wall-mount metering, 0 to 800 A. **Figure 71** shows the EUSERC identification for this equipment.

Follow these requirements when installing a combination CT/direct-connect wall-mount metering.

- Bonding jumpers must be used around knockouts.
- The pull section must be rated at the sum of the service maximum ampacities.
- For services larger than 800 A, see Section 11, *Commercial, Industrial, and Large Residential Services, 801 A or Higher*.

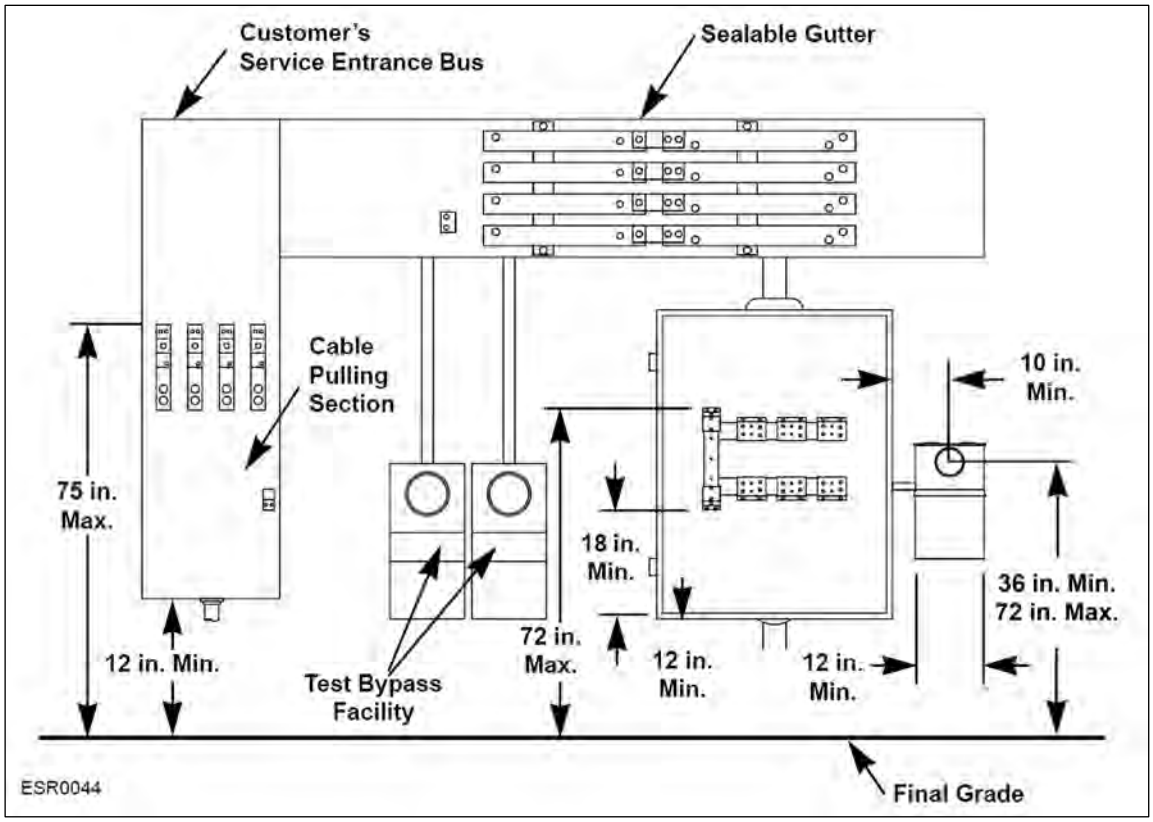

Figure 70: **Combination Current Transformer/Direct-Connect, Wall-Mount Metering, 0 to 800 A**

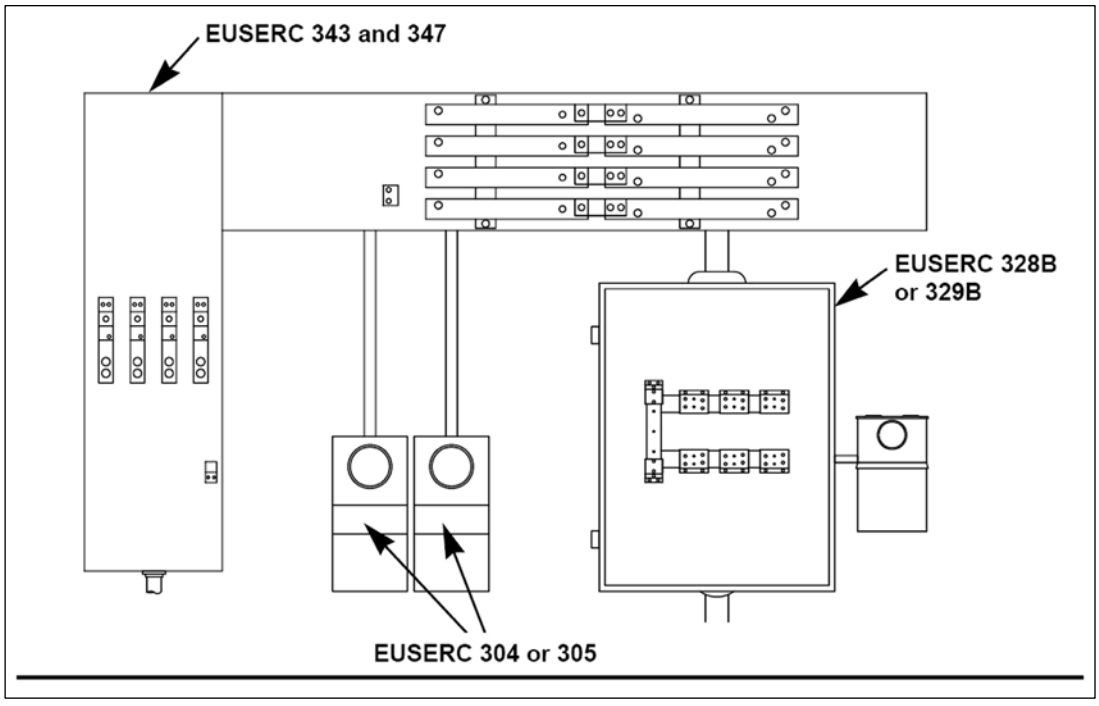

Figure 71: **EUSERC Identifications for Combination Current Transformer/Direct-Connect, Wall-Mount Metering, 0 to 800 A**

10.7 Current Transformer Metering, 800 A Maximum

Current transformer (CT) metering is required when a three-phase service exceeds 200 A, or when a single-phase 120/240 V service exceeds 400 A (320 A continuous). For services over 800 A, see Section 11, *Commercial, Industrial, and Large Residential Services, 801 A or Higher*. PGE prefers switchboard metering, but it is not required for services of 800 A or lower.

The CT cabinet and meter must be mounted outside the building as described in Section 5.2, "Meter Clearances and Location Criteria."

The customer must provide and install:

- A weathertight NEMA 3R-rated metallic CT cabinet that is securely mounted on a rigid surface. The doors are to be hinged and capable of being sealed. (See Section 10.7.3, "Current Transformer Cabinet," for more information.) For installations where both the line and load sides are coming in and going out underground or overhead, the cabinet must be at least 48 in. wide x 48 in. high x 11 in. deep.
- EUSERC-approved CT mounting bases rated 50,000 A fault duty. Fault currents over 50,000 A must have switchboard metering. Contact PGE for maximum available fault current.
- The conduit between the socket enclosure and the CT mounting base.
- The remote socket enclosure, drilled and tapped for a PGE test switch.
- A 6-inch diameter barrier post, which is required where metering equipment is installed in an area with vehicle traffic. For more information, see **Figure 30**, **Figure 31**, and **Table 12** in Section 6.4.6, "Barrier Posts."
- The CT cabinet and meter socket, which must be mounted plumb in both directions.

PGE will own, provide, and install:

- The meter and test switch, with their associated wiring.
- Line-side service conductors on the CT mounting base and connectors for PGE-owned conductors (for underground services only).

Consult PGE for current transformer installation specifications.

IMPORTANT: *To prevent water drainage into the customer's equipment, do not locate PGE equipment, transformers, and vaults higher than the CT cabinet.*

10.7.1 *Current Transformer Metering, Post-Mounted*

Note: The requirements in this section are in addition to those listed in Section 10.7.

Figure 72 shows current transformer metering, post-mounted, 600 V, 800 A maximum. The customer must consult PGE before construction.

Follow these requirements when installing post-mounted current transformer metering:

- The current transformer cabinet must have two factory-installed, 24- x 48-inch hinged doors with handles in the center.

  IMPORTANT: *The cabinet must be installed **at least 12 inches** above the final grade.*

- The meter must be mounted so that it does not interfere with the opening of the cabinet doors.

  IMPORTANT: *For a 4-wire delta service, the high-leg (wild-leg) terminal must be located on the right side and identified by an orange mark.*

- The configuration shown in **Figure 72** can be used as a wall mount if clearance allows.
- The customer must provide 3-inch galvanized, rigid steel pipe supports with caps or 6- x 6-inch pressure-treated wood posts.
- The customer must provide the conduit and the sweep with a 36-inch minimum radius.
- The meter socket must be mounted on the side of the compartment.
- There must be a 1- to 3-inch space between the cabinet and the meter enclosure.
- The customer must provide 24 inches of concrete backfill.

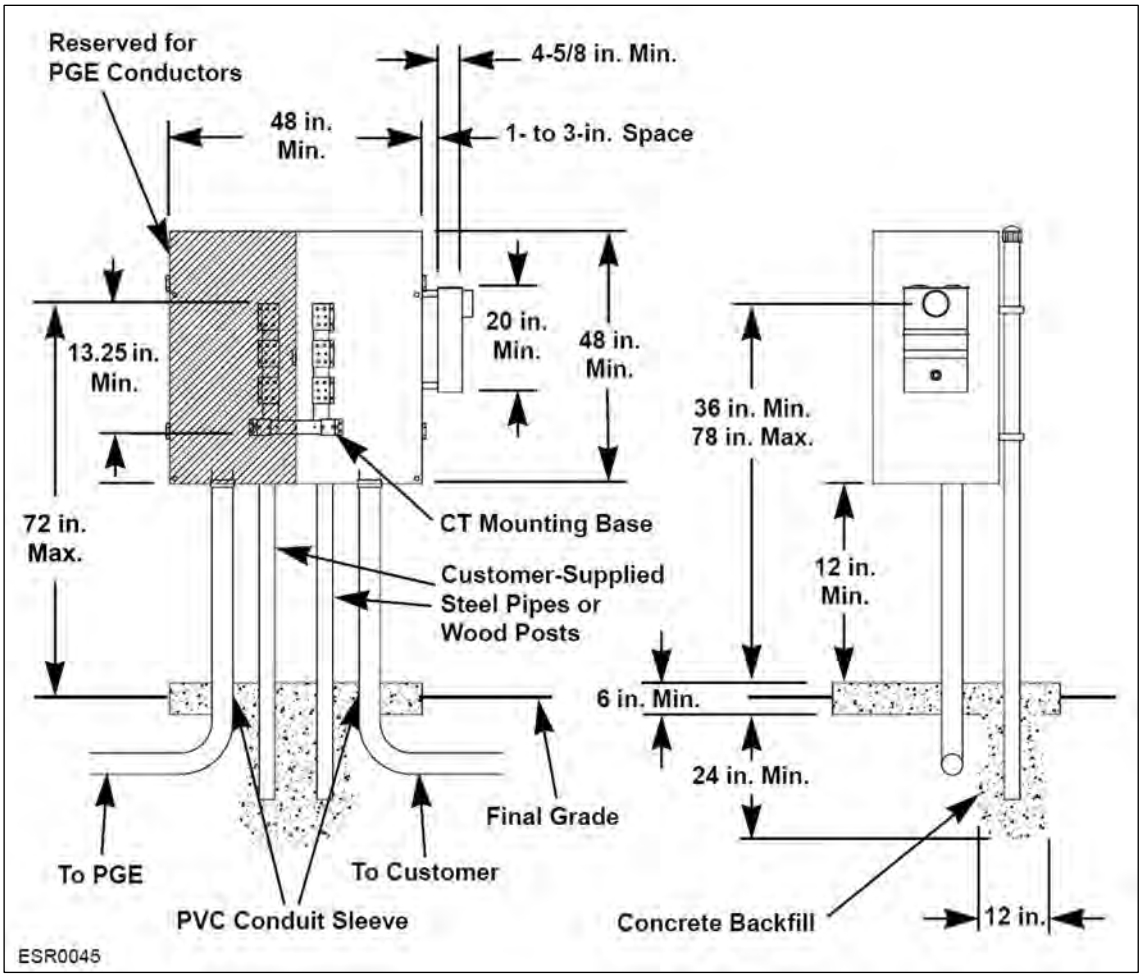

Figure 72: Current Transformer Metering, Post Mounted, 600 V, 800 A Maximum

10.7.2 *Current Transformer Metering, Wall-Mounted*

Note: The requirements in this section are in addition to those listed in Section 10.7.

Figure 73 and **Figure 75** show wall-mounted current transformer metering, 600 V, 800 A maximum (EUSERC 329B). **Figure 74** shows a horizontal installation, and **Figure 76** shows a vertical installation.

Follow these requirements when installing wall-mounted current transformer (CT) metering:

- The customer service entrance conduits must exit the enclosure on the load side of the CT. PGE does not allow customer conductors or conduit in PGE terminating and pull spaces.
- The current transformer cabinet must have two factory-installed, 24- x 48-inch hinged doors with handles in the center.
- For a 4-wire delta service, the high-leg (wild-leg) terminal must be located on the right side and identified by an orange mark.
- The meter socket must not be located above the CT enclosure without PGE approval.
- The cabinet must be at least 12 inches above the final grade.
- For clearances, see Section 5.2, "Meter Clearances and Location Criteria."

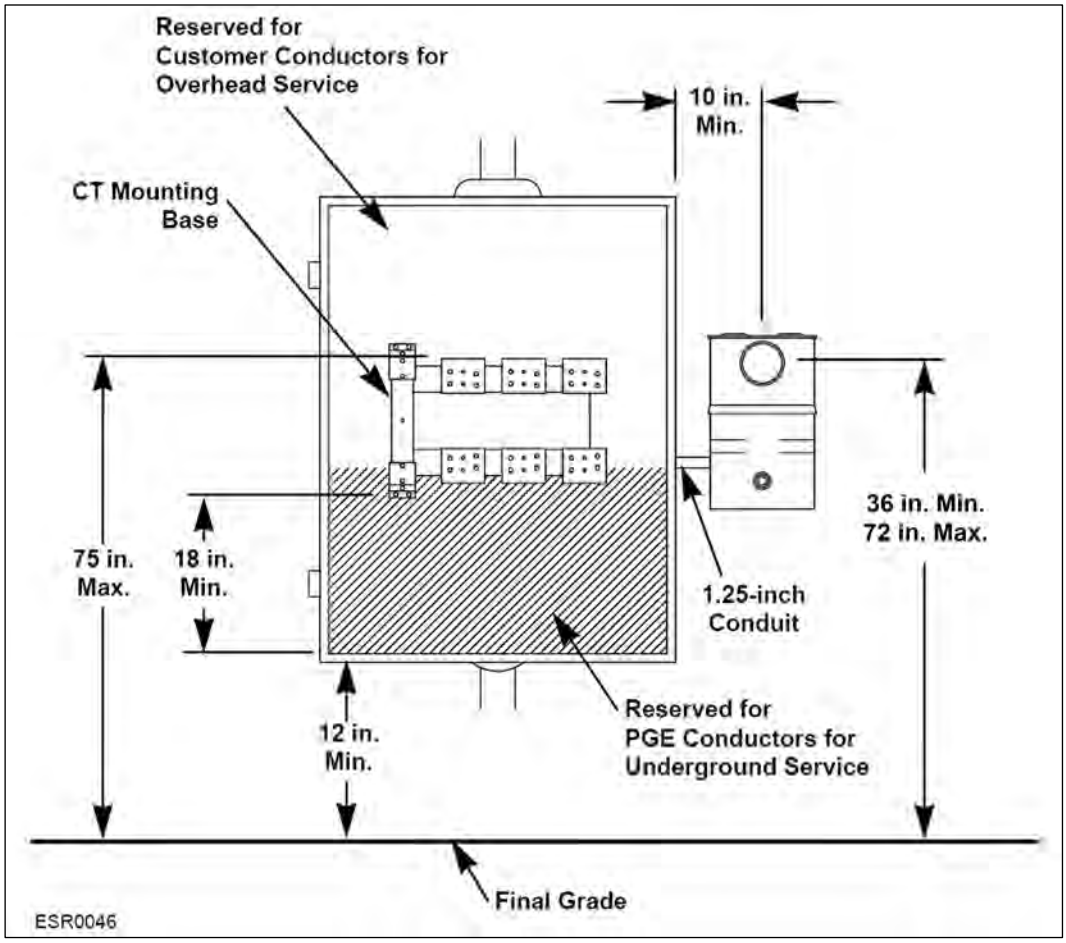

Figure 73: Current Transformer Metering, Horizontal, Wall Mounted, 600 V, 800 A Maximum (EUSERC 329B)

Figure 74: Typical Horizontal Current Transformer Metering Installation

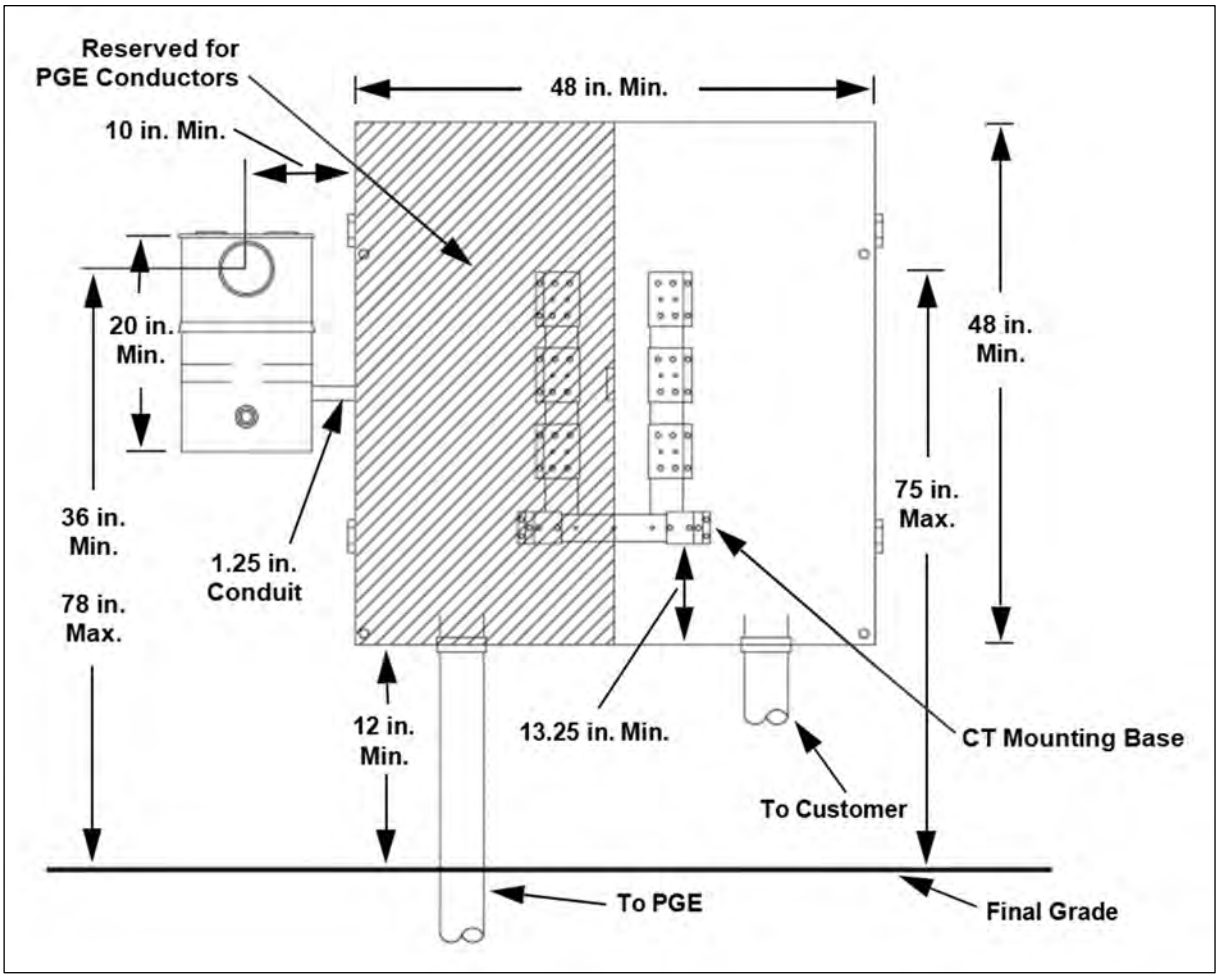

Figure 75: Current Transformer Metering, Vertical, Line and Load Same Side, 600 V, 800 A Maximum (EUSERC 329B)

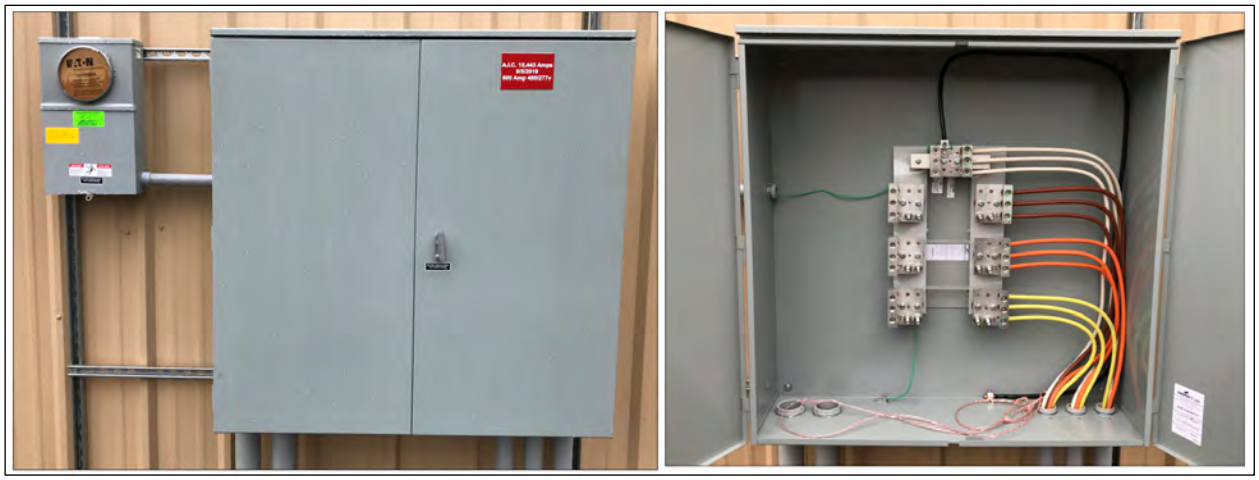

Figure 76: Typical Vertical Current Transformer Metering Installation

10.7.3 *Current Transformer Cabinet*

Figure 77 shows a current transformer (CT) cabinet, 800 A maximum and 0 to 600 V (EUSERC 316, 317, and 318). **Table 20** shows the minimum dimensions of a CT cabinet.

Follow these requirements when installing a CT cabinet.

- Only conductors associated with a single meter are permitted in the CT cabinet. For other underground services, a separate terminating pull box will be provided for a PGE service lateral. **Table 17** on page 110 shows minimum dimensions for pull boxes with terminating facilities.

  Note: No connections will be made in any CT enclosure to supply any other meter. This includes the installation of monitoring equipment

- Customer conductors must exit the enclosure on the load side of the current transformers. Customer conductors are not permitted in the PGE terminating and pull space.
- The cabinet must be mounted in a readily accessible location acceptable to PGE. The cabinet must be at least 12 inches above the final grade.
- The top of the CT mounting bracket must not be more than 75 inches above floor level. The cover must have factory-installed hinges for side opening with sealing provisions, and the hinges must be able to hold the cover in the open position at 90 degrees or more.
- A clear workspace is required in front of the CT cabinet, as shown in **Figure 14** on page 38. The hinged door must open in the direction opposite to the room door so that room ingress or egress is not blocked. The cabinet must be on the main or entry level floor.
- For overhead service, the customer must provide connectors, terminate line, and load-side service conductors in all CT compartments, and they must connect conductors to the line and load sides of the EUSERC-approved mounting base. Line-side and load-side terminations on CT landing pads require two bolts per connector.
- For underground service, the customer must provide a EUSERC-approved CT mounting base for installation in a CT cabinet.
- On the front of the CT cabinet, place a label that reads: *Do Not Break Seal, No Fuses Inside*.

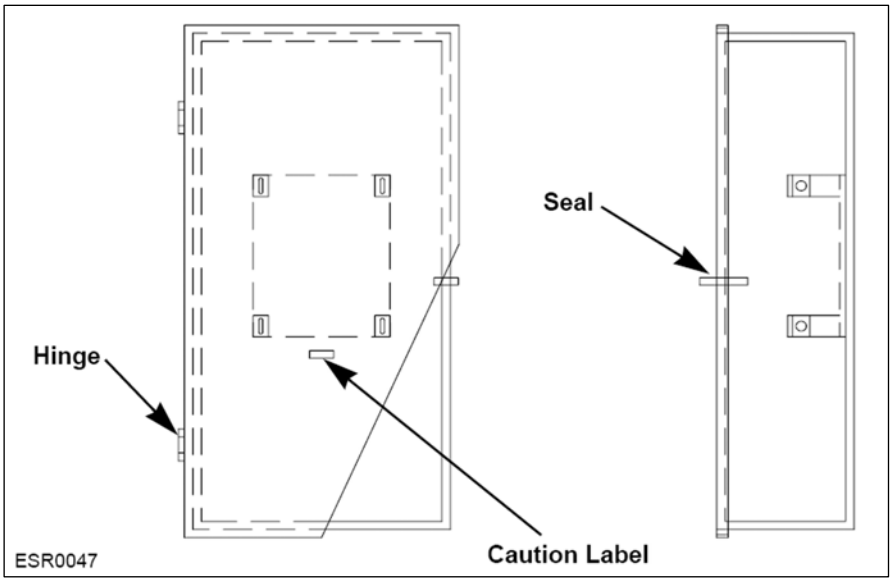

Figure 77: Current Transformer Cabinet, 800 A Maximum, 0 to 600 V (EUSERC 316, 317, 318)

Table 20: Current Transformer Cabinet Minimum Dimensions

Type of Service	EUSERC Drawing	Minimum Exterior Cabinet Dimensions (inches)			CT Mounting Base
		Width	Height	Depth	
Single-phase, 3-wire, 401 to 800 A	No. 317	24	48	11	EUSERC 328B
Three-phase, 4-wire, 201 to 800 A	No. 318	36	48	11	EUSERC 329B
Above 800 A	See Section 11, *Commercial, Industrial, and Large Residential Services, 801 A or Higher*				
Line/load on same side of cabinet	—	48	48	11	EUSERC 329B

10.7.4 *Current Transformer Metering Conduit*

The customer must provide conduit between the meter socket and the CT cabinet.

Follow these requirements when installing conduit.

- To protect metering conductors and ensure bonding of metal parts, at least 1.25 inches of rigid steel or IMC conduit is required, along with proper fittings and bushings.
- Schedule 40 PVC may be allowed when a bonding lug is provided in both the CT cabinet and meter socket. EMT conduit will be allowed for runs of less than 10 feet.
- For standard installation, conduit must be long enough to ensure that there is at least 10 inches between the center of the meter socket and the CT cabinet.
- If the standard location is not suitable or workable, an alternate location may be approved. Alternate locations must have prior written PGE approval and must follow these guidelines:
  - Conduit runs must be 50 feet or less and have no more than three bends. These bends must not total more than 270 degrees, and no single bend may exceed 90 degrees.

- Pull lines are required in all conduit as specified in Section 6.3.3, "Duct Proofing.
- When CT metering conduit dead-ends on the back of a CT cabinet, use PVC flexible non-metallic conduit to extend from the back wall to the front of the cabinet.
- Secure all removable conduit fittings with 1/4 in.–20 screws with sealing provisions. LBs (90-degree ells) may be allowed outside the enclosure for rewires only. LBs may not be used for new construction.

10.7.5 *Current Transformer Meter Socket Enclosure*

Use a meter socket enclosure for CT metering, making sure to reserve a space below the socket for a PGE test switch that has a length of 9.5 inches. **Figure 78** shows the dimensions of the enclosure and **Table 21** lists socket requirements.

Follow these requirements when installing a CT meter socket enclosure:

- Verify that the enclosure contains a mounting perch that is tapped for a test switch. PGE will install the test switch.
- ***Do not*** use a meter socket with circuit closers or bypass clips. It will not be approved.
- The customer must cover and secure all unused openings.

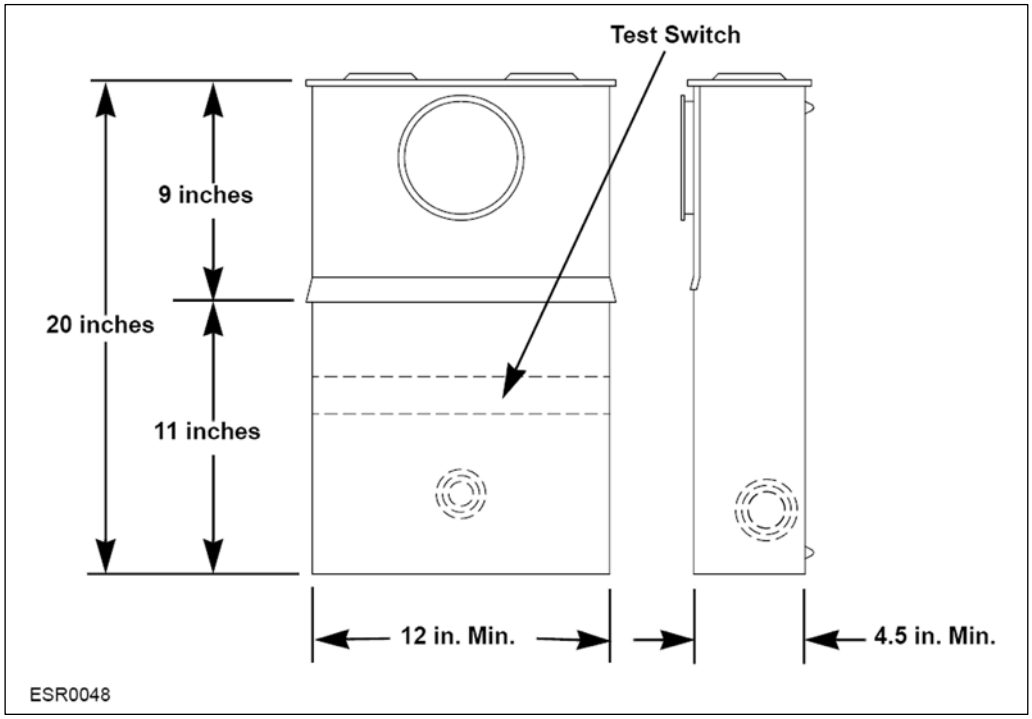

Figure 78: Current Transformer Meter Socket Enclosure

Table 21: Current Transformer Meter Socket Requirements

Type of Service	Socket Type
120/240 V, single-phase, 3-wire	6-jaw
120/208 V network, single-phase, 3-wire	8-jaw
208/120 V, three-phase, 4-wire	13-jaw
480/277 V, three-phase, 4-wire	
240/120 V, three-phase, 4-wire	

10.7.6 *Transformer Mounting Base, Single-Phase and Three-Phase*

Figure 79 shows a transformer mounting base for installation in a current transformer (CT) cabinet, single-phase, 3-wire, 800 A maximum (EUSERC 328B). **Figure 80** shows a typical single-phase CT installation.

Figure 81 shows a transformer mounting base for installation in a CT cabinet, three-phase, 4-wire, 800 A maximum (EUSERC 329B).

Figure 82 shows a typical three-phase CT installation.

Follow these requirements when installing a single-phase or three-phase transformer mounting base in a CT cabinet:

- For an overhead service, the customer must furnish all lugs and connect conductors to the line and load terminals of the CT mounting base. For an underground service, the customer only needs to connect to the load side.
- The mounting base for the CT must meet ratings for available fault current (50,000 A maximum. It accepts bar-type current transformers only.
- Line-side and load-side terminations on CT landing pads require two bolts for each mounting position.
- Termination of service conductors must be aluminum-bodied mechanical lugs. Use a one-position lug for 0 to 400 A and a three-position lug for 401 to 800 A.
- For a single-phase mounting base ***only***, use the clearances described in Section 5.2, "Meter Clearances and Location Criteria."
- For a 4-wire delta service on a three-phase base only, the high-leg (wild-leg) terminal must be located on the right side and identified by an orange mark.

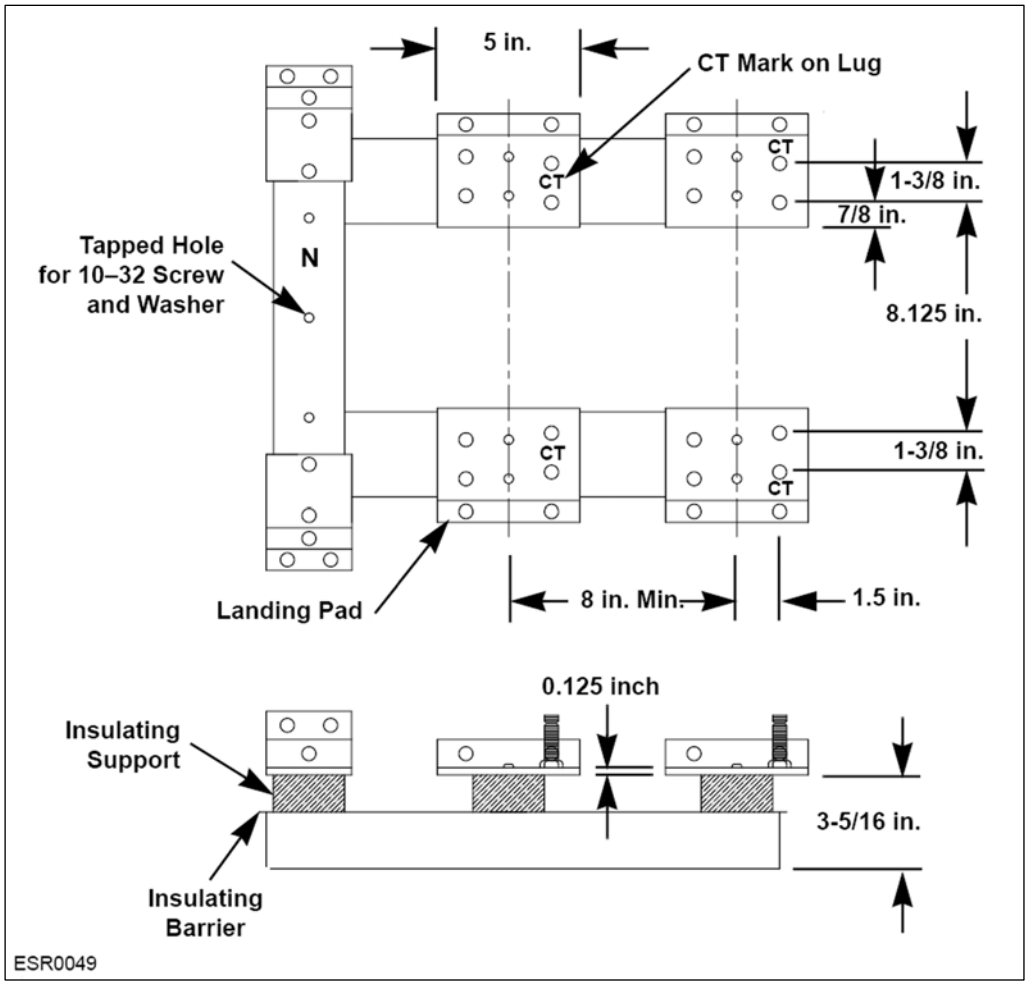

Figure 79: Transformer Mounting Base for Installation in a CT Cabinet, Single-Phase, 3-Wire, 800 A Maximum (EUSERC 328B)

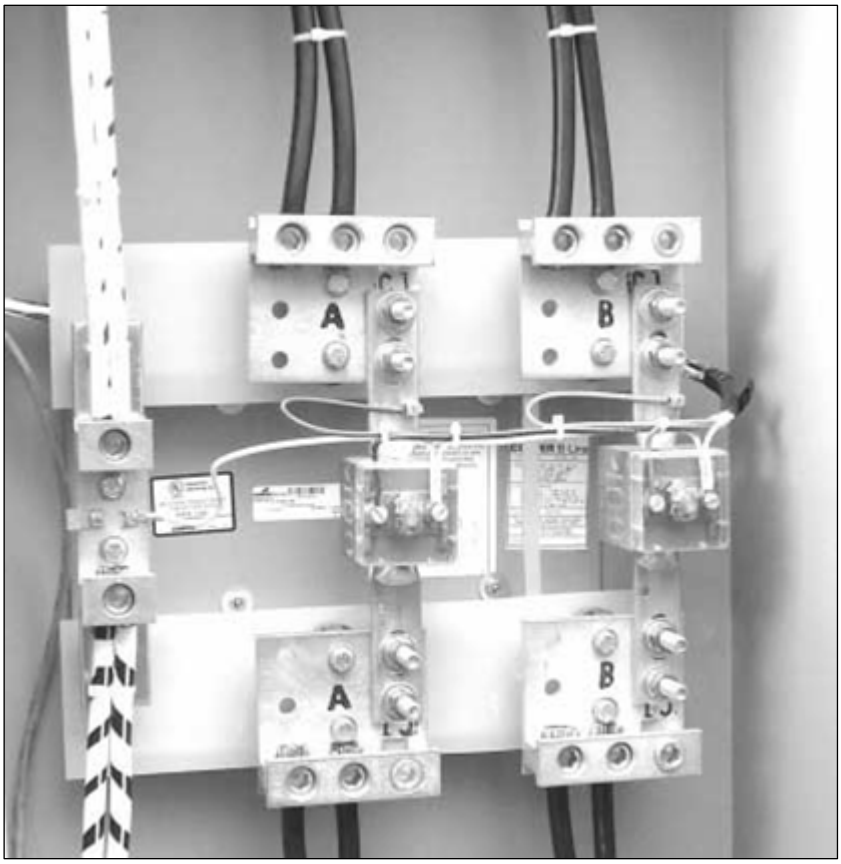

Figure 80: Typical Single-Phase CT Installation

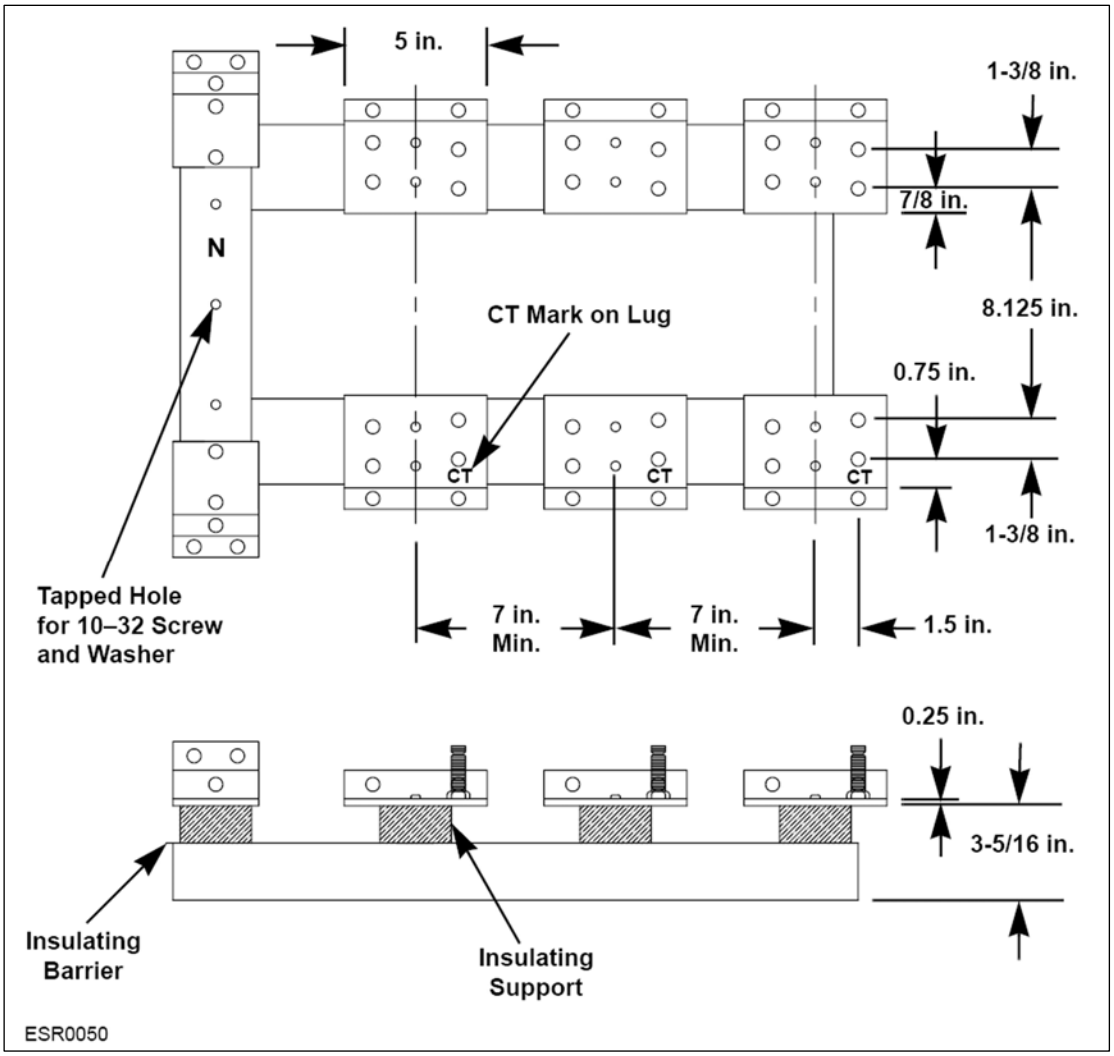

Figure 81: Transformer Mounting Base for Installation in a CT Cabinet, Three-Phase, 4-Wire, 800 A Maximum (EUSERC 329B)

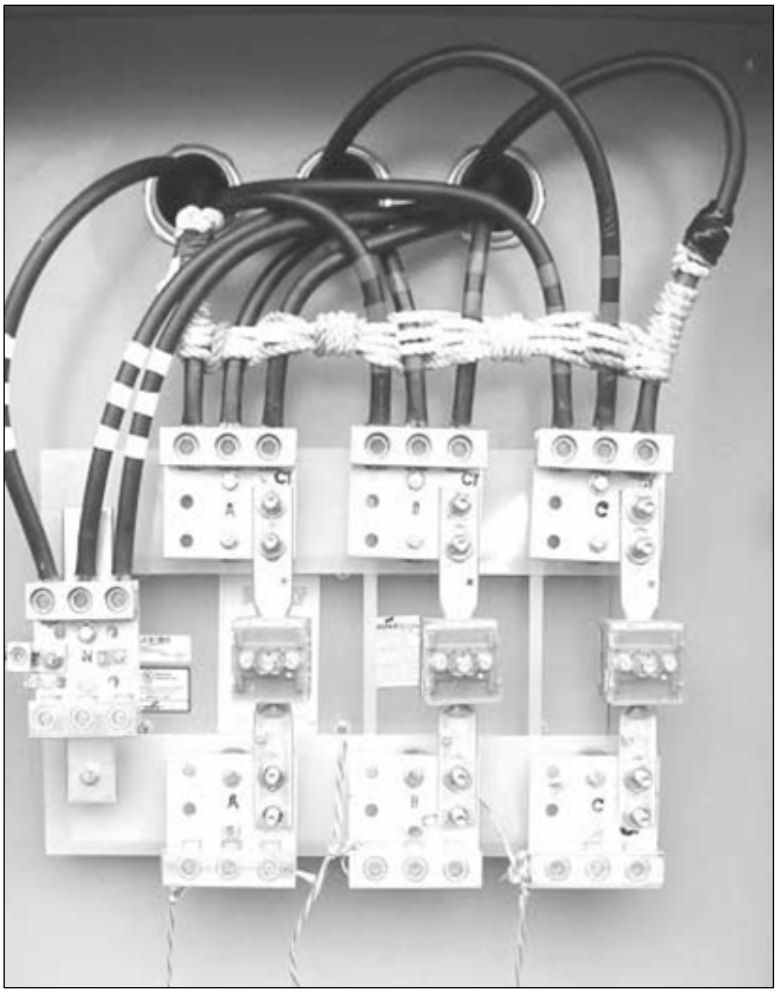

Figure 82: Typical Three-Phase CT Installation

11 Commercial, Industrial, and Large Residential Services, 801 A or Higher

TOPICS IN THIS SECTION

- *Basic Requirements*
- *Switchboard Metering*
- *Switchboard Current Transformer Compartment*

11.1 Basic Requirements

IMPORTANT: *All commercial, industrial, and large residential customers **must** coordinate their service requirements with PGE before purchase and installation of equipment.*

Large residential services are:

- Single-residential services over 320 A continuous.
- All three-phase residential services.

Residential meters must meet the meter clearances and location criteria covered in Section 5.2, "Meter Clearances and Location Criteria."

11.2 Switchboard Metering

A EUSERC-approved switchboard metering section is required when the service entrance rating is greater than 800 A. The switchboard metering section may be used for three-phase services over 200 A and single-phase service over 320 A.

The metering current transformer must be inside the current transformer (CT) compartment and rest on a reinforced concrete slab on grade. The meter and test switch may be mounted on the cover of the hinged compartment or located remotely. The area below the barrier in the CT compartment may be used as a main switch (or breaker) compartment, a load distribution compartment, or a bottom-fed terminating pull section. The metering compartment must be on the supply side of the main switch.

The mounting pad for all switchboard metering enclosures must be a concrete pad that is at least 3.5- ± 0.5-in. thick for the width of the switchboard.

Follow these requirements when installing indoor or outdoor switchboard metering.

- Meter panels must not be hinged to a filler panel.
- The neutral terminal must be permanently identified in clearly visible block lettering that reads: *Neutral* or *N*.
- For 240/120 V, three-phase, 4-wire services, the high-leg (wild-leg) terminal must be located on the right side and be permanently marked in orange by the manufacturer.
- Cable entry through the back of the cabinet generally does not meet PGE requirements due to minimum cable bend radius.

11.2.1 *Indoor Switchboard Metering*

Note: The requirements in this section are in addition to those listed in Section 11.2.

Follow these additional requirements when installing indoor switchboard metering (EUSERC 325 and 326), such as that shown in **Figure 83**:

- Metering switchboards may ***not*** be installed indoors without prior approval from PGE.
- Indoor switchboards must be accessible for maintenance and meter reading. For more information, see Section 5.2, "Meter Clearances and Location Criteria."
- The load section of an indoor switchboard may be used by PGE as the terminating section for underground service (EUSERC 327) as shown in **Figure 84**.
- When installing indoor switchboard metering, the customer must install a concrete pad with no more than 2 inches of concrete in front of any cabinet that contains PGE equipment. See **Figure 85** for details.

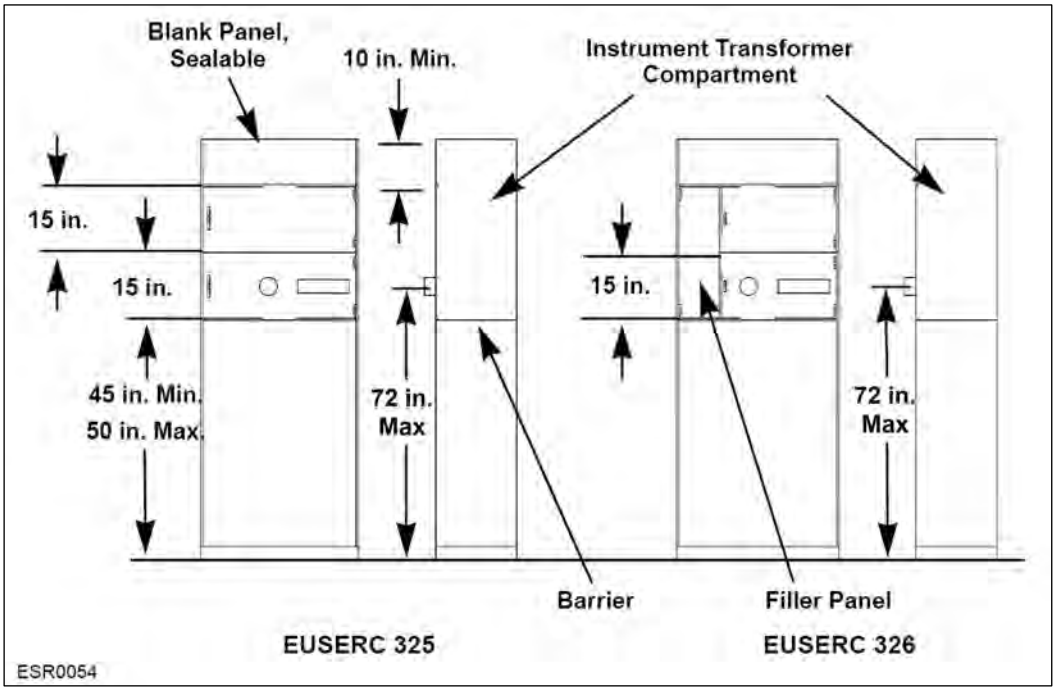

Figure 83: Indoor Switchboard Metering (EUSERC 325 and 326)

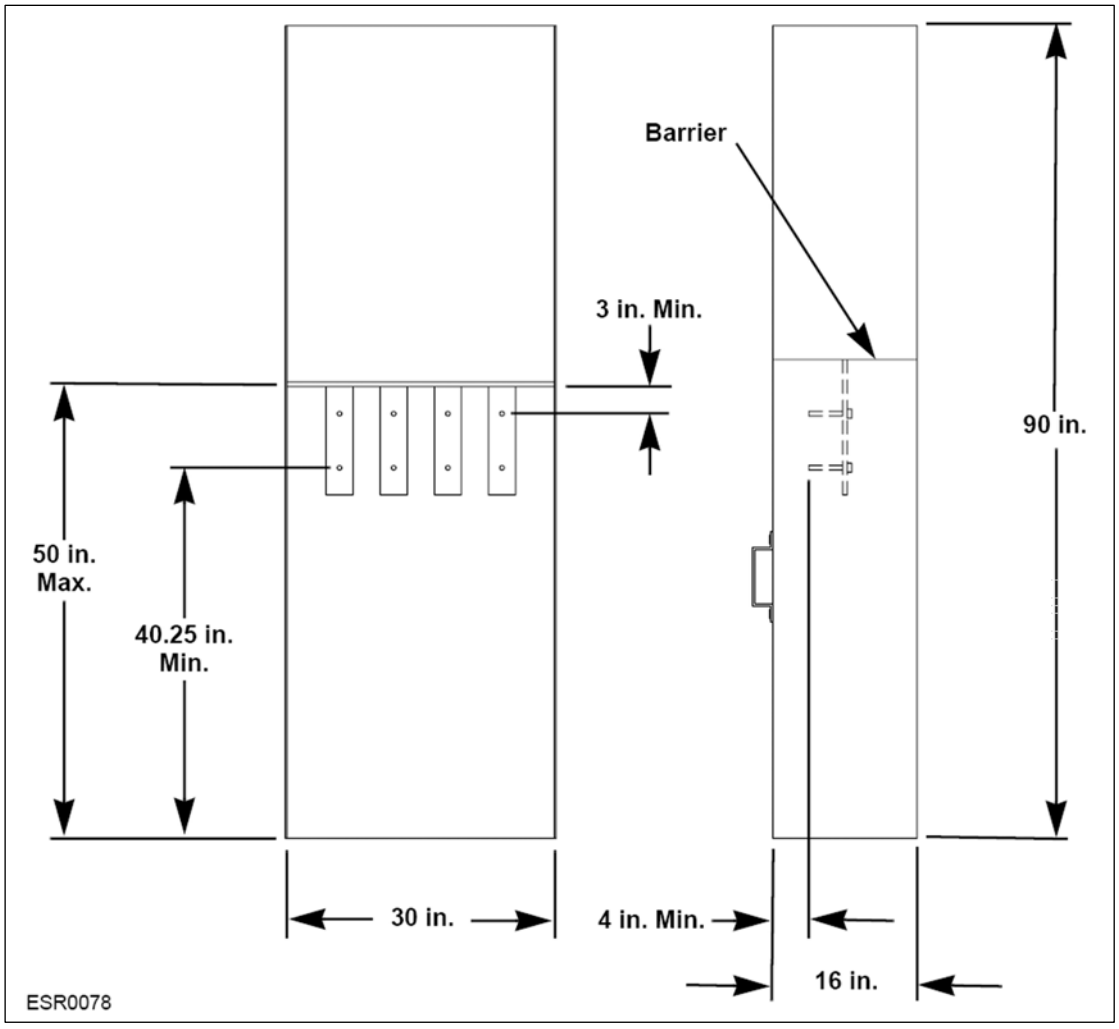

Figure 84: Load Section of an Indoor Switchboard (EUSERC 327)

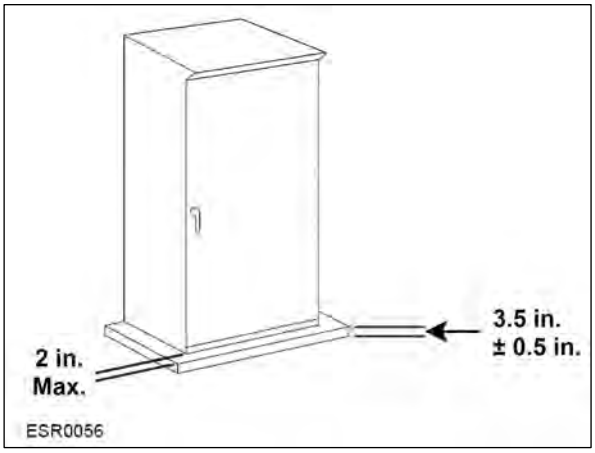

Figure 85: Concrete Pad in Front of Cabinet (Indoor Metering)

11.2.2 *Outdoor Switchboard Metering*

Note: The requirements in this section are in addition to those listed in Section 11.2.

Follow these additional requirements when installing outdoor switchboard metering (EUSERC 354), such as that shown in **Figure 86**:

- Exterior doors on outdoor switchboards must be sealable and must hold securely at a minimum of 90 degrees when open.
- PGE will only approve the outdoor switchboard with a single enclosure door that is constructed with a 4-inch spacer as shown in EUSERC 354.
- Side penetrations (such as shown in **Figure 92** on page 142) are allowed only if the source vault is less than 30 feet from the penetration into the gear with no bends in the conduit run.
- When installing outdoor switchboard metering, the customer must install a concrete pad with 48 inches of concrete in front of any cabinet that contains PGE equipment. Drainage must slope away from the cabinet. See **Figure 87** for details.
- Barrier posts are required if the switchboard is exposed to vehicular traffic. For more information, see Section 6.4.6, "Barrier Posts."

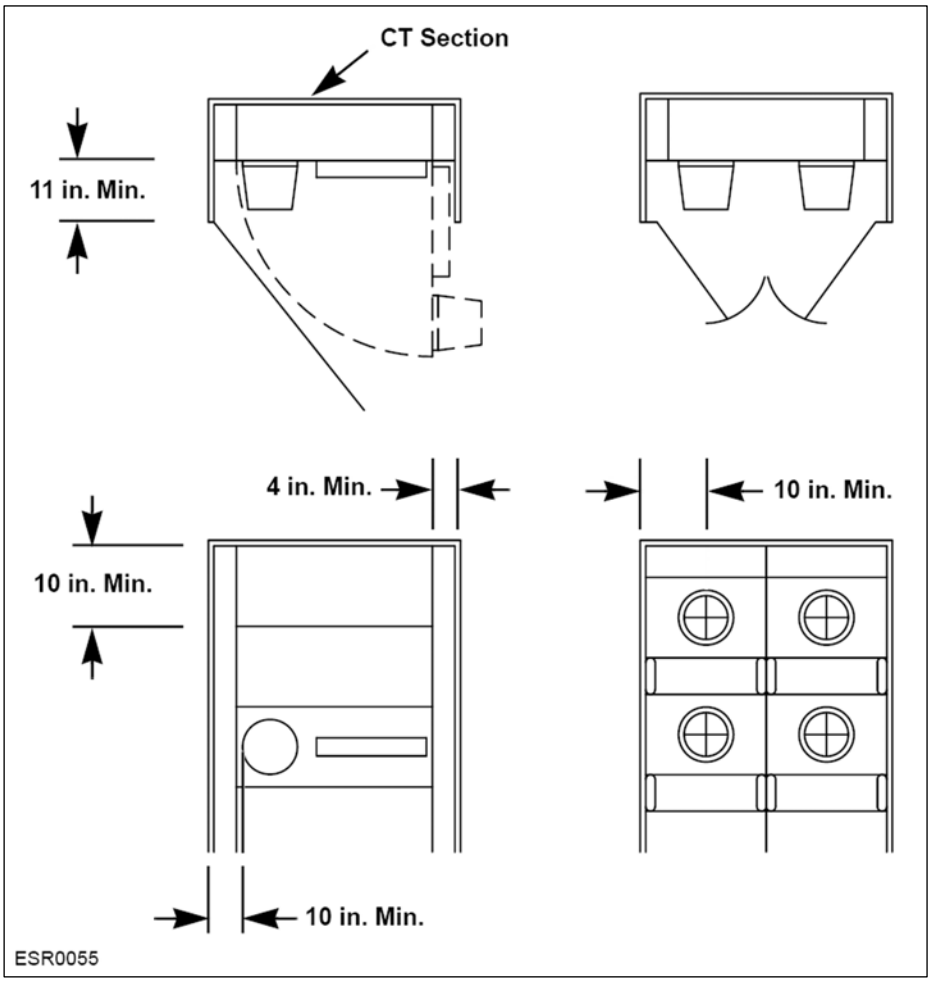

Figure 86: Outdoor Switchboard Metering (EUSERC 354)

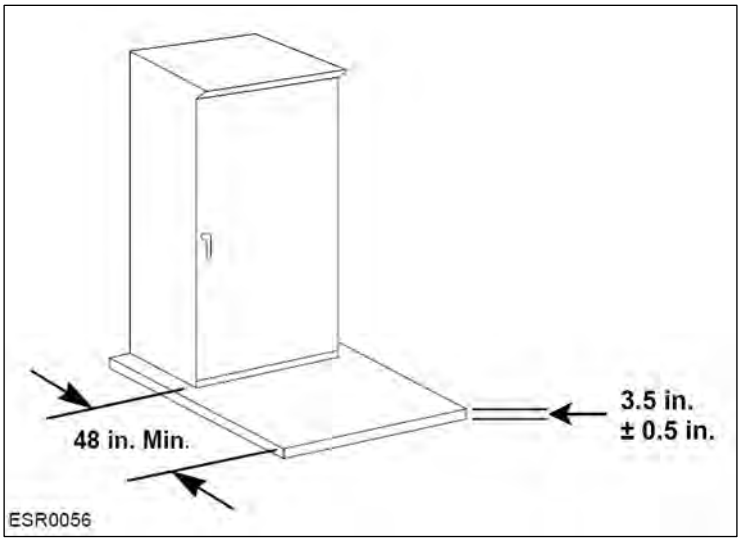

Figure 87: Concrete Pad in Front of Cabinet (Outdoor Metering)

11.2.3 *Switchboard Service Termination*

Follow these basic requirements for switchboard service termination:

- The customer must provide the switchboard service section, instrument transformer mounting base, panels, meter socket, and provisions for a test switch.
- The meter and test switch are to be owned, provided, and installed by PGE in the customer-owned metering compartment. PGE will provide window-type or doughnut-type current transformers for switchboards, but these CTs must be installed and secured by the customer.
- For 4-wire delta services, the high-leg (wild-leg) terminal must be located on the right side and identified by an orange mark. This identification must be consistent on the equipment for all metering and PGE termination points.
- For underground service, PGE will terminate the line-side service conductors using PGE-provided connectors on lug landings in the pull section.
- The locking method used by the customer on the metering enclosure must provide for independent access by PGE.
- Customer-owned conductors and devices (such as limiters and fuses) are not permitted in PGE sealed pull sections or metering compartments.

11.2.3.1 EUSERC Requirements

These EUSERC requirements apply to switchboard service termination:

- Terminating bolts must be secured in place and must be provided with nuts, flat washer, and a spring washer. All these parts must be plated to prevent corrosion. Bus bars are required from the pull section into the service section.
- PGE requires a clear workspace in front of a switchboard that is 78 inches high, at least 48 inches wide, and 48 inches deep.
- Bonding must meet Oregon Electrical Specialty Code (OESC) requirements. Lugs for terminating the customer's bonding wire (or other bonding conductors) must be located

outside the sealable section and must be designed to readily permit the customer's neutral system to be isolated from the PGE neutral when necessary.

- All removable panels and covers to the compartments used for terminating or routing conductors must have sealing provisions.
- All pull and termination sections must have full-front access. Cover panels must be removable and sealable. The panels must be provided with two lifting handles, and they cannot have an area greater than 9 square feet.
- When self-contained meter sockets are installed in switchboards, they must be wired by the switchboard manufacturer.

11.2.4 *Pull Box with Terminating Facilities, 0 to 600 V, 0 to 1200 A*

Figure 88 shows a pull box with terminating facilities 0 to 600 V, 0 to 1200 A (EUSERC 343A, 347). See **Figure 14** on page 38 for meter clearances for multiple-meter installations.

Table 22 lists minimum dimensions for pull boxes with terminating facilities (EUSERC 343A).

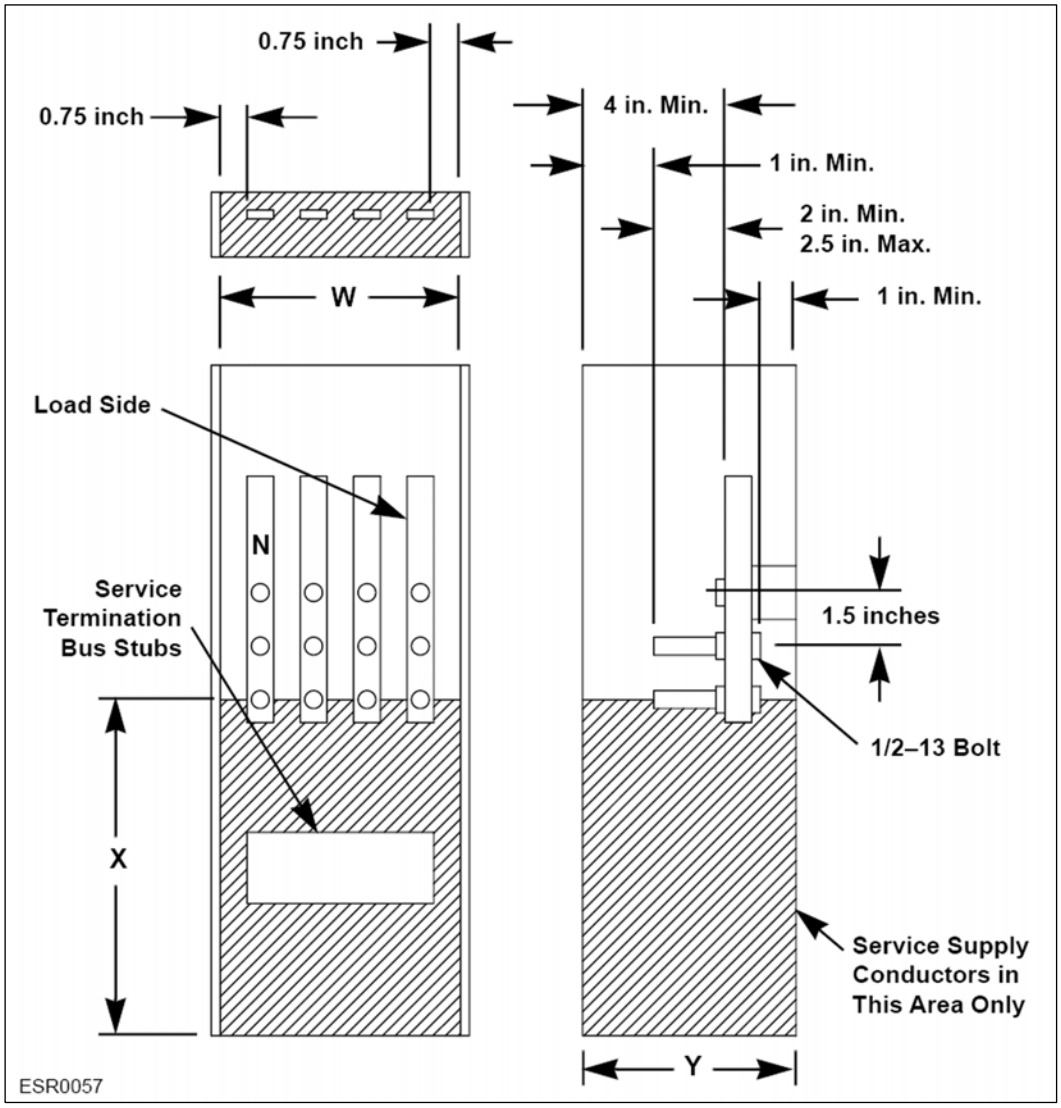

Figure 88: Pull Box with Terminating Facilities 0 to 600 V, 0 to 1200 A (EUSERC 343A, 347)

Table 22: Minimum Dimensions for Pull Boxes with Terminating Facilities (EUSERC 343A)

Total Service (amperes)	W (inches)		X (inches)	Y (inches)
	3-Wire	4-Wire	Lug Height	Depth
0 to 200	10.5	14	11	6
201 to 400	10.5	14	22	6
401 to 800	16.5	22	26	11
801 to 1200	22.5	30	25	11

11.2.5 *Commercial Multiple-Metering, Direct-Connect, Floor-Mounted Switchboard, 1201 A and Higher*

Follow these requirements when installing commercial multiple metering, direct-connect, floor mounted switchboards, 1201 A and higher (EUSERC 306, 345), such as that in **Figure 89**:

- All removable panels and covers to compartments used for metering must be sealable.
- Metering conductors must not pass through adjacent metering compartments except in enclosed wireways.
- For 4-wire delta services, the high-leg (wild-leg) terminal must be located on the right side and identified by an orange mark. This identification must be consistent on the equipment for all metering and PGE termination points.
- Test blocks with rigid insulating barriers must be furnished, installed, and wired or bused to the meter sockets. Cover panels for the test blocks must be sealable and fitted with a lifting handle.
- Meter panels must be removable, but it must not be possible to remove them when the meter is in place.
- Before power is connected, each metered service must have a permanently engraved metal or hard plastic label with letters at least 3/8-inch high that identifies the customer's service address. **Figure 59** on page 106 shows an example label.
- Single-phase, 480 V service must be permanently and visibly labeled as such. PGE requires a red label with white lettering that reads: *SINGLE-PHASE 480 V*. For safety, place the label in a location that's easy to see. Consult PGE for further label requirements.

  Note: Each meter socket and associated disconnect must be correctly labeled as to the unit, suite, or space number.

- For pull section details when used on underground services, see **Figure 90** (or refer to EUSERC 345) and **Table 23**.
- The customer must provide an acceptable concrete pad for all switchboard metering service sections and pull boxes.
- If a freestanding unit will be expandable beyond six meter sockets to accommodate load growth, the initial installation must include a main disconnect.

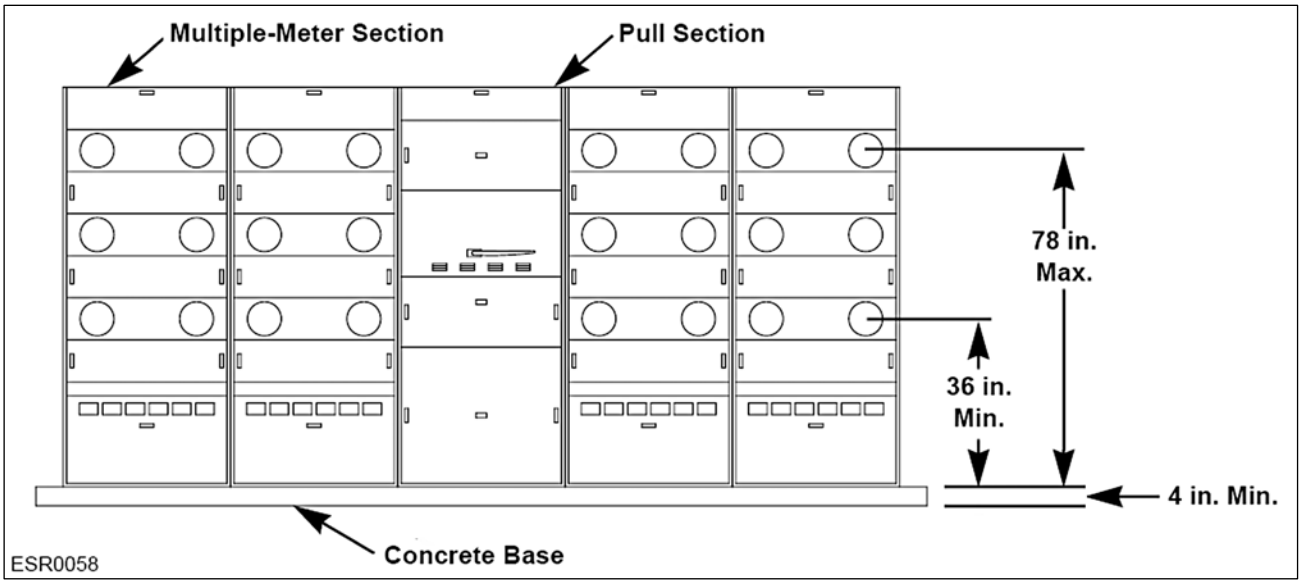

Figure 89: Commercial Multiple Metering, Direct-Connect, Floor-Mounted Switchboard, 1201 A and Higher (EUSERC 306, 345)

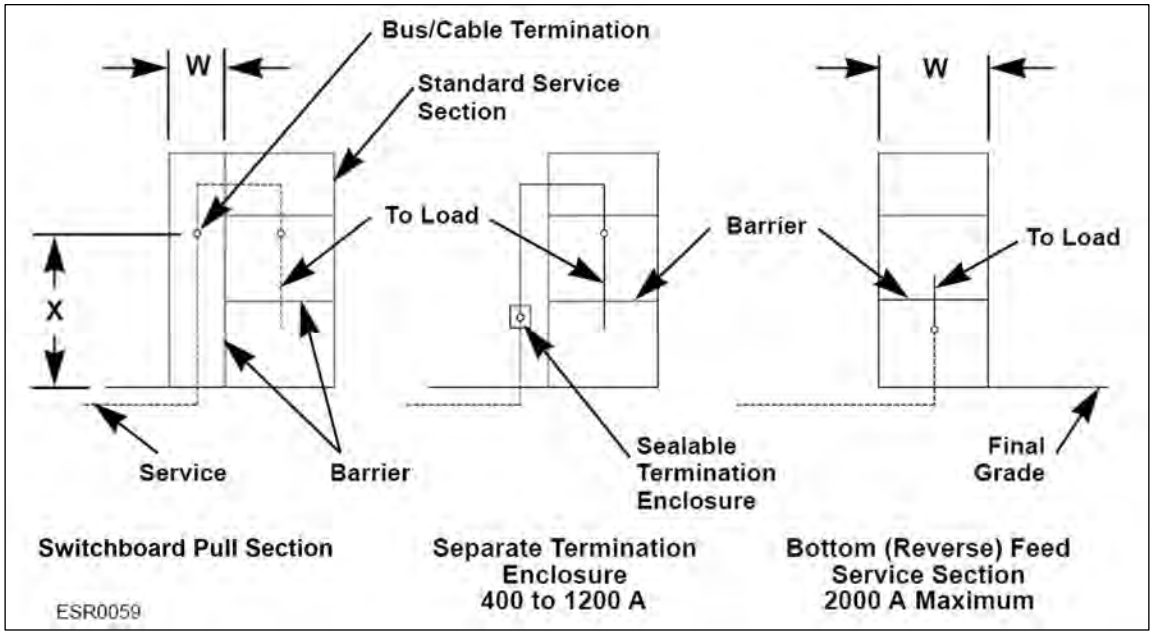

Figure 90: Underground Service Termination Switchboard Service Section, 400 to 3000 A, 0 to 600 V (EUSERC 345)

Table 23: Minimum Pull Section Dimensions (Applies to Figure 90 only)

Switchboard Rating (amperes)	Minimum Width W (inches)		Minimum Height X (inches)
	3-Wire	4-Wire	
200 to 800	24	24	42
801 to 1200	24	30	
1201 to 2000	30	35	
2001 to 3000 *	—	42	60

* Consult PGE for services higher than 2000 A.

11.2.6 Underground *Service Termination Switchboard Service Section, 400 to 3000 A, 0 to 600 V*

Follow these requirements when installing an underground service termination switchboard service section, 400 to 3000 A and 0 to 600 V (EUSERC 345), such as that shown in **Figure 90** above:

- A switchboard pull section, a separate termination enclosure, or a bottom-feed service section must be provided for all switchboard underground services.
- Bus bars with provisions for termination lugs (in accordance with EUSERC 347) are required from the pull section into the service section when the main switch is rated higher than 800 A, or when multiple metering is to be supplied.
- The minimum dimensions in **Figure 90** are for vertical entry at the top or bottom only. Side or rear entry of the service cable into the pull section may require a greater dimension than that shown in **Table 23** above.
- The customer must provide a drawing with the dimensions of the proposed service equipment.
- Consult PGE for services higher than 2000 A.
- Refer to EUSERC 347 for bus/cable termination.
- Refer to EUSERC 343 for sealable termination enclosure.

11.2.7 *Underground Service Termination in a Pull Section Below Ground Level*

The figures in this section show underground service termination in a pull section below the ground level, 400 to 3000 A, 0 to 600 V (EUSERC 345, note 6).

- **Figure 91** shows a pull section with back-entry conduits at the top or bottom.
- **Figure 92** shows a pull section with side-entry conduits at the lower end of the section.

Table 24 lists the variable dimensions shown in the two figures.

Follow these requirements when installing an underground service termination in a pull section below the ground level:

- The cover panels on the pull and wireway sections must be a two-piece design of equal size panels with two lifting handles. The cover panels must be removable and sealable.
- The minimum access dimensions—W1 and W2—are measured between the inside edges of the left-side and right-side return flanges.

- The pull section and termination section shown in **Figure 91** and **Figure 92** are reserved for PGE supply conductors. No conduits or customer wiring is to be installed in—or routed through—this area.
- There must be at least a 4-inch clearance between any energized part and a removable cover panel.
- The customer must provide a Unistrut® cable support bracket. Consult PGE.
- A minimum 10-foot clear workspace is required in front of the pull section and opposite the direction of the cable entry.
- Water may intrude into service conduits, the pull section, and termination section if the source side of PGE facilities (such as a transformer vault) is at a higher elevation than the pull and termination sections.
- When water intrusion can reasonably be expected, the customer must provide a means to prevent water from accumulating in the pull and termination sections. This can be done by providing a water collection system—a concrete well, for example—under the pull and termination sections along with a gravity drain or sump pump to remove any standing water. **Figure 93** shows a pad drain for freestanding switchboard.

  IMPORTANT: *PGE must review and approve of any water accumulation and drainage systems before installation.*

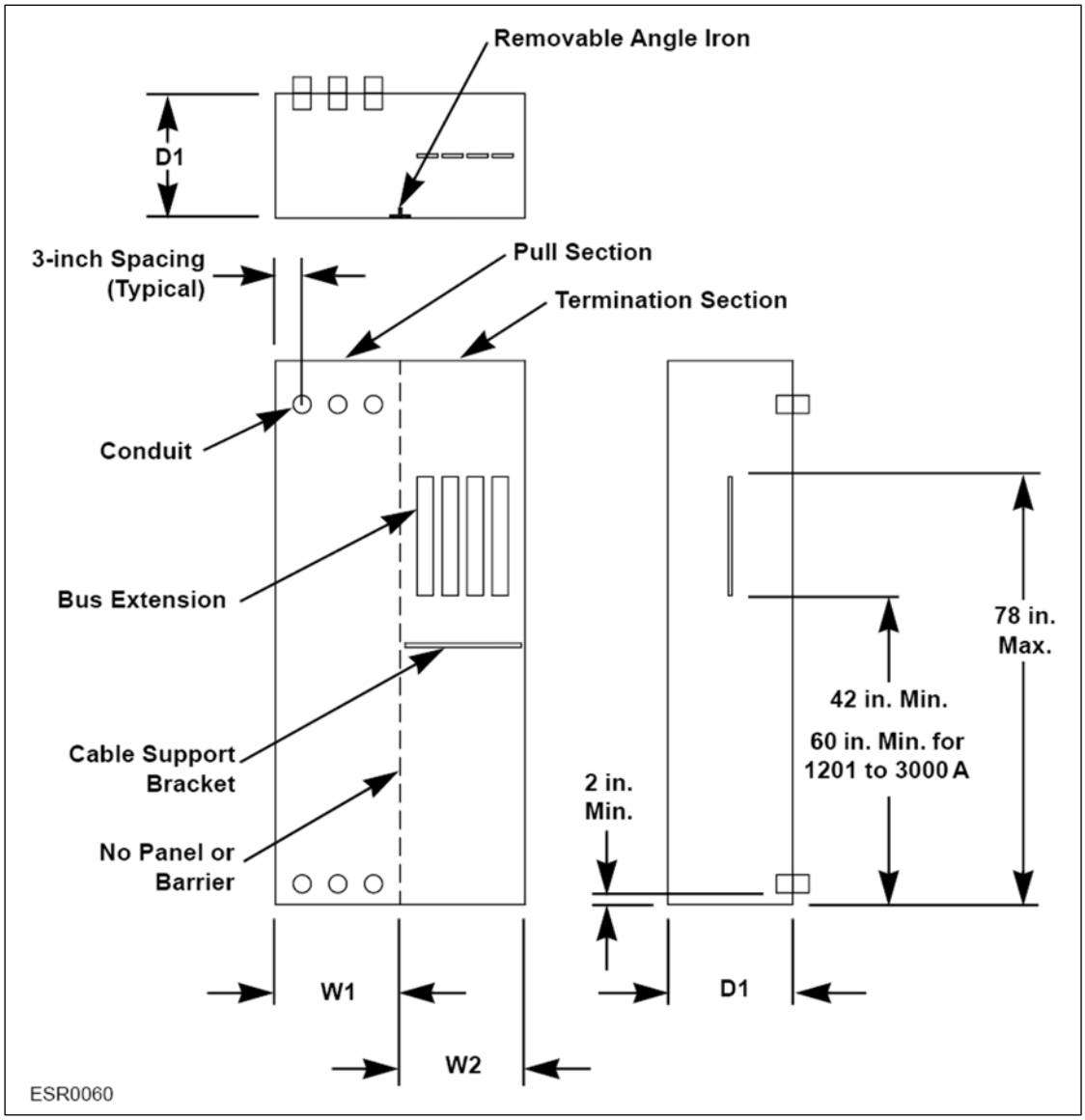

Figure 91: Underground Service Termination in a Pull Section Below Ground Level, Showing Pull Section with Back-Entry Conduits at the Top or Bottom

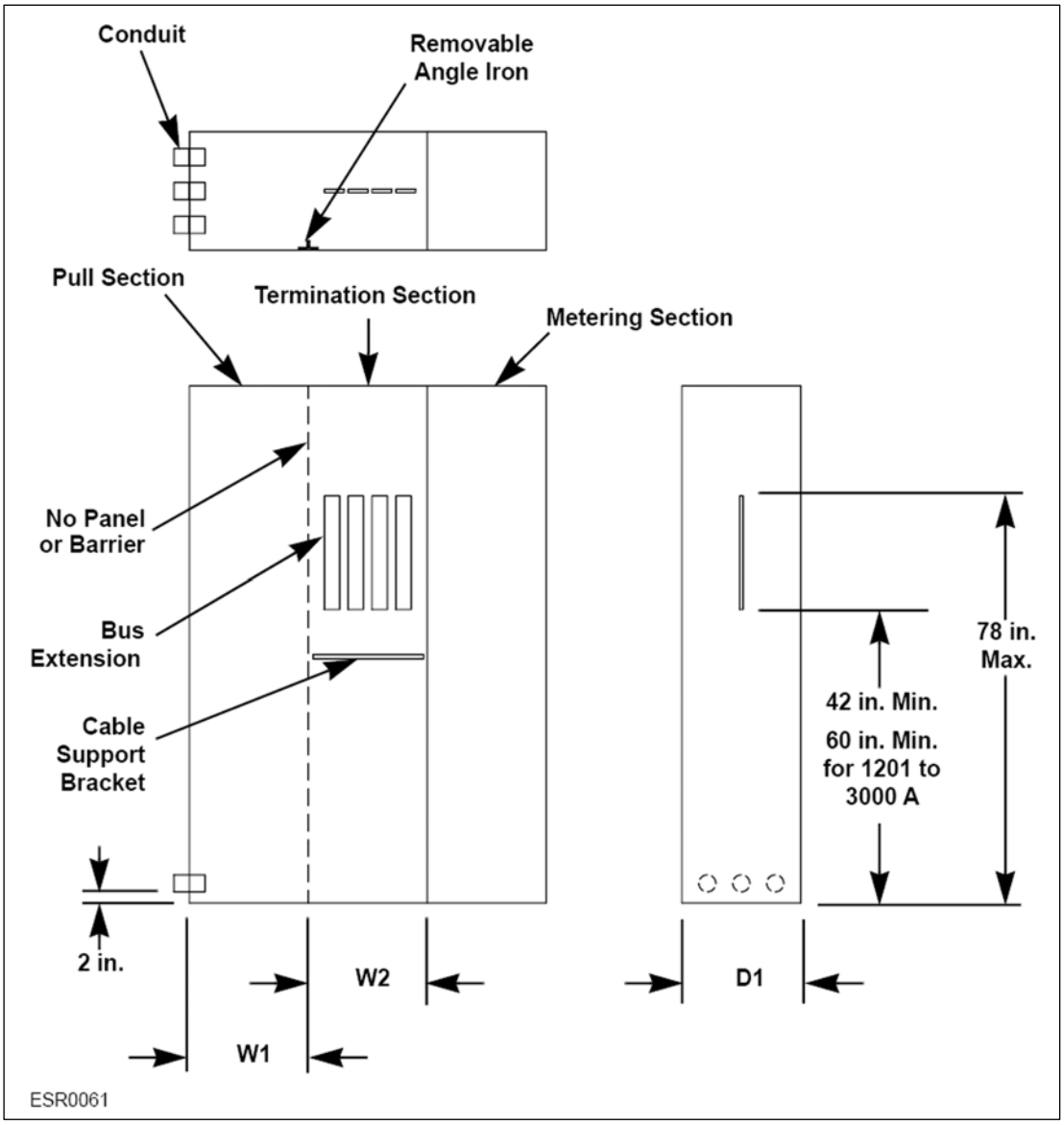

Figure 92: **Underground Service Termination in a Pull Section Below Ground Level, Showing Pull Section with Side-Entry Conduits at the Bottom**

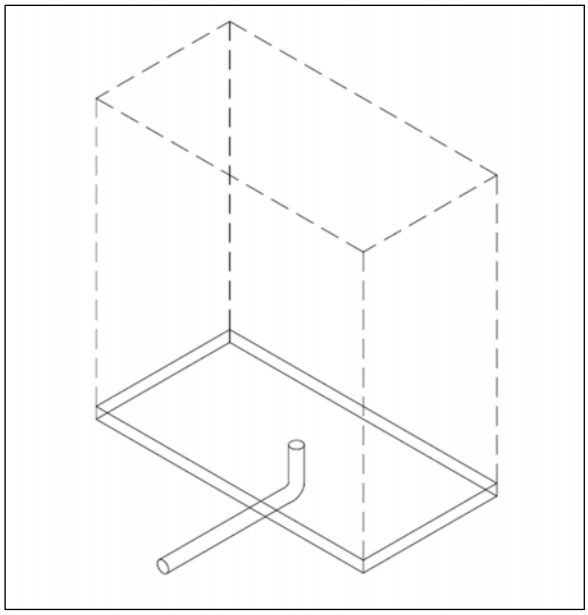

Figure 93: Pad Drain for Freestanding Switchboard

Table 24: Minimum Pull Section Dimensions

Switchboard Rating (amperes)	Pull Section Width W1 (inches)		Wireway Width W2 (inches)	Wireway Depth D1 (inches)
	Single-Phase, 3-Wire	Three-Phase, 4-Wire		
401 to 800	24	24	24	24 (single-phase only) 30
801 to 1200	—	30	30	30
1201 to 3000	—	42	42	48

11.2.8 *Overhead Service Termination Switchboard Service Section*

Follow these requirements when installing an overhead service termination switchboard service section, 0 to 600 V (EUSERC 348), such as that shown in **Figure 94**:

- The service entrance conductors, cable, or bus bar must be furnished and installed by the customer as follows:
  - If the switchboard is served with bus or bar conductors, the conductors must enter through the top, or at the side or back in the upper 10-inch section.
  - When the switchboard is served with cable conductors, the conductors must enter the top of the switchboard only.
- An extension may be required when conduits enter from the side or rear.
- The direction of feed is from the top to bottom in the switchboard service section. Load conductors must exit below the metering compartment and may not be routed back through the current transformer compartment in order to exit the service section.
- Refer to EUSERC 325 and 326 for the requirements for the 90-inch service section.

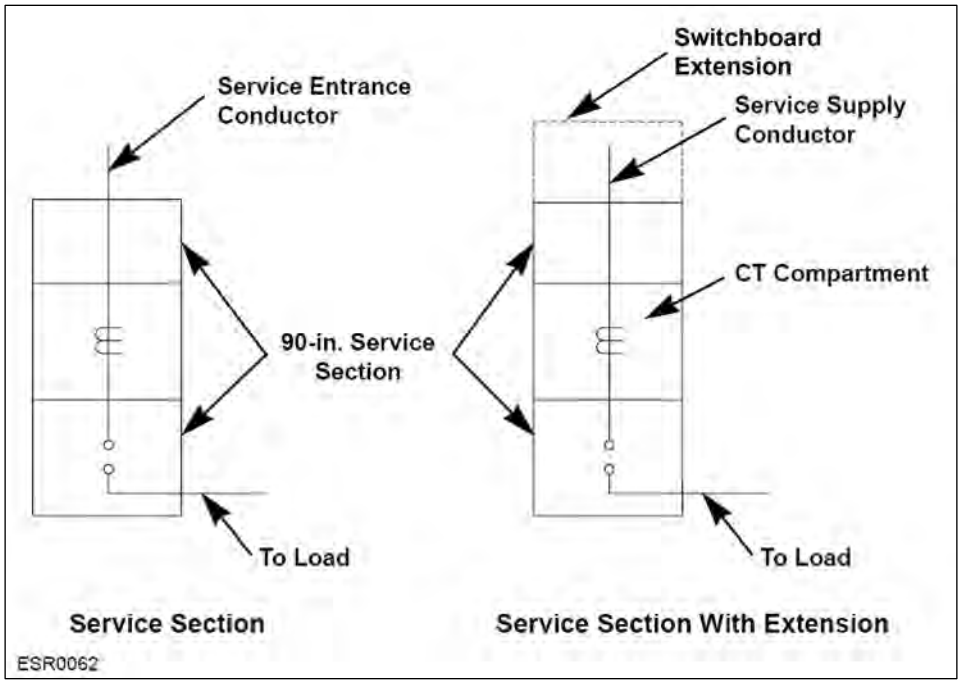

Figure 94: Overhead Service Termination Switchboard Service Section, 0 to 600 V (EUSERC 348)

11.2.9 *Switchboard with Remote Meter Enclosure*

Follow these requirements when installing a switchboard with remote meter enclosure (EUSERC 325 and 339), such as that shown in **Figure 95**:

- The service termination and metering equipment should be located outside, near the transformer. If PGE allows the service termination to be located inside the building, the metering enclosure ***must*** be located outside the building.
- The conduit in the switchboard section must be non-metallic tubing and must be terminated in the current transformer compartment in front of the current transformers. 90-degree sweeps (LBs or similar devices) are not permitted inside the enclosure.
- The neutral terminal must be permanently identified in clearly visible block lettering that reads: *Neutral* or *N*.
- For 240/120 V, three-phase, 4-wire service, the high-leg (wild-leg) terminal must be located on the right side and be permanently marked in orange by the manufacturer.
- If—in the opinion of PGE—the switchboard service section is inaccessible for meter testing and maintenance, the customer must provide direct access between the remote meter and the current transformer.
- The customer must provide and install the remote meter socket enclosure, the metering switchboard section, and 1.25-inch conduit for the metering secondary conductors. For more information, see Section 10.7.4, "Current Transformer Metering Conduit."

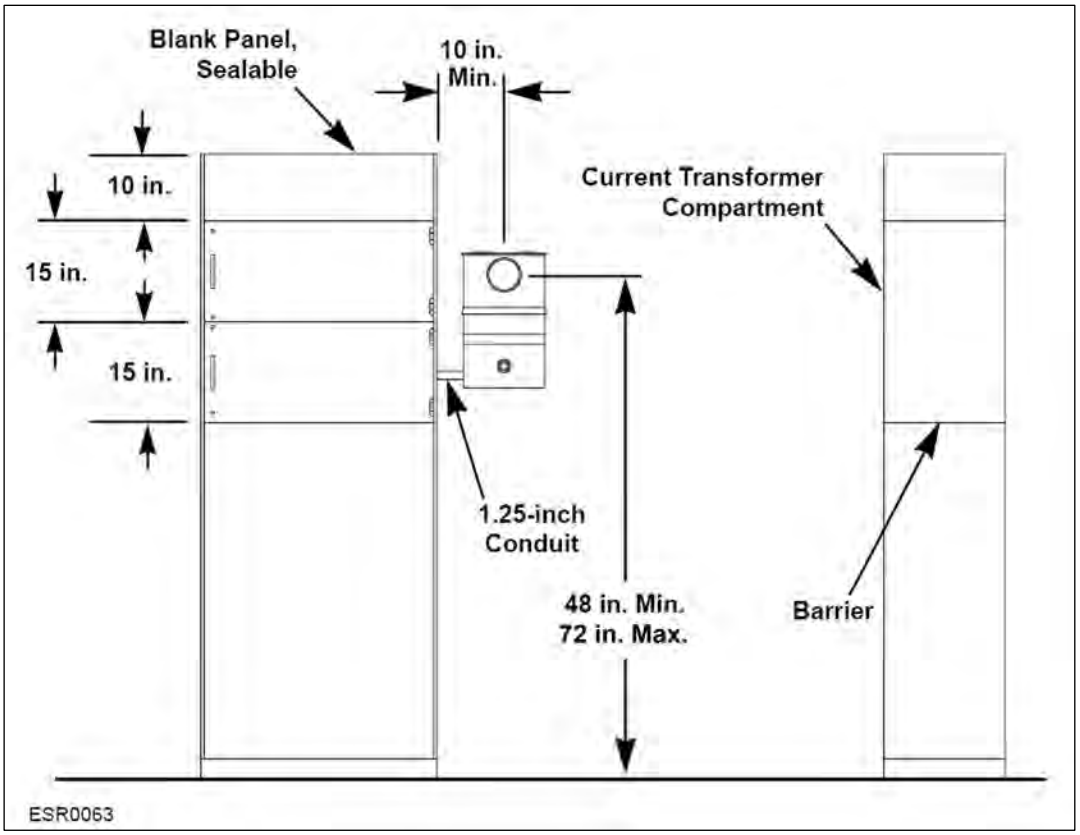

Figure 95: Switchboard with Remote Meter Enclosure (EUSERC 325, 339)

11.3 Switchboard Current Transformer Compartment

Follow these basic requirements when installing a current transformer (CT) compartment for switchboards:

- Set the direction of feed from the top or bottom. No other conductors must pass through this compartment.
- The dimensions are measured to the inside edge of the compartment access opening.

11.3.1 *Switchboard Current Transformer Compartment, 0 to 1000 A, 0 to 600 V*

Note: The requirements in this section are in addition to those listed in Section 11.3.

Follow these additional requirements when installing a CT compartment in a switchboard enclosure, 0 to 1000 A, 0 to 600 V, three-phase, 4-wire service (EUSERC 320), such as that shown in **Figure 96**.

- Bus arrangements and supports must be provided as shown in **Figure 96.** The neutral bus may be located at either side.
- A clear, unobstructed workspace must be provided around the CT bus units from the barrier to the upper support bar.
- The barrier must be constructed of rigid insulating material that is resistant to electrical arc tracking.

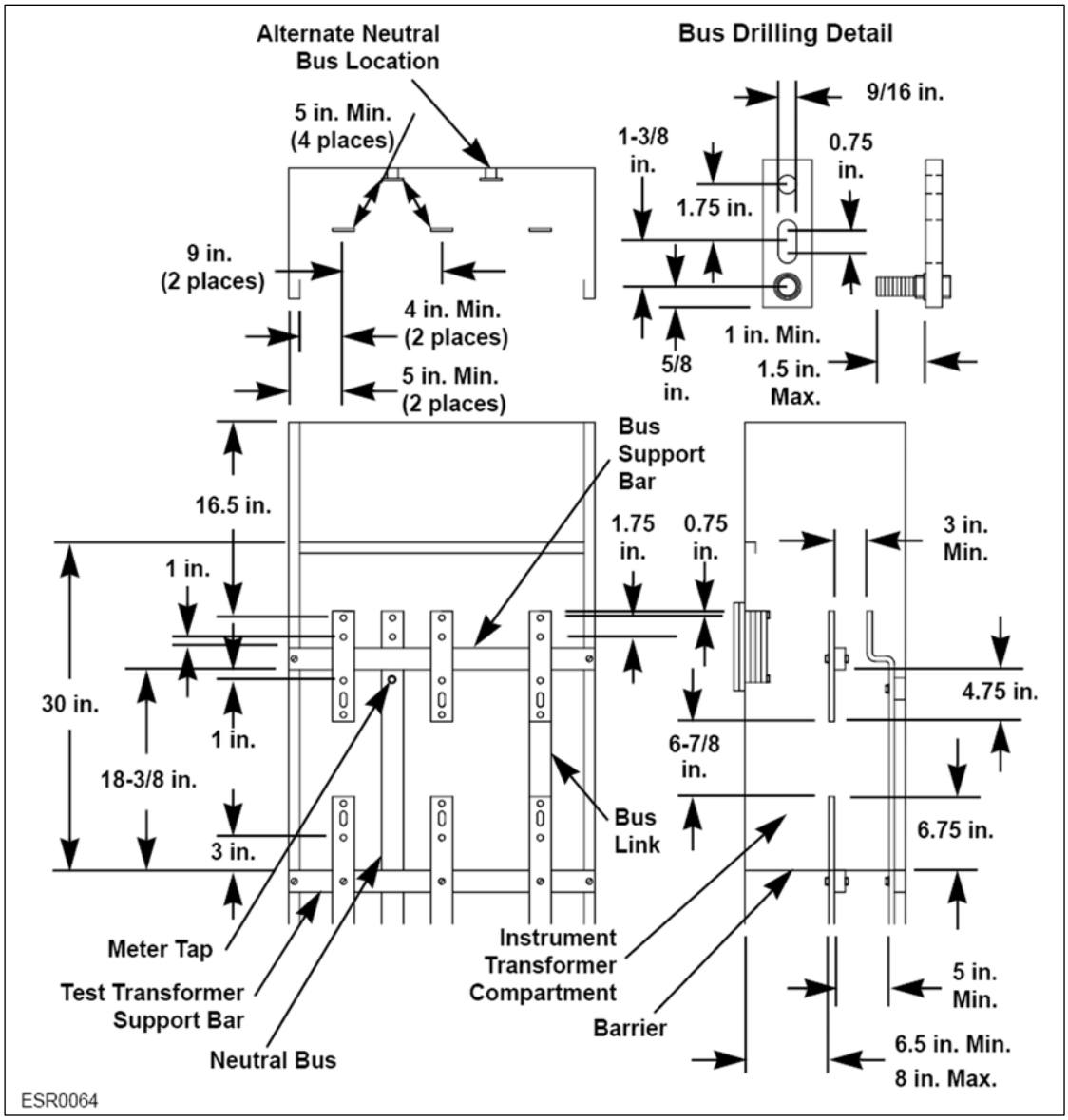

Figure 96: Switchboard Current Transformer Compartment, 0 to 1000 A, 0 to 600 V, Three-Phase, 4-Wire Service (EUSERC 320)

11.3.2 *Switchboard Current Transformer Compartment, 1001 to 3000 A, 0 to 600 V*

Note: The requirements in this section are in addition to those listed in Section 11.2.

Follow these additional requirements when installing a CT compartment in a switchboard, 1001 to 3000 A, 0 to 600 V, three-phase, 4-wire service (EUSERC 322), such as shown in **Figure 97**.

- Busways must remain in position when the removable section B is out.
- When horizontal-cross busways supply the service section phase buses, a neutral bus bar extension must be provided in the instrument transformer compartment above the lower CT bus support.

- The customer must install a doughnut-style CT.

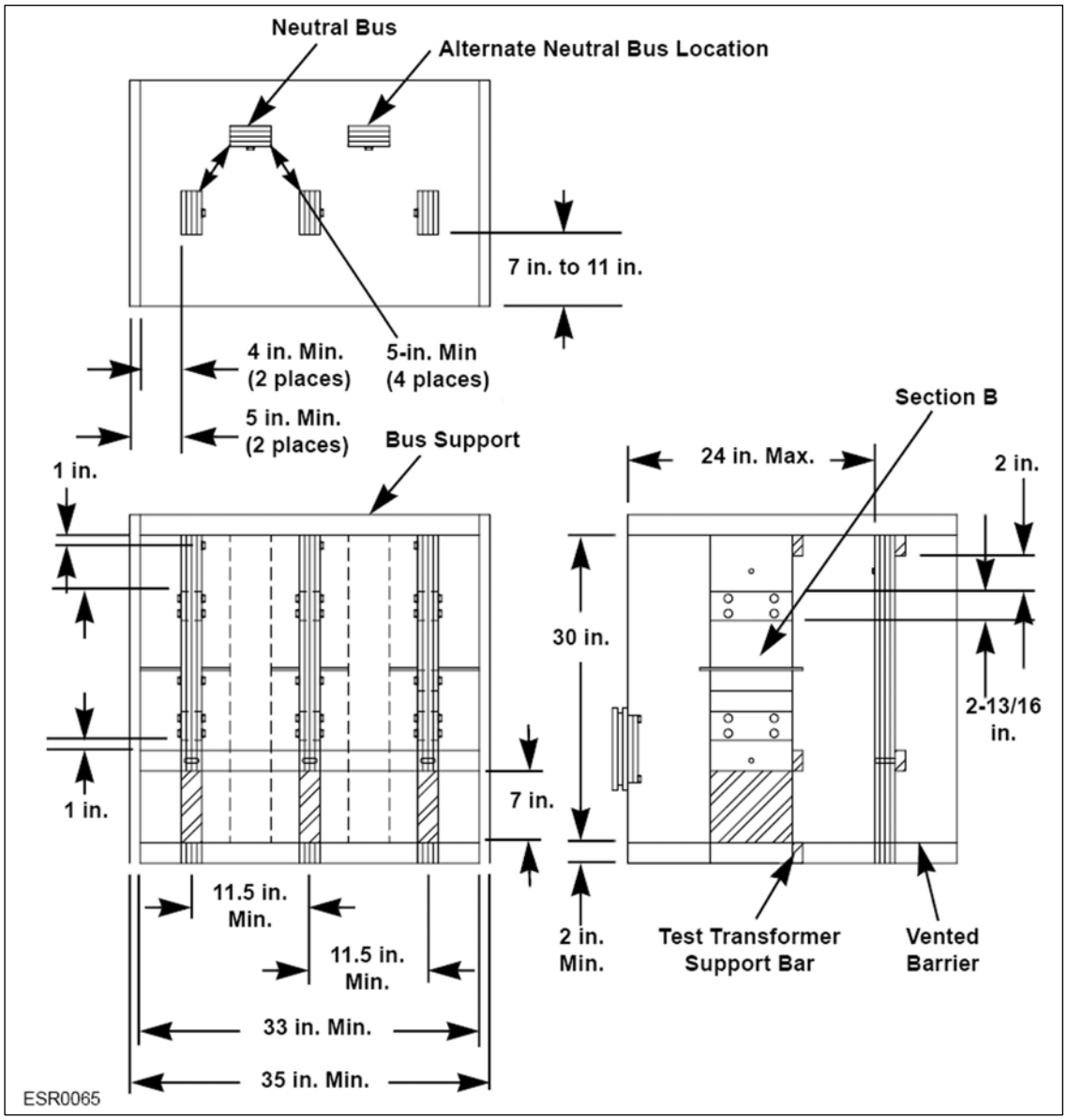

Figure 97: Switchboard Current Transformer Compartment, 1001 to 3000 A, 0 to 600 V, Three-Phase, 4-Wire Service (EUSERC 322)

12 Agricultural and Other Pole-Mounted Services

TOPICS IN THIS SECTION

- *Irrigation Pumping Overhead Metering, Direct Connect*
- *Underground Irrigation Pumping Service Backstop Options*
- *Meter Access Platform in a Flooded Area*

12.1 Irrigation Pumping Overhead Metering, Direct Connect

Follow these requirements when installing an irrigation pumping overhead metering, direct-connect service, such as that shown in **Figure 98**:

- The customer must install the service conductors from the pump termination section to the meter socket, and from the meter socket to the weatherhead.
- Consult PGE for platform requirements.
- For clearance information, see **Table 3** on page 42.
- The pole provided by the customer must be pressure-treated or thermally treated by the manufacturer with an approved American Wood Preservatives Association standardized preservative.
- For pole height, class, and depth requirements, see Section 3.8.2, "Customer-Owned Poles and Guying."
- PGE will bond the down guy to the service neutral and pole ground conductor.
- The down guy must be attached at the weatherhead height.
- The customer must provide and install a minimum 5/16-inch down guy to support the PGE overhead conductor.
- The customer is to provide and install an anchor.
- A 96-inch minimum must be maintained between the mounting studs.

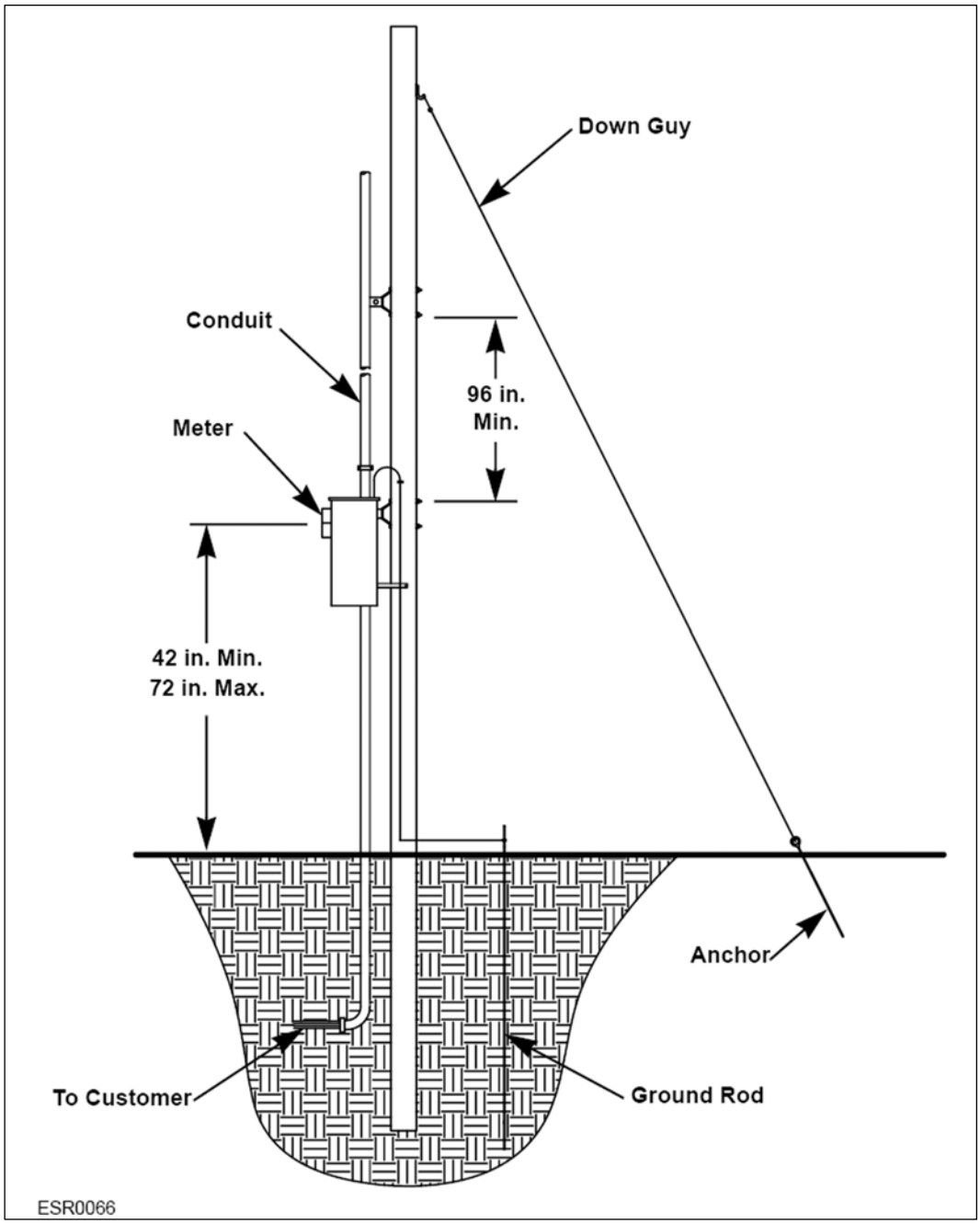

Figure 98: Irrigation Pumping Overhead Metering, Direct Connect

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12.2 Underground Irrigation Pumping Service Backstop Options

Follow these requirements when installing an underground irrigation pumping service backstop, such as the four examples shown in **Figure 99**:

- All hardware must be galvanized or stainless steel.
- All wood posts and poles must be pressure treated or thermally treated by the manufacturer with an approved American Wood Preservatives Association standardized preservative.
- All steel sheets must be 1/8- to 3/8-inch thick galvanized steel.
- All metal pieces must be bonded to the ground conductor.
- 2- x 2-inch galvanized steel posts may be used.
- All posts and poles must be set as follows:
  - 36 inches deep with concrete backfill, *or*
  - 60 inches deep with no concrete backfill.
- The wood posts must be a minimum 4 x 6 inches.
- The wood support must be 2 x 6 inches.
- Wood poles must be 6 inches in diameter.
- All posts and poles must be capped.
- A Unistrut must be installed between the posts or poles to support conduit.
- Both the meter and the disconnect switch must be bolted to the Unistrut.

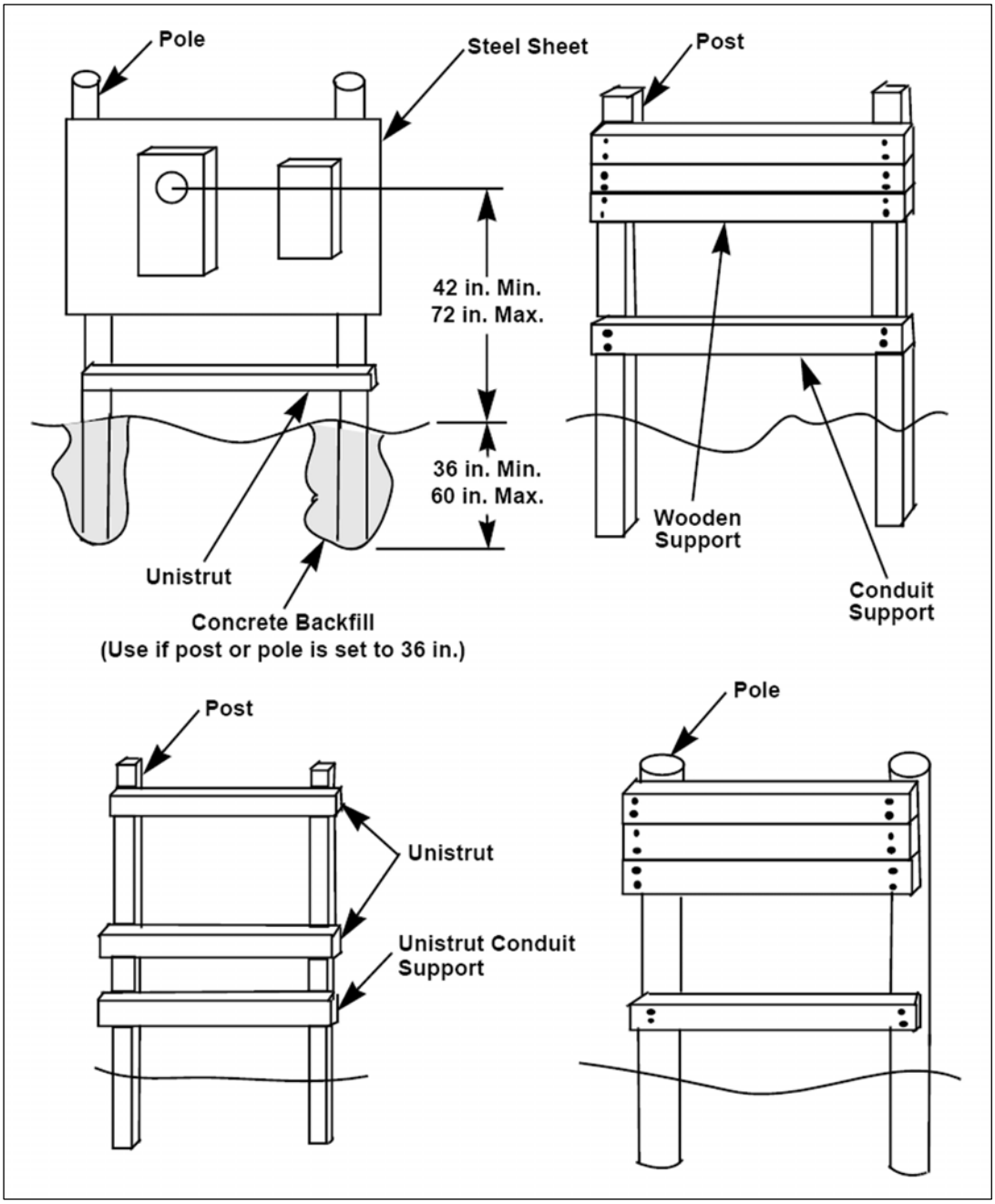


Figure 99: Underground Irrigation Pumping Service Backstop Options

12.3 Meter Access Platform in a Flooded Area

Follow these requirements when installing a meter access platform in a flood area, such as the typical customer-installed platform shown in **Figure 100**:

- PGE requires a clear workspace in front of metering equipment. This workspace must be 78 inches high, at least 48 inches wide, and 48 inches deep.
- PGE and the customer will determine when a platform is required and where it will be located. The platform must be approved by PGE before installation.

  Note: Contact PGE for variations in platform requirements.

- All lumber used to make a platform must be pressure-treated. The customer must pay the cost of construction and must maintain the structural strength of the platform to allow future access.
- The customer is responsible for obtaining permits and use of land associated with a meter access platform.
- The pole must be furnished and installed by the customer.
- The stair run varies with the height of the platform. The handrail stanchions must be equally spaced.
- The customer must ensure that the minimum electrical clearances are maintained from the platform to the service attachment. See **Table 3** on page 42 for a list or required clearances.

IMPORTANT: *PGE will notify the customer if a hazardous situation exists with a meter access platform. The customer will have 60 days to repair the safety or maintenance issue involved. If repairs are not made by the end of this time, the customer's service will be subject to disconnection.*

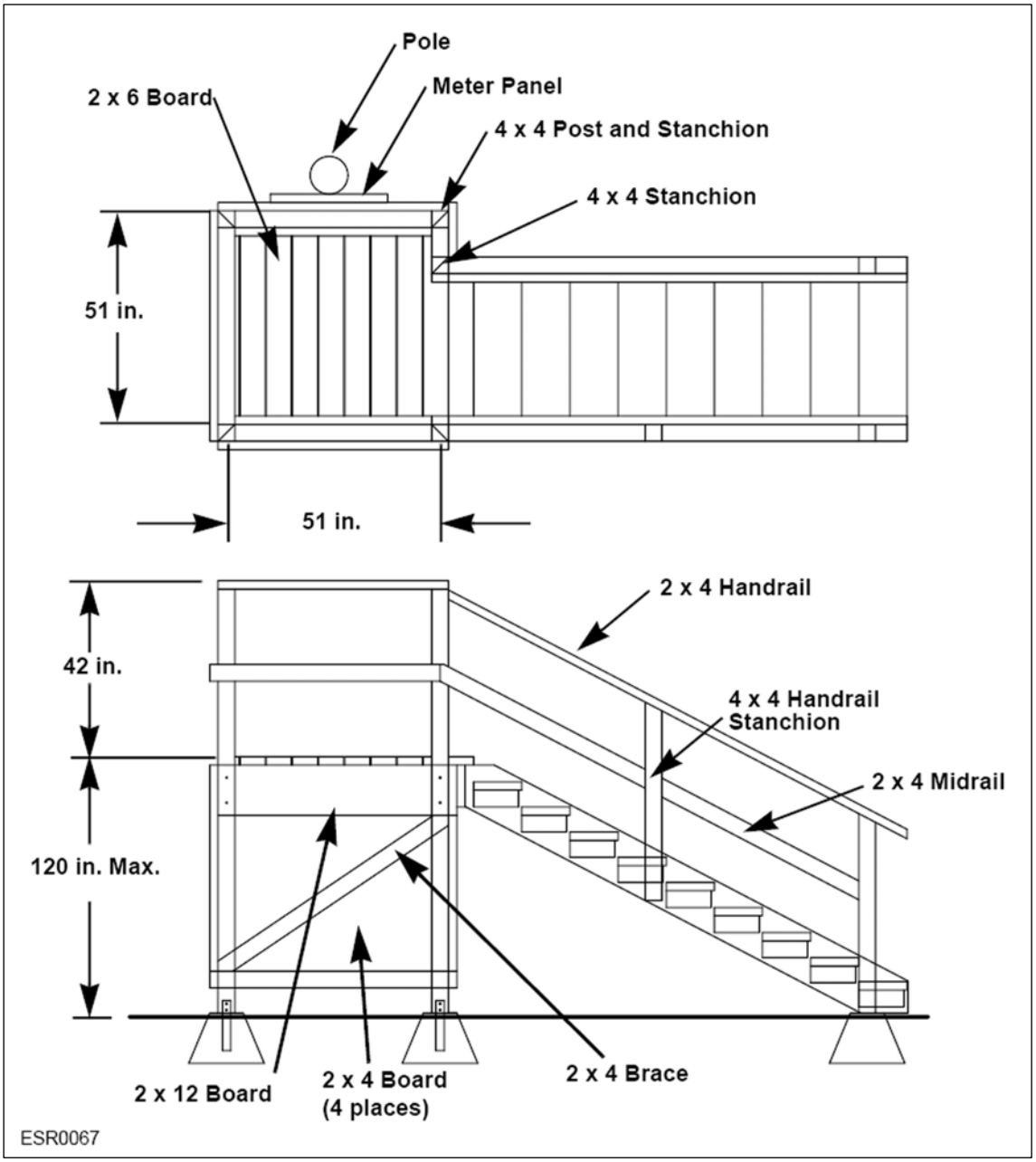


Figure 100: Typical Meter Access Platform

Appendix A Required Files for Service

The information in this appendix applies only to multiple-family and residential developments, commercial and industrial developments, and road improvement projects.

When requesting new service, upgraded service, or road improvement projects in the Portland General Electric (PGE) service territory, PGE requires that specific forms and files be submitted to PGE Service Coordination. The phone and fax numbers for Service Coordination can be found in the *Preliminary Information* section.

The forms for new or upgraded service can be found in Appendix B and Appendix C. The requirements for formatting and submitting electronic files are included here.

1. Submit one of the following forms:
   - *Request for Multi-family and Residential Development*
   - *Request for New Commercial Service*
   - *Request for Upgrade or Relocation of Existing Commercial Service*
2. Send a hard copy of the full set of drawings, along with a cover letter, to the appropriate PGE Regional Design Center:

Gresham	1705 E Burnside St.	Gresham	97030
Portland	3700 SE 17th Ave.	Portland	97202
Southern	4245 Kale St.	Salem	97305
Western	2213 SW 153rd Drive	Beaverton	97003

3. The Design Project Manager (DPM) assigned to your project will provide you with an email address. The PGE email address format is:

   firstname.lastname@pgn.com

4. Provide computer-aided drafting (CAD) files with civil engineering drawings of the site plan and profile. PGE accepts MicroStation version 8 and AutoCAD version 10 and older. PGE will use your files in the original survey coordinate system or datum. Updates to these files are requested at milestones in the project.
5. Include the same layers in the CAD files as are shown on the site plan and profile hard copy. The minimum layers needed are:
   - Survey control points
   - Existing and future street right of way
   - Lot lines
   - Lot numbers
   - Street names
   - Building footprints
   - Curbs
   - Sidewalks
   - Centerlines of streets and roadways
   - Easements
   - Stationing
   - Existing electrical facility locations

6. Make sure that your data meets these requirements:
   - If survey control points are not available in CAD format, PGE software will accept these points in text or Excel file format.
   - If you use nonstandard file and layer naming conventions, provide guidelines for reference.
   - If your data contains attachments—such as aerial imagery—either provide the attachments or delete the files from your reference before submittal.
   - If you send a file that is 90% complete, and later send a file that is 93% complete, it is critical that you let PGE know what has changed. Itemize in an email or on the CAD drawing all data that has changed.
   - If you send multiple files, provide a description of what is included in each file.
7. Submit your files via email. Zipped files are acceptable, but executable (*.exe) files are not.

   Note: Contact your PGE Project Manager for approved file transfer methods if your files are too large to transfer using e-mail.

8. For road construction projects, specify the datum of the file sent. PGE uses North Oregon State Plane (NAD83, international ft.). If there is a local datum plane (LDP), provide the conversion factor.

Appendix B Single-Family and Multiple-Family Service

Obtaining New Single-Family Residential Electric Service

Customer Responsibilities

1. Obtain building and electrical permits from the appropriate city, county, or other jurisdiction. Obtain easements and tree-trimming permits if required.
2. Complete the appropriate version of the *Request for Single-Family Residential Service* form: Design or Non-Design.

   For an example of the Design version of the form, see **Figure 102** and **Figure 103**. You can fill out the form online or download a PDF version if you go here:

   https://www.portlandgeneral.com/construction/request-for-single-family-residential-service-design

   The Non-Design version of the form is available online only. To fill out this form, go here:

   https://www.portlandgeneral.com/construction/request-for-single-family-residential-service-non-design

   If you are not sure which version of the form you need, an online aid can help you decide if you go here:

   https://www.portlandgeneral.com/construction/request-for-single-family-residential-service-non-design
3. Provide a hard copy of the scaled plot or site plan that was submitted for the building permit. New connected load data that is not accompanied by a site plan may delay initiation of service. **Figure 101** on page 160 shows an example plot/site plan.
4. All pertinent documents, such as the signed *Line Extension Cost Agreement*, permits, or easements—as well as any money owed to PGE—must be received by PGE ***before*** the final inspection of your service by PGE and before a PGE line crew will be scheduled to connect your service.
5. Before digging a trench, contact the Design Project Manager (DPM) for design approval.
6. All costs associated with digging trenches, installing pads, vaults, conduit, handling road crossings, and permits are the responsibility of the customer.
7. Right-of-way excavation requires a permit. A PGE-approved contractor may be required. Contact the DPM for further information.
8. Arrange a preconstruction meeting between the excavation contractor and PGE at the job site.
9. Request an inspection by PGE and obtain PGE approval of the trench, conduit, and vault before backfilling.
10. After passing the appropriate municipal electrical inspection, request an inspection by PGE by contacting a Service Coordinator at 800-542-8818 or (in the Portland metro area) 503-323-6700.

    IMPORTANT: *PGE **will not** energize the service until all inspections have been performed.*

11. Contact the Oregon Utility Notification Center (OUNC) for the location of underground utilities. Call 8-1-1 or 800-332-2344; or visit callbeforeyoudig.com. In the Portland metro area, call 503-246-6699.

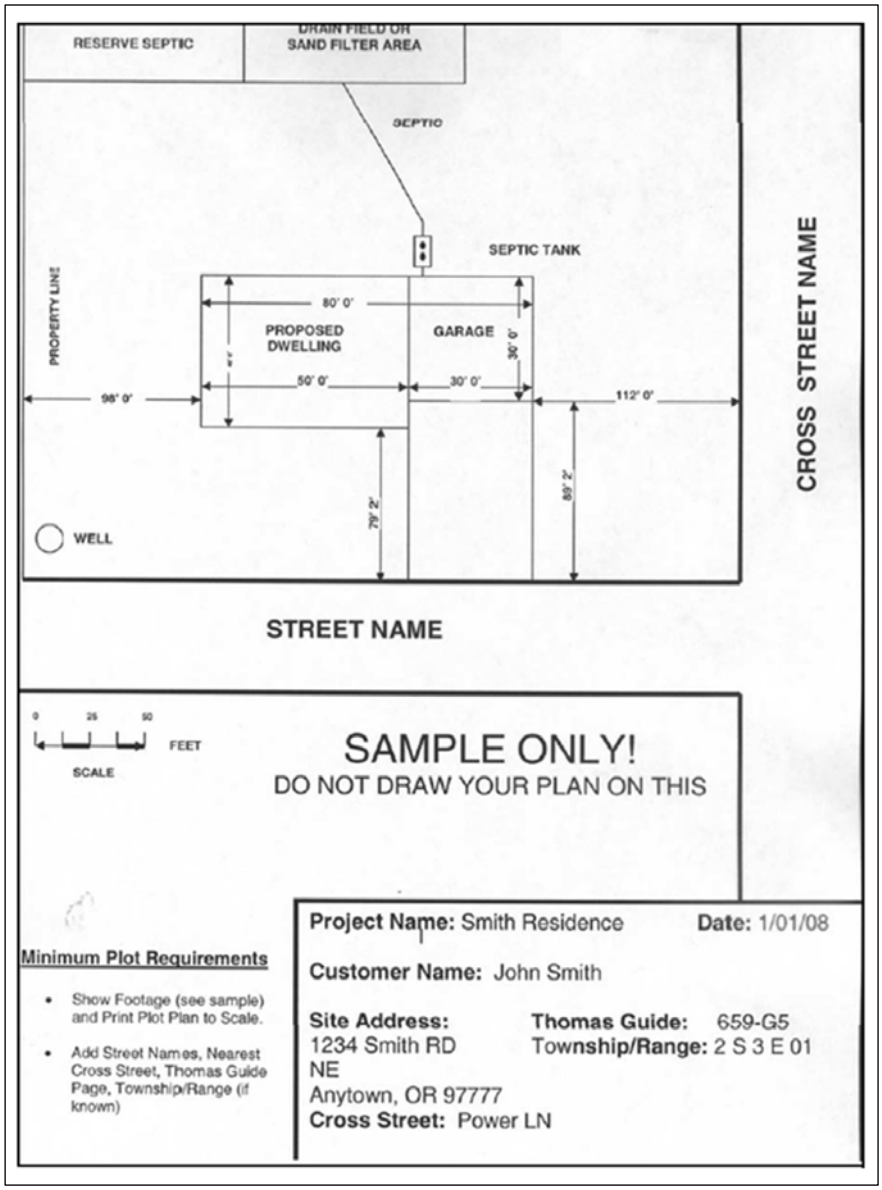


Figure 101: Example Plot/Site Plan

PGE Responsibilities

1. PGE will prepare an installation design and determine the customer costs owed to PGE (if any). Allow 60 days for preparation of an installation design.
2. PGE will inspect all electrical services, trenches, conduits, and vault systems.
3. PGE will schedule the connection of service after all customer responsibilities have been met.

Request Form

This section shows the hard-copy version of the Design version of the *Request for Single-Family Residential Service* form.

Request for Single-Family Residential Service

Fill out all fields. If the field is not applicable, enter N/A.

Date (mm-dd-year) _____

PGE Work Request No. _____

Permit No. _____

Customer/Applicant

Name _____

Service address _____

City _____ State _____ Zip _____

Email address _____

Nearest cross street _____

Legal description _____

(tax lot number, lot number, block number)

Billing Information (for construction costs only)

Name _____

Company name _____

Mailing address _____

City _____ State _____ Zip _____

Email address _____

Contact person _____

Phone number(s) _____

Existing customer account number (if applicable) _____

Contact Information (if different from billing information)

Name _____

Company name _____

Mailing address _____

City _____ State _____ Zip _____

Email address _____

Contact person _____

Phone number(s) _____

Figure 102: Request for Single-Family Residential Service (Design), Page 1

Single-Family Service Information

Square footage of house _____ square feet

New permanent service size: Amps _____ Voltage _____

Overhead or Underground (circle one)

Estimated connection date of permanent service (mm-dd-year) _____

Is temporary service required? Yes _____ No _____

If service exists:

Customer account number _____

Meter number _____

Overhead to underground conversion? Yes _____ No _____

Upgrade and/or relocation of existing service? (circle one or both)

Existing size in amps _____

Requested size in amps _____

New Connected Load	
Customer Load	**Energy Source**
Water heater	Electric _____ or Gas _____
Range	Electric _____ or Gas _____
Space heater/furnace; enter kW if electric	Electric _____ kW or Gas _____
Air conditioning (AC) or heat pump (HP)? (circle one)	Tons _____ Locked rotor amps _____
Number of AC or HP units	_____
Electric vehicle (EV) charging unit?	Yes _____ kW No _____
Other loads (such as pump and hot tub)	_____ kW

NOTE: When inadequate or inaccurate information results in design changes, the cost will be borne by the property owner or electrician.

Site grading, utility, and landscaping plans are required to complete the PGE electrical design.

Hard copies of the service request form, scaled plot or site plan, and building footprint may be mailed to 7800 SW Mohawk St., Tualatin, OR 97062. See *Appendix A, Required Files for Service*. Contact a Service Coordinator at 503-323-6700 or 800-542-8818; files may be faxed to 503-612-3501.

Figure 103: Request for Single-Family Residential Service (Design), Page 2

Obtaining Multiple-Family and Residential Development Electric Service

Customer Responsibilities

1. Obtain building and electrical permits from the appropriate city, county, or other jurisdiction. Obtain easements and tree-trimming permits if required.
2. Complete the *Request for Multi-family and Residential Development Service* form. For an example of this form, see **Figure 104** and **Figure 105**. You can fill out the form online or download a PDF version if you go here:

   https://www.portlandgeneral.com/construction/request-for-multifamily-and-residential-development
3. Provide a hard copy of the scaled plot or site plan that was submitted for the building permit. The site plan must show the preferred ground level service and meter locations. Include the electrical room(s) and metering equipment specifications, if applicable. A full-size set of drawings and CAD files must be submitted. See Appendix A *Required Files for Service*.
4. If applicable, check the local jurisdiction for streetlight requirements.
5. All pertinent documents, such as the signed *Line Extension Cost Agreement*, permits, and easements—as well as any money owed to PGE—must be received by PGE ***before*** the final inspection of your service by PGE and before a PGE line crew will be scheduled to connect your service.
6. Before digging a trench, contact the Design Project Manager (DPM) for design approval.
7. All costs associated with digging trenches, installing pads, vaults, conduit, handling road crossings, and permits are the responsibility of the customer.
8. Right-of-way excavation must be performed by a PGE-approved contractor. Contact the DPM for further information.
9. Arrange a preconstruction meeting between the excavation contractor and PGE at the job site.
10. Request an inspection by PGE and obtain PGE approval of the trench, conduit, and vault before backfilling.
11. After passing the appropriate municipal electrical inspection, request an inspection by PGE by contacting a Service Coordinator at 800-542-8818 or (in the Portland metro area) 503-323-6700.

    IMPORTANT: *PGE **will not** energize the service until all inspections have been performed.*
12. Contact the Oregon Utility Notification Center (OUNC) for the location of underground utilities. Call 8-1-1 or 800-332-2344; or visit callbeforeyoudig.org. In the Portland metro area, call 503-246-6699.

PGE Responsibilities

1. PGE will prepare an installation design and determine the customer costs owed to PGE (if any). Allow 60 days for preparation of an installation design.
2. PGE will inspect all electrical services, trenches, conduits, and vault systems.
3. PGE will schedule the connection of service after all customer responsibilities have been met.

Request Forms

This section shows the hard-copy version of the *Request for Multi-Family and Residential Development Service* form.

Portland General Electric

Request for Multifamily and Residential Development Service

Fill out all fields. If the field is not applicable, enter N/A.

Date (mm-dd-year) _____

PGE Work Request No. _____

Permit No. _____

Customer/Applicant

Name _____

Service address _____

City _____ State _____ Zip _____

Email address _____

Nearest cross street _____

Legal description _____
(tax lot number, lot number, block number)

Billing Information (for construction costs only)

Name _____

Company name _____

Mailing address _____

City _____ State _____ Zip _____

Email address _____

Contact person _____

Phone number(s) _____

Existing customer account number (if applicable) _____

Contact Information (if different from billing information)

Name _____

Company name _____

Mailing address _____

City _____ State _____ Zip _____

Email address _____

Contact person _____

Phone number(s) _____

Figure 104: Request for Single-Family Residential Service, Page 1

Multifamily Service Information

Type of dwelling: Subdivision Minor partition Manufactured home park (circle one)
Number of lots _____
Apartment Condominium Row house Town house (circle one)
Number of units _____
Number of individual services _____
Number of buildings _____
Apartments per unit _____ Service size _____ amps
Square feet per unit _____ Service voltage _____
Estimated connection date of permanent service (mm-dd-year) _____

Service type: Overhead or Underground (circle one)
If service exists: Conversion or Relocation (circle one)
Is streetlighting required? If so... Quantity _____ Type _____

New Connected Load	
Customer Load	**Energy Source**
Lighting	Electric _____
Water heater	Electric _____ or Gas _____
Range	Electric _____ or Gas _____
Space heater/furnace; enter kW if electric	Electric _____ kW or Gas _____
Air conditioning (AC) or heat pump (HP)? (circle one)	Tons _____ Locked rotor amps _____
Number of AC or HP units	_____
Largest motor	_____
Electric vehicle (EV) charging unit?	Yes _____ kW No _____
Number of EV units	_____
Other loads (such as pump and hot tub)	_____ kW

For mixed-use development a separate *Request for New Commercial Service* form must be submitted for the nonresidential load.

NOTE: When inadequate or inaccurate information results in design changes, the cost will be borne by the property owner or electrician.

Site grading, utility, and landscaping plans are required to complete the PGE electrical design.

Hard copies of the service request form, scaled plot or site plan, and building footprint may be mailed to 7800 SW Mohawk St., Tualatin, OR 97062. See *Appendix A, Required Files for Service*. Contact a Service Coordinator at 503-323-6700 or 800-542-8818; files may be faxed to 503-612-3501.

Figure 105: Request for Multi-Family and Residential Development Service, Page 2

Appendix C Commercial Service

Obtaining New Commercial Electric Service

Customer Responsibilities

1. Obtain building permits and electrical permits from the appropriate city, county, or other jurisdiction. Obtain easements and tree-trimming permits if required.
2. Complete the *Request for New Commercial Service* form. For an example of this form, see **Figure 106** and **Figure 107**. You can fill out the form online or download a PDF version if you go here:

   https://www.portlandgeneral.com/construction/request-for-new-commercial-service
3. Provide a hard copy of the scaled plot or site plan that was submitted for the building permit. The site plan must show the preferred ground level service and meter locations. Include the electrical room(s) and metering equipment specifications, if applicable. See Appendix A *Required Files for Service*.
4. Check the local jurisdiction for streetlight requirements.
5. All pertinent documents, such as the signed *Line Extension Cost Agreement*, permits, and easements—as well as any money owed to PGE—must be received by PGE ***before*** the final inspection of your service by PGE and before a PGE line crew will be scheduled to connect your service.
6. Before digging a trench, contact the Design Project Manager (DPM) for design approval.
7. All costs associated with digging trenches, installing pads, vaults, conduit, handling road crossings, and permits are the responsibility of the customer.
8. Right-of-way excavation must be performed by a PGE-approved contractor. Contact the DPM for further information.
9. Arrange a preconstruction meeting between the excavation contractor and PGE at the job site.
10. Request an inspection by PGE and obtain PGE approval of the trench, conduit, and vault before backfilling.
11. After passing the appropriate municipal electrical inspection, request an inspection by PGE by contacting a Service Coordinator at 800-542-8818 or (in the Portland metro area) 503-323-6700.

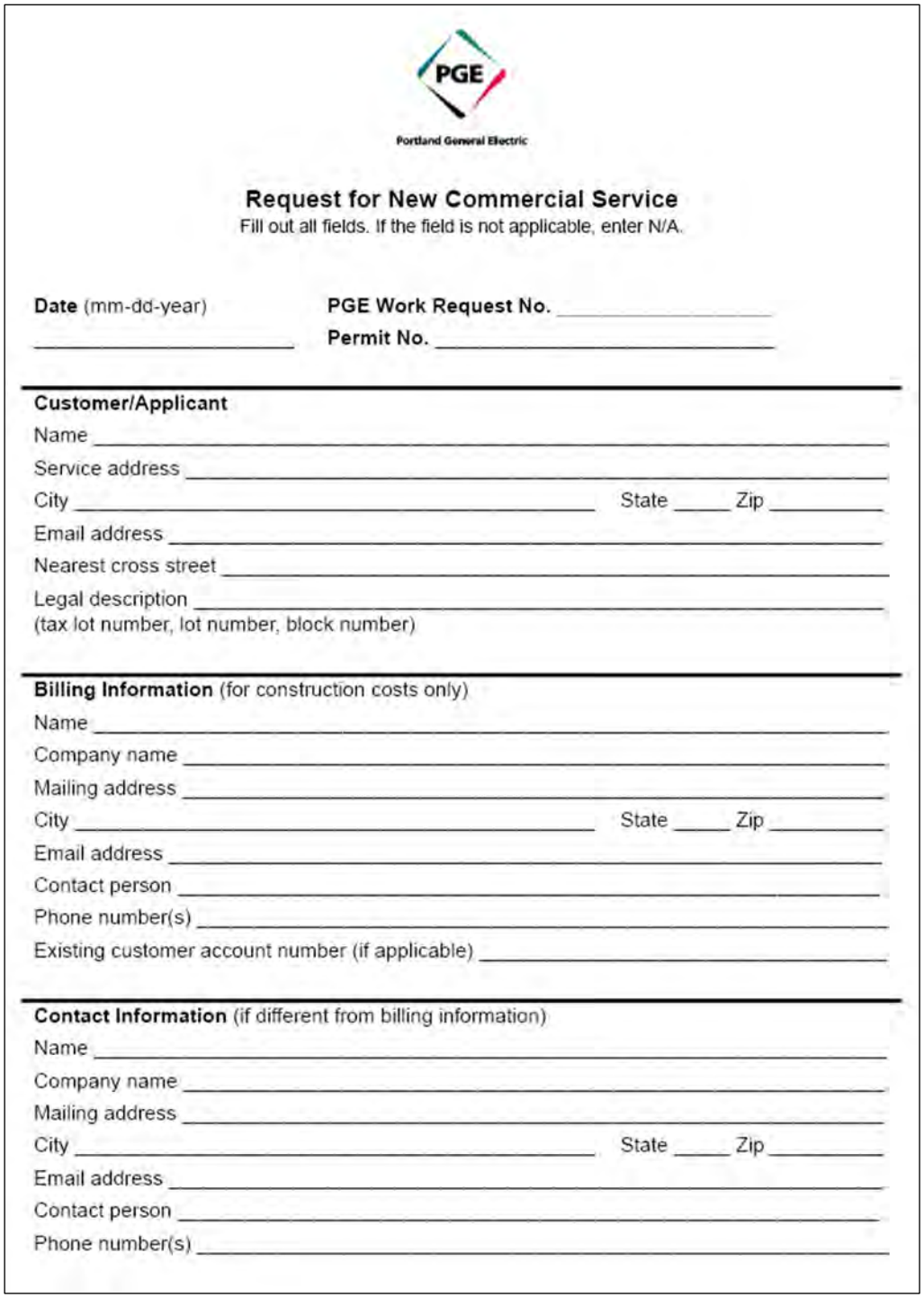
    IMPORTANT: *PGE **will not** energize the service until all inspections have been performed.*
12. Contact the Oregon Utility Notification Center (OUNC) for the location of underground utilities. Call 8-1-1 or 800-332-2344; or visit callbeforeyoudig.org. In the Portland metro area, call 503-246-6699.

PGE Responsibilities

1. PGE will prepare an installation design and determine the customer costs owed to PGE (if any). Allow 60 days for preparation of an installation design.
2. PGE will inspect all electrical services, trenches, conduits, and vault systems.
3. PGE will schedule the connection of service after all customer responsibilities have been met.

Request Forms

This section shows the hard-copy version of the *Request for New Commercial Service* form.



Portland General Electric

Request for New Commercial Service

Fill out all fields. If the field is not applicable, enter N/A.

Date (mm-dd-year) _____

PGE Work Request No. _____

Permit No. _____

Customer/Applicant

Name _____

Service address _____

City _____ State _____ Zip _____

Email address _____

Nearest cross street _____

Legal description _____
(tax lot number, lot number, block number)

Billing Information (for construction costs only)

Name _____

Company name _____

Mailing address _____

City _____ State _____ Zip _____

Email address _____

Contact person _____

Phone number(s) _____

Existing customer account number (if applicable) _____

Contact Information (if different from billing information)

Name _____

Company name _____

Mailing address _____

City _____ State _____ Zip _____

Email address _____

Contact person _____

Phone number(s) _____

Figure 106: Request for New Commercial Service, Page 1

New Commercial Service Information

Type of business: Office Food store Medical office/Health care facility Restaurant
Retail Warehouse (circle one) Other ☐

Operating hours: One shift Two shifts Continuous (circle one) Other _____

Service size: Amps _____ Voltage _____

Overhead or Underground (circle one)

Single-phase or Three-phase (circle one)

Estimated connection date of permanent service (mm-dd-year) _____

Is temporary service required? Yes _____ No _____

Is streetlighting required? If so... Quantity _____ Type _____

New Connected Load

Load Type	Load[1]		
	Single-Phase (kW)	Three-Phase (kW)	Connected (kW)
Lighting			
Receptacles			
Water heater			
Cooking			
Electric heat			
Refrigeration/HVAC			
Largest size	_____ tons		
Motors[2]			
Largest size and locked rotor amps (LRA)	_____ kW	_____ LRA	
Welders			
Largest size	_____ kW		
Computers			
Elevators			
Electric vehicle (EV) charging unit			
Number of EV units			
Other loads			
Total connected kW			

1. Typical conversion factor: 1 hp = 1 kW; 1 ton = 1 kW
2. Motors that are 10 hp or larger may be required to be equipped with reduced voltage starters.

NOTE: When inadequate or inaccurate information results in design changes, the cost will be borne by the property owner or electrician.

Site grading, utility, and landscaping plans are required to complete the PGE electrical design.

Hard copies of the service request form, scaled plot or site plan, and building footprint may be mailed to 7800 SW Mohawk St., Tualatin, OR 97062. See *Appendix A, Required Files for Service*. Contact a Service Coordinator at 503-323-6700 or 800-542-8818; files may be faxed to 503-612-3501.

Figure 107: Request for New Commercial Service, Page 2

Upgrade or Relocation of Existing Commercial Electric Service

Customer Responsibilities

1. Obtain building and electrical permits from the appropriate city, county, or other jurisdiction. Obtain easements and tree-trimming permits if required.
2. Complete the *Request for Upgrade or Relocation of Existing Commercial Service* form. For an example of this form, see **Figure 108** and **Figure 109**. You can fill out the form online or download a PDF version if you go here:

   https://www.portlandgeneral.com/construction/request-for-upgrade-or-relocation-of-existing-commercial-service
3. Provide a hard copy of the scaled plot or site plan that was submitted for the building permit. The site plan must show the preferred ground level service and meter locations. Include the electrical room(s) and metering equipment specifications, if applicable. See Appendix A *Required Files for Service*.
4. All pertinent documents, such as the signed *Line Extension Cost Agreement*, permits, and easements—as well as any money owed to PGE—must be received by PGE prior to the final inspection of the service by PGE and before a PGE line crew can be scheduled to connect your service.
5. Before digging a trench, contact the Design Project Manager (DPM) for design approval.
6. All costs associated with digging trenches, installing pads, vaults, conduit, handling road crossings, and permits are the responsibility of the customer.
7. Right-of-way excavation must be performed by a PGE-approved contractor. Contact the DPM for further information.
8. Arrange a preconstruction meeting between the excavation contractor and PGE at the job site.
9. Request an inspection by PGE and obtain PGE approval of the trench, conduit, and vault before backfilling.
10. After passing the appropriate municipal electrical inspection, request an inspection by PGE by contacting a Service Coordinator at 800-542-8818 or (in the Portland metro area) 503-323-6700.

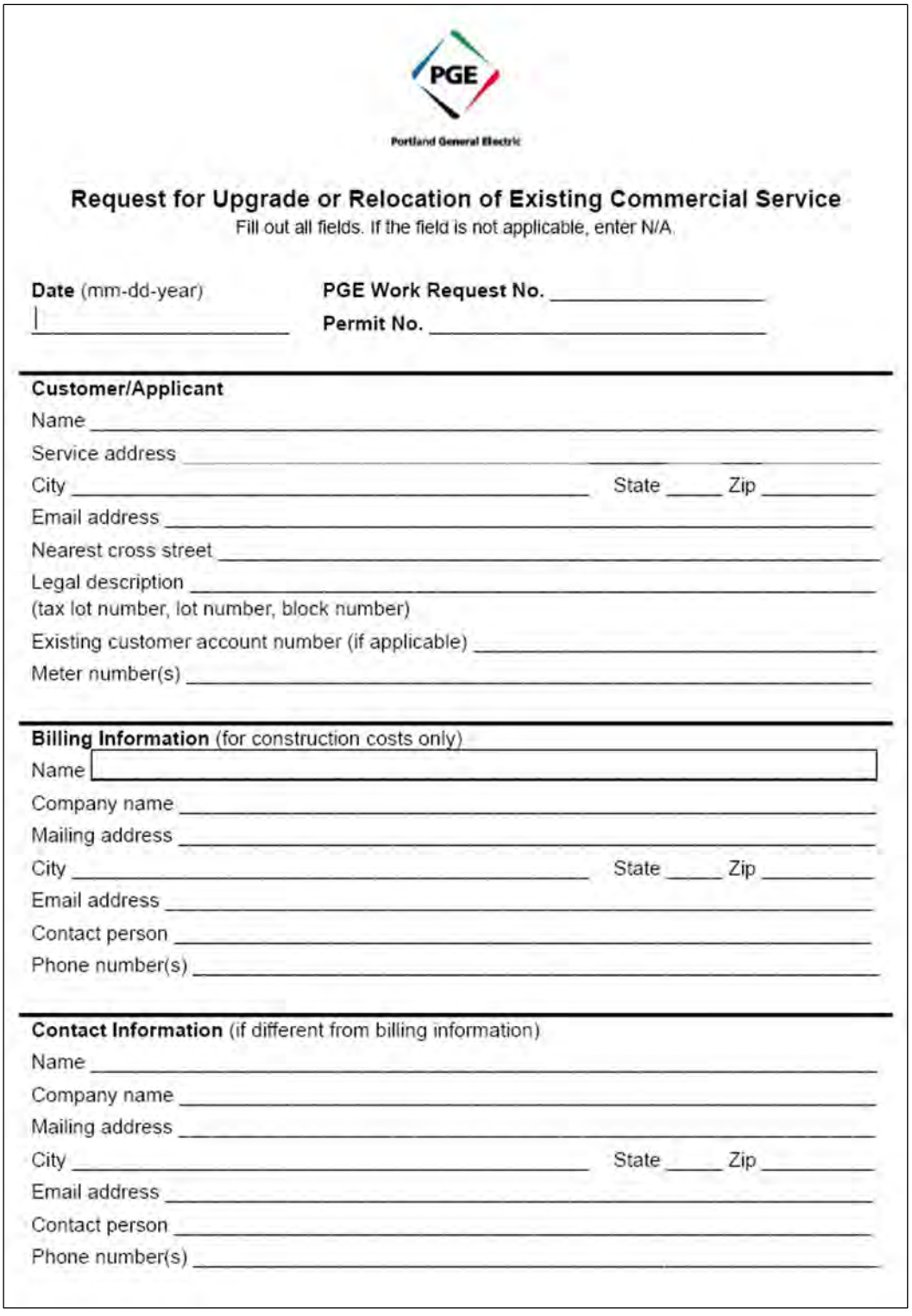
    IMPORTANT: *PGE **will not** energize the service until all inspections have been performed.*
11. Contact the Oregon Utility Notification Center (OUNC) for the location of underground utilities. Call 8-1-1 or 800-332-2344; or visit callbeforeyoudig.org. In the Portland metro area, call 503-246-6699.

PGE Responsibilities

1. PGE will prepare an installation design and determine the customer costs owed to PGE (if any). Allow 60 days for preparation of an installation design.
2. PGE will inspect all electrical services, trenches, conduits, and vault systems.
3. PGE will schedule the connection of service after all customer responsibilities have been met.

Request Form

This section contains the hard-copy version of the *Request for Upgrade or Relocation of Existing Commercial Service* form.



Portland General Electric

Request for Upgrade or Relocation of Existing Commercial Service

Fill out all fields. If the field is not applicable, enter N/A.

Date (mm-dd-year) _____

PGE Work Request No. _____

Permit No. _____

Customer/Applicant

Name _____

Service address _____

City _____ State _____ Zip _____

Email address _____

Nearest cross street _____

Legal description _____
(tax lot number, lot number, block number)

Existing customer account number (if applicable) _____

Meter number(s) _____

Billing Information (for construction costs only)

Name _____

Company name _____

Mailing address _____

City _____ State _____ Zip _____

Email address _____

Contact person _____

Phone number(s) _____

Contact Information (if different from billing information)

Name _____

Company name _____

Mailing address _____

City _____ State _____ Zip _____

Email address _____

Contact person _____

Phone number(s) _____

Figure 108: Request for Upgrade or Relocation of Existing Commercial Service, Page 1

Upgrade or Relocation of Existing Service Information

Existing size: Amps _____ Voltage _____
Overhead or Underground (circle one)
Single-phase or Three-phase (circle one)
Estimated connection date of permanent service (mm-dd-year) _____
Is temporary service required? Yes _____ No _____

Requested size: Amps _____ Voltage _____
Overhead or Underground (circle one)
Single-phase or Three-phase (circle one)

New Connected Load

Load Type	Load[1]		
	Single-Phase (kW)	Three-Phase (kW)	Connected (kW)
Lighting			
Receptacles			
Water heater			
Cooking			
Electric heat			
Refrigeration/HVAC			
Largest size	_____ tons		
Motors[2]			
Largest size and locked rotor amps (LRA)	_____ kW	_____ LRA	
Welders			
Largest size	_____ kW		
Computers			
Elevators			
Electric vehicle (EV) charging unit			
Number of EV units			
Other loads			
Total connected kW			

1. Typical conversion factor: 1 hp = 1 kW; 1 ton = 1 kW
2. Motors that are 10 hp or larger may be required to be equipped with reduced voltage starters.

NOTE: When inadequate or inaccurate information results in design changes, the cost will be borne by the property owner or electrician.

Site grading, utility, and landscaping plans are required to complete the PGE electrical design.

Hard copies of the service request form, scaled plot or site plan, and building footprint may be mailed to 7800 SW Mohawk St., Tualatin, OR 97062. See *Appendix A, Required Files for Service*. Contact a Service Coordinator at 503-323-6700 or 800-542-8818; files may be faxed to 503-612-3501.

Figure 109: Request for Upgrade or Relocation of Existing Commercial Service, Page 2

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