Electric Service Requirements

ESR

January 2022

PGE

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Information in this document is accurate at the time of publication but is subject to change without notice.

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

Cover image: Residential construction in Salem. (Photo: Marie Mendez Nunez)

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About This Book

This 2022 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 replaces all earlier editions. All new and updated content in this book is highlighted in gray, just like this paragraph. If changes have been made to a figure, the figure's caption 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. This book may require different electrical equipment specifications than have been previously accepted in PGE service areas.

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.*

Construction lead time varies with workload. Contact a PGE Service Coordinator as early in your design process as possible. You'll find contact information " on page 15.

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 is subject to change without notice. While requirements 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.

PGE Contact Information

Phone Numbers

Contact	Phone Number		
	Toll-Free	Local	Fax
Service Coordination *To open a new request for service or schedule a final inspection*	800-822-1077	503-323-6700	503-612-3501
Customer Service *To request billing and payment information for existing accounts*	800-542-8818	503-228-6322	0151
Tree Trimming	800-544-1794	503-736-5460	—
Oregon Utility Notification Center *To locate underground utility cables*	8-1-1 or 800-332-2344	503-246-6699	—
Outages and Emergencies, 24 hours *To report a power outage*	800-544-1795	503-464-7777	—
Light Out (streetlights) *To report a streetlight problem*	800-544-1795	503-464-7777	—
Energy Theft Hotline *To report an energy theft*	800-962-8184	—	—
Interconnection Team *To obtain information on customer-owned solar and wind systems, and on batteries*	503-464-8100	—	—

Email Addresses

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

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 7** on page 68 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 19** on page 118 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 5.2, "Meter Location Criteria."

Table continues on next page

Error	Requirement
Overhead	
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 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 5.2, "Meter 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.

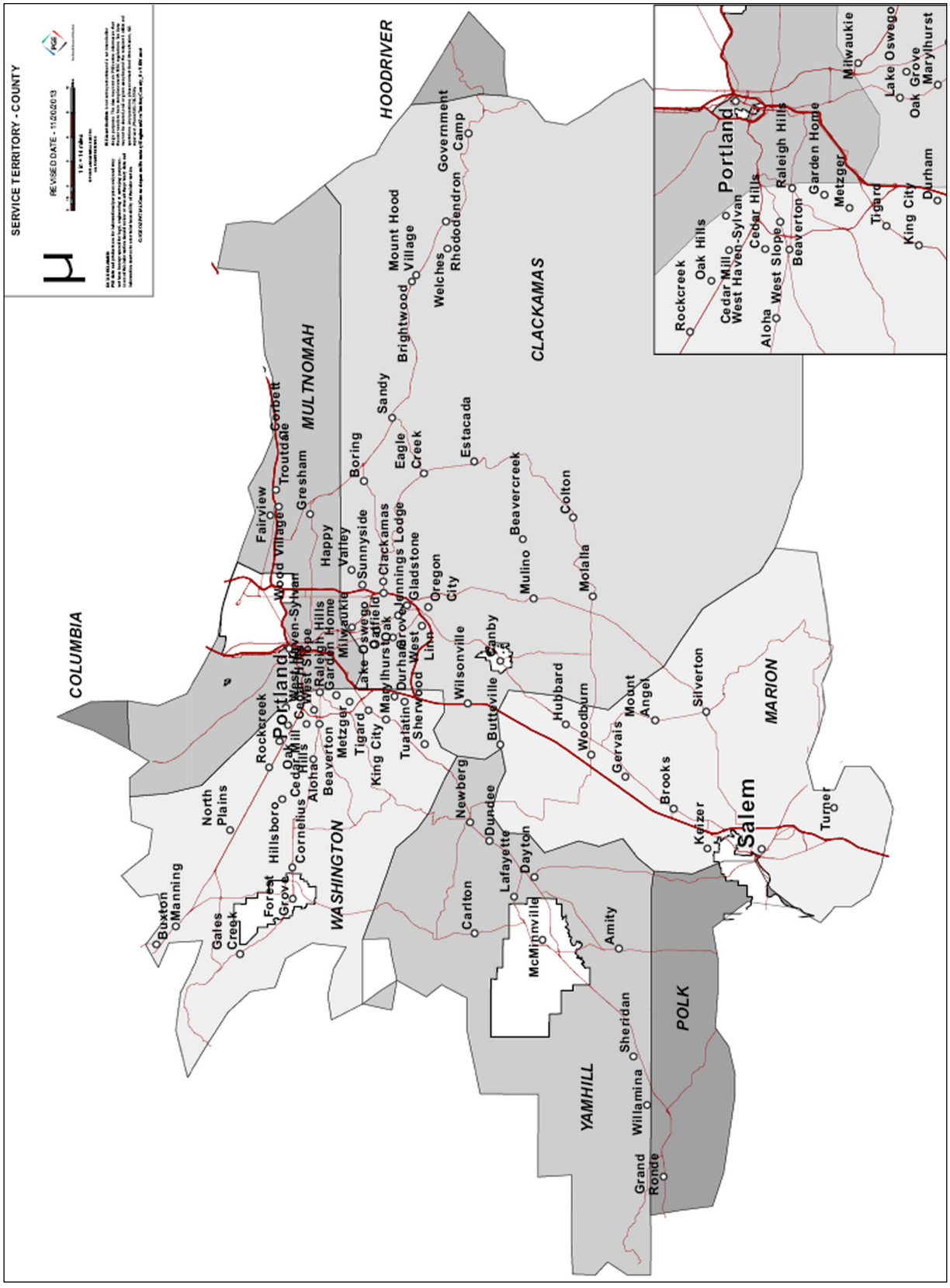
Bypass	A method that allows for service continuity to the customer while the meter is removed for test or inspection.
Chamfered	The smoothing of internal rough edges of factory- or field-cut conduits to prevent damage to PGE underground conductors when pulled into the conduit.
Current transformer	A transformer 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).
Easement	The non-possessory right to enter onto and use the real property of another for a specific purpose. Easements are typically perpetual and run with the land. PGE frequently requires an easement for use of private or public property for the construction, operation, and maintenance of its power and power-related electrical facilities. These include poles, overhead and underground lines, transformers, vaults, guy wires and anchors.
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.
Permit	The granting of a temporary right to use the property of another for a specific limited purpose. Permits are often granted for specified periods of time. They are subject to revocation and are generally non-transferrable.
PGE	Portland General Electric.
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.
Right of way	The right to pass over a parcel of land, usually to and from another piece of land. These rights are usually granted by cities, counties, or other governmental bodies for public travel.

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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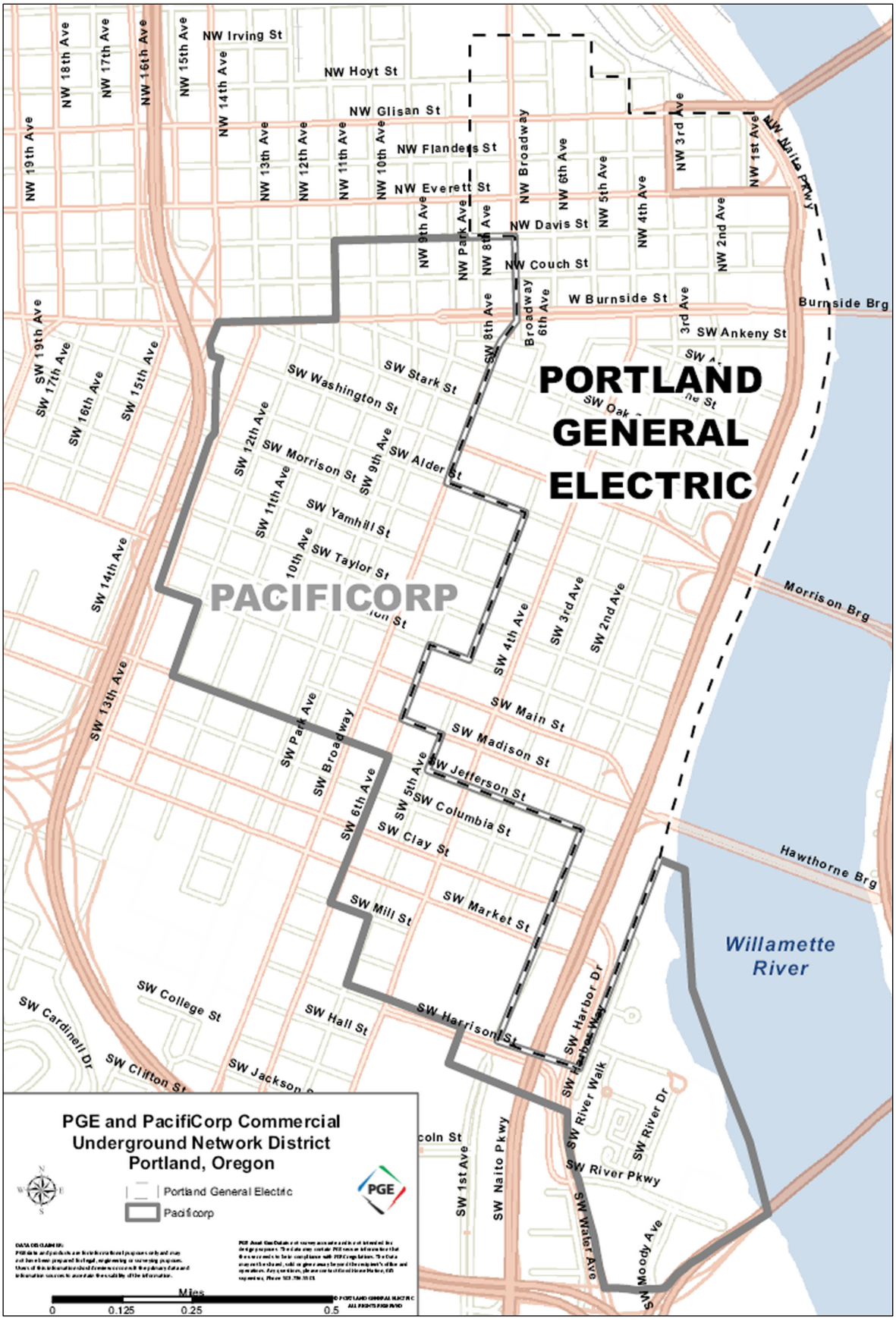
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NW Hoyt St
NW Glisan St
NW Flanders St
NW Everett St
NW Davis St
NW Couch St
W Burnside St
SW Ankeny St
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SW Washington St
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SW Alder St
SW Yamhill St
SW Taylor St
SW Main St
SW Madison St
SW Jefferson St
SW Columbia St
SW Clay St
SW Market St
SW Mill St
SW Harrison St
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SW College St
SW Clifton St
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NW 1st Ave
NW Naito Pkwy
Burnside Brg
Morrison Brg
Hawthorne Brg
SW Harbor Dr
SW Harbor Way
SW River Walk
SW River Dr
SW River Pkwy
SW Naito Pkwy
SW 1st Ave
SW Water Ave
SW Moody Ave
SW Cardinell Dr
PGE and PacifiCorp Commercial Underground Network District
Portland, Oregon
Portland General Electric
Pacificorp
PGE
Miles
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0.25
0.5

1 General Requirements

TOPICS IN THIS SECTION

1.1 *Charges*

Electric service is supplied to the customer under the rates, rules, regulations, and marketing programs approved by PGE's Tariff. Rates for residential, commercial, and industrial customers are determined based on the type of customer and the amount of energy used at the site. Services usually have a monthly basic charge and fees based on the amount of electricity used. PGE's Service Coordination team (Service.coordinators@pgn.com) can assist you in determining the rate schedule for a new or upgraded service. See the PGE tariffs at PortlandGeneral.com for a complete list of rate schedules.

1.2 *You, Our Customer*

1.2.1 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 "Errors That May Cause PGE to Turn Down a Request for Electric Service" on page 14.*

1.2.2 Customer Responsibilities

1.2.2.1 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.

1.2.2.2 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.

1.2.2.3 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.

1.2.2.4 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 5.6.8, "Barrier Posts."

1.2.2.5 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.

1.2.2.6 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. Common problems caused by landscaping and fencing are shown in **Figure 1**. 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*.

Figure 1: Typical Landscaping Problems

1.2.2.7 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.

1.2.3 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.

1.2.4 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.

1.2.4.1 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.

1.2.4.2 Single-Family Residential, 201 A and Higher

For single-family residences with services that are 201 V 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.

1.2.4.3 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.

1.2.4.4 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.

1.2.5 Work Activity 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's Service Coordination team (service.coordinators@pgn.com) 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.

1.2.6 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.

1.2.7 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.

1.2.8 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.

1.2.9 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.

1.2.10 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.

For more information on power quality, call PGE at 503-736-5750 or send an email to TCC.Power.Quality@pgn.com.

1.2.11 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 microprocessors.

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.

1.2.12 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%.

1.3 *Motors*

To discuss the addition of a new motor to an existing service, send an email to PGE's Service Coordination team at service.coordinators@pgn.com.

1.3.1 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.

1.3.2 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.

1.3.3 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 1.2.10, "Power Quality." Contact PGE for further information.

Note: When installing an ASD controller, contact PGE's Service Coordination team (service.coordinators@pgn.com) to determine whether the controller is affected by the pole-top reclosers.

1.4 *Customer Generation (Generators, Solar, Wind, and Other Qualifying Resources)*

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

This section provides basic information about PGE's standards and requirements for interconnecting, operating, and maintaining customer-owned and installed generation sources in parallel with PGE's electric distribution system. PGE's *Distribution Interconnection Handbook* (https://portlandgeneral.com/renewable-installers/interconnection-qualifications) provides a much more comprehensive guide to PGE's requirements for application, technical screenings and studies, the commissioning process, and other information.

IMPORTANT: *Customer generation does not include emergency or standby generation.*

1.4.1 Responsibilities

1.4.1.1 PGE Responsibilities

- PGE will review customer applications and conduct any studies needed to determine and identify any customer costs required to upgrade PGE's system to support the proposed customer generation.
- PGE will provide and install meters, if necessary.

1.4.1.2 Customer Responsibilities

Customers are responsible for obtaining PGE approval for customer generation installations ***before*** installation. Customer generation projects that involve new customer load, new buildings, or upgrades to existing services that are not compliant with existing PGE standards often require design work. Projects that require design work have a lead time for design requests.

Failure to obtain PGE approval before installation may result in delays and unanticipated costs to the customer for any necessary corrections.

IMPORTANT: *Whenever a new customer-owned production system is installed or any service equipment change is made to an existing customer-owned facility (such as a meter base, electrical room, or meter room), the electrical equipment room must be retrofitted and/or brought up to the requirements specified in Section 13, Electrical Equipment Rooms and Interior Installations and in the Electrical Equipment Room Checklist contained in that section.*

- If upgrades must be made to PGE's infrastructure in order to accommodate a customer-owned generation source, the customer is responsible for the cost of the upgrade identified during the review.
- Customer equipment must comply with PGE requirements, as well as any other applicable codes, standards, statutes, administrative rules, tariffs, or rate schedules that may apply to the customer's interconnection.
- Customers are responsible for any required maintenance to their system.
- Customer-owned renewable generation facilities and associated equipment cannot be located on PGE poles, meters, or other PGE equipment.
- Customers are responsible for placarding customer-owned generation equipment. See 3.9.8, "Required Labelling."

1.4.2 Disconnect Switch Requirements

When customer-owned equipment is required to have a disconnect, these requirements apply:

- The switch should be located within 10 feet of the PGE meter, in direct line of sight. Any variance from this requirement must be approved by PGE.

  If PGE approves a variance, an engraved phenolic map of the site showing the locations of both the meter and the disconnect must be placed above the PGE meter.
- The disconnect switch must be accessible 24 hours a day. Any hindrance (such as siding, caulking, enclosures, and landscaping) must be removed by the property owner to allow unrestricted access. Fences must have an unlocked gate or PGE-approved lock allowing for unrestricted PGE access.

City and municipal requirements may require additional modes of disconnection.

1.4.3 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.

1.4.4 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 review proposed generation facility designs and 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.

1.4.5 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 review proposed cogeneration facility designs and 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.

Before installing any cogeneration equipment, contact PGE's Small Power Production group by calling 503-464-8300 or by sending an email to Small.PowerProduction@pgn.com.

1.4.6 Net Metering

⚠ WARNING

To ensure safety, customer-owned equipment **cannot** *be turned on until* **all** *of the following occur:*

- *PGE reviews and approves the proposed interconnection, and*
- *The system passes the local jurisdiction's electric inspection, and*
- *PGE conducts its on-site inspection and gives permission to turn the system on.*

PGE customers interested in adding solar, wind, or other renewable generation to a home or business must participate in PGE's net metering program. You can find information on this program at PortlandGeneral.com.

To ensure the safety and reliability of PGE equipment and personnel, all customers must submit a net metering application for PGE's review using the PowerClerk portal (before purchasing and installing a system. Customers applying for a new service must also submit a separate net metering application using the portal. You can access the PowerClerk portal here: https://pgenm.powerclerk.com/).

If you have any questions about net metering, call PGE at 503-464-8100 or send an email to NetMetering@pgn.com.

1.4.6.1 General Requirements

- Residential customers may have a generating nameplate capacity of 25 kW or smaller; systems greater than 25 kW are not allowed. Commercial customers may have a nameplate capacity of 2 MW or smaller.

  Separately metered barns and shops located on residential property may be eligible for a commercial rate. Contact PGE's Customer Service team at 503-464-777 to discuss rate schedule eligibility.
- Renewable energy must support a customer load associated with a new or existing service. This program does not allow the sale of electricity by the customer.
- Net metering systems with production capabilities that will affect the service conductors by more than 30 A require a lockable disconnect switch located either within 10 feet of the meter or in line of sight from the meter. Any variance from these requirements must be approved by PGE.

  If a variance is approved, a warning label and map showing the location of the disconnect must be mounted at the meter. The installed meter will be used for revenue or billing purposes, and it must be located at the point of interconnection.
- A clearly legible, hard-plastic (phenolic) warning label is required (see labeling requirement).
- 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 59** on page 122).
- A written agreement with PGE and proof of a passed electrical inspection by the local jurisdiction is required before PGE will schedule an inspection and give permission to operate the renewable.

1.4.6.2 Bidirectional Meter

A bidirectional meter is provided free of charge to net metering customers when PGE makes its final inspection for the renewable. This meter measures excess renewable energy. The meter independently tracks both the amount of excess energy the customer sends to PGE and the amount of energy that the customer purchases from PGE. Any excess kilowatt-hour credits will be deducted from the customer's usage or banked for later use.

1.4.6.3 Total Solar Production for Net Metering Customers

PGE cannot view the total amount of energy produced by customer-owned net metering systems. Energy produced by net metering facilities is first used to meet the energy needs of a customer's house or business and only excess energy passes through PGE's meter. Customers may choose to install their own generation meter to measure the total renewable generation before energy is used by their building's appliances.

1.4.7 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).

The small generation interconnection PGE is obligated to undertake is a robust and lengthy review process. Small Power Producers looking to submit an interconnection request can do so online.

For additional information and requirements, consult the How Independent Producers Can Sell Power to PGE page at PortlandGeneral.com and PGE's *Distribution Interconnection Handbook* (https://portlandgeneral.com/renewable-installers/interconnection-qualifications).

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.

You can consult PGE's Small Power Production group by calling PGE at 503-464-8300 or sending an email to Small.PowerProduction@pgn.com.

1.4.8 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—a solar production meter—is also installed. The 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. **Figure 2** shows a typical residential metering arrangement for the solar payment option.

The solar production meter must be installed outside, within 10 feet of the other PGE-owned meter. Contact PGE for further information. A warning label must be mounted on, or adjacent to, each meter base.

Existing customers interested in transferring an active agreement to a new home should contact PGE's Solar Payment Option team. Transfer documentation and proof of liability insurance is required before interconnection. If you have any questions, call PGE at 503-464-8100 or send an email to the Solar Payment Option team at solar@pgn.com.

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

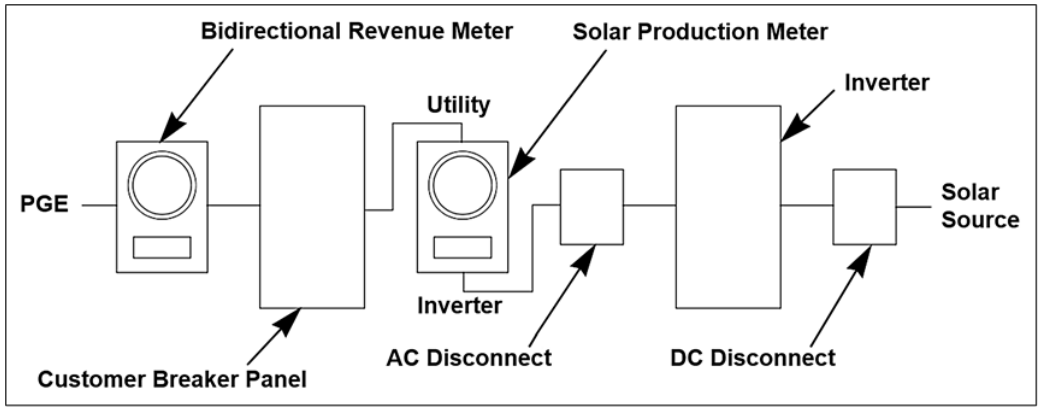

Figure 2: Typical Metering for Residential Solar Payment Option

1.5 *Customer-Owned Storage—Batteries*

PGE customers interested in adding energy storage systems (such as batteries) may do so to offset their energy use or serve as a backup energy system. Customer-owned storage may not discharge to PGE unless approved by PGE. Customers interested in installing a storage-only system or a storage-plus-renewably system (like a battery-plus-solar system), must submit an interconnection application in using the PowerClerk portal (see link below) to ensure the safety and reliability of PGE equipment and personnel.

Standalone storage is not a qualifying renewable for the net metering program; however, applications for storage systems 25 kW and smaller are reviewed by the Interconnection team's Net Metering Coordinators. Contact PGE's Interconnection team with questions by sending an email to NetMetering@pgn.com or calling PGE at 503-464-8100.

Commercial customers applying for systems greater than 25 kW will need to apply online via the Small Power Producers PowerClerk portal (https://pgenm.powerclerk.com/). PGE's Small Power Production group is available for consultation via email at Small.PowerProduction@pgn.com or by calling PGE at 503-464-8300.

1.5.1 Standalone Storage Requirements

Residential customers may install a storage system 25 kW and smaller. Systems greater than 25 kW are not allowed on residential services.

Commercial customers may install a storage system 25 kW and greater by applying online via the Small Power Producers PowerClerk portal (https://pgenm.powerclerk.com/).

Systems greater than 7.2 kW require a manual ac disconnect that must be located within 10 feet of the meter, within line of sight from the meter.

Customers are responsible for placarding customer-owned generation equipment. (See 3.9.8, "Required Labelling.")

A written agreement with PGE and proof of a passed municipal electrical inspection is required before PGE will give permission to operate the renewable.

2 Permits and Applications

TOPICS IN THIS SECTION

- *Codes and Ordinances*
- *Permits, Rights of Way, and Easements*
- *Pre-Design Support*
- *Applying for Service*
- *Design and Construction Timeline Considerations*
- *Emergency Connects and Reconnects*
- *Streetlights*
- *Area Lighting*

2.1 *Codes and Ordinances*

The construction of new or upgraded services 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).

In case of conflict, the appropriate tariff, code, or ordinance supersedes the interpretation offered in this book. Always refer to the most recent publication of any code, ordinance, or tariff.

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.

On private property, an easement is required for the placement of electrical facilities. These include poles, guy wires, anchors, overhead and underground lines, transformers, vaults, junction boxes, and pedestals.

For work in the road right of way, a permit from the local jurisdiction is required before such work may be performed. Permits may also be required if the electrical facilities cross public property, railroad tracks, ODOT-managed highways, parks, or state/federal land.

2.2.1 PGE Street-Operating Permit

Only PGE-approved excavation contractors and contractors who have made other special agreements with PGE are allowed to work under a PGE street-operating permit. Contact your PGE Design Project Manager to verify excavator requirements and confirm that your excavator is approved. Customers must ensure the excavator is approved at the time of excavation.

These steps are required when operating under a PGE street-operating permit:

1. PGE will acquire the permit and provide a copy to the contractor.

1. The contractor must notify the local jurisdiction before work is to begin according to the permit terms and conditions. Jurisdictions within the PGE service territory have varied requirements regarding the amount of advance time needed to provide notification.
2. A hard copy of the permit must be on site at all times during construction.
3. All PGE trenches and conduits must be inspected by PGE before backfilling.
4. On completion, the contractor must submit a post-construction notification to the jurisdiction.

2.3 *Pre-Design Support*

Creating a development partnership between your project team and PGE at the beginning of a project is critical to the successful and timely delivery of electrical service. New and existing services require extensive planning for utility facilities, utility conflicts, safety clearances, and adherence to jurisdictional requirements and/or right-of-way provisions. By contacting PGE early—before all design documents are finalized—we can help your design team develop an economical and effective option for your site and avoid costly redesigns.

The pre-design partnership will involve:

- Discussion of overhead and/or underground service options.
- Evaluating possible meter locations based on PGE requirements and site-specific clearances.
- Discussion of any unique clearances and utility conflicts.
- Understanding solar, battery, EV, and other green energy goals.
- Consideration of area lighting or streetlighting requirements.

To initiate the discussion, submit a request for service using PGE's PowerPartner portal (https://portlandgeneral.force.com/powerpartner/s/login/).

2.4 *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.*

To apply for service, the customer must submit a request for service on PGE's PowerPartner portal (https://portlandgeneral.force.com/powerpartner/s/login/). PGE will get in touch with you within five business days to discuss your project.

PGE's design timeline depends on submission of accurate load information, required pre-design documents and notification if things change with the project. (See Appendix A: Required Files for Service.) Commercial customers must provide all the required information, including voltage, service sizes, connected load, square footage of new construction, the size of the largest motor, any electric vehicle charging stations, and any other requested information.

PGE needs the pre-design information to develop the design, assess the suitability of proposed utility locations, and verify safety clearances. Once all complete pre-design documents are received, PGE will provide the customer with a design commitment date. Dates vary depending on the type of project (residential, small commercial, large commercial, multi-use), job queue, weather, and may be up to 12 weeks or more in the future.

IMPORTANT: *If changes are made in design documents, email the updated document(s) to PGE as soon as possible. Clearly detail on the drawing and/or email message the updates that have been made to the original. Some changes may require a complete re-design, on-site space considerations, and/or new equipment.*

2.5 Design and Construction Timeline Considerations

- A PGE Design Project Manager (DPM) will respond within five business days of receipt of your request for service. They will review the project and request any missing documents or other information needed to initiate a design. For many projects, the DPM will schedule a pre-design site visit.
  - If area lighting is desired or streetlights are required by the local jurisdiction, make note of this in the Request for Service Form on PGE's PowerPartner portal (https://portlandgeneral.force.com/powerpartner/s/login/). If this is not noted on the original request or the requirement is identified later, customers must contact Service Coordination (service.coordinators@pgn.com) to create a new work order so that a streetlight project manager will be assigned to the project.
  - If the project site will include a battery, solar, or other renewable resources, a separate application, review, and approval is required. Application information is available at the Generate Your Own Power page at PortlandGeneral.com.
- PGE's design commitment date depends on the receipt of all necessary customer information and the amount of work in PGE's design queue. From the time all required customer documentation is received, the average design timeline for your service is 60 days. (See Required Design Documents below.) If the reviewing departments identify the need for additional documents, the amount of time it takes to obtain those documents is added to the timeline. Delays in receiving customer information are added to the design time, but not necessarily in a day-for-day ratio.
- Your PGE DPM may send you a preliminary design if applicable and arrange a meeting with your design team and PGE internal resources to resolve issues.
- Once PGE provides a final approved job sketch, the customer has six months to return the signed line extension cost agreement (LECA), pay any costs due, and build and energize the service. After six months, the LECA and the design must be reviewed by PGE (and revised if necessary) before a project can move to the pre-construction stage. If changes are made after the design has been approved by the customer and gone through PGE's approval process, a redesign fee may apply at the time of review.

  IMPORTANT: *PGE's final drawing is the **only** approved plan for PGE-owned facilities. Electrical or civil plan sheets from the customer's plan set that have been approved by the local jurisdiction's permitting authorities do not override PGE's drawing. The customer is responsible for reconciling any differences between the PGE-approved plan sheet(s) and the public works and building plans.*
- For underground services, a pre-construction site visit by a PGE Field Construction Coordinator may be required.
- Construction lead times depend upon the timing of the following:
  - Customer's return of the signed LECA and payment of any costs due.
  - The amount of time needed to obtain special non-standard transformers or other equipment not in PGE's stock (if such equipment is required). This may require a six-month lead time or longer.
  - The project meeting the requirements of local ordinances and/or state laws. This may include approval of the electrical installation by the applicable electrical inspection authority. PGE will approve the service 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.
  - Passing all required PGE inspections. Some projects have one inspection, while more complex, underground services may have a pre-construction conference, multiple inspections, and requests for documents.

    Note: Underground services will require a trench and conduit inspection before backfill.

- Passing the final inspection. Once a PGE service inspector conducts this inspection and the site passes inspection, a PGE meterman may be scheduled to install the meter. After installation of the meter, a PGE crew will install the wire and energize the service.

2.6 *Emergency Connects or Reconnects*

Requests 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's Service Coordination team (Service.coordinators@pgn.com) 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.

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 deemed unsafe to do so.*

For more information on emergency connects or reconnects, call PGE's Service Coordination team at 800-822-1077 or 503-323-6700.

2.7 *Streetlights*

If the local jurisdiction requires streetlights for your project, make note of this in your request for service. If this is not noted on the original request or the requirement is identified later, you ***must*** contact PGE's Service Coordination team (Service.coordinators@pgn.com) and create a new work order for a streetlight project manager to be assigned to the project.

While PGE offers three options for streetlight facilities under our tariff, local jurisdictions determine which option is to be installed. Before PGE can start the design, the customer must provide the PGE Streetlighting project manager with a streetlight design layout stamped *Approved* by the appropriate local jurisdiction. The layout must include complete streetlight design details, including pole and luminaire specifications.

Note: Streetlight materials are ordered for each project and have long lead times, anywhere between eight weeks and six months. If you have an Option A project, PGE recommends contacting the Streetlighting project manager as soon as you can to coordinate materials ordering.

2.8 *Area Lighting*

Customers interested in illuminating perimeters, parking lots, or other locations can request PGE owned and maintained area lighting. Customers should contact the Service Coordination team (Service.coordinators@pgn.com) to start a work order and discuss the costs and design requirements (if any) with a PGE lighting project manager.

3 Services

TOPICS IN THIS SECTION

3.1 *Types and Sizes of Service Furnished*

Available electric service is 60 hertz (Hz), alternating current (ac), single-phase or three-phase. (See 3.2, "Load Requirements" for more information.) The nominal secondary voltages and maximum allowable services are listed in **Table 1** and **Table 2** below.

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 in underground conduit for which PGE has terminated underground cables inside a conduit. The maximum allowable service size available at each voltage depends on the transformer configuration. For underground service requirements, see Section 6, *Underground Requirements*.

IMPORTANT: *PGE may not allow an overhead transformer to feed underground service. Consult a PGE Design Project Manager about your project.*

Table 1: PGE 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 where PGE has terminated with overhead conductors. For example, overhead wires bring PGE's circuit to its connection with the customer's system at a weatherhead.

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 *Load Requirements*

3.2.1 Single-Phase Service

Customers are responsible for providing PGE with accurate connected load information

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.

Table 3: Single-Phase Service Load Requirements and Limitations

Equipment or Load	Requirements and Limitations
Loads > 2 kW	Must be operated at 208V or higher.
Single-phase motors ≤ 5 horsepower (hp)	Motors larger than 5 hp requires PGE approval. Single-phase motors larger than 3 hp may cause voltage dips that are objectionable to some customers.
Any single air conditioner ≤ 5 tons	Less than or equal to 5 tons.
Any single heat pump ≤ 5 tons	Less than or equal to 5 tons.
Electric heating, indoor or outdoor	No more than 48 A of load at 240 V when switched on or off.
Electric tank-style water heaters	No more than 48 A of load at 240 V when switched on or off.
Service rated > 320 A continuous	CT metering required. See Section 10.7. Customers requiring 400 A continuously cannot be served by a 400 A maximum (320 A continuous) meter base.
Excessive load for a single-phase service	PGE may require the customer to use three-phase service instead of single-phase service.

3.2.2 Three-Phase Service

Three-phase service will be provided upon request to residential and nonresidential customers in accordance with the current PGE tariff. PGE provides the voltage supplied to a customer based on that customer's electrical needs and on the characteristics of the PGE distribution system in the customer's 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 service over 200 A.*

  This service requires current transformer (CT) metering as described in 10.7, "Current Transformer Metering, 800 A Maximum" or 10.5, "Customer's Responsibility for Maintaining Switchboards."

- *Connection of single-phase loads to three-phase services.*

  Follow these guidelines:

  - 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.

- *Three-phase, 480 V service.*

  This 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.

- *Three-phase, 4-wire, grounded-delta service.*

  This service will not be supplied from underground primary systems. The high-leg (wild-leg), 4-wire deltas must be marked with UL listed orange electrical tape and be on the right side of the meter base or current transformer (CT) cabinet.

- *New three-phase, 3-wire service.*

  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 to their existing 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.

3.2.3 Medium Voltage Services

Customers interested in medium-voltage service should consult PGE to confirm that they qualify and obtain PGE's requirements. PGE requires medium-voltage instrument transformers and transformer-rated meters for customers with a medium-voltage service greater than 600 V. (PGE defines low voltage as less than 600 V, and medium voltage as 600 V to 35 kV.) Requirements are detailed in the *Medium-Voltage Service Requirements* document at PortlandGeneral.com.

Customers that qualify for a medium-voltage service must consult PGE to:

- Obtain the applicable EUSERC 400 standards and equipment requirements.
- Identify an acceptable location for the service entrance equipment.

- Submit equipment specifications and drawings to PGE for protective devices, transformers, metering equipment, and customer generation (if applicable).
- Obtain PGE's review and agreement that the customer equipment meets PGE requirements prior to fabrication and/or construction.

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

Services to mixed-use facilities with both residential and commercial customers are complex, and these services are not addressed in this *ESR* book. ***Before*** plans are completed or electrical equipment is purchased, consult a PGE Design Project Manager for availability of service voltages, overhead or underground service options, transformer locations, and service entrance requirements.

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.

3.4 Connecting and Disconnecting New Services

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.

3.5 Connecting and Disconnecting an Existing Service

IMPORTANT: *All requests for connection and disconnection of service must be scheduled with PGE's Service Coordination team (Service.coordinators@pgn.com).*

Licensed electricians may remove and replace a single-phase 120/240 V residential meter but may not move the PGE service line. Electricians must notify PGE's Service Coordination team (Service.coordinators@pgn.com) ***before*** pull the meter for each address. When repairs or modifications are complete, PGE must be promptly notified so that its workers can inspect, install, and seal the meter.

Connection and disconnection of any service must be done by PGE. The customer will be billed a charge according to the fee schedule at the time services were performed.

A permit and inspection by the local code-enforcing agency and a PGE inspection 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 that changes the capacity of the service or affects the terminations of PGE's service conductors.
  - For existing services, the metering equipment and working clearances must be brought up to current requirements.
  - If existing metering equipment is installed in an electrical room, the room must be retrofitted and/or brought up to the requirements in 13, Electrical Equipment Rooms.
  - If any upgrade is made to a PGE pole, PGE will require removal of existing customer-owned meter base(s) and installation of meter equipment that meets current requirements.

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 information about emergency connects or reconnects, see 2.6, "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.

For fees and additional information, see PGE's tariff.

3.8 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.*

For commercial and industrial customers, the *point of delivery* 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. PGE will install service connections to the customer's meter equipment at the main-floor or entry-floor level only. For more information, see Section13, "Electrical Equipment Rooms and Interior Installations."

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 PG0E's Service Coordination team (Service.coordinators@pgn.com) to schedule a site visit to determine an appropriate location for the customer's meter equipment.

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

3.9 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 1.2.8, "Time-of-Use Metering."

Customer equipment can only be installed on the load side of PGE's metering. *No customer equipment will be allowed inside or on the line side of a meter or current transformer enclosure.* This includes load monitoring and control devices and current-limiting fuses. The meter socket must not be used as a junction box.

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. These electricians must notify PGE's Service Coordination team (Service.coordinators@pgn.com) ***before*** pulling a meter. When repairs or modifications are complete, the customer must promptly notify PGE so that its workers can inspect, install, and seal the meter. For more information, see 3.9.3, "Sealing Provisions" and 1.2.2.1, "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.*

3.9.1 Prohibited Meter Equipment Locations

For the safety of PGE personnel and customers, metering equipment (such as a meter base or CT cabinet) is prohibited in the following locations:

- Directly over a window well, stairway, ramp, or steps
- In an area likely to be fenced. If a customer installs a fence or enclosure, they must—at their own expense—provide access acceptable to PGE or move the meter socket to a location identified by PGE.
- On the drive-through side of a commercial business. Existing services located within a drive-through are grandfathered unless the service is upgraded. Drive-through lanes will be subject to closure during working hours to accommodate PGE's maintenance needs.
- Mobile structures, such as a trailer, barge, crane, dredge, dragline, or any mobile pumping equipment; or on a floating dwelling unit (such as a houseboat).
- On poles owned by PGE.
- Places or surfaces where excessive vibration may interfere with the meter's operation.
- Any place where PGE determines that safety may be compromised.

3.9.2 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. Ringless-style meter sockets are not approved.
- Meter jaws.
- Manual link bypasses or safety sockets (when required).
- Sealing means for all sections.

Consult PGE for meter socket types.

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.

When a blank position is required in a multi-meter pack, the meter socket wiring and meter socket must be removed and a permanent manufacture-provided plate must be affixed to the meter position. (If manufacturer-provided plates are not available, PGE will accept a minimum 12-gauge steel plate that meets applicable NEMA ratings.) The plate must be riveted or welded in place. To prevent water intrusion, a watertight seal around the plate (such as a seal weld) is required around a plate for equipment with a NEMA 3R rating.

3.9.2.1 Meter Socket Requirements

Mixed-use services may require a combination of line items. See the applicable *ESR* book sections for more details.

Table 4: Meter Socket Requirements by Service Type and Gear Rating

Service Type	Gear Rating	Phase	Voltage	Metering Enclosure Requirements	ESR Section	Relevant EUSERC Drawings
Single residential	100 A, 200 A	1Φ	120/240 240/480	Direct-connect, ring-type.	7.2 , 7.3, 9 (mobile home)	301, 301A, 301B, 307
	320 A continuous	1Φ	120/240	Direct-connect, ring-type safety socket with manual test bypass.	7.2 7.3	302B
Single meter commercial	Up to 200 A	1Φ 3Φ	Up to 480	Direct-connect, ring-type safety socket with manual test bypass, or commercial meter pedestal.	10.3, 10.6 (pedestal)	304, 305, 308
	Up to 800 A *	1Φ	120/240 240/480	CT-rated, ring-type safety socket with test switch	10.7	339
		3Φ	Up to 480			
	Up to 3000 A	1Φ	120/240 240/480	Switchboard with CT-rated meter panel with test switch.	11.2	325, 326, 332, 354
		3Φ	Up to 480			
Multi-family, up to six meters	Up to 600 A	1Φ	120/240 240/480	Combination termination enclosure and ring-type multi-meter pack(s)	8.4	342
Multi-family	Up to 800 A *	1Φ	120/240 240/480	Ring-style multi-meter pack(s). Safety socket required for house meter only.	8.1, 8.2	353
	Up to 1200 A	3Φ	208/120			
	Up to 3000 A	3Φ	208/120	Switchboard with ring-style multi-meter bank(s). Safety socket required for house meter only.	8.1, 8.2, 11.2	
Multi-meter, commercial	Up to 800 A *	1Φ	120/240 240/480	Ring-style, safety-socket, multi-meter pack(s) with manual test bypass. May include CT-rated meter(s).	10.6	339, 353
	Up to 1200 A	3Φ	Up to 480			

Table continues on next page

Service Type	Gear Rating	Phase	Voltage	Metering Enclosure Requirements	ESR Section	Relevant EUSERC Drawings
Multi-meter, commercial	Up to 3000 A	3Φ	Up to 480	Switchboard with ring-style, safety-socket meter panel(s) with manual link bypass and/or CT-rated meter panel(s) with test switch(es).	11.2	306, 325, 326, 332, 354

* 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.

3.9.3 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.

3.9.4 Mounting of Meter Sockets

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, the cover, or with the operation of manual link bypasses.

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 temporary repair jobs if they are coordinated with PGE before the repair is performed.

Adequate must protection exists for meters that could be subject to physical damage. Barrier posts are required when metering equipment is exposed to vehicle traffic. For information on barrier posts, see 5.6.8, Barrier Posts" or contact PGE's Service Coordination team (Service.coordinators@pgn.com).

For clearance information, see 5.3, "Meter Clearance Dimensions"; 5.5.4, "Clearances Around Pad-Mounted Electrical Equipment"; 5.6.8, Barrier Posts"; and 5.6.1, "Clearances of PGE Electrical Equipment from a Gas Meter Set."

3.9.5 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.

3.9.6 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.

3.9.7 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.

3.9.8 Required Labelling

Before power is connected, PGE requires that the equipment and services listed in this section be identified by a permanently engraved metal or hard plastic label with letters at least 3/8-inch high.

IMPORTANT: *The customer must ensure that each meter socket is labeled correctly. PGE may check meter installations to verify that the socket labels are correct. If a meter socket is incorrectly labeled, PGE may charge the customer a fee according to the fee schedule in PGE's tariff at the times services were performed.*

3.9.8.1 Voltage Labelling

Voltage labelling is required for:

- All 480 V services. The label must be ***red*** with white lettering.
- Buildings that have multiple services with different voltages. Labelling of voltage is required on each termination section. Remote meter base installations with multiple voltages must have labelling of the voltage on the cabinet and the meter base.

Figure 3: Meter Label Showing Voltage

3.9.8.2 Labelling for Multi-Tenant Installations

Each meter socket of a multi-tenant installation must be labelled with the address and/or unit number. Sites that have multiple meters with different voltages require labelling on each termination section.

Figure 4: Meter Label with Service Address

Gray highlighting is used to mark new, updated, and moved content.
Highlighting does not indicate the importance of the text.

3.9.8.3 Structures with Multiple Services

Structures with multiple services must be labelled with the service name and voltage (*Service #1-120/240 V* and *Service #2-277/480 V*, for example) on the termination cabinet and transformer. The customer is responsible for ordering the labels and placing them on the termination section, and for providing PGE with the label for the transformer. Labels must be placed on the termination cabinet before the service is energized.

Figure 5: Meter Label with Service Name and Voltage

3.9.8.4 Services with Customer Generation

Services with customer generation (such as solar and wind) require a Potential Back Feed label in addition to voltage and/or address labels. The label must be red and contain the following text in white letters that are 3/8-inch high: *WARNING: Customer-owned generation. Two sources may be present*.

Note: PGE may require additional labels for parallel generation such as customer-owned storage (batteries).

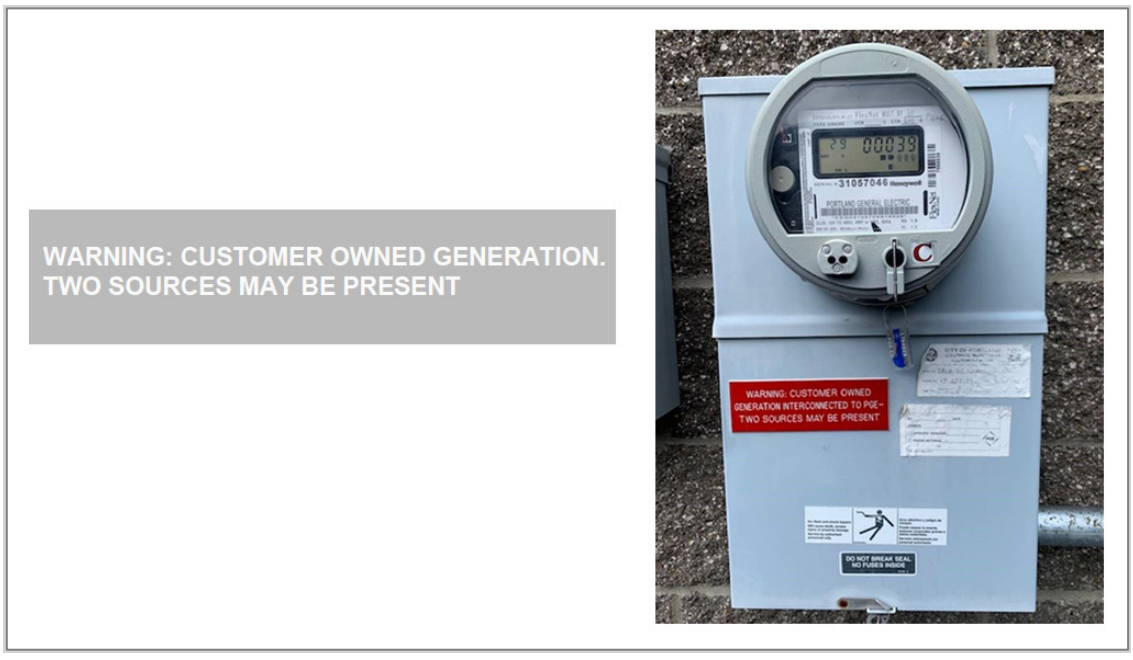

Figure 6: Meter Label for Service with Customer Generation

3.9.8.5 Services Exceeding What PGE Can Provide

Some services listed in **Table 1** and **Table 2** exceed what PGE can provide. In these cases, PGE requires the customer to placard their service. If a customer requests a service that exceeds what PGE can provide and PGE approves that service, the customer will be required to placard the service.

Figure 7: Placard for Service Exceeding What PGE Can Provide

3.10 *Customer-Owned Equipment*

3.10.1 Enclosures that House Both PGE and Customer-Owned Equipment

Where PGE and customer-owned devices are housed within a single enclosure (such as a switchboards or commercial pedestal), the utility sections must be separated from customer sections by metallic barriers. These sections must seal and lock separately.

3.10.2 Customer-Owned Equipment on PGE Poles

Customer-owned metering equipment, switching devices, conduits, conductors, or luminaires ***must not*** be mounted on a PGE pole. If customer-owned equipment was previously allowed on a PGE pole, that equipment must be removed when either of the following occurs:

- The customer's electrical equipment is modified in any way.
- The PGE pole is replaced, relocated, or removed.

3.10.3 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. For proper setting depths for poles longer than 24 feet, contact PGE's Service Coordination team (Service.coordinators@pgn.com).
- 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, and the guy attachment must be at the height of the weatherhead.*

  The customer must provide the following:

  - A 3/8-inch eyebolt where the service attaches to the pole.
  - The drip loop and a minimum 5/16-inch galvanized steel cable down guy and anchor. The guy must have a lead-to-height ratio of 1:2. Allow 24 inches of cable to create the drip loop.

Customer-owned poles and guying are shown in **Figure 65** and **Figure 66** in 9.2.2, “Mobile Home.”

3.10.4 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.

4 Temporary Service

TOPICS IN THIS SECTION

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

4.1 *Basic Requirements*

Temporary service is a means of supplying electricity to your site on a temporary basis. Typically, a temporary service provides power for the construction phase of a project while the site is being prepared for permanent service. Temporary service is provided either overhead or underground, depending on PGE's existing service to the area.

4.1.1 General Process for Obtaining a Temporary Service (Excluding Gold Temporary Service)

IMPORTANT: *PGE will not connect and energize a temporary service if it fails to meet the requirement listed in this ESR book, lacks appropriate clearances, or is deemed unsafe by PGE.*

The process of obtaining a temporary service normally follows these steps:

1. Obtain an electrical permit for the meter base from the local jurisdiction.
2. Submit a temporary service request using PGE's PowerPartner portal. (https://portlandgeneral.force.com/powerpartner/s/login/) or contact PGE's Service Coordination team (Service.coordinators@pgn.com) to request a site visit to identify a spot for a temporary meter.
3. PGE visits the site and identifies an approved meter spot.
4. Prepare the job site and install the temporary service.

   IMPORTANT: *Before doing any digging, call the Oregon Utility Notification Center hotline (811 or 800-332-2344) to locate underground utilities.*
5. For underground temporary services, call the PGE inspector or Field Construction Coordinator before trenches and conduit are backfilled for inspection.
6. Pass inspections to verify compliance with local and/or state ordinances and laws.
7. Contact PGE's Service Coordination team and inform them that the temporary service installation has passed inspection and the site is ready for the PGE inspection.
8. PGE conducts an inspection and later (if the site passes the inspection) PGE crews will connect and energize the temporary service.

4.1.2 PGE Requirements for Identifying a Location for Temporary Service

IMPORTANT: *Contact PGE's Service Coordination team (Service.coordinators@pgn.com) to schedule a meter spot on all temporary services. PGE must confirm the location for all meters through an on-site visit before service can be established.*

Common requirements for locating a meter include:

- A temporary service for construction work must be located so that the meter is protected from accidental damage.
- When practical, PGE will place the temporary service in a location that will be usable throughout the construction period.

  Note: If a temporary service needs to be relocated, the customer must pay the relocation cost in accordance with the PGE schedule of charges.

A temporary service must be located on the property being served. If temporary power cannot be located on the property, then PGE may approve locating it in the public right of way with approval from the local jurisdiction. Any temporary service placed in a right of way must be located within a fenced or barricaded site that is not accessible to pedestrian traffic.

4.1.3 Customer Charges for Temporary Service

Charges vary depending on the type of service that PGE has in the area. Electric service is metered and billed based on the applicable rate schedule. PGE's Service Coordination team (Service.coordinators@pgn.com) can explain current temporary service fees.

Residential single-family and qualifying multi-family dwellings in underground service areas may qualify for a PGE Gold Temporary Service (also known as an Enhanced Temporary Service). This is an unmetered service. See 4.6, "PGE Gold Temporary Service for Underground Residential Applications" for additional details.

4.2 *Typical Structures for Temporary Service for Construction Work*

IMPORTANT: *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.*

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 requirements in this section are not met.*

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

- Poles:
  - 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.
  - 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.
  - The customer-provided service pole must be safe, and a service post must be suitable for supporting the tension of the service conductor. If these requirements are not met, PGE will not energize the temporary service.
  - To provide stability, use tamped, 3/4-inch minus crushed rock at a depth that equals the required depth of the pole or post.
- Stakes:
  - Only steel stakes may be used. Wood stakes are not 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.
- Clearances:
  - 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 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 4.4.2, “Overhead Clearance Post (4- x 4-Inch).”
  - 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—even with mechanical protection—are not permitted.
- Grounding rod:
  - 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.
- Temporary covers:
  - Where the customer provides openings for PGE equipment (such as a pad-mounted transformer), they must also provide and install a temporary cover. For temporary cover requirements, see 1.2.2.6, “Landscaping.”
- Permits:
  - An electrical permit and inspection by the local code enforcement agency is required for all temporary services.

4.4 *Overhead Temporary Service Equipment Requirements*

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: The requirements here are in addition to the construction requirements in 4.3.

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 8 shows a typical overhead service post.

Figure 8: Typical Overhead Service Post

Figure 9 shows a detail of the attachment point and connection point in an overhead service post.

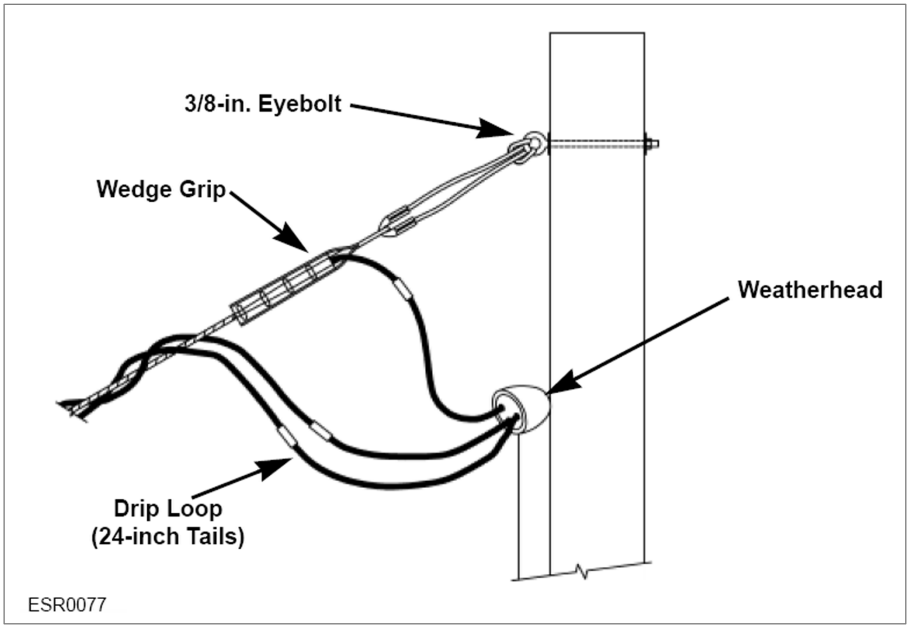

Figure 9: Detail of Attachment Point and Connection Point

Figure 10 shows front and side views of a typical temporary weatherhead installation.

Figure 10: 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: The requirements here are in addition to the construction requirements in 4.3.

These requirements apply when installing a service post in a non-road or traffic-free crossing (as shown in **Figure 11**):

- 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 2- x 4-inches and set in the ground at least 24 inches. If ground conditions prohibit driving a wood stake, it is acceptable to substitute a 0.75-inch round steel stake set in the ground to the same depth. **Figure 12** shows a steel stake, brace, and U-bolt. **Figure 13** shows a typical steel stake and brace installation.

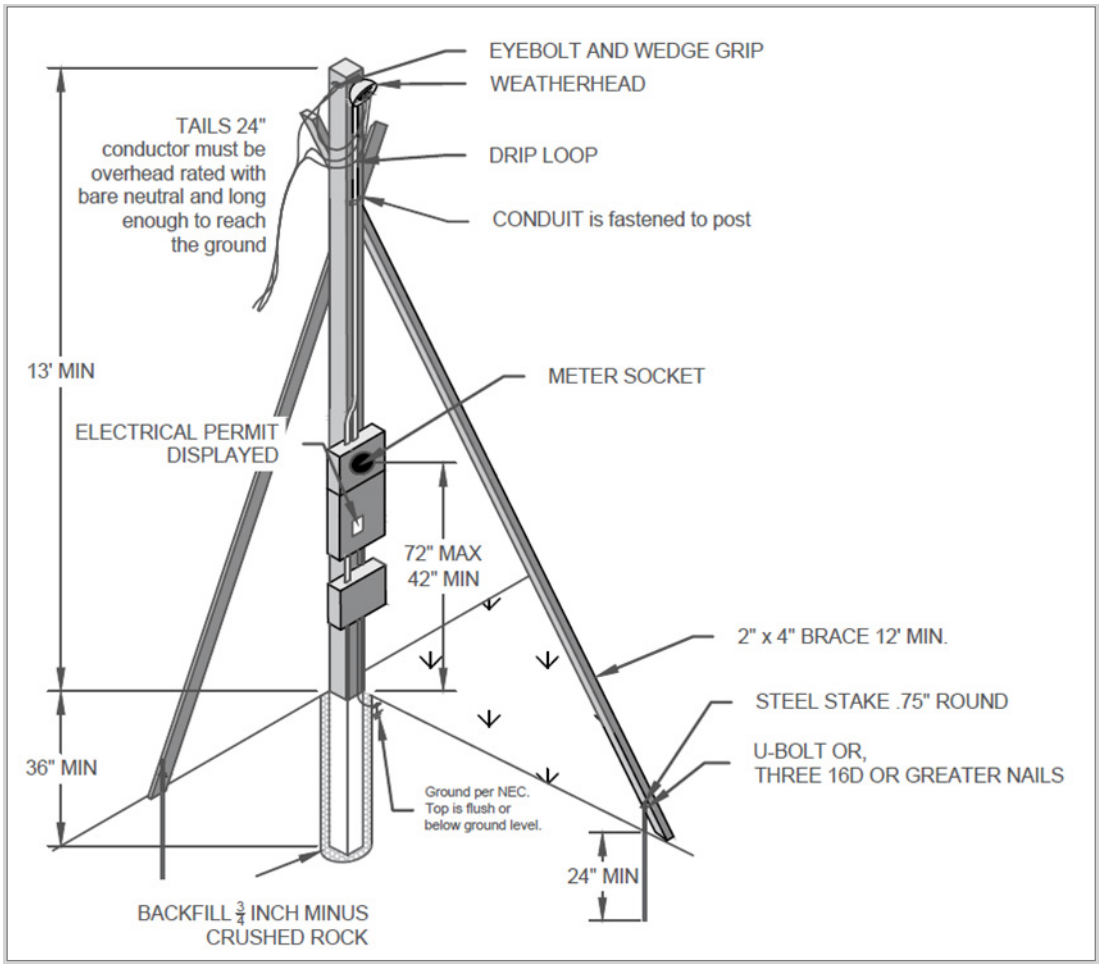

Figure 11: 6- x 6-inch Overhead Service Post in a Non-Road Crossing

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

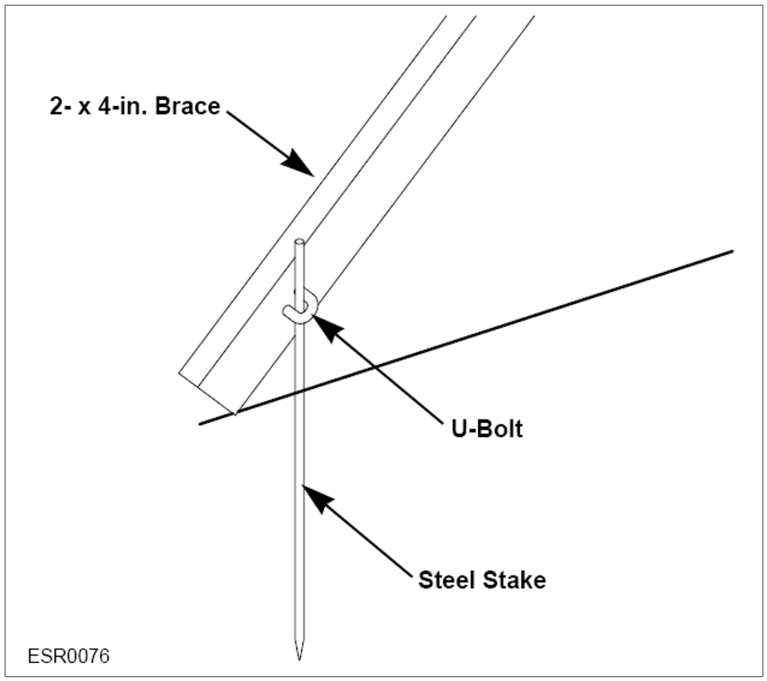

Figure 12: Required Steel Stake with Brace and U-Bolt

Figure 13: Typical Steel Stake and Brace Installation

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Highlighting does not indicate the importance of the text.

4.4.1.2 Overhead Service Post in a Road Crossing or Traffic Crossing

Note: The requirements here are in addition to the construction requirements in 4.3.

These requirements apply when installing an overhead service post (shown in **Figure 14**)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 2- x 4-inches and set in the ground at least 36 inches. If ground conditions prohibit driving a wood stake, it is acceptable to substitute a 0.75-inch round steel stake set in the ground to the same depth. **Figure 12** above shows a steel stake, brace, and U-bolt. **Figure 13** above shows a typical stake installation.

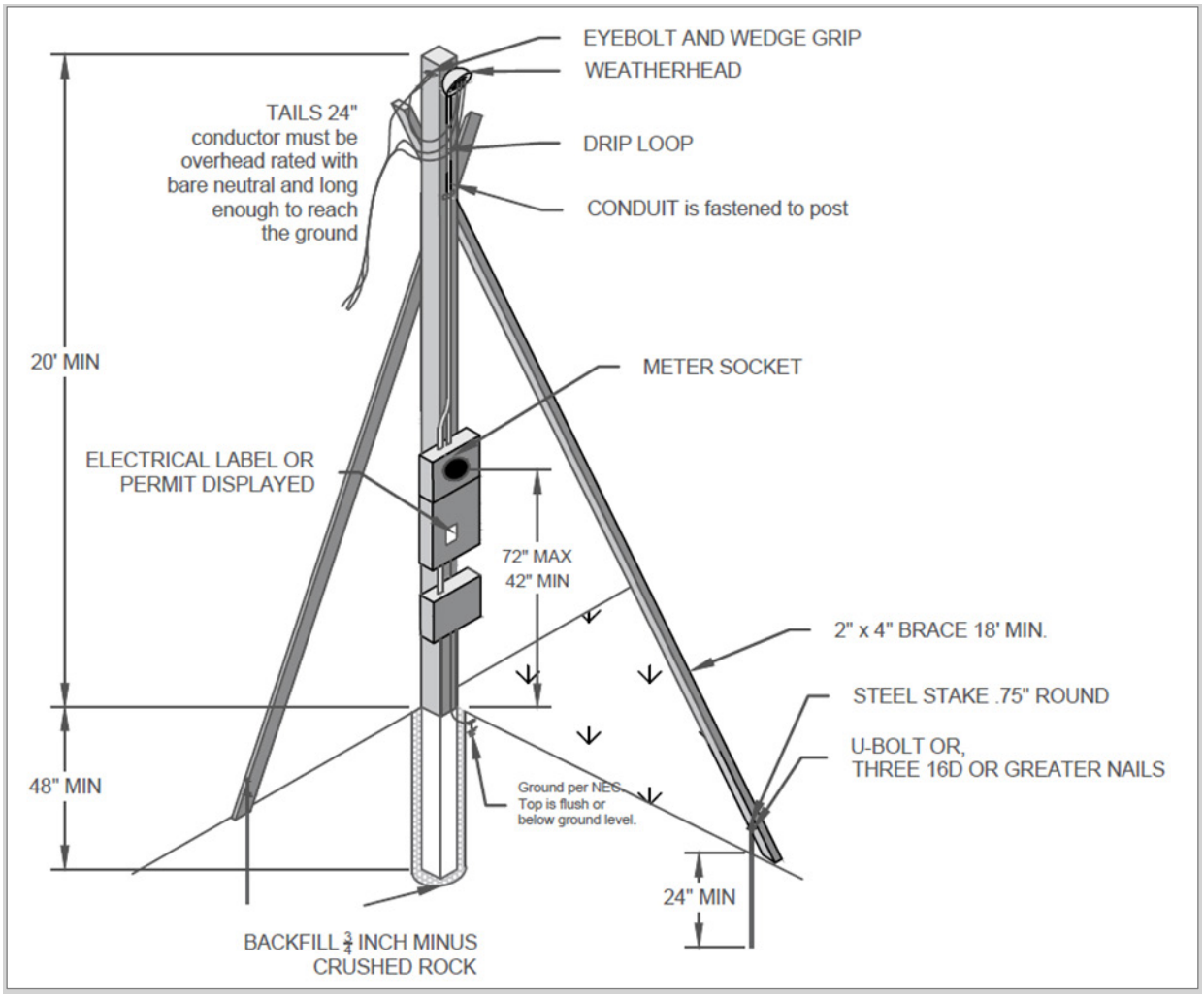

Figure 14: 6- x 6-inch Overhead Service Post in a Road or Traffic Crossing

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

Note: The requirements here are in addition to the construction requirements in 4.3.

A 4- x 4-inch overhead clearance post (shown in **Figure 15**) 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 steel stakes must be 2- x 4-inches and set in the ground at least 24 inches. It is acceptable to substitute a 0.75-inch round steel stake set in the ground to the same depth.
- Maintain a maximum of 60 feet between the posts.
- Maintain at least 8 feet between the post and the stake.

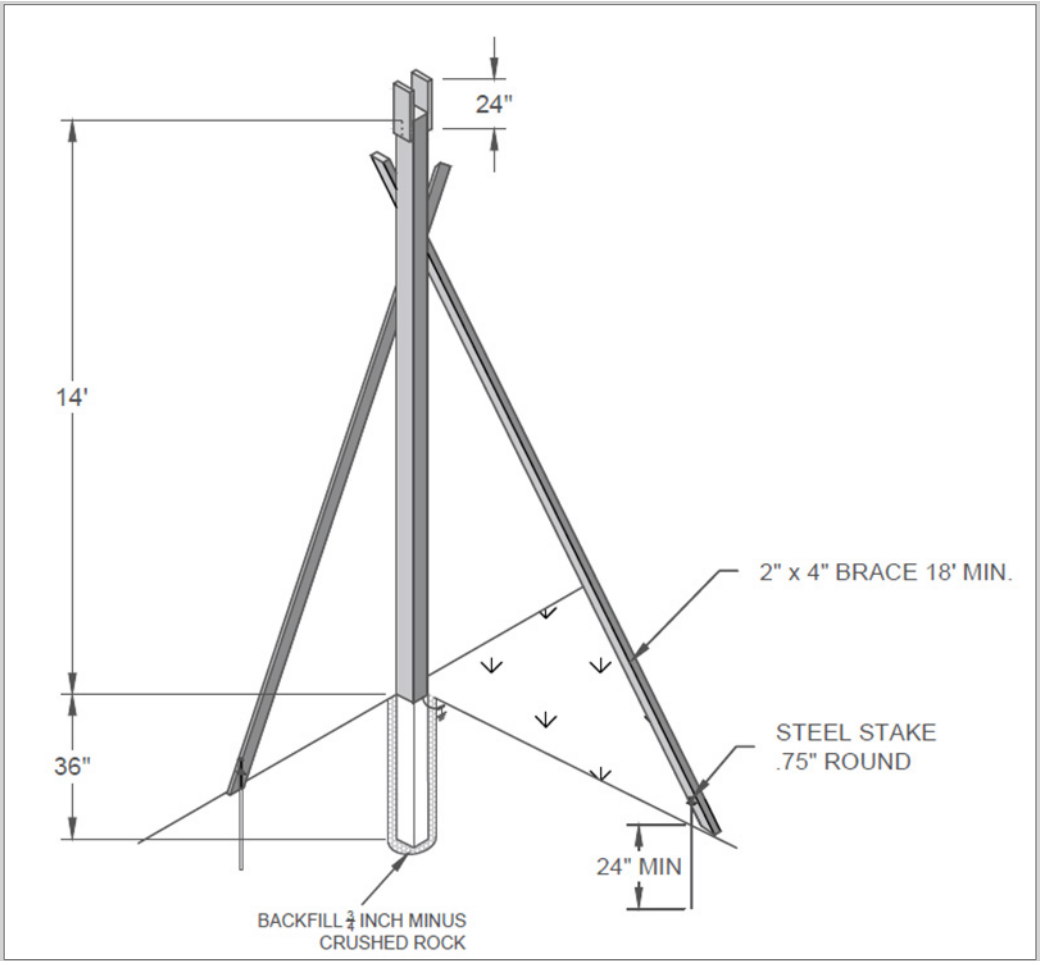

Figure 15: 4- x 4-inch Overhead Clearance Post

4.5 *Underground Temporary Service Equipment Requirements*

4.5.1 Post-Mounted Underground Service (6- x 6-Inch)

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

A temporary underground service (shown in **Figure 16**) 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.

Permanent underground services require 5 feet of straight pipe between sweeps. See 6.3.2, "Conduit Sweeps and Pull Lines."

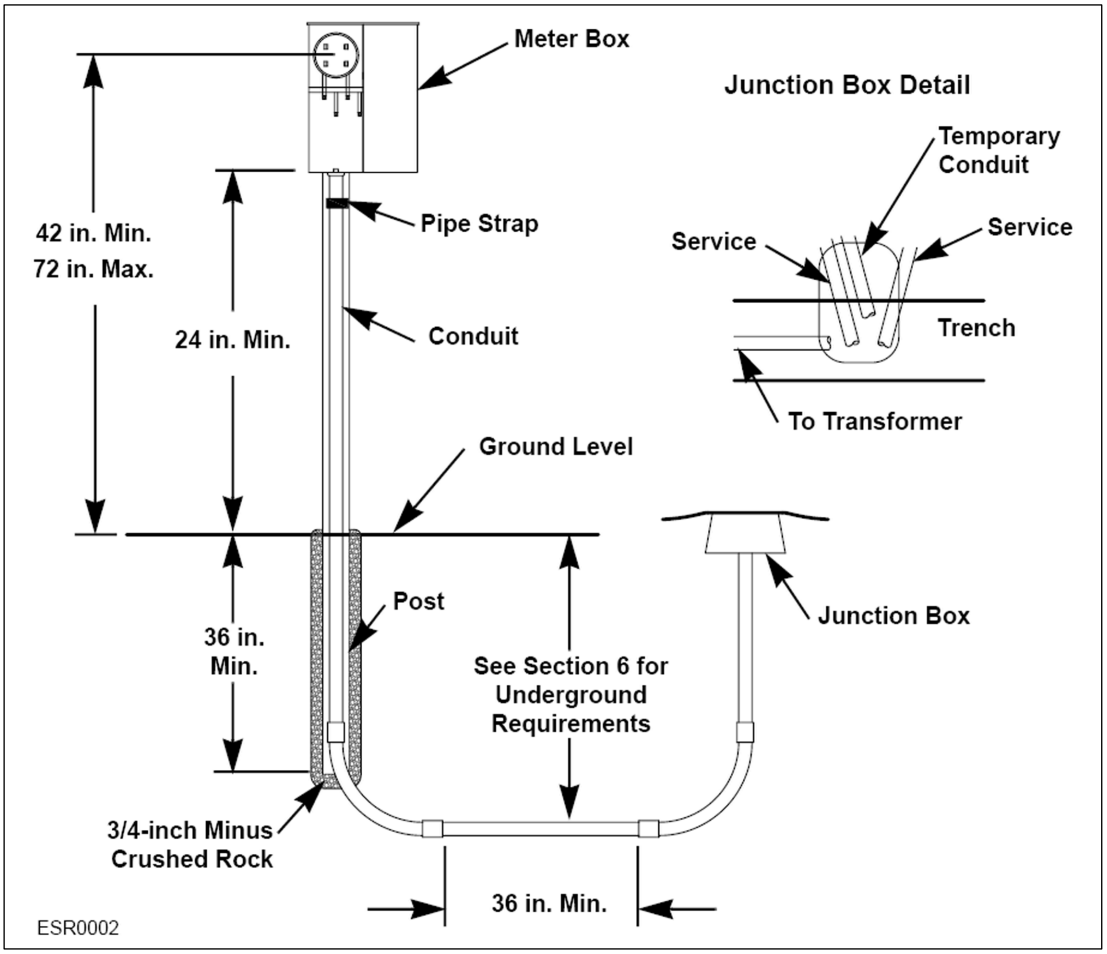

Figure 16: Temporary Underground Service Mounted on 6- x 6-inch Post

4.6 *PGE Gold Temporary Service for Underground Residential Applications*

PGE Gold Temporary Service is an enhanced service that provides an unmetered, flat-rate, temporary service for underground lines and pad-mounted transformers serving 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.

If no transformer is present at the site or a new transformer is required, a PGE construction drawing will be required. The customer is responsible for installing the conduit according to the design sketch. PGE is responsible for installing the transformer for 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. To request additional information, contact PGE's Service Coordination team (Service.coordinators@pgn.com).

5 Clearances and Location Requirements

TOPICS IN THIS SECTION

- *Basic Requirements*
- *Meter Location Criteria*
- *Meter Clearance Dimensions*
- *Metering Workspace Requirements*
- *Single-Meter Installation*
- *Multiple-Meter Installation*
- *Clearances for Overhead Services*
- *Locations and Clearances for Transformers, Switches, Vaults, and Other Electrical Equipment*
- *Safety Clearances from Other Hazards*
- *Barrier Posts*

IMPORTANT: *Clearance information for electrical equipment rooms has been moved to Section 13, "Electrical Equipment Rooms and Interior Installations," which begins on page 187.*

5.1 *Basic Requirements*

IMPORTANT: *Information about clearances for electrical equipment rooms has been moved to Section 13, "Electrical Equipment Rooms and Interior Installations," which begins on page 187.*

This section describes the key clearances for meter sockets, transformers, working clearances, and safety clearances from other hazards. The information here does not provide a comprehensive list of clearances, however. Even if a location seems to meet requirements described in this book, PGE must perform one or more on-site visits to confirm the location of meters, conduits, transformers, and other PGE-owned equipment before foundations are laid and equipment is purchased.

If any details of your project change after the project has been designed, the meter gear review is completed, and the customer has returned the signed Line Extension Cost Agreement (including the meter location, meter gear modifications, or elevation grade changes), PGE will need to re-review your project to confirm that the requested changes are acceptable. If design changes are required or needed, PGE may charge a redesign fee in accordance with its tariff.

IMPORTANT: *Wherever PGE equipment (such as a transformer, switchboard, current transformer [CT] cabinet, or sectionalizing cabinet) is installed in a location subject to vehicle traffic, the customer is required to install and maintain PGE-approved barrier posts. See 5.7.6, "Barrier Posts" for more information.*

5.2 *Meter Location Criteria*

IMPORTANT: *PGE must perform an on-site visit to confirm the location and meter socket for all meters before meter installation, even if gear location meets the requirements outlined in this book.*

The customer must provide suitable space and provisions for mounting a meter socket at a location acceptable to PGE. Meters and current transformer (CT) cabinets will be located outdoors unless PGE confirms—before installation—that no acceptable outdoor location exists. The metering equipment location must be accessible to PGE employees for 24 hours a day, 7 days a week for reading, testing, and replacing meters.

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.

Metering equipment, meter bases, and CT cabinets are prohibited in the following locations:

- Directly over a window well, stairway, ramp, or steps.
- In an area likely to be fenced. If a customer installs a fence or enclosure, the customer must—at their own expense—provide access acceptable to PGE or move the meter socket to a location identified by PGE.
- On the drive-through side of a commercial business. Existing services located within a drive-through are grandfathered unless the service is upgraded, and drive-through lane(s) will be subject to closure during working hours for PGE maintenance needs.
- On mobile structures such as a trailer, barge, crane, dredge, dragline, or any mobile pumping equipment; or on a floating dwelling unit (such as a houseboat).
- On poles owned by PGE.
- In places that may interfere with the meter's operation or on surfaces with excessive vibration.
- Any place where PGE determines that safety may be compromised.
- In places where the meter face or the door to the PGE equipment is obstructed.

Meters should not be blocked by any materials, including landscaping.

5.2.1 Meters in Gated Areas

If a meter must be located behind a fence, or a fence is added after a meter is installed, the customer must install a gate in one of these places:

- On the same side of the site where the meter is located, or
- On the side of the site where there will be the shortest distance from the street to the meter.

5.2.2 Residential Meter Location Criteria

PGE locates residential meters and current transformer (CT) cabinets outdoors 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.

PGE will not locate meters within 36 inches of a window well or steps in a stairway, or in any other unsafe or inconvenient location. PGE will avoid approving a meter location on an exterior bedroom or bathroom wall or patio, as well as exterior walls that are likely to be fenced in the future.

Keep shrubs and plants from obstructing clearances to metering equipment. For more information, see 3.9.5, "Access to the Meter Socket."

5.2.3 Nonresidential Meter Location Criteria

Locate nonresidential meters and current transformer (CT) cabinets outdoors unless PGE confirms—before installation—that no acceptable outdoor location exists. PGE will install service connections to customer's metering equipment only at the main level or entry floor level.

Indoor locations must have prior written approval by PGE and a PGE access plan. Locations must be within a room located on the structure's outside wall with a door leading directly to the outside. For comprehensive requirements, see Section 13, *Electrical Equipment Rooms and Interior Installations*.

5.3 *Meter Clearance Dimensions*

5.3.1 Metering Workspace Requirements

Workspaces must meet ***all*** the following criteria:

- The minimum unobstructed workspace in front of a meter is 72 inches high, 48 inches wide, and 48 inches deep (or the width of the equipment, whichever is greater). The width of the workspace in front of the electrical equipment must be the width of the equipment or 48 inches, whichever is greater. These clearances are shown in **Figure 17**.

Note: The figure is stretched and the image is not to scale. The widths shown are not the actual widths of the equipment.

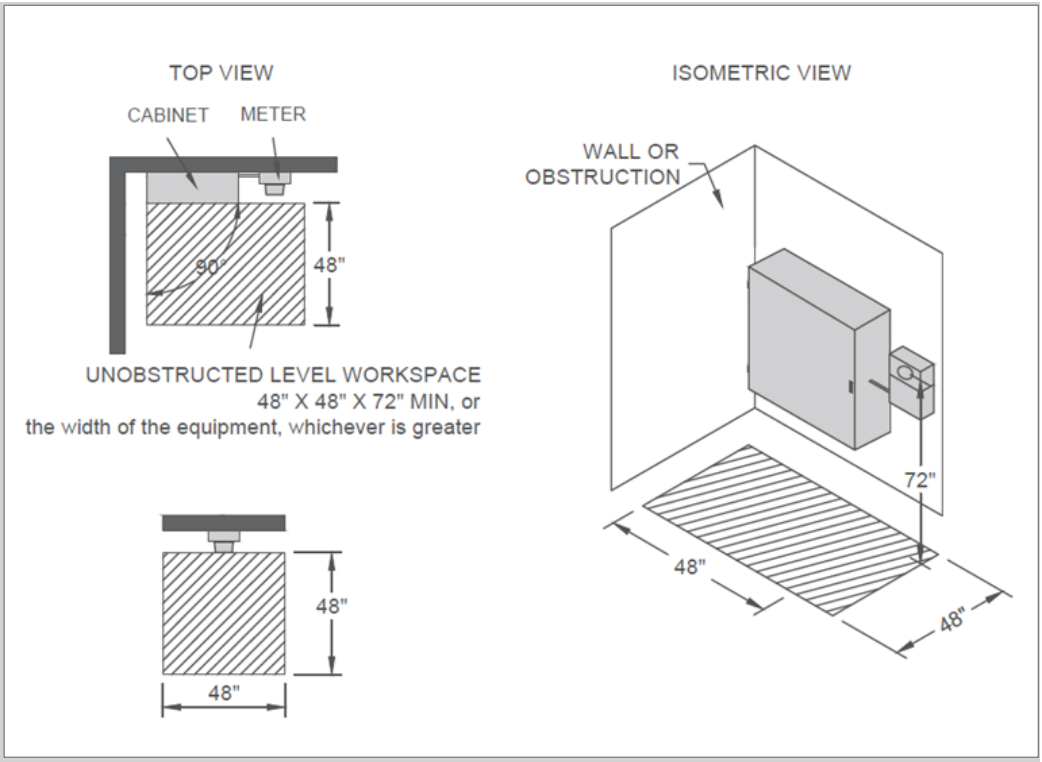

Figure 17: Minimum Unobstructed Workspace Around Metering Equipment

- A meter installed in a cabinet requires a minimum 48-inch–deep space to allow the cabinet door(s) to open to at least 90 degrees. Similarly, the workspace must allow equipment doors or hinged panels to open to at least 90 degrees and lock in the open position.
- Open cabinet doors on a piece of utility equipment must not block the exit.
- All meters and metering equipment must be located at least 36 inches horizontally from a gas meter.
- When live parts that are normally enclosed are exposed for inspection or servicing, the workspace must be suitably guarded if it's in a passageway or general open space.
- Transformer working clearances must maintain at least 36 inches of clearance between the non-door opening sides of a single-phase transformer pad or vault edge and any aboveground obstacles. Three-phase transformer pads and vault edges require 48 inches of clearance to any aboveground obstacle (trees, bushes, fences) or facility (such as a transformer, switchboard, or obstacle wall).

5.3.2 Single-Meter Installation

Table 5 lists the general clearances for single-meter socket installations and single-meter switchboard installations.

Table 5: Clearances for Single-Meter Socket and Switchboard Installations

Description	Clearance
Height of the center of the meter socket from the finished grade or floor	42 in. min. 72 in. max.
Horizontal clearance from the wall or obstruction to the center of the meter socket	10 in.
Vertical clearance from the ceiling or obstruction to the center of the meter	9 in.
Depth of level unobstructed workspace in front of the meter	48 x 48 x 72 in.

5.3.2.1 Single-Meter, Flush-Mount Installation

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. The building face must not extend beyond the face of the meter box (as shown in **Figure 18**). A minimum 3/4-inch plywood backing is required.

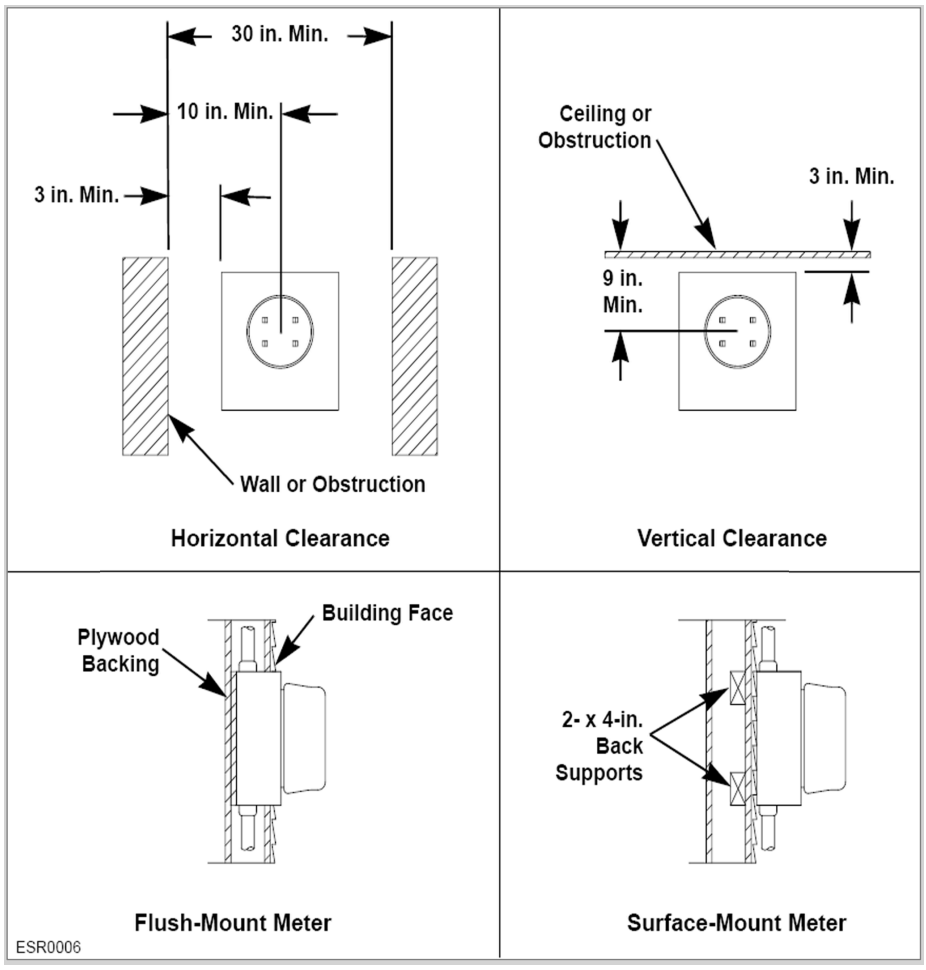

Figure 18: Meter Clearances for Single-Meter Installations

Gray highlighting is used to mark new, updated, and moved content.
Highlighting ***does not*** indicate the importance of the text.

5.3.2.2 Single-Meter, Surface-Mount Installation

A surface-mount meter must have at least two 2- x 4-inch back supports, as shown in **Figure 18**.

5.3.3 Multiple-Meter Installation

A multiple-meter installation in a room or on adjacent walls must follow these additional requirements. All of these requirements apply to the drawings shown in **Figure 19**.

- 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.
- No more than five meters are allowed in a single vertical gang meter stack.

Table 6: Clearances for Multiple-Meter Socket and Switchboard Installations

Description	Clearance
Clearance from the open door of a CT cabinet to a wall or obstruction	4 in. min.
Clearance from the side of a CT cabinet to a wall or obstruction	30 in. min.
Clearance from the front of a CT cabinet to a wall or obstruction	48 in. min.
Horizontal clearance between the side of the meter box to a wall or obstruction	10 in. min.
Horizontal clearance between multiple meters located on adjacent walls	16 in. min. *
Height of uppermost meter socket above finished grade	72 in. max. *
Height of lowermost meter socket above finished grade	36 in. min. *

* Clearance is measured from the center of the meter.

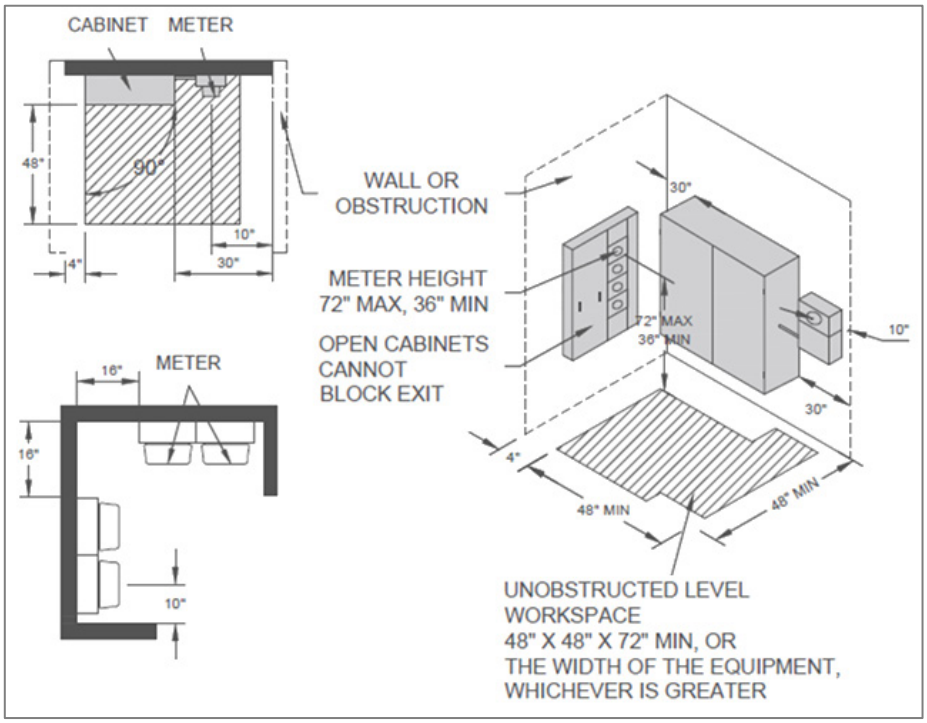

Figure 19: Meter Clearances for Multiple-Meter Installations

5.4 *Clearances for Overhead Services*

The clearances in **Table 7** are in accordance with the National Electrical Safety Code (NESC) or PGE standards.

Residential and other pitched-roof services that are not accessible to a bucket truck must have a 14-foot clearance from the ground to the point of attachment. The weatherhead height should not be greater than 5 feet above the roof line unless required to achieve the 14-foot clearance. To maintain required clearances over roads and other surfaces traveled by vehicles and also ensure that the weatherhead is not greater than 5 feet above the roof line, a clearance pole may be required. Contact PGE for more details about your project.

Table 7: 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.

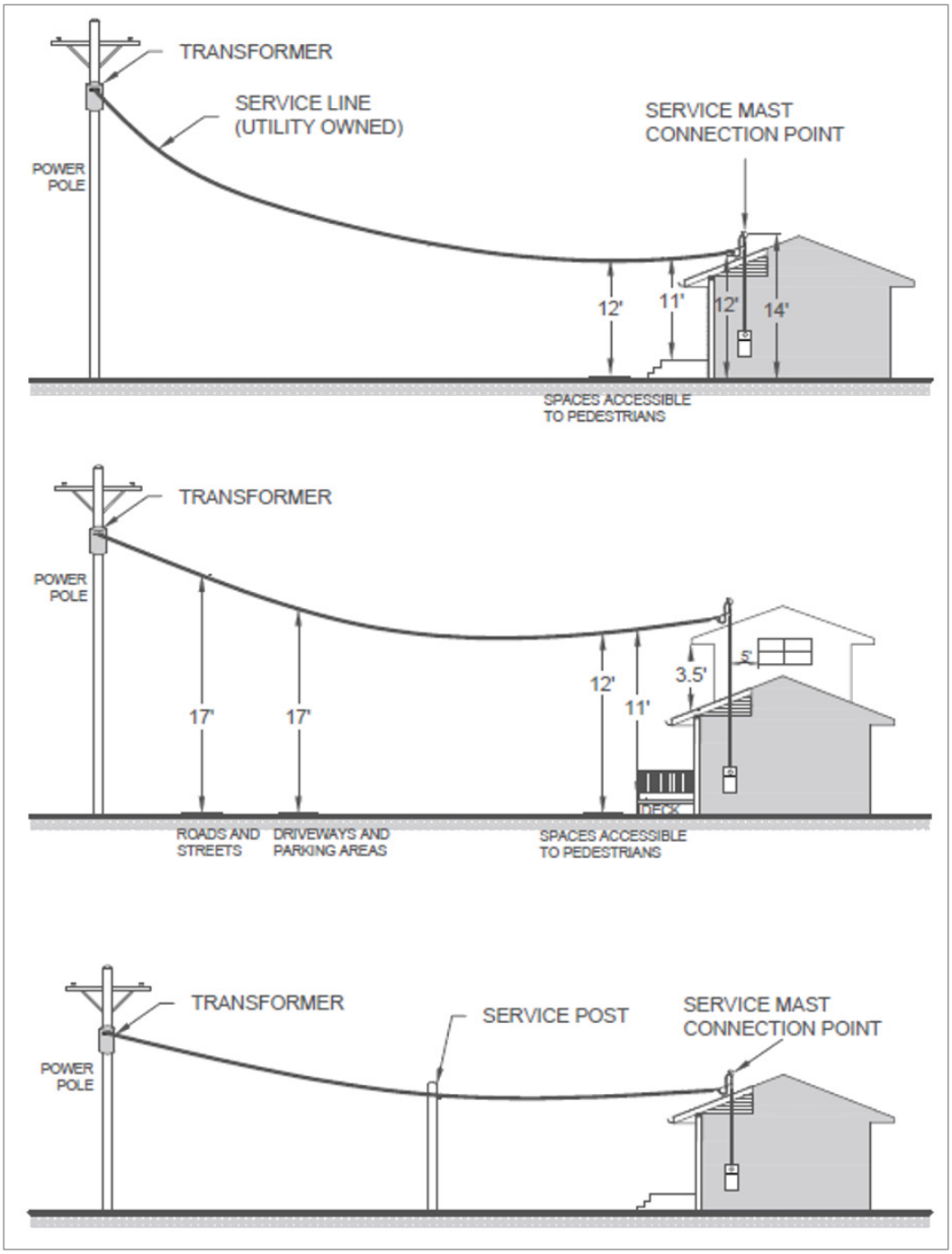

Figure 20: Clearances in Typical Overhead Service Configurations

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

- Buildings should not be constructed under or adjacent to lines. NESC requires horizontal clearances from conductors to steps, buildings, porches, balconies, and roofs. Consult PGE for additional information.
- The maximum distance between the meter base and the corner of the house closest to a PGE line is 10 feet (120 inches).

- A gas meter set, meter, regulator, or flange must be at least 36 inches from the PGE meter as shown in **Figure 16**.
- Meters should be at least 36 inches from of a window or door with a view of living spaces.
- Window wells must be at least 30 inches from a PGE meter in all directions.
- Clearances for service drops and drip loops are listed in **Table 7**.

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

- Weatherheads must be at least 24 inches above the roof and within 48 inches of the roof edge. See 7.3.2, "Service Mast Guy and Anchor Requirements" for guying requirements.
- Within 2 feet of the weatherhead, provide a single attachment point 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.
- The cable and drip loop must be at least 18 inches above an inaccessible roof as defined by NESC.
- The point of attachment for the cable must be a 3/8-inch eyebolt or 3/8-inch eye lug located within 24 inches of the weatherhead as shown in **Figure 16**.

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

- Conductor leads must be 24-inch minimum for connection to the service drop.
- The service cable length must not exceed 6 feet over the roof surface.
- See 7.3, “Overhead Service” for requirements for single-family overhead services.

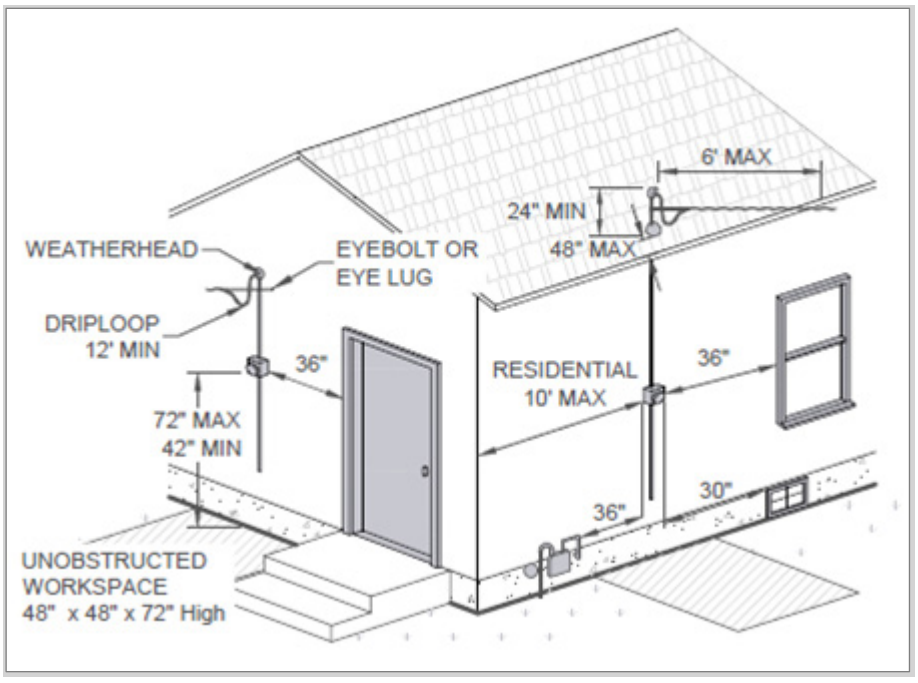

Figure 21: Metering Equipment for Overhead Service

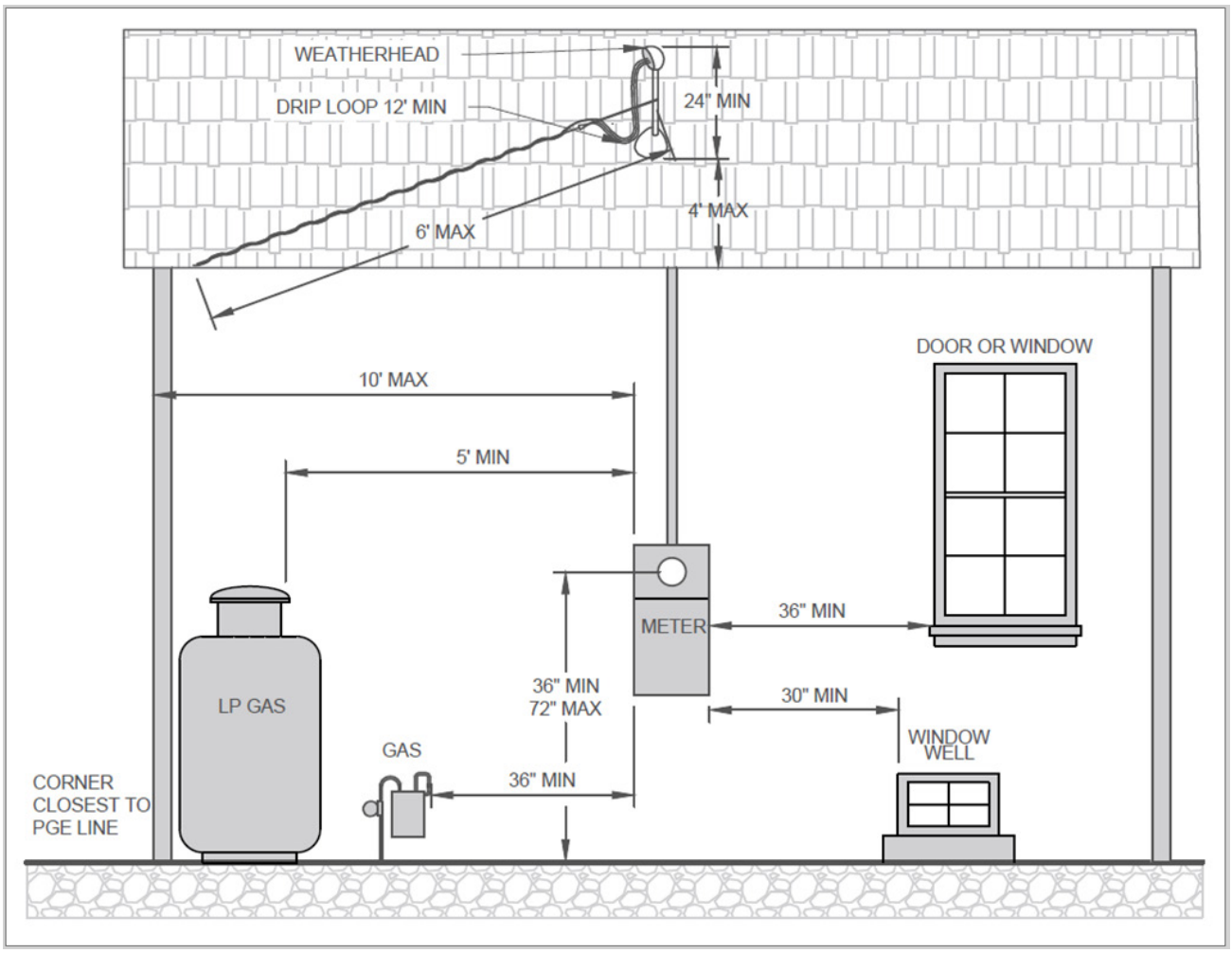

Figure 22: Residential Meter Clearances for Overhead Service

5.5 *Locations and Clearances for Transformers, Switches, Vaults, and Other Electrical Equipment*

Note: Locate transformers between 5 feet and 15 feet from a maintained drivable surface.

PGE will select the location of electrical equipment using the clearances listed in **Table 8**, any additional applicable NESC clearances, the size of the transformer, and the working space clearances for the equipment.

PGE equipment clearances must not be obstructed by landscaping, parking areas, sidewalks, driveway areas associated with truck loading docks, or other obstructions.

These clearances must be evaluated.

- Safety clearances from electrical equipment to combustible surfaces and hazards, such as gas equipment, LP equipment, bodies of water, and vehicular traffic. See 5.5.1.
- Safe work clearances for PGE personnel in front of electrical equipment. See 5.5.2.

Table 8: Clearances for Pad-Mounted Equipment

For This Clearance …	Clearance Distance
Horizontal clearance in front of and extending parallel to the front of the equipment enclosure *and* any side with a door or access panel	10 feet. See 5.6.3.
Horizontal clearance from the side or back of the equipment to a combustible wall or roof, including overhangs, balconies, decks, and wood fences *See 5.6.2.5 FM Approved Transformer for reduced clearances	8 feet. See 5.6.1.
Noncombustible walls (including steel, brick, or concrete) if the side of the transformer facing the wall does not have doors	36 inches. See 5.6.1.
Fire sprinkler valves, standpipes, and fire hydrants	48 inches. See 5.7.5.
Doors, windows, vents, fire escapes, and other building openings	8 feet. See 5.6.1.
The edge of a swimming pool or any body of water	5 feet. See 5.7.5-5.7.6.
Gas meter as measured from the nearest gas component	36 inches. See 5.7.1.
Facilities used to store LP or hazardous liquids or fuels	10 feet or more. See 5.7.2.
Underground fuel storage tank	10 feet or more. See 5.7.3.

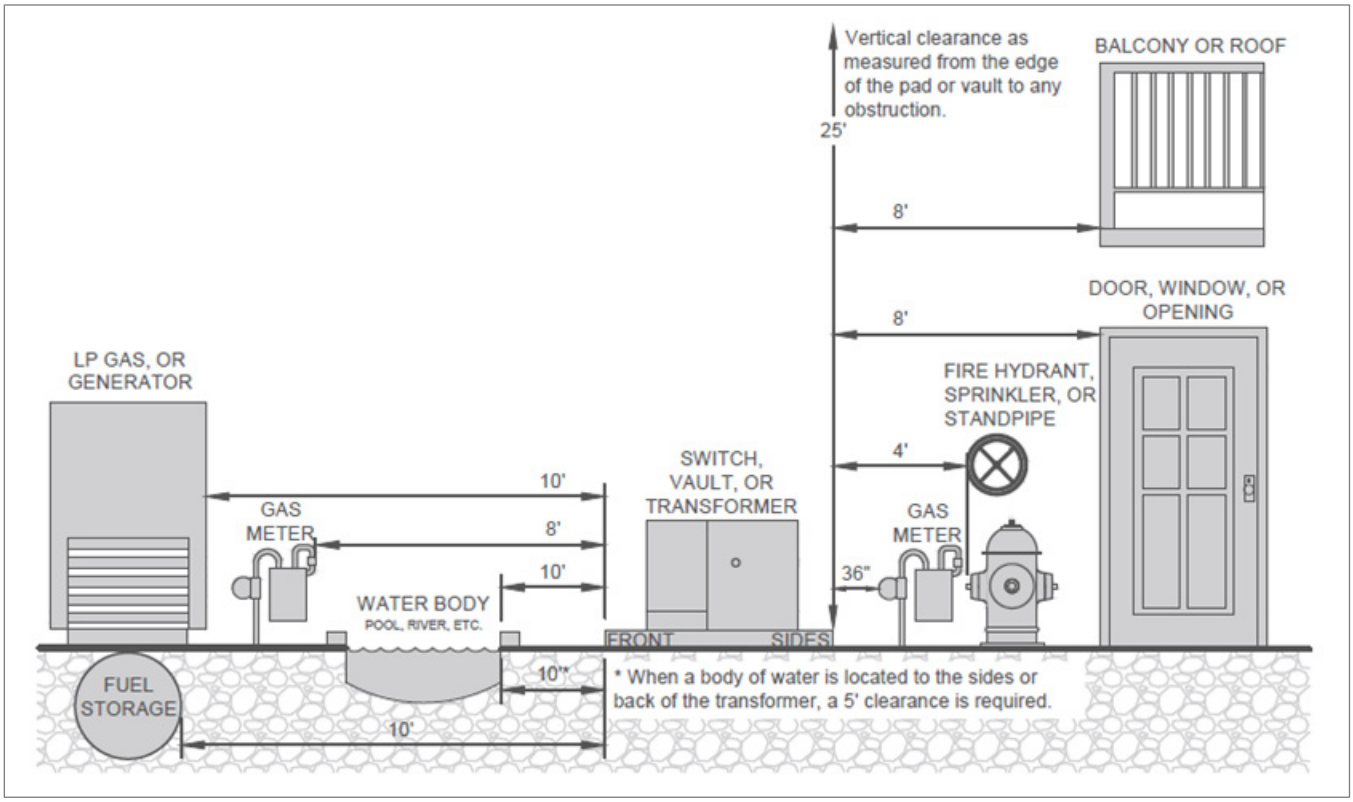

Figure 23: Clearances for PGE Electrical Equipment

5.5.1 Clearances of PGE 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. The minimum separation distance can be reduced by using a less-flammable dielectric fluid and/or a fire barrier.

5.5.1.1 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 (as shown in **Table 9**).

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 9: 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.

5.5.1.2 Clearances for Oil-Filled Transformers

IMPORTANT: *These clearances apply to oil-filled transformers only. For clearances for fluid-filled transformers, see 5.5.1.3, "Clearances for FM Approved Transformers."*

Clearances of Oil-Filled Transformers 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 clearances shown in **Figure 24** and listed in **Table 10**. The separations provided in **Table 10** apply to both pad-mounted and submersible transformers.

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

Note: Locate transformers between 5 feet and 15 feet from a maintained drivable surface. See 5.5.3, "Drivable and Accessible Surface for PGE Equipment."

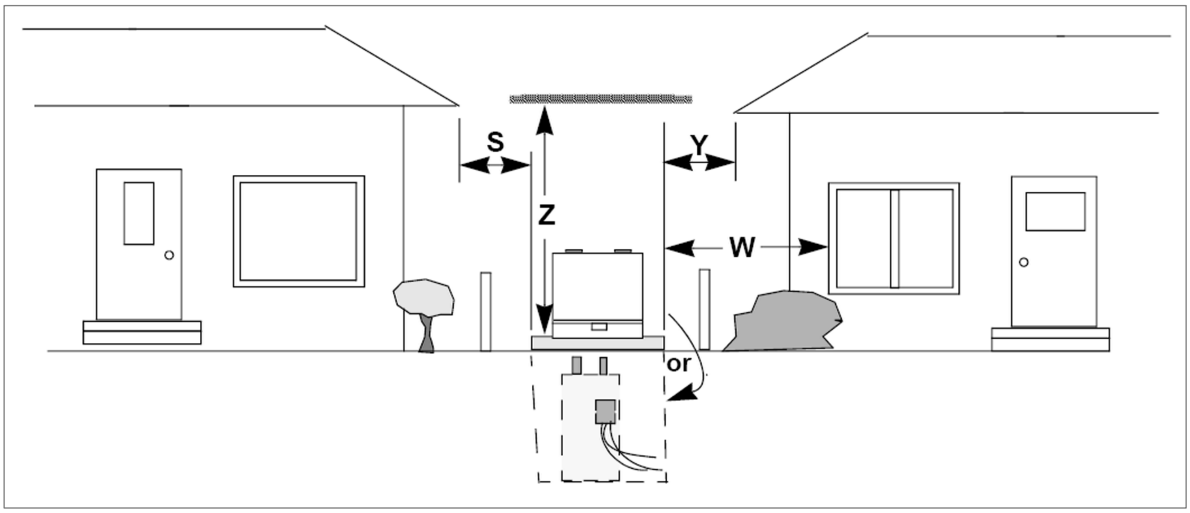

Figure 24: Minimum Clearances of Oil-Filled Transformers from Buildings

Table 10: Minimum Clearances of Oil-Filled Transformers from Buildings

Oil Capacity (gallons)	Clearance			
	To Noncombustible Structure (S) (feet)	To Combustible Structure (Y) (feet)	To Any Opening in Structure (W) (feet)	Vertical Distance (Z) (feet)
0–499	3 * 5 (3-phase only) *	8 **	8 †	20 ††
500–5000	25 *	50 **	50 †	50 ††
5001 or more	50 *	100 **	100 †	100 ††

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

** Clearance 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.

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

Clearances of Oil-Filled Transformers 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 clearances listed in **Table 11** must be applied. The distances in the table apply to both pad-mounted and submersible transformers.

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

Figure 25 and **Figure 26** show the minimum clearances of the side or back of a transformer from combustible and non-combustible surfaces. All distances are measured from the edge of the transformer pad.

Table 11: Minimum Clearances of Oil-Filled Transformers from Other Oil-Filled Equipment

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

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

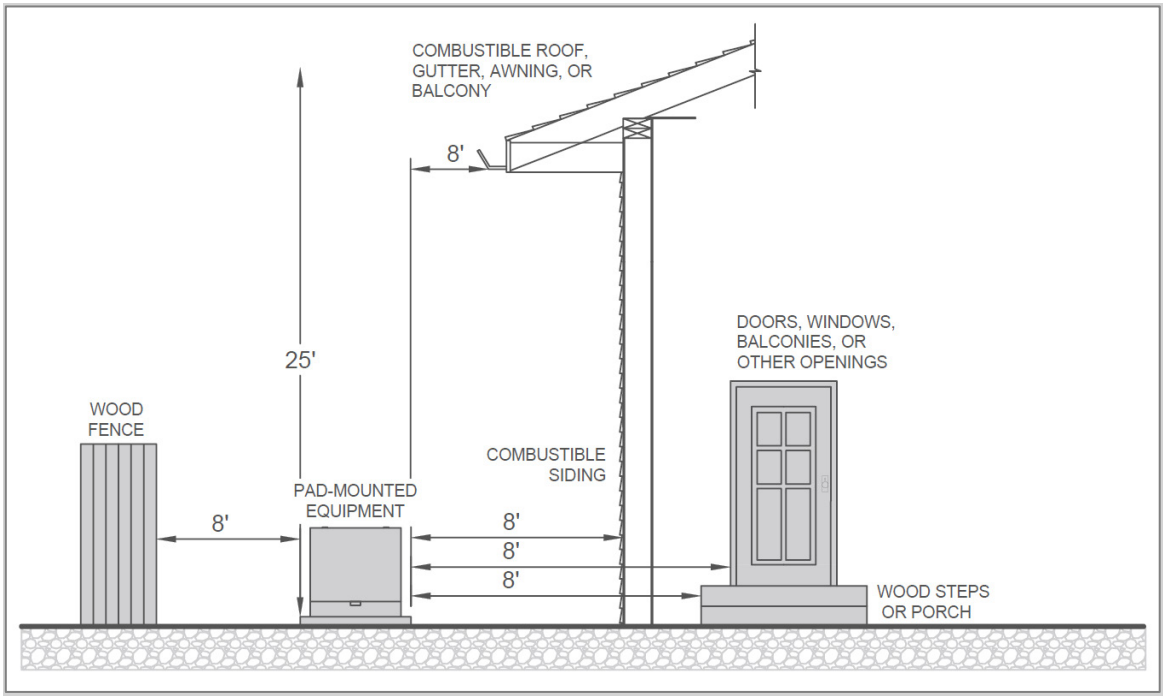

Figure 25: Minimum Clearances of the Side or Back of a Transformer from Combustible Surfaces

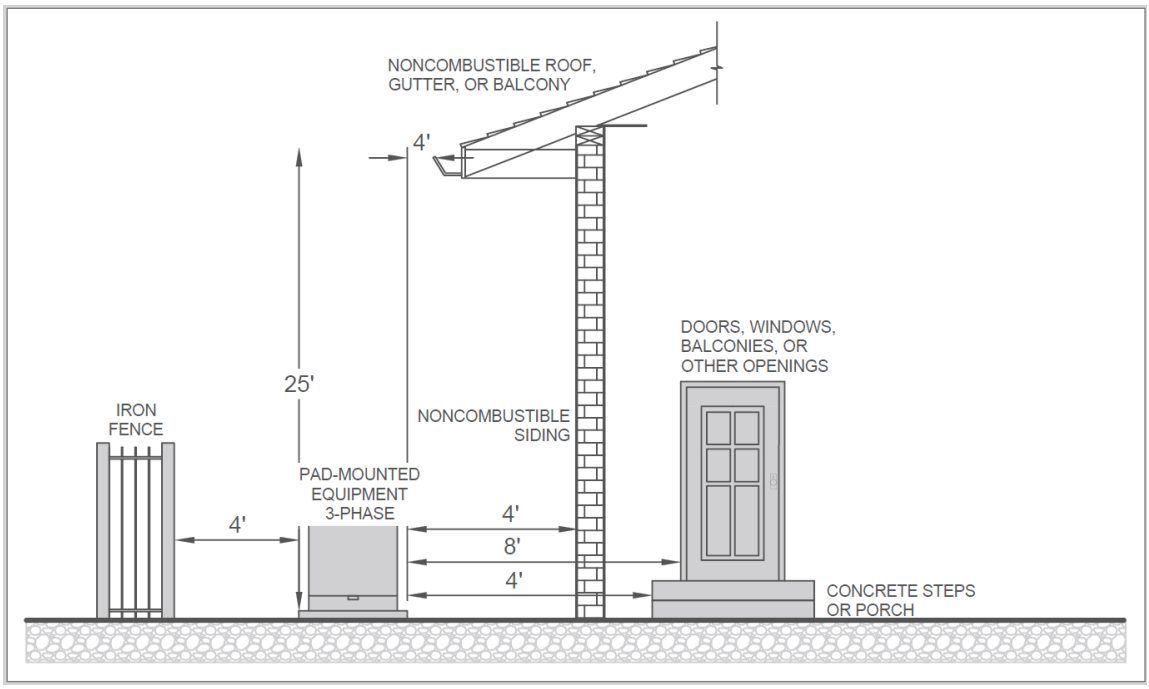

Figure 26: Minimum Clearances of the Side or Back of a Three-Phase Transformer from Noncombustible Surfaces

5.5.1.3 Clearances for FM Approved Transformers

Where the clearances between oil-filled transformers and combustible structures or other oil-filled equipment given in **Table 10** and **Table 11** 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.

Clearances of FM-Approved Transformers from Buildings

The minimum separation distances listed in **Table 12** are required when locating FM Approved transformers next to buildings.

Table 12: Minimum Clearances of FM Approved Transformers from Buildings

Fluid Capacity (gallons)	Minimum Clearance (feet)				
	To Noncombustible Structure (S)		To Combustible Structure (Y)	To Any Opening in Structure (W)	Vertical Distance (Z)
	Single-Phase	Three-Phase			
All sizes	3 *	5 *	8 **	8 †	20 ††

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

** Clearance 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.

†† Clearance 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*.

Clearances of FM Approved Transformers from Other Oil/Fluid-Filled Equipment

The minimum separation distances listed in **Table 13** are required when locating FM Approved transformers next to other oil/fluid-filled equipment.

IMPORTANT: *The other equipment must also be FM Approved for the reduced separation in **Table 13** to apply. Otherwise, the distances from oil-filled equipment listed in **Table 11** must be used.*

Table 13: Minimum Separation of FM Approved Transformers from Other Oil/Fluid-Filled Equipment

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

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

5.5.1.4 Firewalls Around Oil-Filled Equipment Next to a Building

In some circumstances, PGE may approve the construction of a firewall to reduce the required clearance of oil-filled equipment from a combustible building. The firewall must be built by the customer to PGE's specifications.

- The firewall must have a minimum two-hour fire rating.
- The height of the firewall must be at least 12 inches above the top of the largest-size transformer that may be used at the site. Typically, a 6-foot–high wall is sufficient for the majority of PGE pad-mounted equipment.
- The sides of the firewall must extend 24 inches horizontally beyond the exposed ends of the oil-filled equipment.
- Required working clearances between PGE equipment and the firewall must be maintained.

Figure 27 shows the required clearances between a firewall, structures, and equipment.

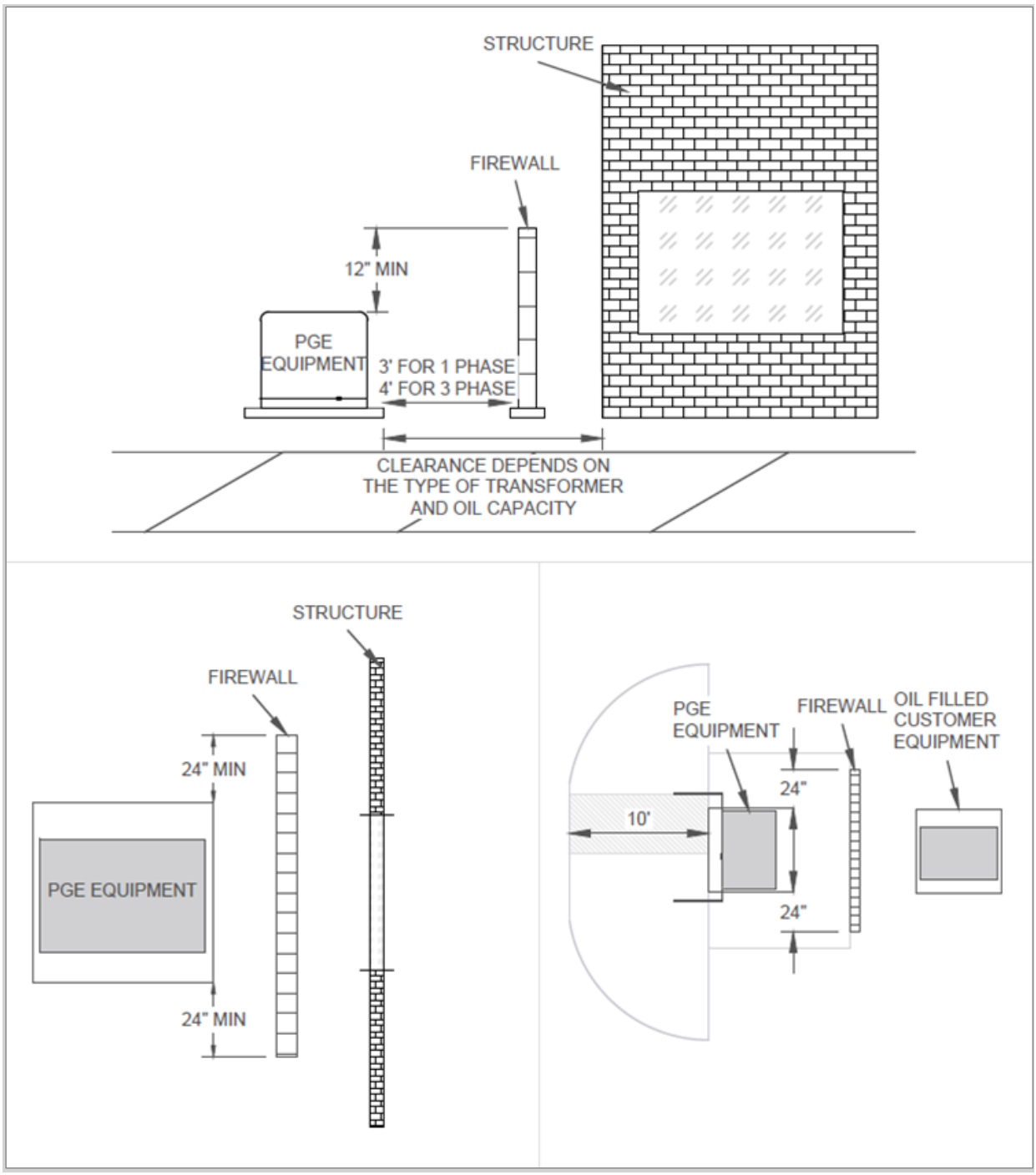

Figure 27: Clearances of Firewalls from Structures and Equipment

5.5.2 Working Areas Around PGE Transformers, Switches, Vaults, and Other Electrical Equipment

The work performed by PGE line crews requires that a clear and level working area be maintained around electrical equipment. Clearances should not be obstructed by any structure, wall, landscaping, parking spot, fence, gate, or other obstruction.

5.5.3 Drivable and Accessible Surface for PGE Equipment

There are two situations in which PGE defines a drivable surface:

- Access.

  Space needed to provide a drivable and accessible surface for PGE vehicles and equipment.

- Bollards.

  Drivable surfaces traversed by cars, trucks, and other equipment that require bollards (barrier posts) for protection of PGE equipment. For bollard requirements, see 5.6.8, “Barrier Posts.”

PGE vehicles and equipment require drivable surfaces that are beyond what is required for typical cars and trucks. Because of this, PGE equipment must be located within 15 feet of a 12-foot wide permanent drivable surface (paved or compacted gravel) that allows for unrestricted access.

These surfaces are ***not*** drivable surfaces for PGE vehicles:

- Sidewalks.
- Lawns.
- Landscaped areas.

5.5.4 Clearances Around Pad-Mounted Electrical Equipment

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

- At least 10 feet of horizontal clearance 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 36 inches of horizontal clearance on any non-opening side of the electrical equipment.
- At least 30 feet of vertical clearance above final grade.

Figure 28 shows the required clearances for pad-mounted electrical equipment adjacent to a noncombustible structure. **Figure 29** shows the required clearances for pad-mounted electrical equipment adjacent to a combustible structure.

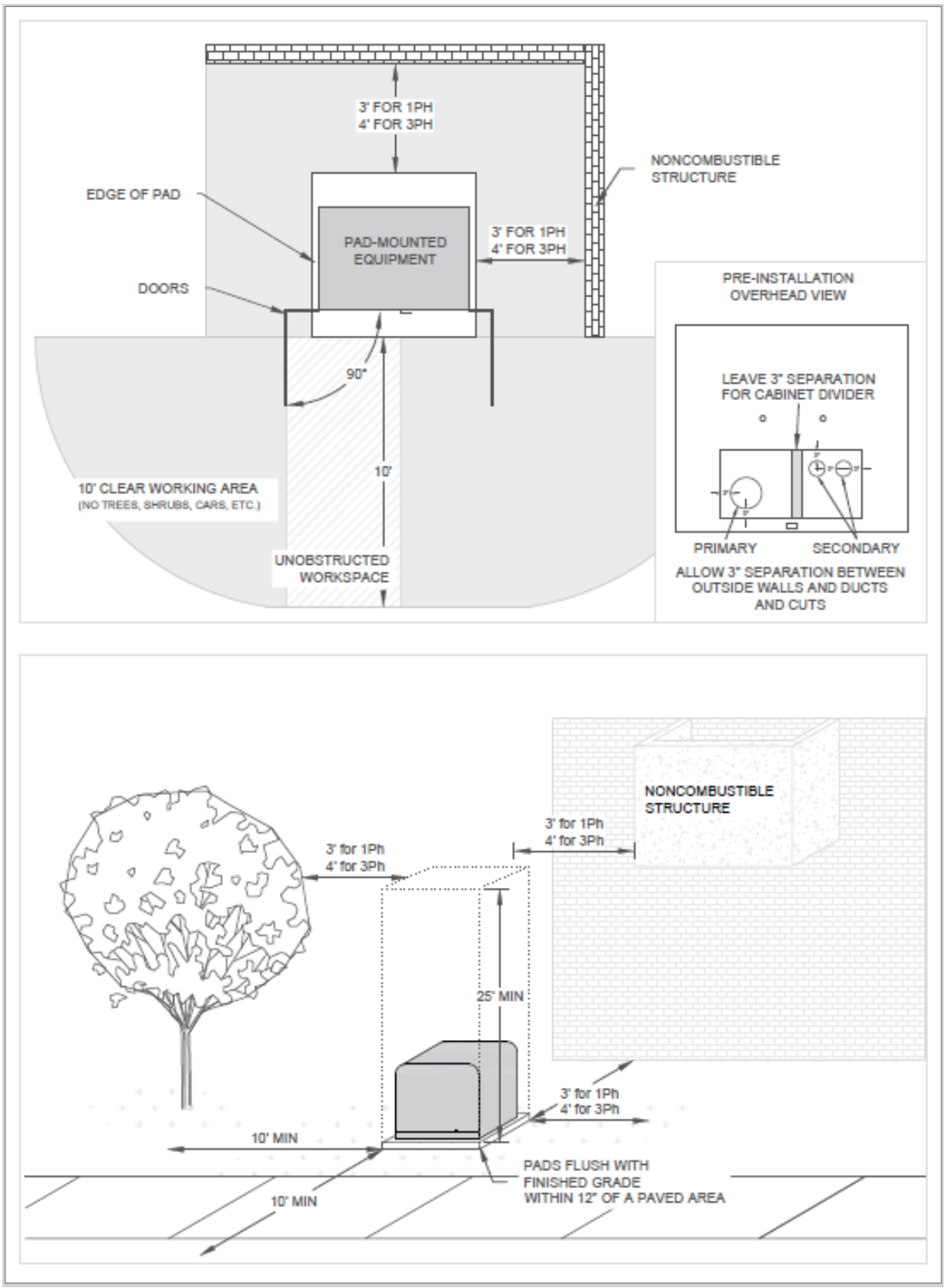

Figure 28: Working Clearances Around Pad-Mounted Electrical Equipment Adjacent to a Noncombustible Structure

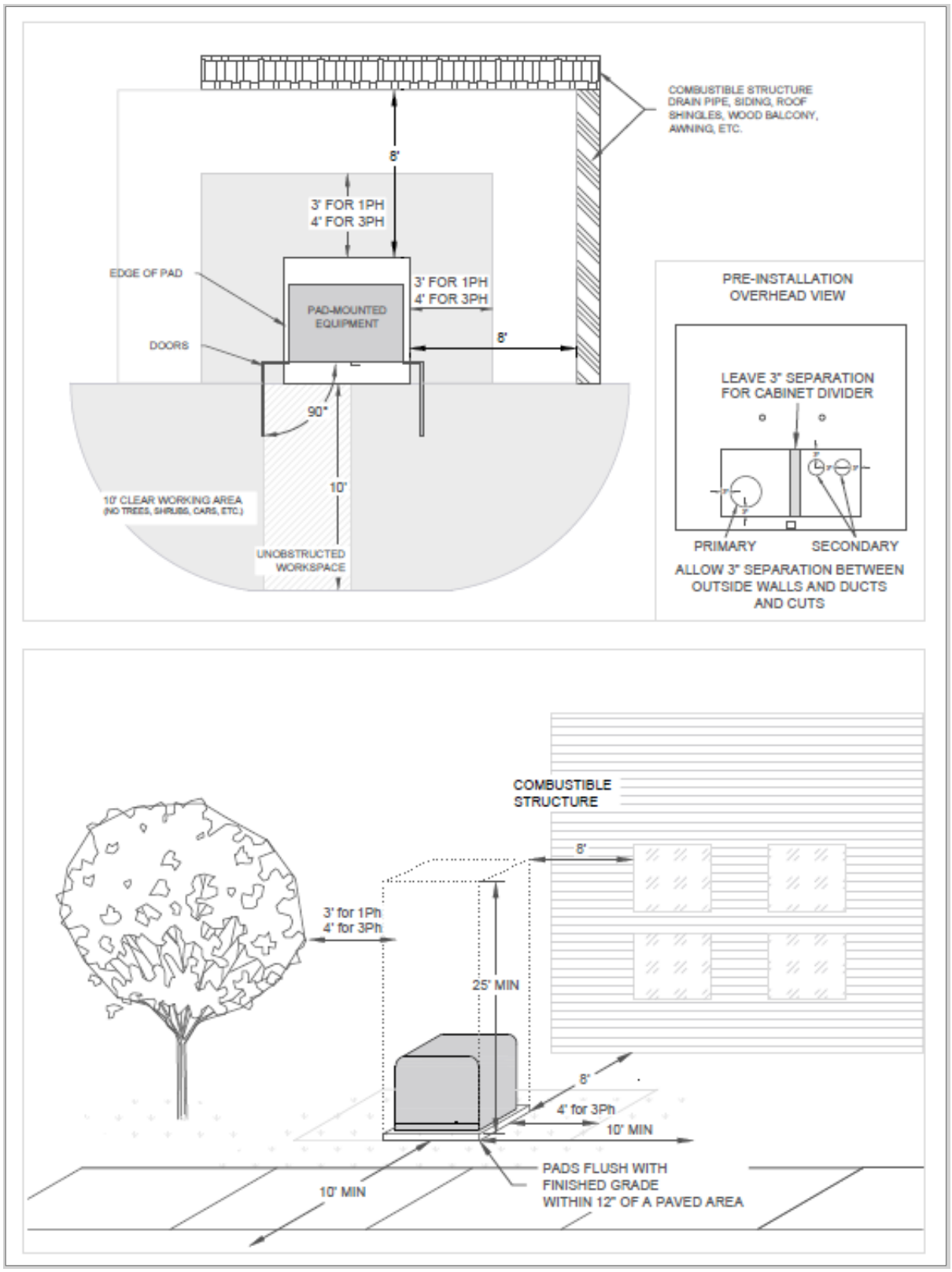

Figure 29: Working Clearances Around Pad-Mounted Electrical Equipment Adjacent to a Combustible Structure

5.5.5 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 hinges.) At least 5 feet of horizontal separation is required behind the enclosure lid and 30 feet of vertical separation is required above the lid.

Figure 30 shows the separation requirements for submersible electrical equipment.

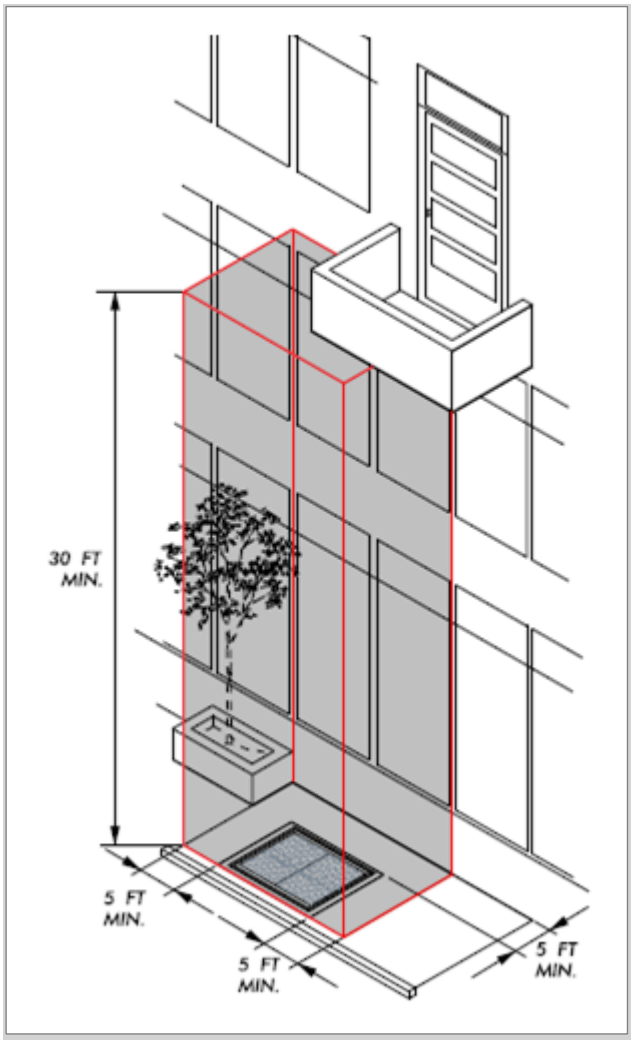

Figure 30: Working Clearances Around PGE Submersible Equipment

5.6 *Safety Clearances from Other Hazards*

5.6.1 Clearances of PGE Electrical Equipment from a Gas Meter Set

IMPORTANT: *The minimum clearance between a gas meter, gas meter regulator, or gas meter flange and an electrical meter, secondary voltage pedestal, or handhole is 36 inches.*

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 31**—varies with the number of meters and associated equipment.

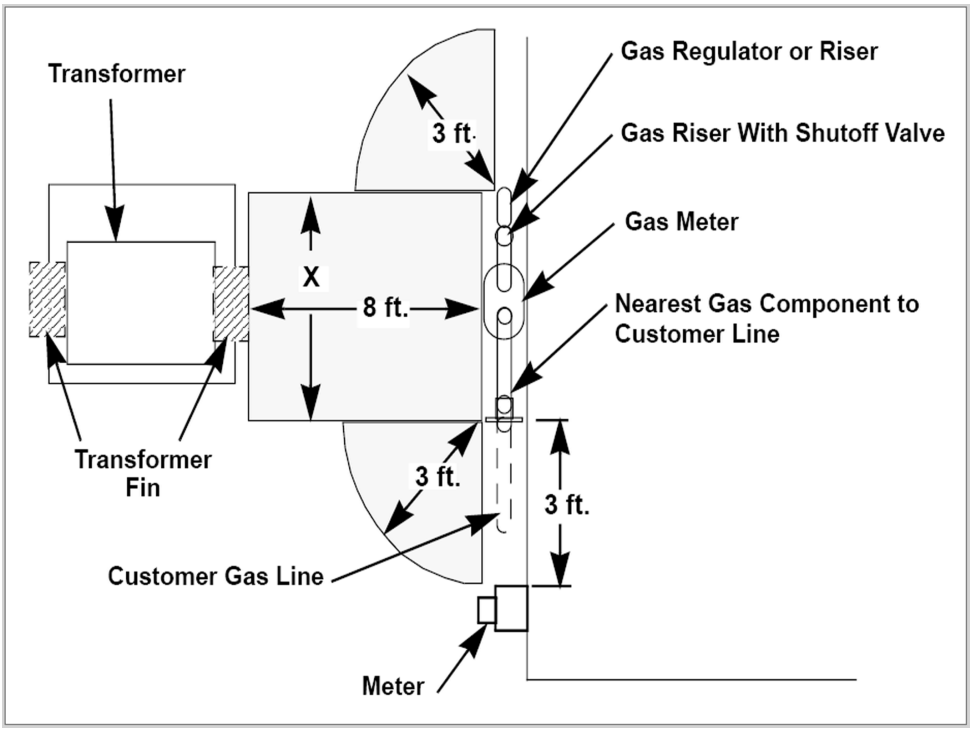

Figure 31: Separation of Electrical Equipment and a Meter from a Gas Meter Set

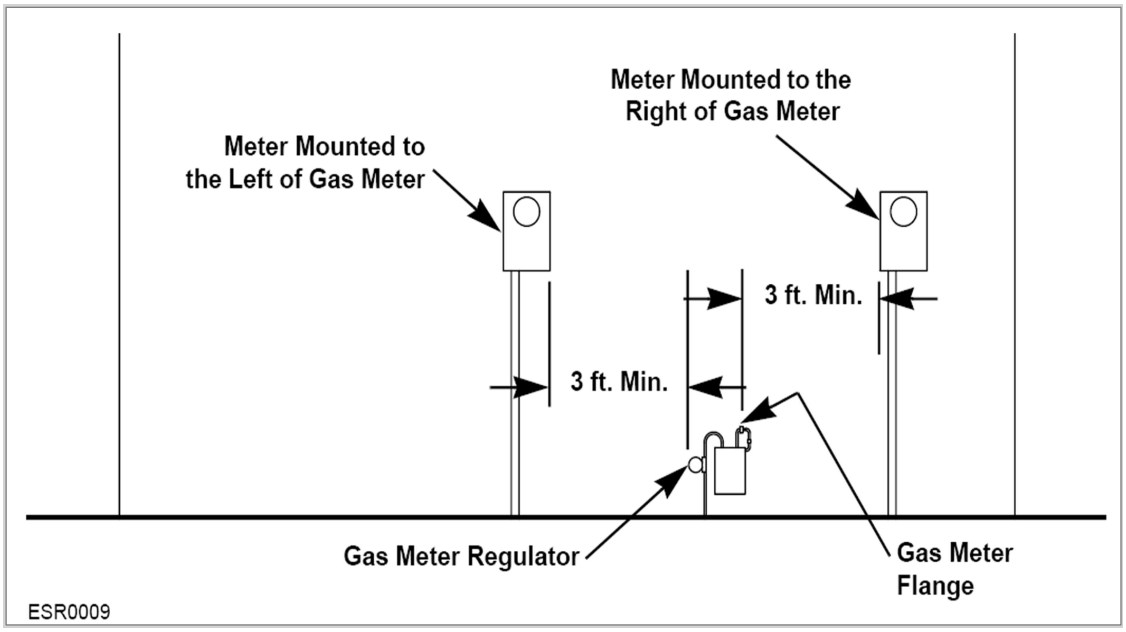

Figure 32: Separation of a Meter from a Gas Meter Regulator and Gas Meter Flange

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

Electrical equipment—such as a transformer, switch, vault, or pedestal—is 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 33**, 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 14** 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 that authority's approval.

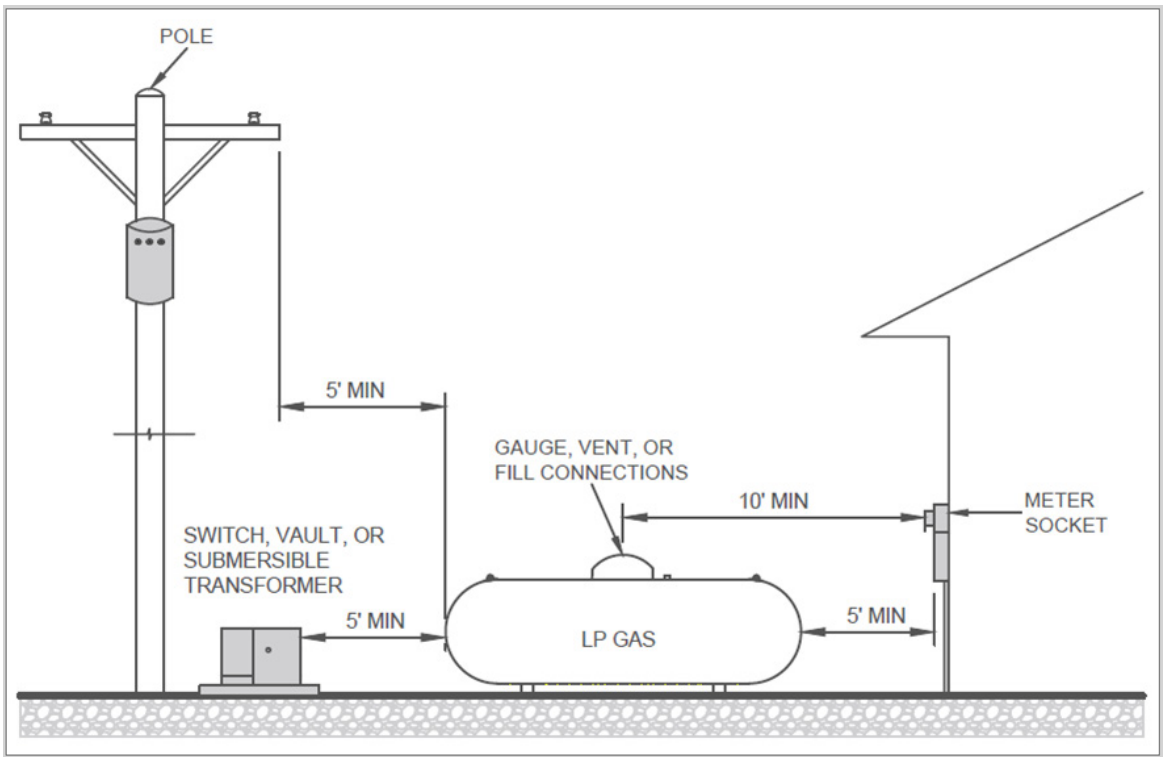

Figure 33: Minimum Distances from an Aboveground LP Storage Tank

Table 14: 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*.

5.6.3 Separation of Conduit from a Fuel Storage Tank

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

5.6.4 Fire Hydrants

The clearance between fire hydrants and structures must not be less than 4 feet, as shown in **Figure 33**. The clearance between fire hydrants and electrical equipment must not be less than 4 feet.

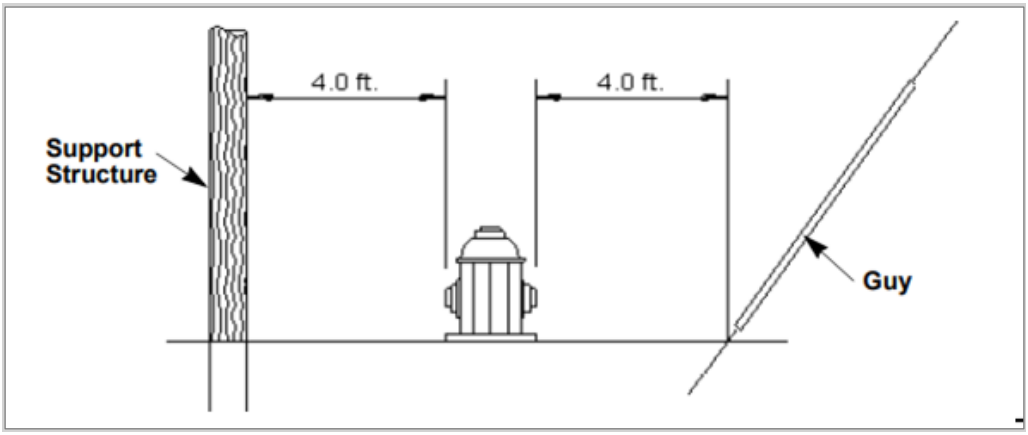

Figure 34: Clearances from Fire Hydrant to Support Structures

5.6.5 Irrigation Sprinklers

Meter sockets, terminal cabinets, current transformer cabinets, and transformers should be located away from landscape irrigation sprinklers.

5.6.6 Overhead Clearances from Pools, Diving Structures, or Bodies of Water

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.

5.6.7 Underground Cable Clearances Near Water

PGE will not install facilities under or through a body of water (such as a river, creek, or steam) or water feature (such as a pool, pond, or fountain). When installing new facilities, all underground cable and conduit must be kept at least 5 feet from the edge of any body of water or water feature. Additional clearances or encasement may be required if the body of water is expected to continue to erode and/or shift over time (such as with wandering streams). Contact PGE for additional site-specific information and requirements.

5.6.8 Barrier Posts

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

Customers are required to Install barrier posts (bollards) around all electrical equipment (such as transformers, switchboards, CT cabinets, or sectionalizing cabinets) in areas where that equipment is exposed to vehicle traffic. The barrier post design and location must be approved by PGE. **Figure 35** shows barrier post dimensions and installation details.

Barrier posts are ***required*** for the following:

- When the distance from a landscaped area to the side of PGE equipment is 5 feet or less.
- When the distance from the face (or back) of a standard 6-inch curb to the pad of the PGE equipment is 5 feet or less.
- When PGE equipment is accessible to vehicular traffic via a paved or gravel surface.

  IMPORTANT: *Sidewalks without curbs, parking lot tire stops, and other types of mountable curb **do not** provide adequate protection.*

- At the discretion of PGE given site conditions, such as when future development is anticipated and/or planned.

Note: Barrier posts will be required around poles and vaults that are subject to vehicular traffic at the sole discretion of PGE

5.6.8.1 Placement and Clearance Requirements

IMPORTANT: *Obtain PGE approval for the number and location of barrier posts before installation.*

These requirements apply to barrier post installations:

- Install barrier posts on all sides of the equipment that are exposed to vehicles.
- Barrier posts must be spaced no more than 6 feet apart, measured from the face of the post.

  Note: It is sometimes necessary to place barrier posts less than 6 feet apart to maintain required safe working clearances in front of primary conductor connections. Depending on site conditions, this may increase the total number of barrier posts required for the installation.

- 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 from single-phase equipment and at least 4 feet from three-phase equipment.
- When placing barrier posts in front of equipment doors, a 4-foot clearances is required from the edge of the pad. Doors must be able to open 90 degrees.
- PGE requires 10 feet of unobstructed working clearance in front of primary conductor connections. See **Figure 36**.
- Do not locate barrier posts in front of the left half of pad-mounted equipment or vaults. See **Figure 37.**

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

5.6.8.2 Installation Requirements

- Install barrier posts in undisturbed earth. If 3 feet of undisturbed area is not available after the vault is set, the area between the vault wall and the barrier post hole must be filled with 3/4-inch minus compacted gravel.
- Each barrier post must be set in a concrete foundation that extends at least 3 inches below the bottom of the post.
- Areas with heavy vehicle traffic (such as truck traffic lanes and loading docks/areas) must have barriers with reinforced concrete foundations
- Barrier posts must be 6-inch diameter, Schedule 40 galvanized steel posts. Post dimensions are listed in **Table 15**.
- Steel posts must be filled with concrete. All concrete must have a minimum compressive strength of 3000 psi after 28 days.
- Barrier posts must have a domed top.
- At the foot of a barrier post located at final grade, the concrete must have a 2-inch dome to prevent water pooling.
- Paint all barrier posts safety yellow and apply two 3-inch-wide reflective bands near the top of each post, as shown in **Figure 35**.
- 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.

Table 15: Barrier Post Dimensions for Specific Loacations

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

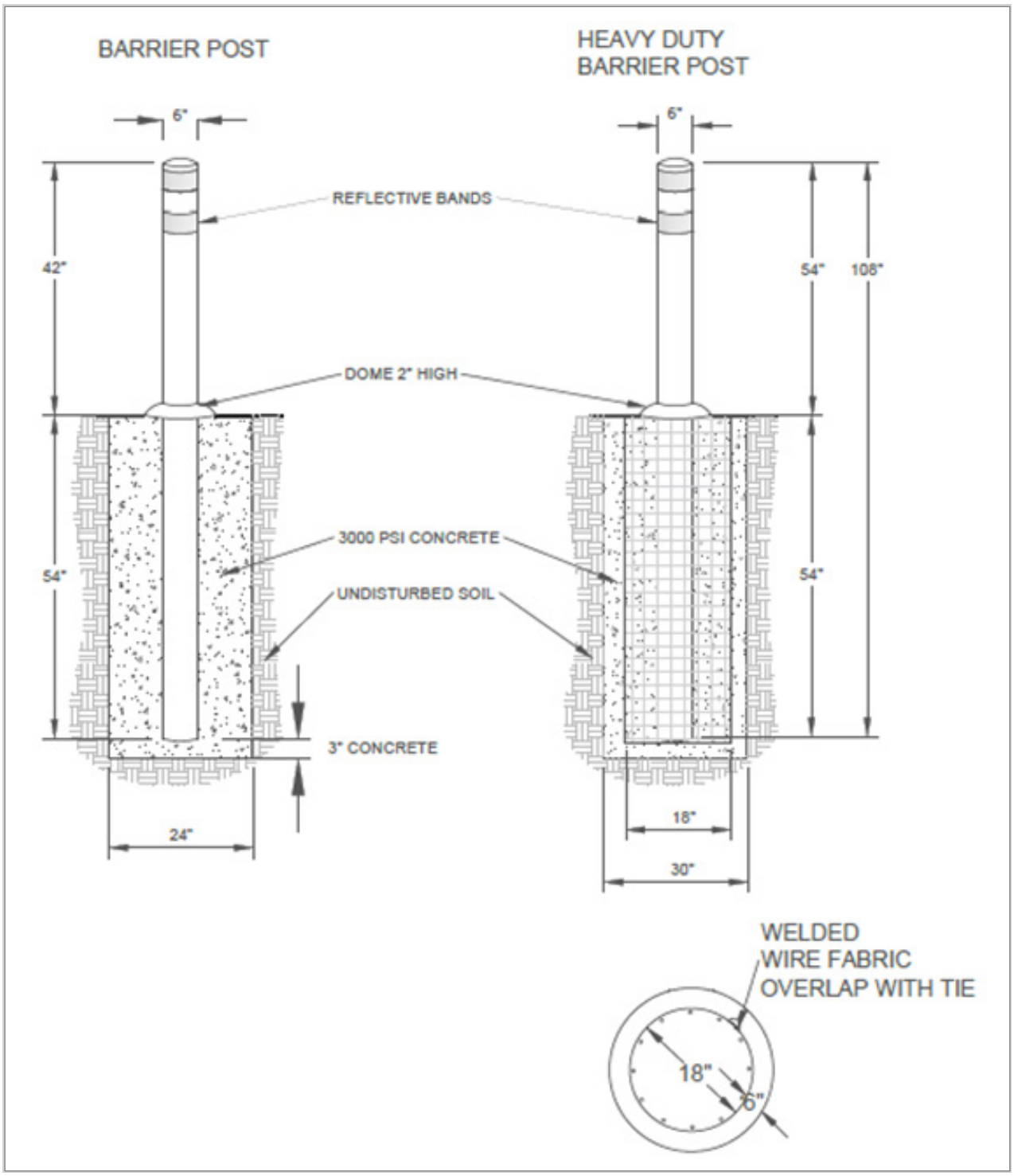

Figure 35: Barrier Post Dimensions and Installation Details

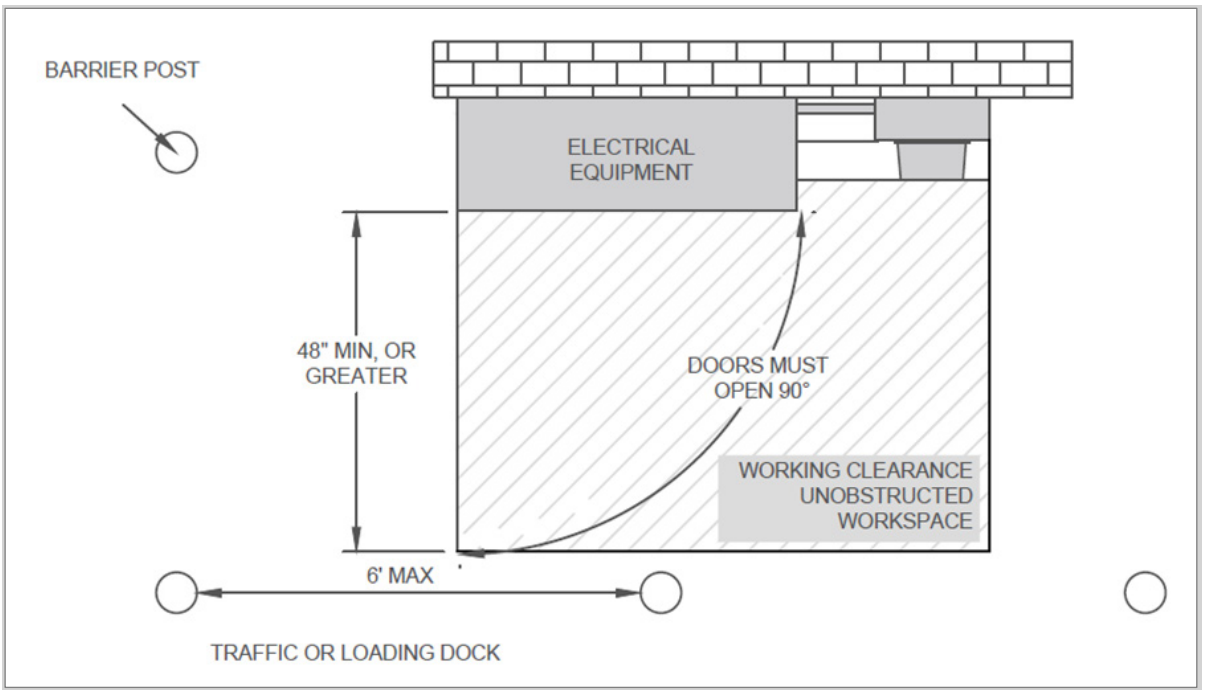

Figure 36: Placement and Clearances for Barrier Posts Around Electrical Equipment

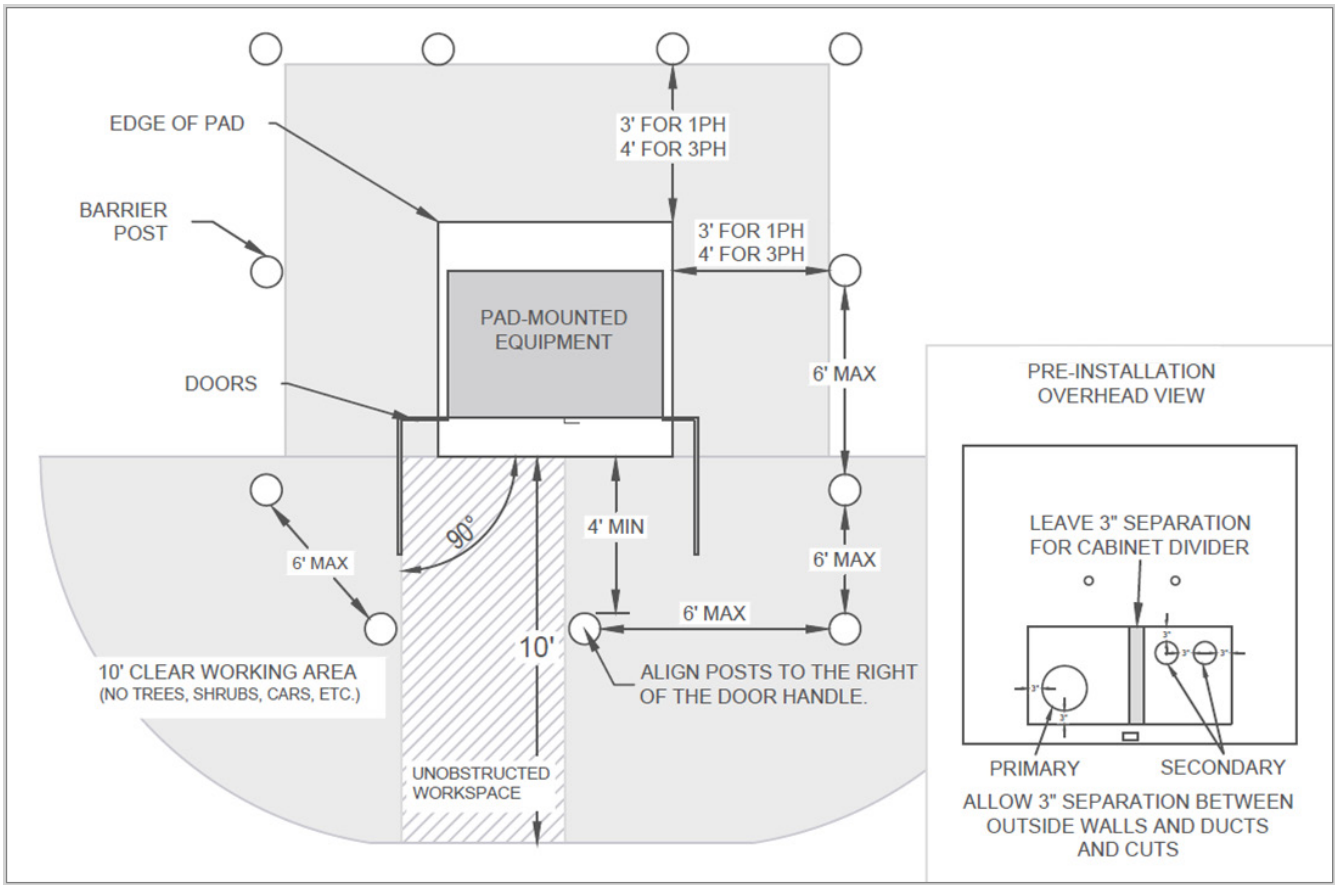

Figure 37: Placement and Clearances for Barrier Posts Around Pad-Mounted Equipment

6 Underground Requirements

TOPICS IN THIS SECTION

6.1 *Basic Requirements*

IMPORTANT: *If there are any changes to your project details (including elevation grade, landscaping, or building footprint) PGE will need to review the service entrance location again. Changes to a customer project can affect the trench depth, conduit, vault, barrier posts, and other PGE requirements.*

6.1.1 General Customer Responsibilities

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.

6.1.1.1 Plan

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.
- Residential and commercial services less than 400 A will require a meter spot.
- Commercial services 400 A and greater will require a Pre-Construction Meeting at the site with a Field Construction Coordinator (FCC). Customers are responsible for scheduling the meeting before they install the conduit.
- Before backfilling, customers are responsible for scheduling an on-site inspection to verify that all requirements have been met.

6.1.1.2 Prepare

- Before you dig, call 8-1-1 for the location of underground utilities, or to have previous locates refreshed. For more information, see 1.2.9, “Call Before You Dig.”
- Refer to the Oregon Utility Notification Center’s *Standards Manual* for additional information about customer responsibilities, including potholing. Potholing is required near existing trenches and when directional boring.
- When a PGE standby crew is needed, schedule it several weeks ahead of time. A PGE standby crew will observe when a customer penetrates into an energized facility. The customer is responsible for supplying the equipment and manpower.

6.1.1.3 Protect

IMPORTANT: *Do not undermine PGE equipment—including underground cable, transformers, vaults, or poles—unless approved by a PGE standby crew.*

- Obtain appropriate materials to cover, mark, and protect the excavation.
- Safety tape or ribbon must be used to identify open-trench hazards.
- Appropriate materials are required for road plating and cover of exposed pits.

6.1.2 PGE Responsibilities

- PGE will provide customers with a list of approved manufacturers for 1730 junction boxes as well as a list of approved vault manufacturers on PortlandGeneral.com.
- PGE will provide conduit markers, ground rods, and secondary pedestals (PF-300s) at PGE yards to customers with job numbers.
- PGE will identify the service route and location for customer trenches and conduit to the PGE distribution line or transformer.
- A PGE standby crew will be scheduled for customers that are penetrating into an energized facility. The standby crew will open the facility to confirm conduit entry/exit and will serve as safety watch for the customer or customer's contractor.
- 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:
  - Conduit location on PGE poles with PGE-installed standoff brackets.
  - Underground service laterals.
  - Meter locations.
  - Service outlet locations.
  - Current transformers.
  - Terminal cabinet enclosures.
  - All PGE conduit, vaults, pads, and PGE-owned equipment.

  Routing conduit under buildings or other permanent obstructions is not permitted.
- 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 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 38**. If this is not possible, trench shoring may be required to

comply with OSHA rules. Spoil may be placed in the street if approval is received from the local jurisdiction.

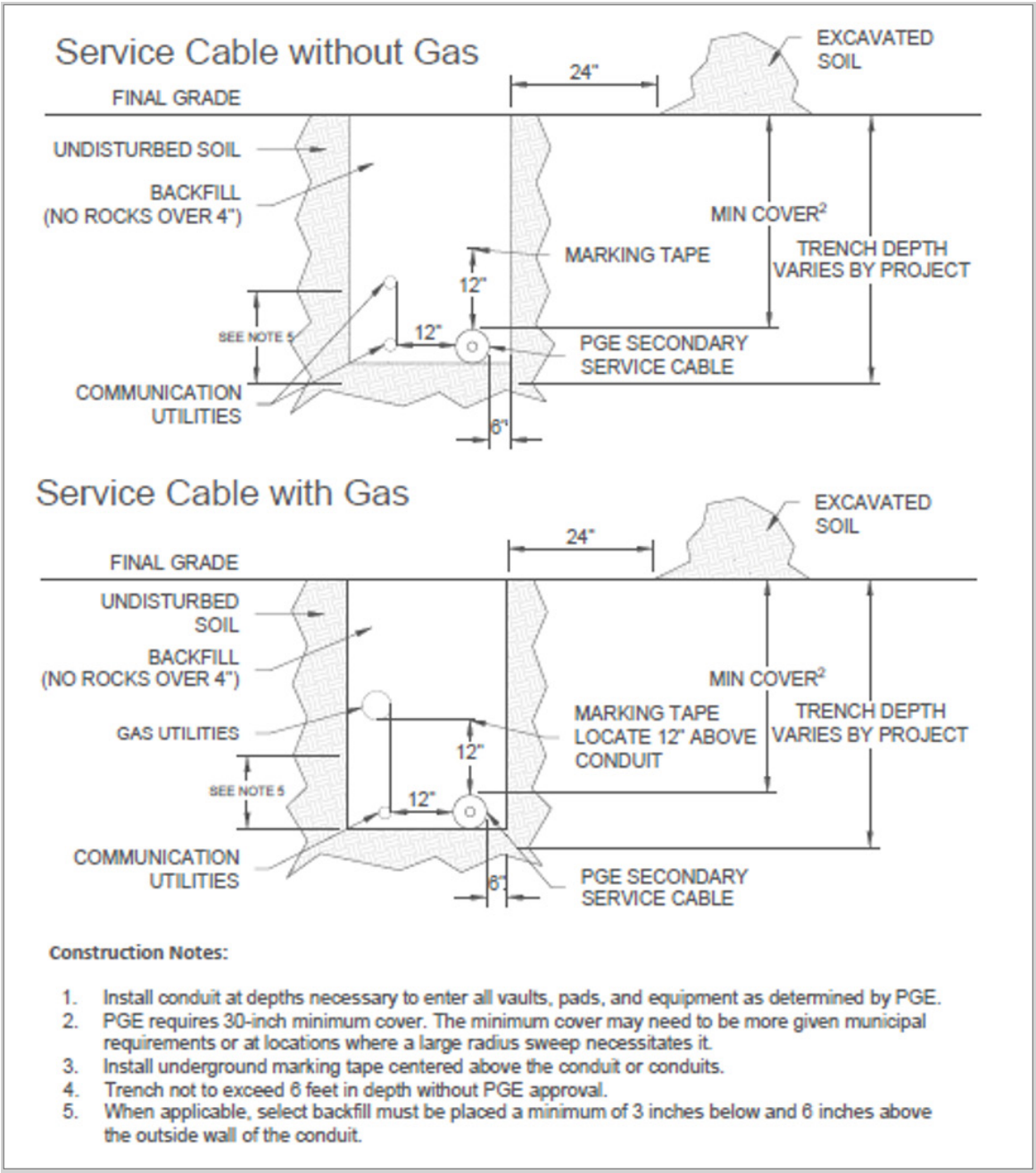

Figure 38: Service Cable Trench for Joint Use With or Without Gas

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 Marking Tape

Red underground marking tape is required above buried ducts or conduits. The tape should be centered 12 inches above the conduit.

For conduit packages wider than 24 inches, two runs of tape are required. The tape runs must be separated by 15 inches or less.

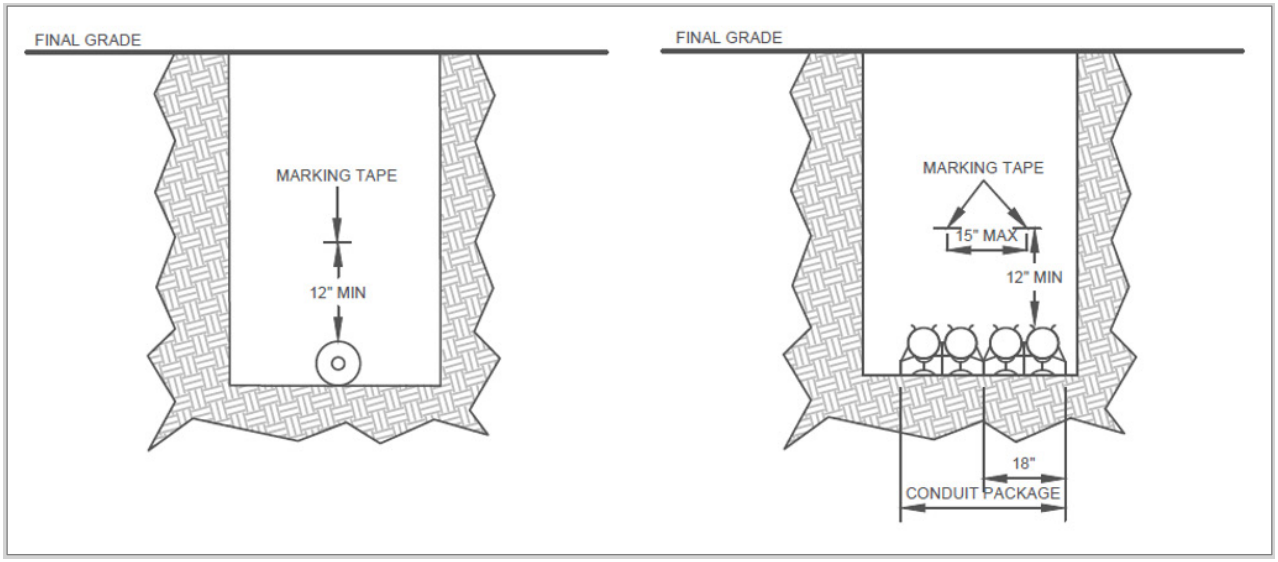

Figure 39: Placement of Marking Tape Above Ducts or Conduit

6.2.3 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 36** and **Figure 37** (above) show the minimum requirements for trench depth and cable separation. Communication conduit must be installed before PGE conducts the trench inspection (pre-backfill).

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.*

On private property, customer-owned water lines are allowed in trenches adjacent to PGE-approved conduit. If the PGE service is not directly buried, the customer's water line must have a minimum 1-foot vertical and 2-foot horizontal clearance from PGE conductors. **Figure 40** shows the minimum requirements for trench depth and cable separation.

On public property, no water or sewage pipe may be in the same trench as PGE conduit.

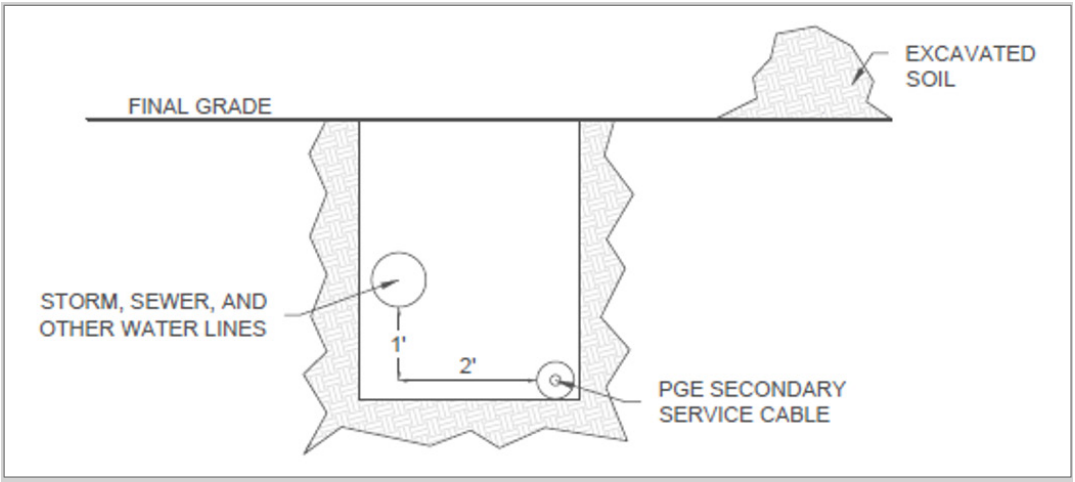

Figure 40: Clearances from PGE Service Cable to Water Lines on Private Property

6.2.4 Select Backfill

When on-site backfill contains rocks larger than 4 inches or rocks with sharp corners, select backfill or backfill processed on-site must be used. Either 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 12% 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.

6.2.5 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 mechanical protection is used. Acceptable mechanical protection is a minimum 2-inch layer of 3000 psi concrete directly above the conduit that has at least 6 inches of horizontal coverage beyond the outer walls of the conduit.

6.2.6 Controlled Density Fill

Controlled density fill (CDF) or controlled low-strength material (CLSM) may be necessary in areas where future excavation of conduit is expected (road crossings, for example). Conduit in CDF must be fully encased at a minimum of 6 inches on all sides. Red concrete dye is required when CDF is used for backfilling a trench or any other energized equipment.

CDF must meet these requirements:

- It must have maximum compressive strength between 100 and 200 psi.
- Its allowable slump is 7 inches (+/- 2 inches) at the time of batching.
- It must be dyed red with dye mixed at the batch plant.

Additional requirements exist for under-foundation backfill. Consult with PGE for requirements.

6.2.7 Mitigating Potential Surface and Subgrade Water Flows

The customer is responsible for obtaining base flood plain elevation requirements from the local jurisdiction and for recognizing—and mitigating—potential surface and subgrade water flows that may let water enter into customer-owned 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. If rock or other obstructions are encountered, consult PGE to discuss the route. When the conduit terminates at a PGE pole, PGE must be consulted for the exact conduit location. (See 6.3.3, "Standoff Brackets.").Before backfilling, customer-installed conduit must be inspected by PGE.

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.*

All primary and secondary cables ***must*** be in conduit. The customer must install either rigid steel or electrical-grade Schedule 40 gray PVC conduit. When multiple conduits are present, conduits must have 3 inches of clearance between the outside of conduit walls. All PVC joints must be glued. All factory-cut and field-cut conduits must be chamfered to prevent damage to PGE cables.

To avoid damage to underground conductors and service equipment caused when soil settles, all service conduit riser elbows must be backfilled at least 4 inches deep with tamped 3/4-inch minus crushed rock. Steel risers may be required on risers that face traffic.

Conduit should never be installed under bodies of water, buildings, decks, or other structures.

Note: PGE allows the use of HDPE duct for horizontal directional boring applications. Schedule 40 mechanical-interlocking PVC duct may be used as an alternative to HDPE duct when directional boring is required. For more information on HDPE duct, see 6.3.6, "HDPE Duct and Connectors."

Table 16 shows conduit requirements for secondary voltage conductors. Additional conduit requirements for secondary voltage conductors include:

- 4-inch conduit may be substituted for 3-inch conduit, except for 200 A or 320 A continuous services.
- 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 multiple-conduit installations where a horizontal configuration in the trench cannot be obtained. Contact PGE for approved conduit spacers.

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 16** are for **reference only**. Requirements for a specific situation depend on the design and requirements of the service.*

Table 16: 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
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 sufficient 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.

Sweeps of PVC, rigid steel, and fiberglass are acceptable. 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 17 lists fiberglass sweep specifications.

Table 17: Fiberglass Sweep Specifications

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

IMPORTANT: *The vertical height is typically greater than the sweep radius when installed at 90 degrees. Typically, 2–4-inch fiberglass has a vertical clearance of 58 inches and 5–6-inch fiberglass has a 7-foot vertical clearance. Consult with your manufacturer for specific dimensions.*

If a customer's conduit extends to a PGE pole, the customer must provide the sweep and PGE will provide the standoff bracket (see 6.3.3, "Standoff Brackets.") To obtain the exact location on the pole, contact PGE's Service Coordination team (service.coordinators@pgn.com) to request a consultation with a service inspector.

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

All conduits must have a 500-pound–rated nonconductive pull line with 6 feet of line extending from each end of the conduit. The pull line must be installed after the conduit is joined and the glue is dry.

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*.

Where a new conduit and/or pull line will be entering an existing PGE secondary vault or transformer, the installer is required—before installation—to schedule a PGE standby crew. The standby crew will meet the installer at the site on the day when the installer will be penetrating the PGE equipment.

IMPORTANT: *Do not undermine PGE equipment—including underground cable, transformers, vaults, or poles—unless that work is approved by a PGE standby crew.*

6.3.3 Standoff Brackets

Your job may require PGE to install a 12-inch or 18-inch standoff bracket. A PGE service inspector will either install the bracket on the pole or mark the location on the pole for the conduit. To get a standoff bracket installed on a customer-owned pole, contact PGE's Service Coordination team (service.coordinators@pgn.com). As shown in **Figure 41**, there must be at least 8 inches between the pole and the backside of the conduit.

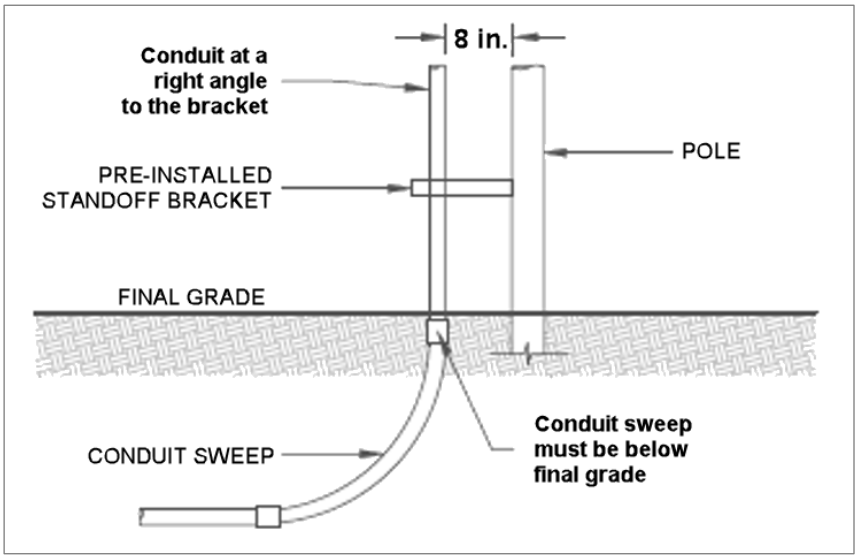

Figure 41: Secondary Voltage Overhead to Underground Service with Pole Bracket

6.3.4 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.

6.3.5 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.

Conduits must be labeled on the vault wall with the PGE pad or vault number that the conduit is routed to. Pull strings must be tied to the vault lids in switch vaults and transformer vaults, and the vaults must be free of mud, dirt, and debris.

6.3.6 HDPE Duct and Connectors

HDPE duct may be used for horizontal directional drilling (HDD) applications. For safety reasons, all duct must be black with three equally spaced extruded red stripes. For HDD applications, Schedule 40 PVC with a mechanical connection (such as Certa-Lok, Bore-Gard, or a similar mechanical connection product) may be allowed as alternate.

HDPE duct sections must be joined by mechanical fittings that have barbed threads on both ends (like Certa-Lok or Bore-Gard) or by a swedge coupler with two-part conduit adhesive (like BonDuit). The duct must meet the requirements of PGE specification LC20515, which is available on request from a PGE Design Project Manager. Contact PGE's Field Construction Coordinator (FCC) when using HDPE duct.

All HDPE direct-bore installations (regardless of length) must use woven polyester pull tape (such as Muletape or Herculine) for all brushing and mandrel proofing of the conduit. A single continuous non-spliced run of tape must remain within the conduit.

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 outside diameter 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. Consult the PGE job sketch for the location of the ground rod within the transformer pad cable blockout.

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.

For vault clearances, see 5.5.5, “Clearances Around PGE Submersible Equipment.”

6.4.3 Clearances

For the required clearances from a pad-mounted transformer, see 5.5, “Locations and Clearances for Transformers, Switches, Vaults, and Other Electrical Equipment.”.

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 when installing the electrical equipment.

6.4.6 Barrier Posts

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

Customers are required to install and maintain one or more barrier posts around all electrical equipment (such as transformers, switchboards, CT cabinets, sectionalizing cabinets, or vault cabinets) in areas where that equipment is exposed to vehicle traffic. For barrier post placement, clearance, and installation requirements, see 5.6.8, “Barrier Posts.”

7 Single-Family Service

TOPICS IN THIS SECTION

7.1 *Basic Requirements*

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

A residence must contain cooking, bathing, and sleeping as defined by Rule B in PGE's tariff.

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 5.2, "Meter 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 16** on page 97.

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 meter socket must be rated for a maximum current capacity of 100 A, 200 A, or 400 A (320 A continuous). All meter sockets must meet current ANSI C12, UL, and EUSERC requirements. Meter sockets must be ring-type.

All single-phase, direct-connect sockets rated 400 A (320 A continuous) must have an approved manual link bypass that meets EUSERC 302B.

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. A list of approved Tier 15 and Tier 22 junction boxes is available on PortlandGeneral.com in a PDF document called PGE-Approved Handhole Manufacturers and Part Numbers.

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 6.2, "Trenches Provided by the Customer" and 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 42 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 18**.

Figure 43 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 18**.

Figure 44 and **Figure 45** show residential underground approved meter sockets for 400 A maximum (320 A continuous), single-phase service (EUSERC 302B).

Figure 46 shows a typical installation of an underground service extension to the house.

Figure 47 shows a surface-mount installation, and **Figure 48** shows the optional seismic footing design. **Figure 49** shows a flush-mount installation.

Figure 50 shows an underground conduit system for long-side service.

Figure 51 shows a 3 inch-to-2.5 inch reducing swedge coupler.

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.
- PGE is responsible for installing a standoff bracket on the pole. See 6.3.3, "Standoff Brackets."

- 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 46**.) 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.
- Class 320 A meter bases are permitted to have an integrated customer load section if the utility section is equipped with manual link bypass studs in accordance with EUSERC 302B
- 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.
- Conduit sweep and pull line requirements are described in 6.3.2, “Conduit Sweeps and Pull Lines.”
- When the conduit extends to a PGE pole or handhole, consult PGE for the exact conduit location. PGE will then install a standoff 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. For more information, see 6.3.3, “Standoff Brackets.”
- 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 47**. 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 47**.

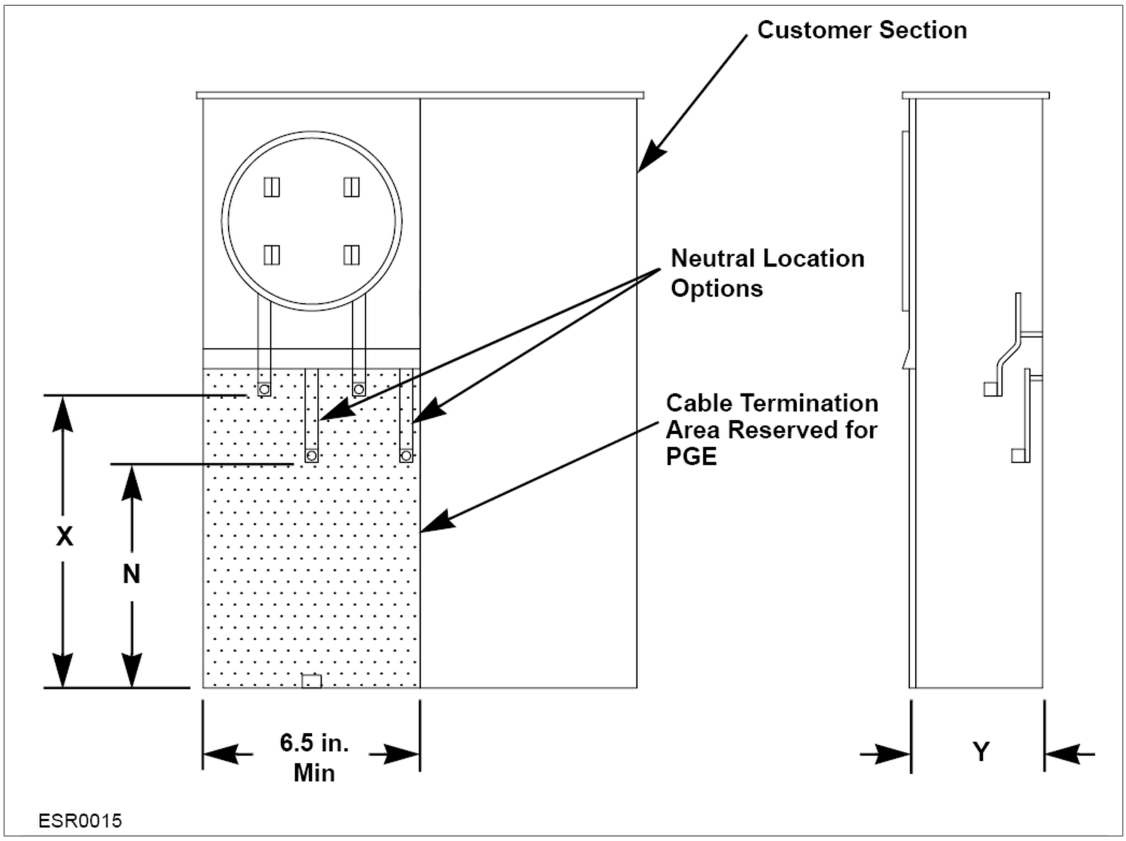

Figure 42: Residential Underground Approved Combination Meter Socket for 100 A and 200 A Maximum Single-Phase Service (EUSERC 301)

The variable dimensions shown in the table below apply to **Figure 43**.

Table 18: 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

Gray highlighting is used to mark new, updated, and moved content.
Highlighting ***does not*** indicate the importance of the text.

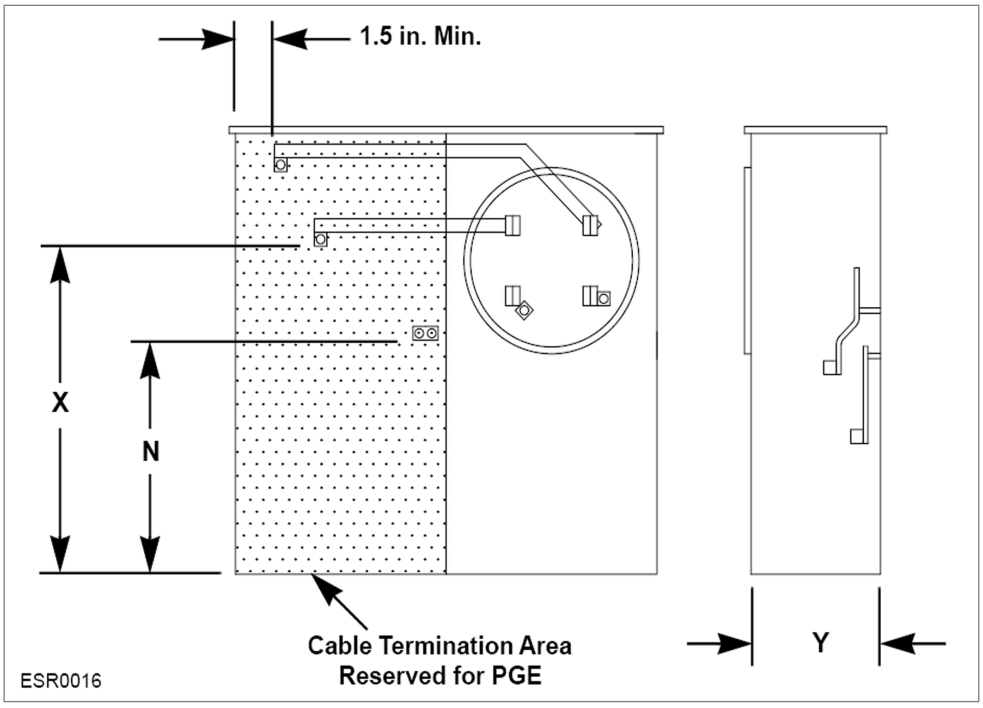

Figure 43: Residential Underground Approved Meter Socket for 200 A Maximum Single-Phase Service (EUSERC 301A)

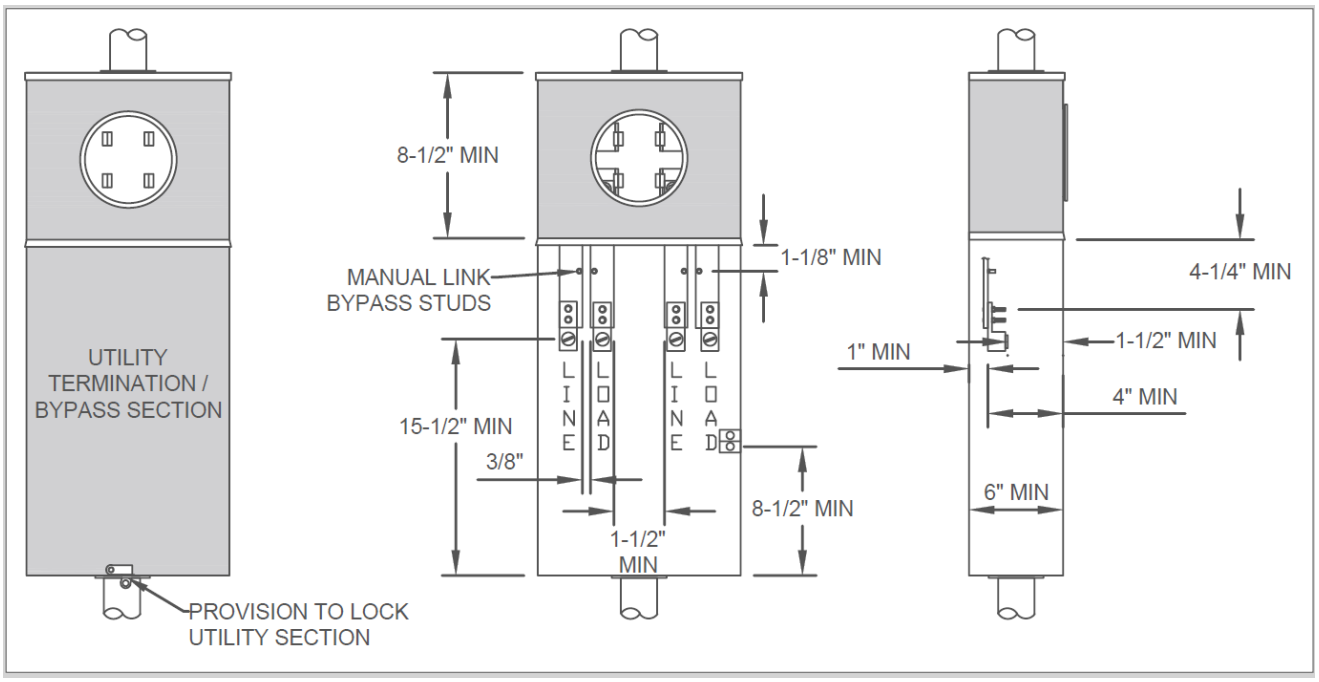

Figure 44: Residential Underground Approved Meter Socket for 400 A (320 A Continuous) Maximum Single-Phase Service (EUSERC 301B) – Part 1

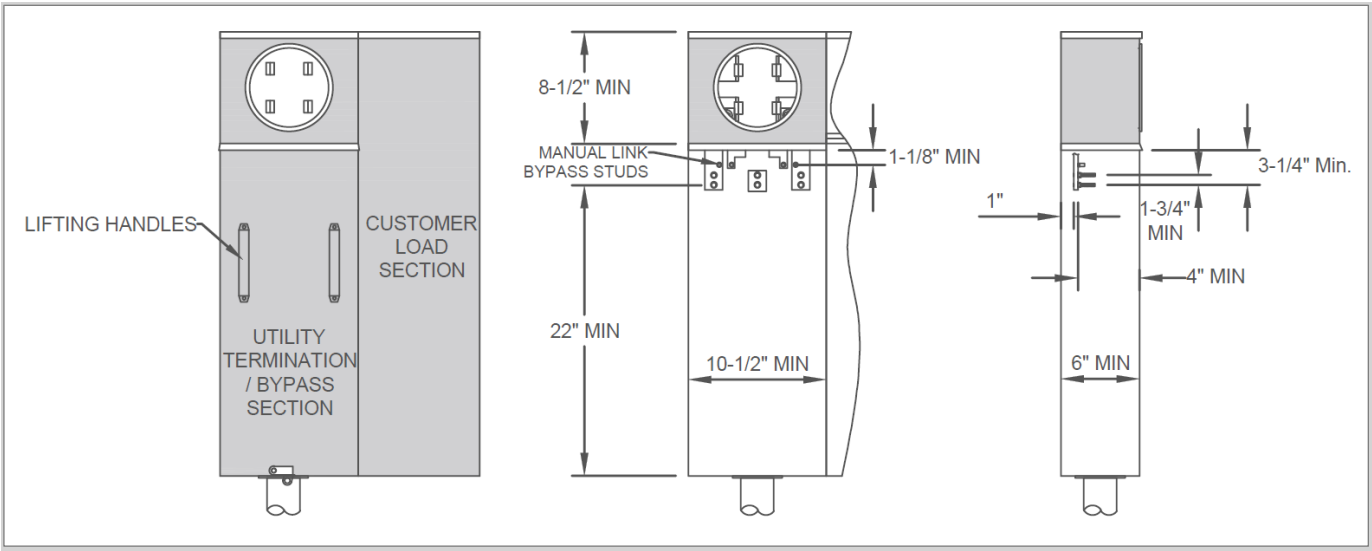

Figure 45: Residential Underground Approved Meter Socket for 400 A (320 A Continuous) Maximum Single-Phase Service (EUSERC 301B) – Part 2

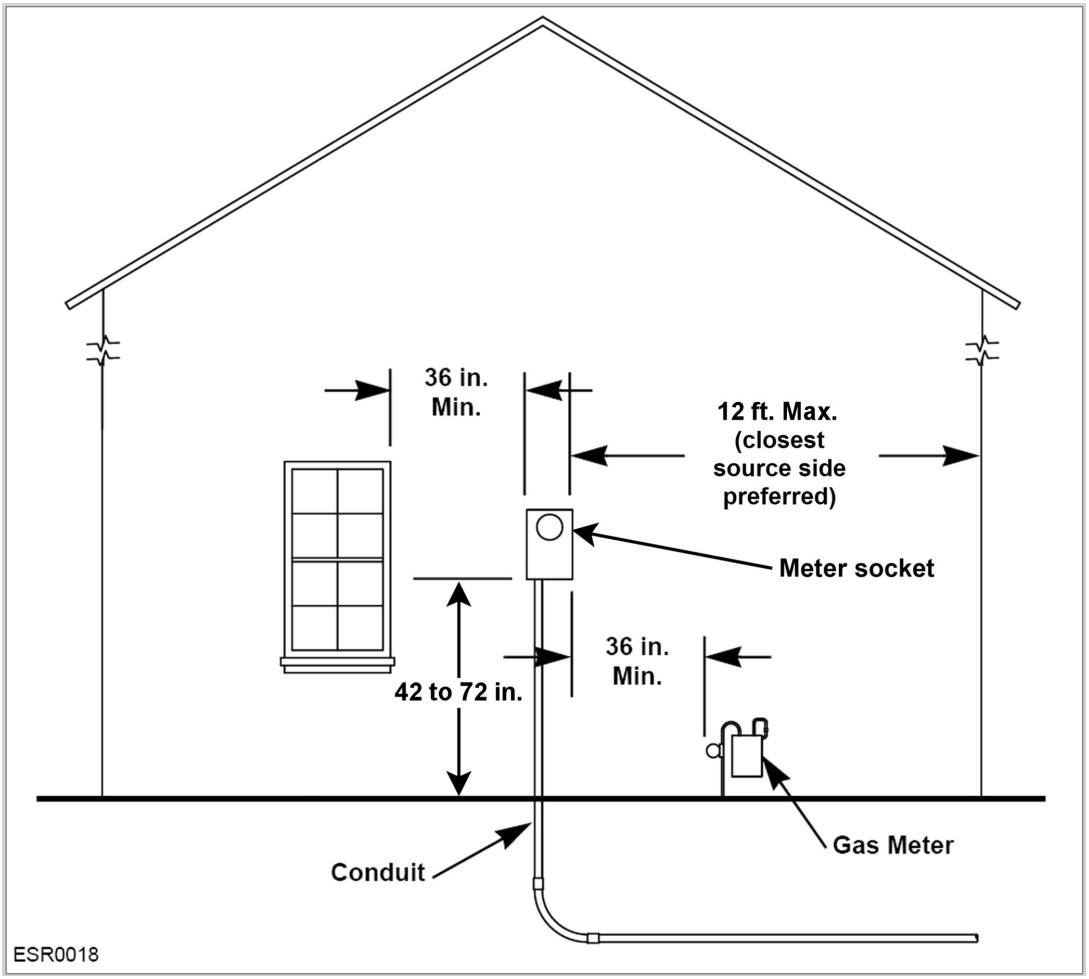

Figure 46: Underground Service Extension

7.2.1.1 Surface-Mount Installation

Note: The requirements in this section are in addition to those in 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 47** and to the optional seismic footing design shown in **Figure 48**:

- 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. For more information, see 7.2.1.4, "2 x 4 Framing with Reducing Swedge Couplers for Meter Base Applications."

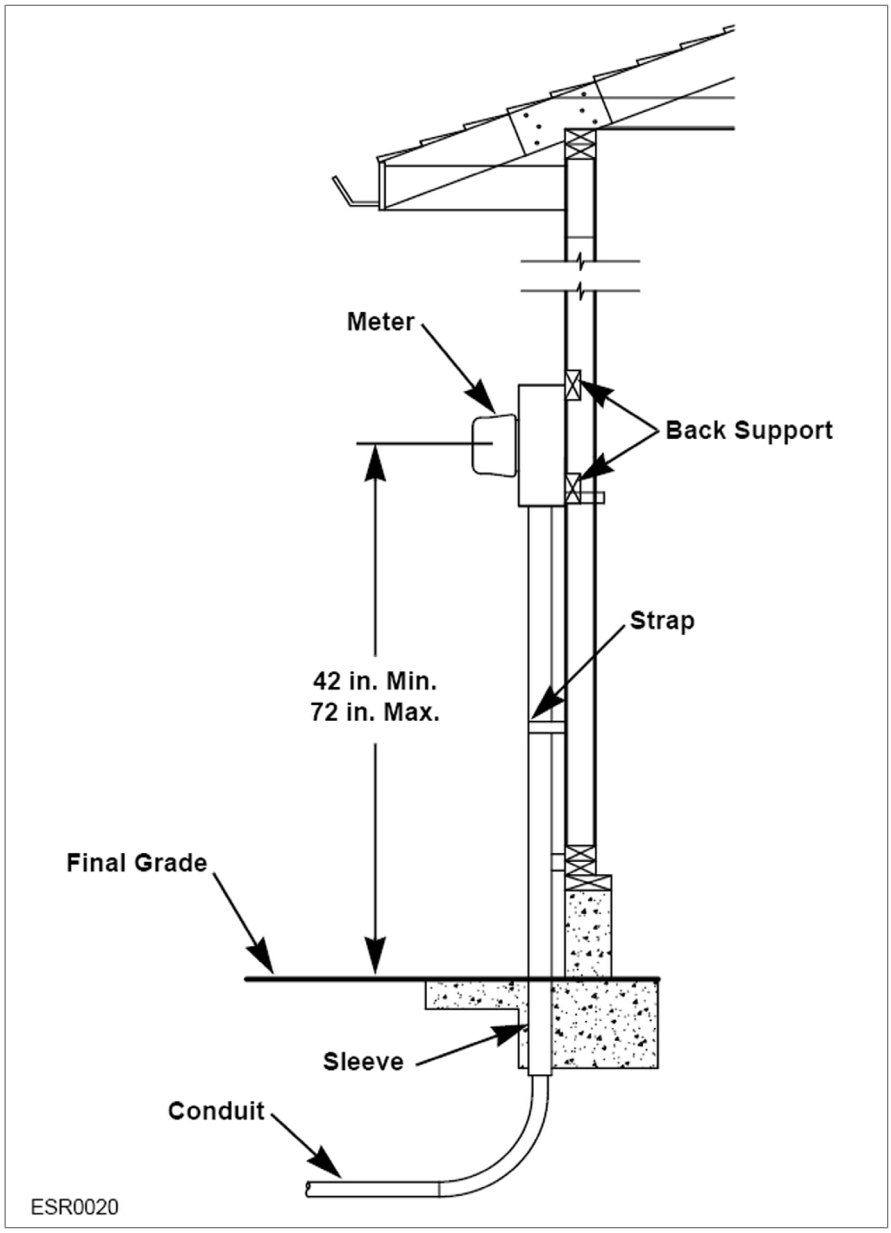

Figure 47: Surface-Mount Installation

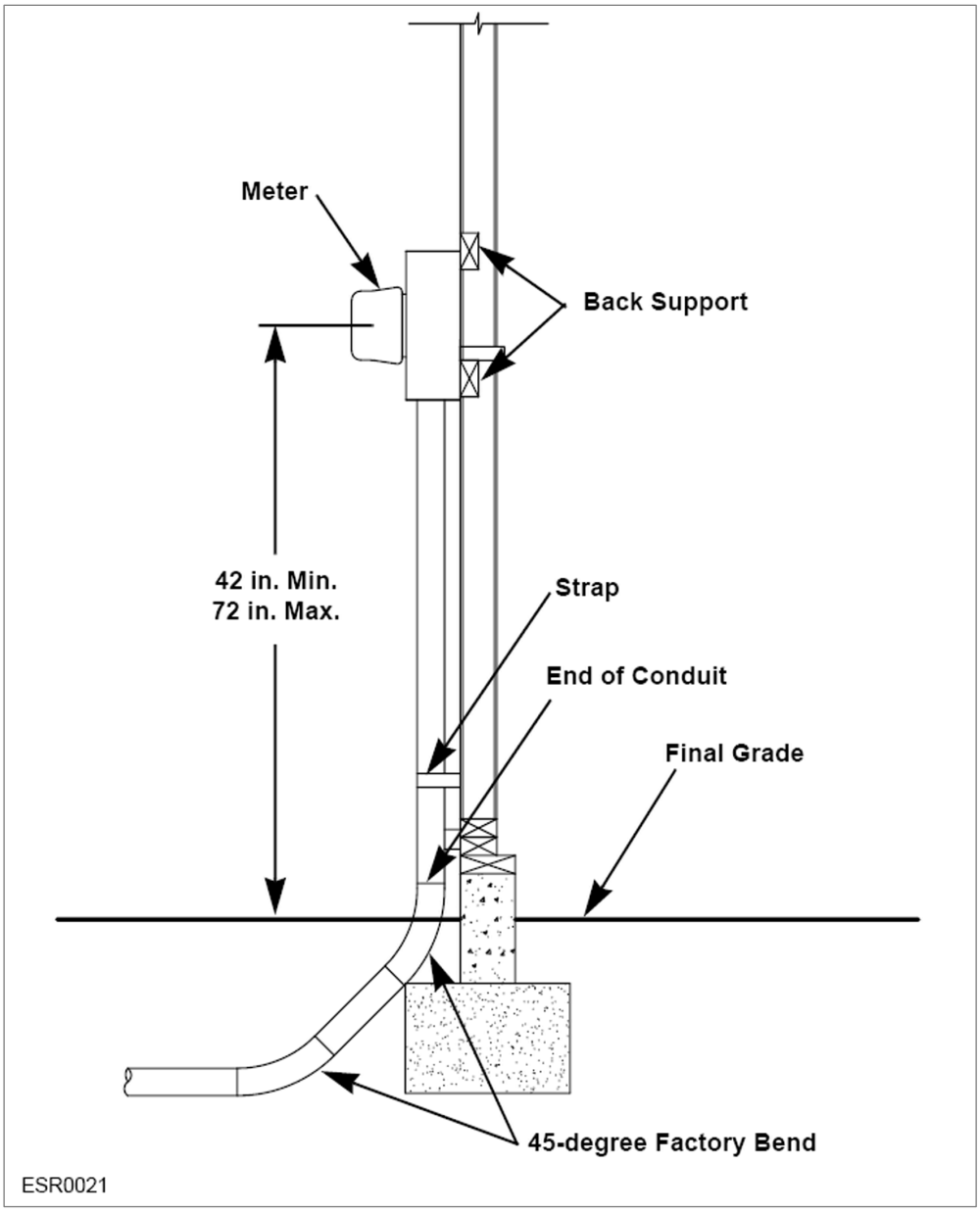

Figure 48: Seismic Footing Design

7.2.1.2 Flush-Mount Installation

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

These requirements apply to a flush-mount installation, such as the one shown in **Figure 49**:

- No bends are allowed in the conduit riser between the meter socket and the underground sweep. **Figure 49** 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.

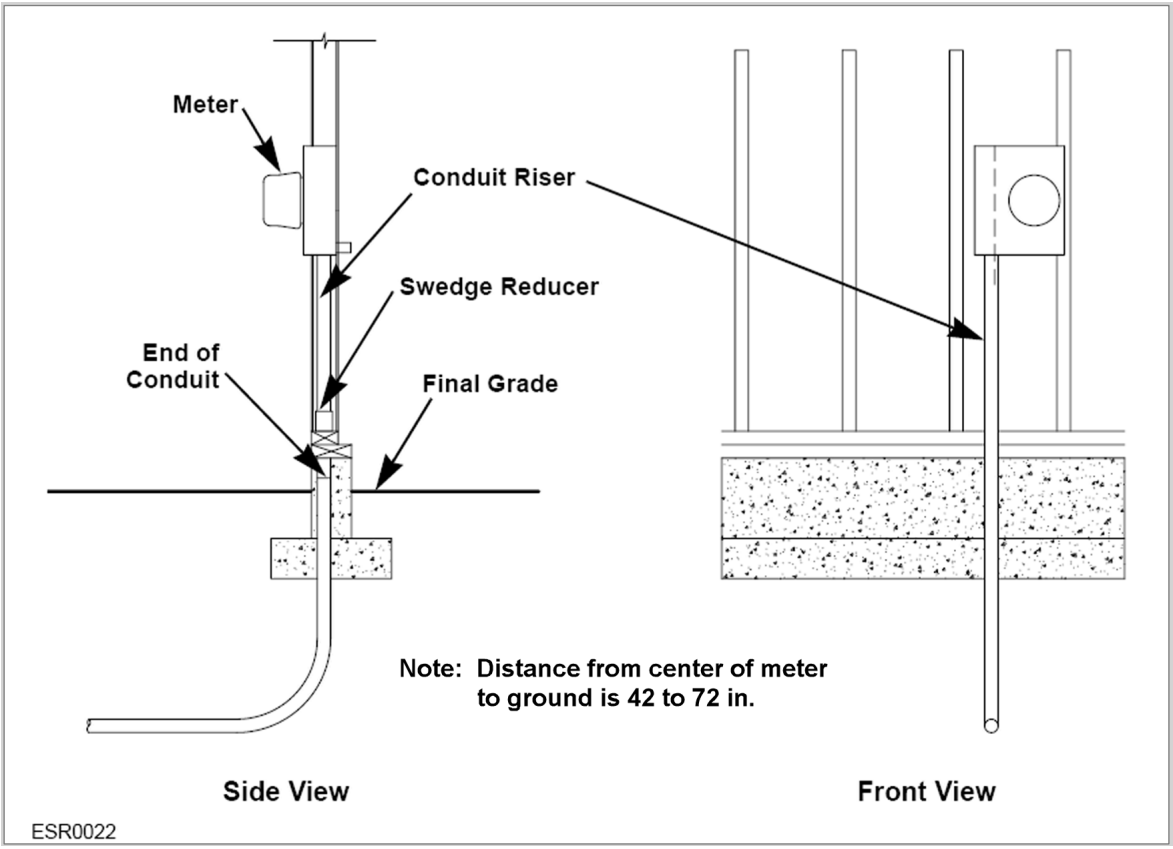

Figure 49: **Flush-Mount Installation**

7.2.1.3 Underground Conduit System for Long-Side Service

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

These requirements apply to an underground conduit system for long-side service, such as the one shown in **Figure 50**:

- 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.

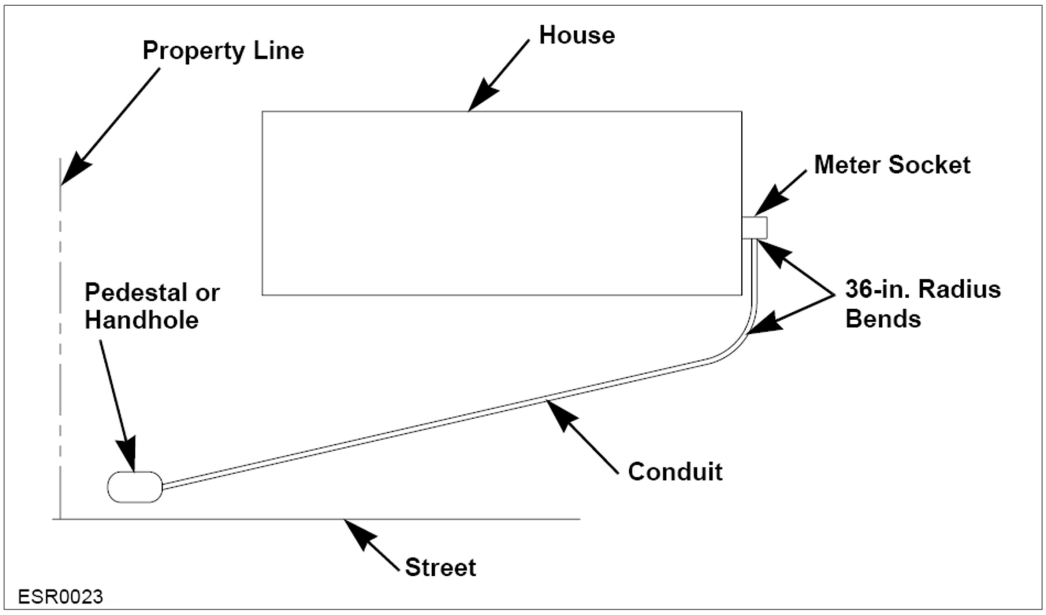

Figure 50: Overhead View of An Underground Conduit System for Long-Side Service

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 (such as the one shown in **Figure 51**) may be installed as close as possible to the meter socket to reduce conduit size for 2 x 4 framing.

Figure 51: Reducing Swedge Coupler

7.2.2 Secondary Splice Pedestal

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

Follow these requirements when installing a secondary splice pedestal, such as the PF-300 secondary splice pedestal shown in **Figure 52**:

- 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 and mark conduits 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.

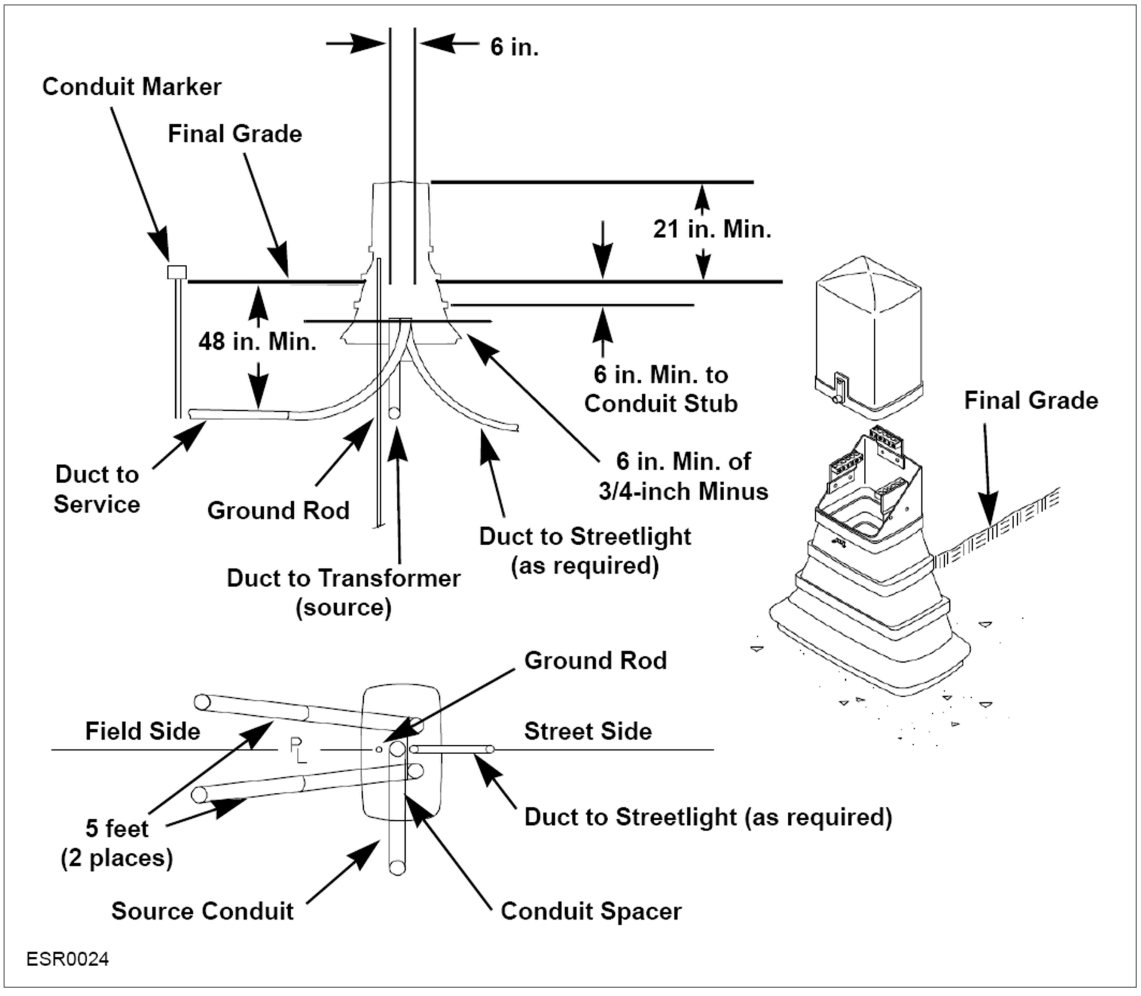

Figure 52: PF-300 Secondary Splice Pedestal

7.2.3 Secondary Handhole

Note: The requirements in this section are in addition to those in 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 53**:

- 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 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 53** has a 21.75- x 34.75-inch polymer cover marked ELECTRIC. This size may vary with the manufacturer.

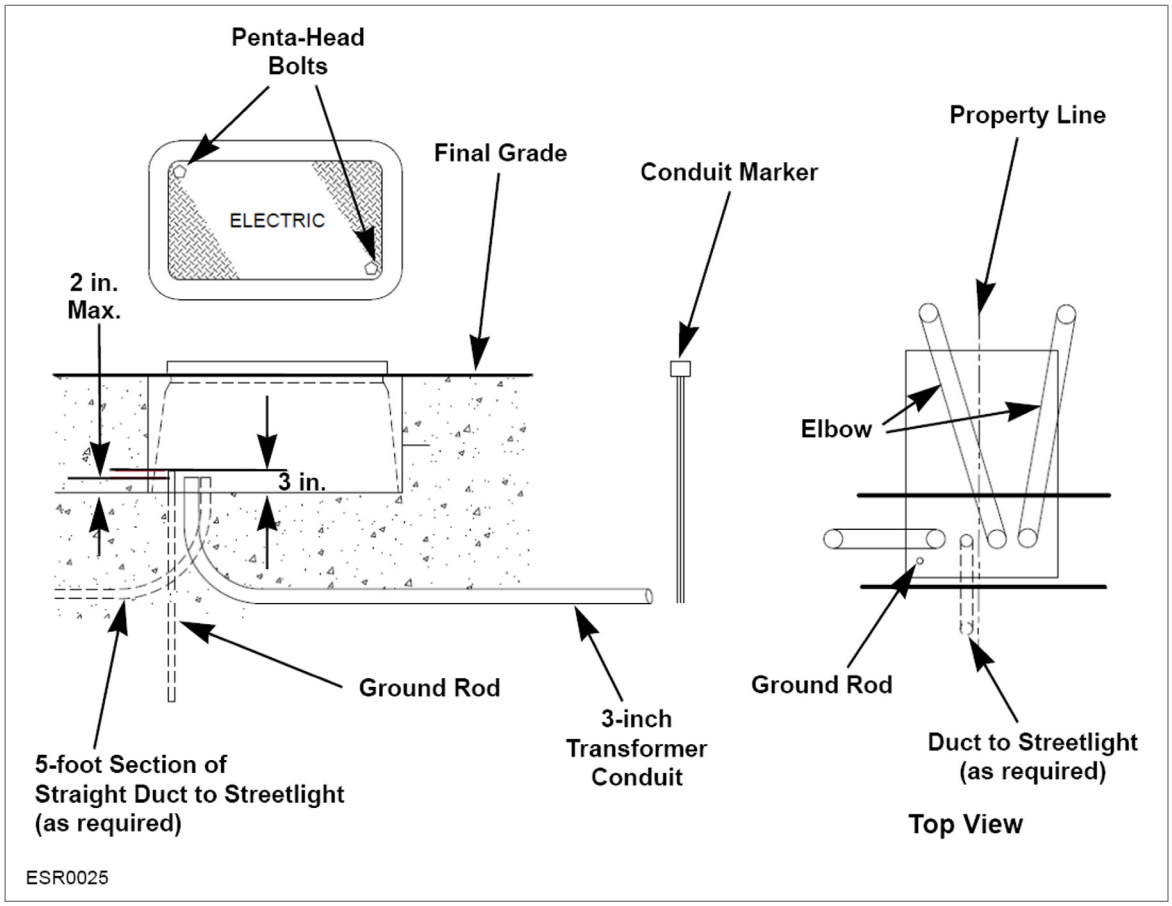

Figure 53: **Secondary Handhole**

7.2.4 Post-Mounted, Freestanding Residential Meter Pedestal

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

Before a pedestal can be installed, the customer must 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 outer diameter (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 54**:

- 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.

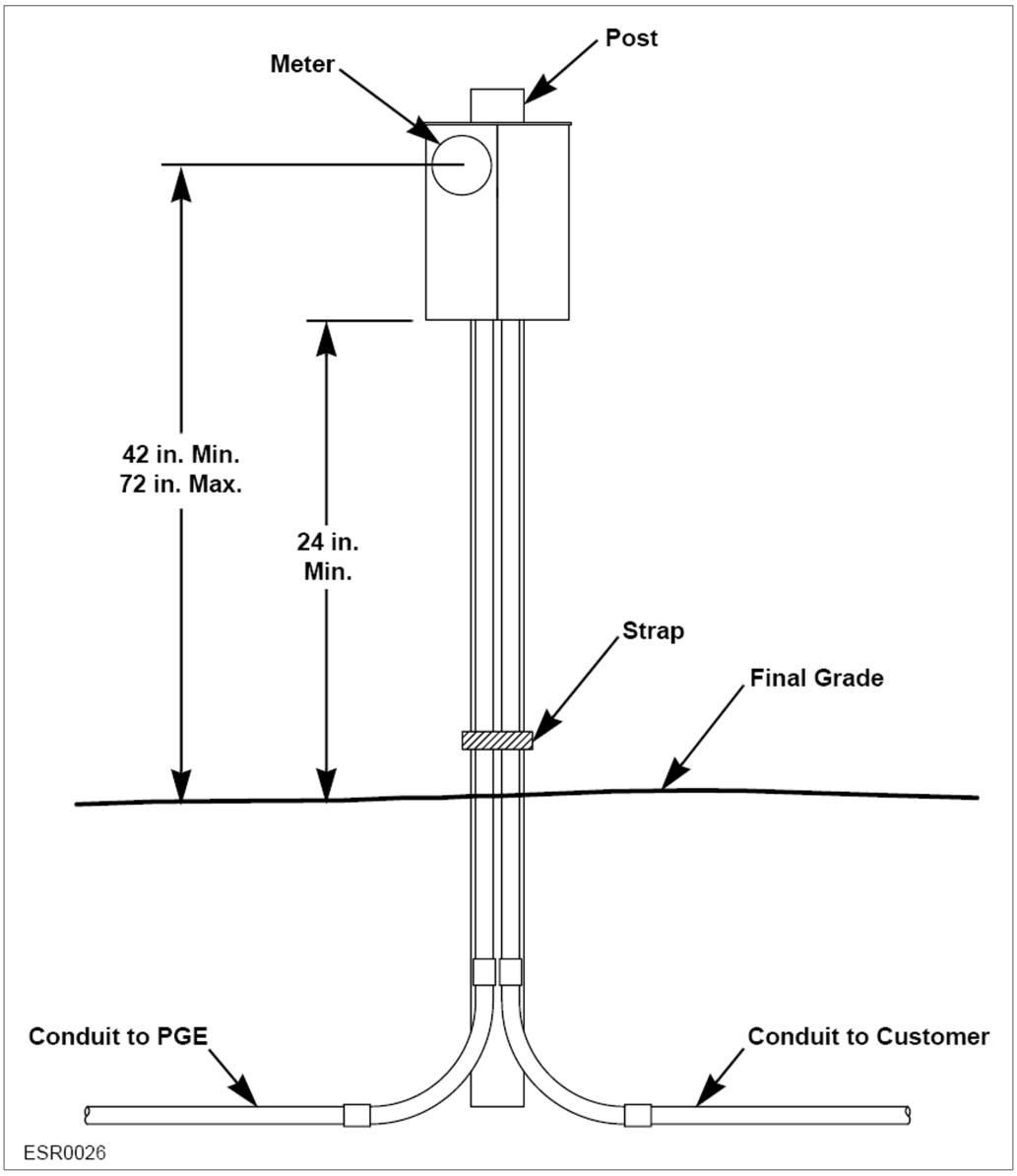

Figure 54: Post-Mounted Freestanding Residential Meter Pedestal

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 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 18** on page 66.

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 7** on page 68.

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 21** on page 70 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 55 shows a residential overhead approved meter socket for 100 A, 200 A (EUSERC 301 or 301B), and 400 A (320 A continuous) maximum, single-phase service (EUSERC 302B).

Figure 56 shows a residential overhead approved meter socket for 100 and 200 A maximum, single-phase service.

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

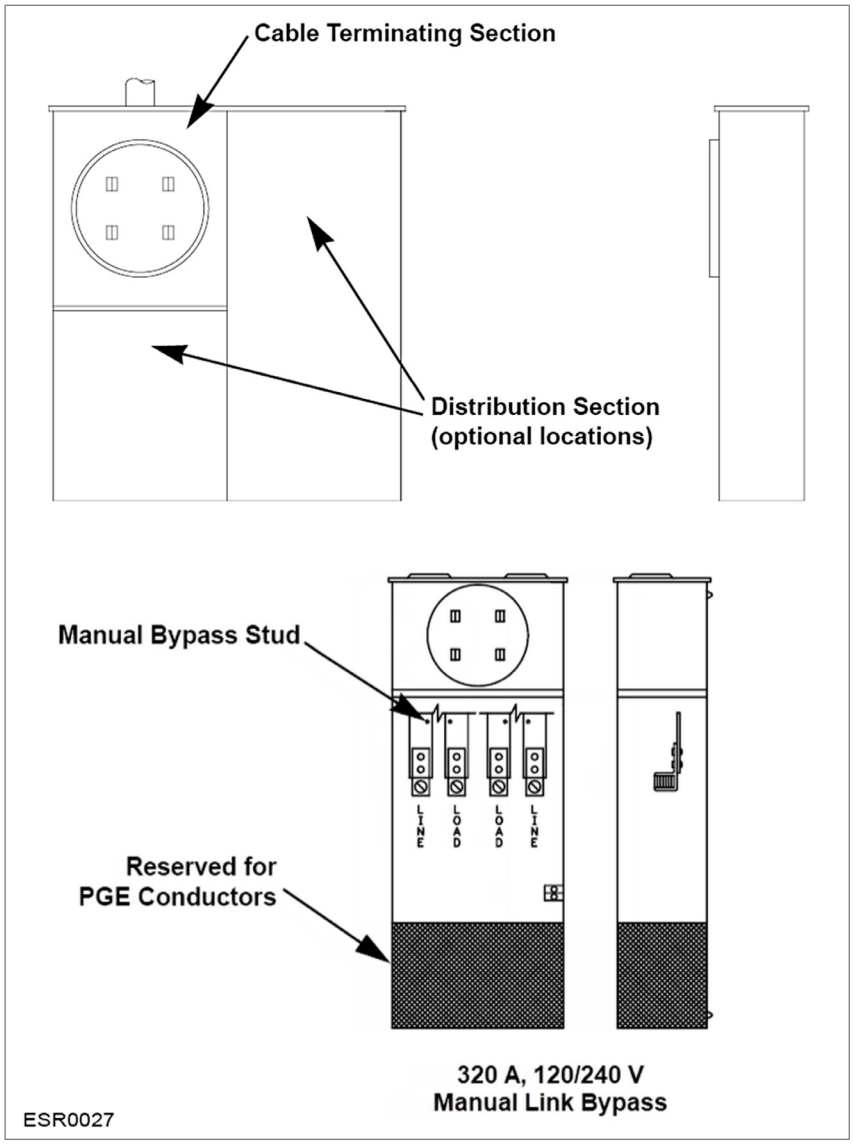

Figure 55: Residential Overhead Approved Meter Socket for 100 A, 200 A, and 400 A

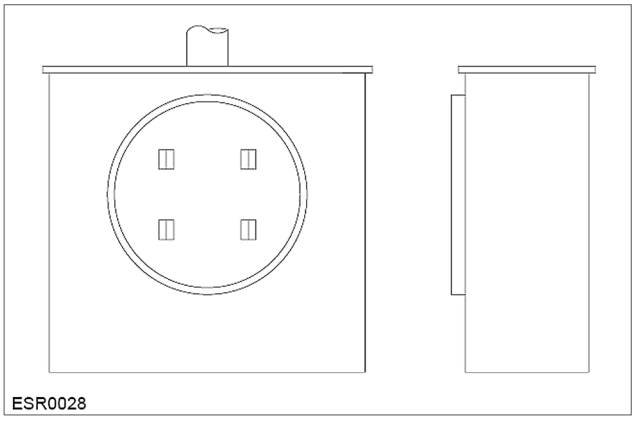

Figure 56: Residential Overhead Approved Meter Socket for 100 A and 200 A

7.3.1 Surface-Mount and Flush-Mount Installations

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

These requirements apply to surface-mount and flush-mount installations, such as the ones shown in **Figure 57**:

- 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 19** for guy requirements by mast size and for maximum height without guys.
- Mount the service mast on the side nearest the distribution pole. See 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 19: 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	

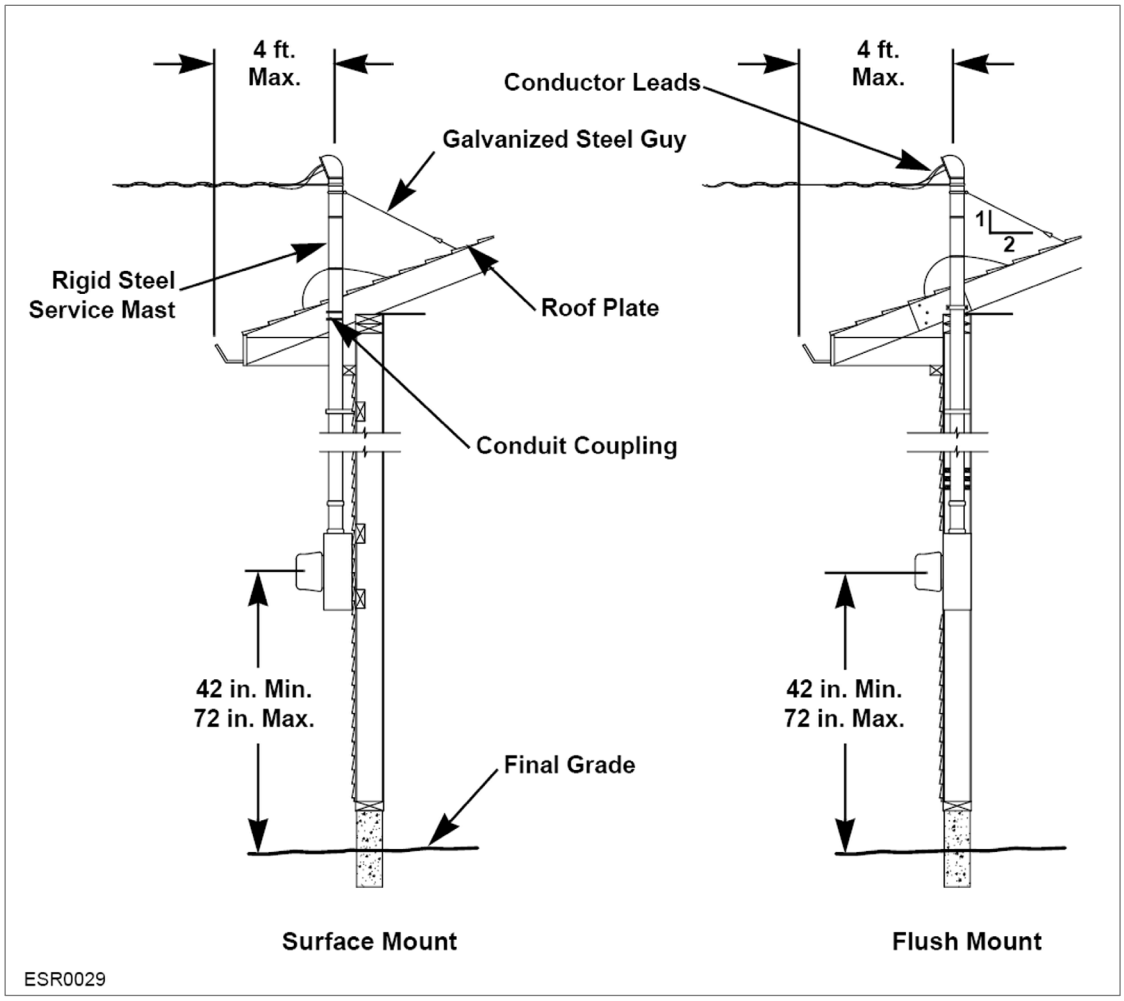

Figure 57: Overhead Service for Surface-Mount and Flush-Mount Metering

7.3.2 Service Mast Guy and Anchor Requirements

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

These requirements apply to mast guys and anchors (see **Figure 57** and **Figure 58**):

- Fit the roof plate between the shingles and then use 1/4–20 bolts to secure the plate to the rafters.
- 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.

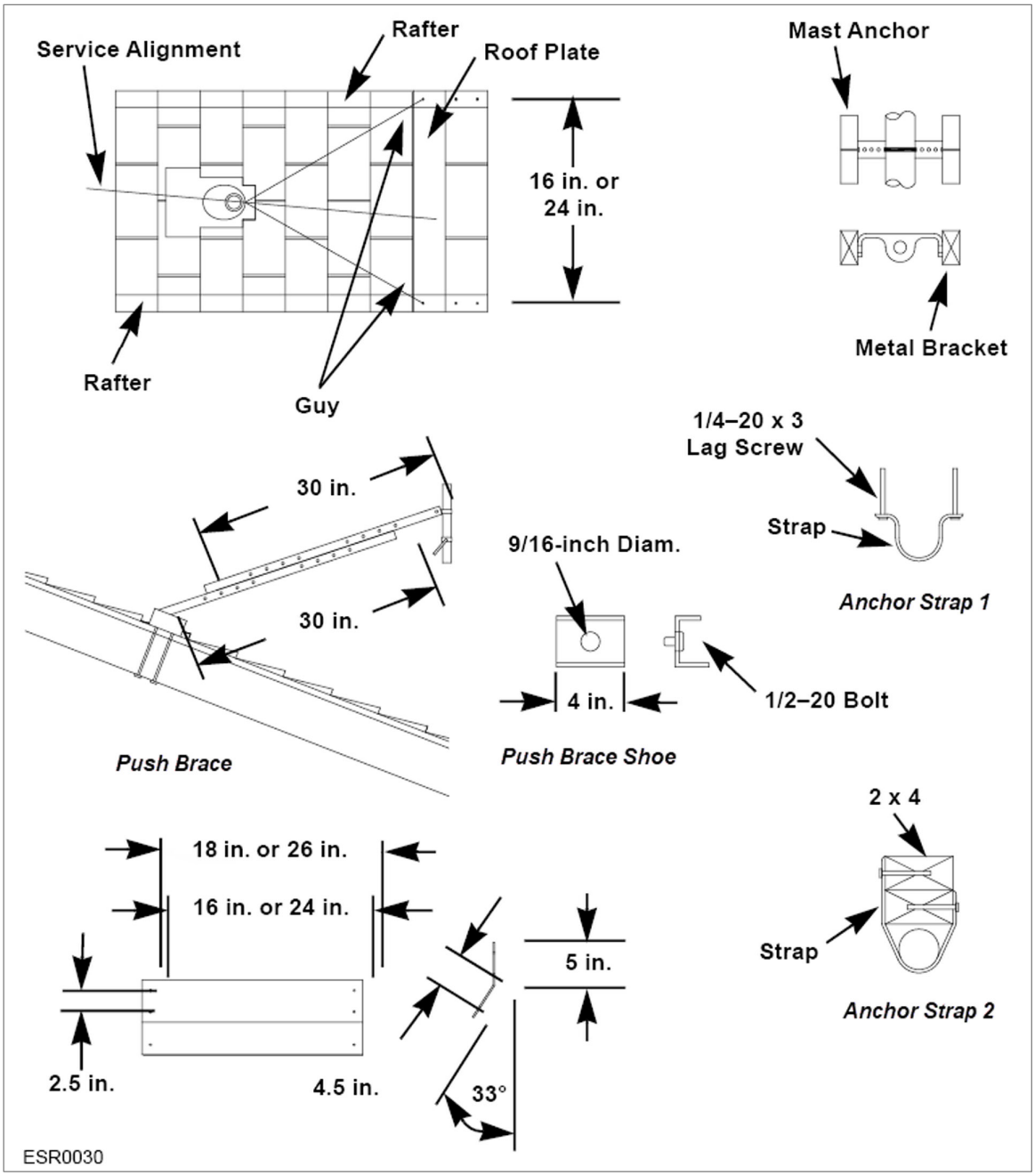

Figure 58: Service Mast Guys and Anchors

8 Multiple-Family Service

TOPICS IN THIS SECTION

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.
- All meter sockets must be wired to breaker or disconnect position, or they must be permanently sealed by the manufacturer.
- PGE will install meters in all meter sockets before energization.
- 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 enter into the customer's electrical equipment.
- 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.
- Multi-tenant installations must be labelled at each meter socket with the address and/or unit number (as shown in **Figure 4** on page 47). Sites with multiple meters with different voltage require labelling on each termination section. See 3.9.8.2,"Labelling for Multi-Tenant Installations" for all labelling requirements.

  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 when a meter socket is incorrectly labeled. See PGE Schedule 300 and Tariff Rule M, Section 1.D.*

- A three-phase main breaker is required at the service entrance when single-phase power is provided from three-phase 208/120 V service.
- 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 59** shows).

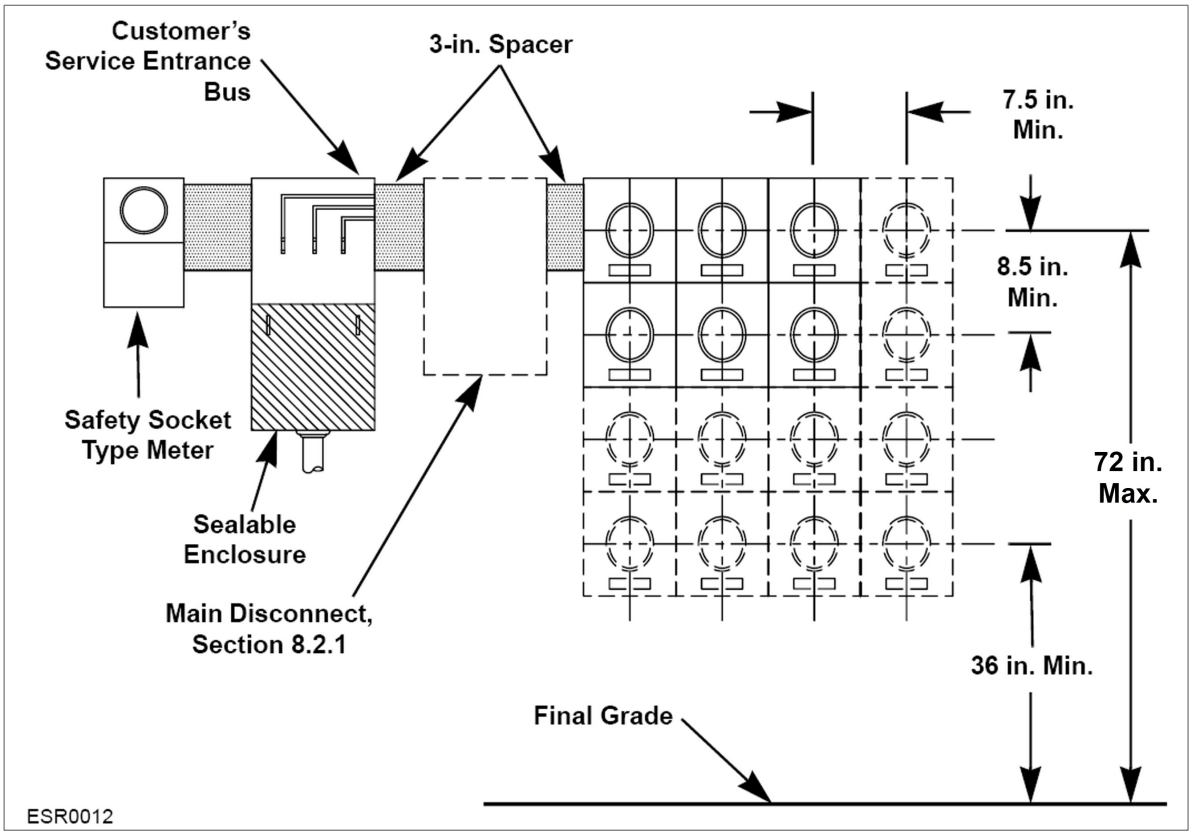

Figure 59: Meter Socket Installation for Underground and Overhead Multiple-Family Services

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

Figure 60 shows a typical grouping.

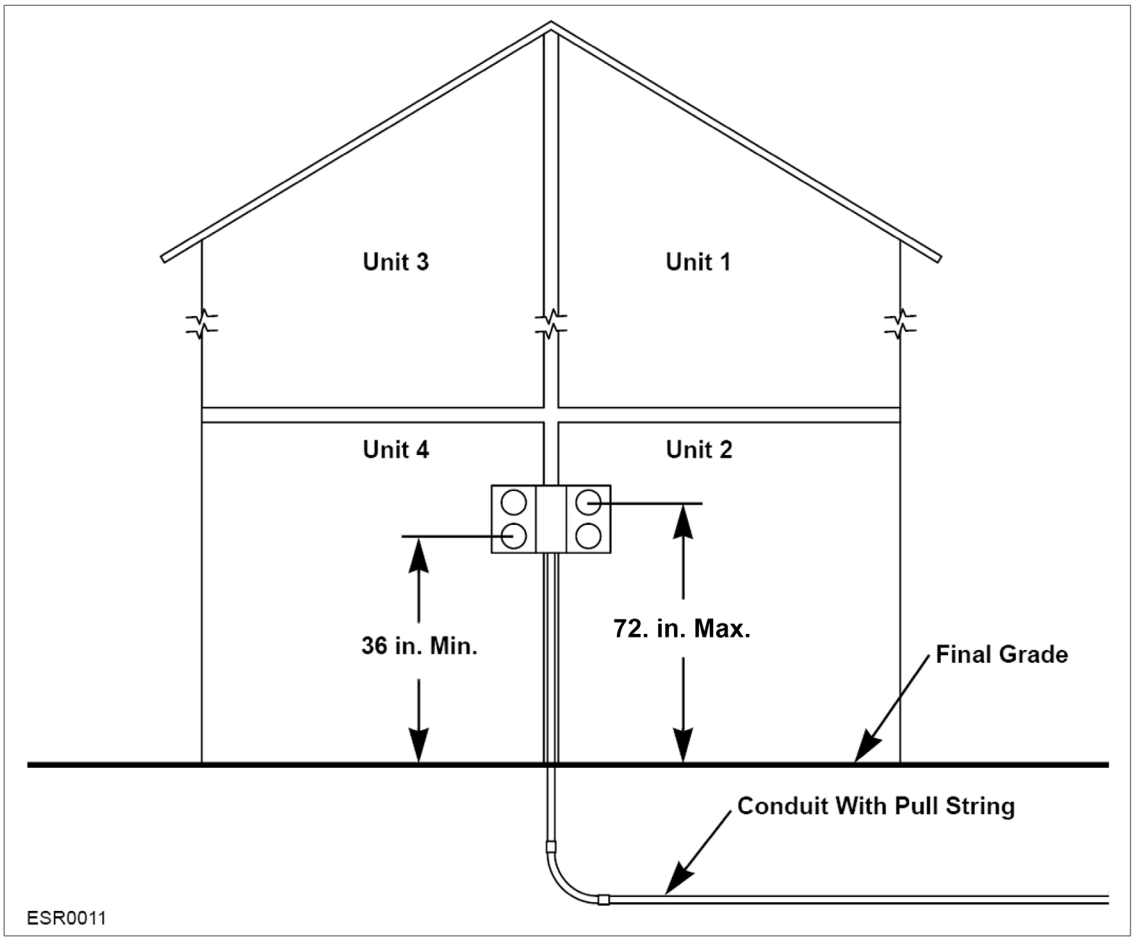

Figure 60: **Underground Service for a Multiple-Family Dwelling**

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 59** above.

8.2.2 Accessory Dwelling Units (ADUs)

Accessory dwelling units (ADUs) must be metered at the location of the primary residence meter. The metering equipment must consist of a single 2-pack meter base with a hard labels on each meter socket showing the respective addresses. See 3.9.8.2,"Labelling for Multi-Tenant Installations" and **Figure 4** on page 47 for more information.

An exception ***might*** be made to this rule if either of the following is the case:

- The ADU is closer to PGE lines than the primary residence. It could be possible to meter both from the ADU.
- The ADU is accessed from a different direction than the main residence and it is not feasible to feed both from the same location. It may be feasible to have separate meter bases with hard labels.

Contact PGE and the local jurisdiction for location-specific requirements for specific situations.

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 60** 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 59** 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*

The figures in this section show typical service-terminating arrangements for:

- A two-meter socket module rated 0 to 200 A.
- A three-meter to six-meter socket module rated 201 to 600 A.

Table 20 lists the dimensions of the terminating section for meter socket modules rated 0 to 600 A.

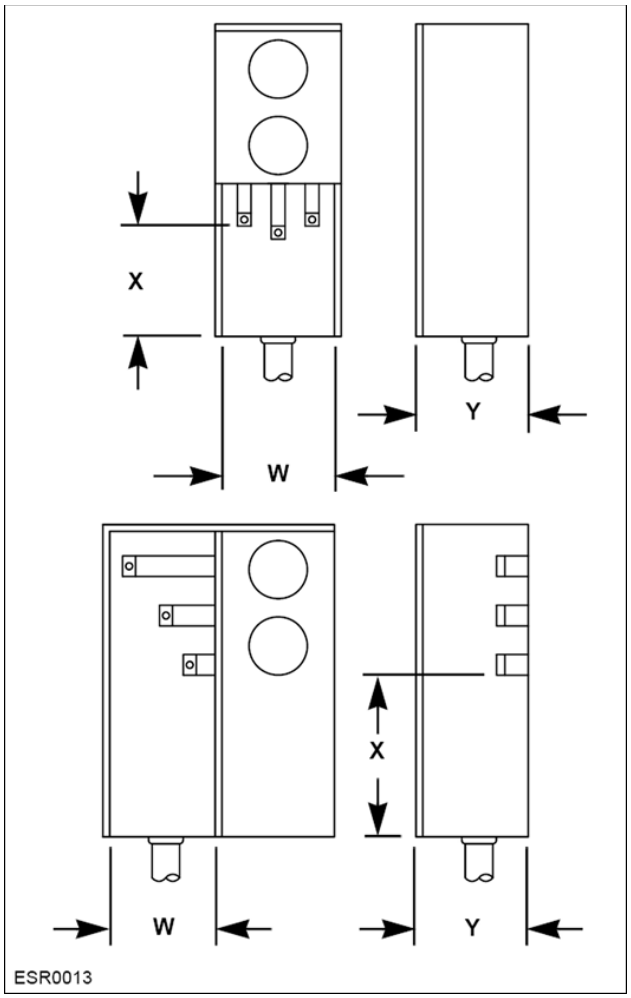

Figure 61: Service Terminating Arrangements for Two Meters Rated 0 to 200 A (EUSERC 342)

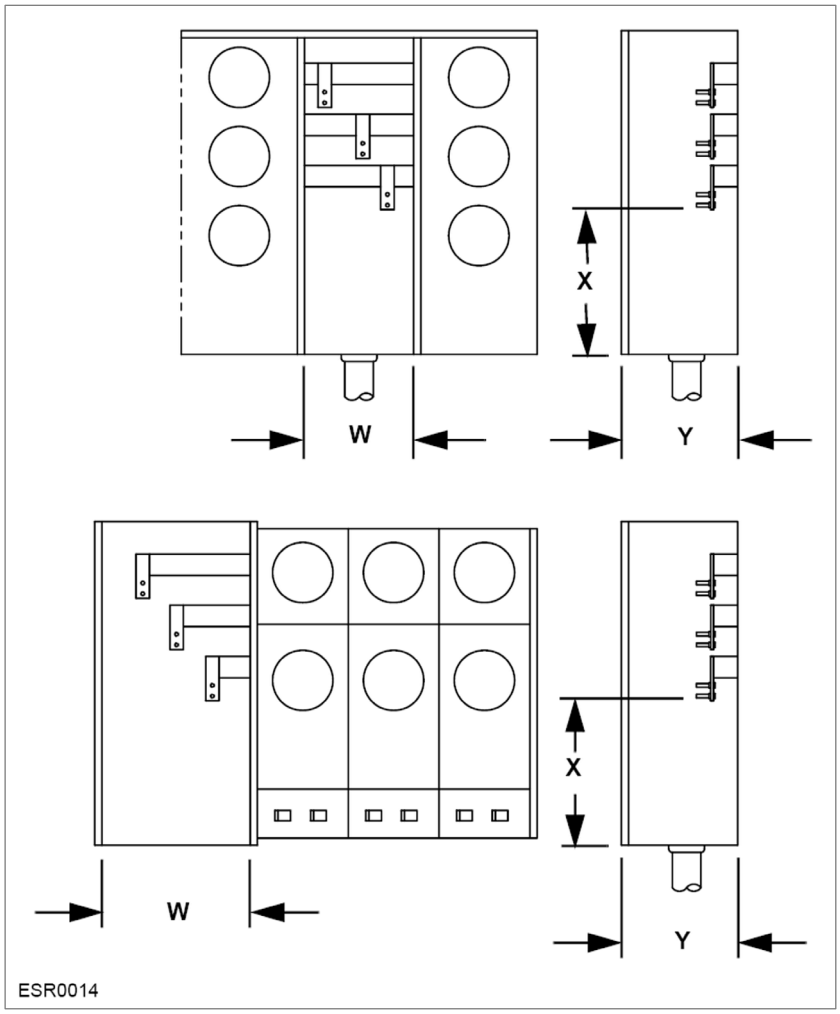

Figure 62: Service Terminating Arrangements for Three to Six Meters Rated 201 to 600 A

Table 20: 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

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 Homes

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 5.2, "Meter 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 Homes

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 63 shows installation details for pedestal service, and **Figure 64** 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 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 63**:

- 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.

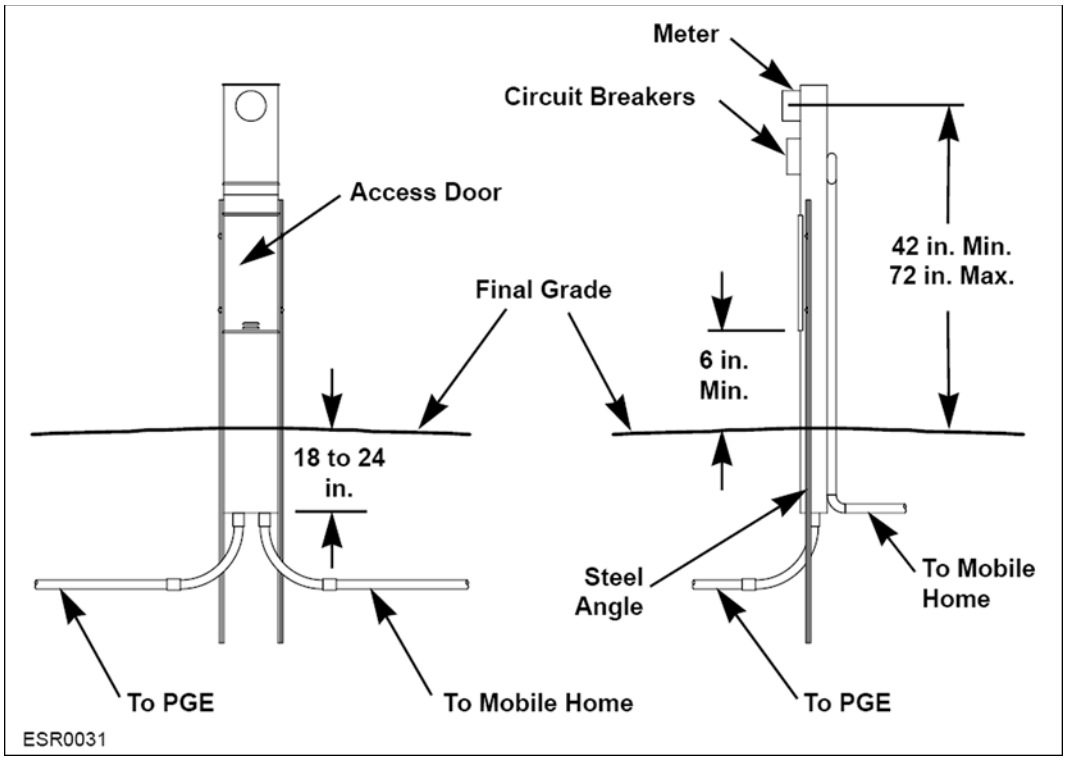

Figure 63: Underground Pedestal Installation Service for a Mobile Home (EUSERC 307)

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 64**):

- 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 6.2, "Trenches Provided by the Customer."

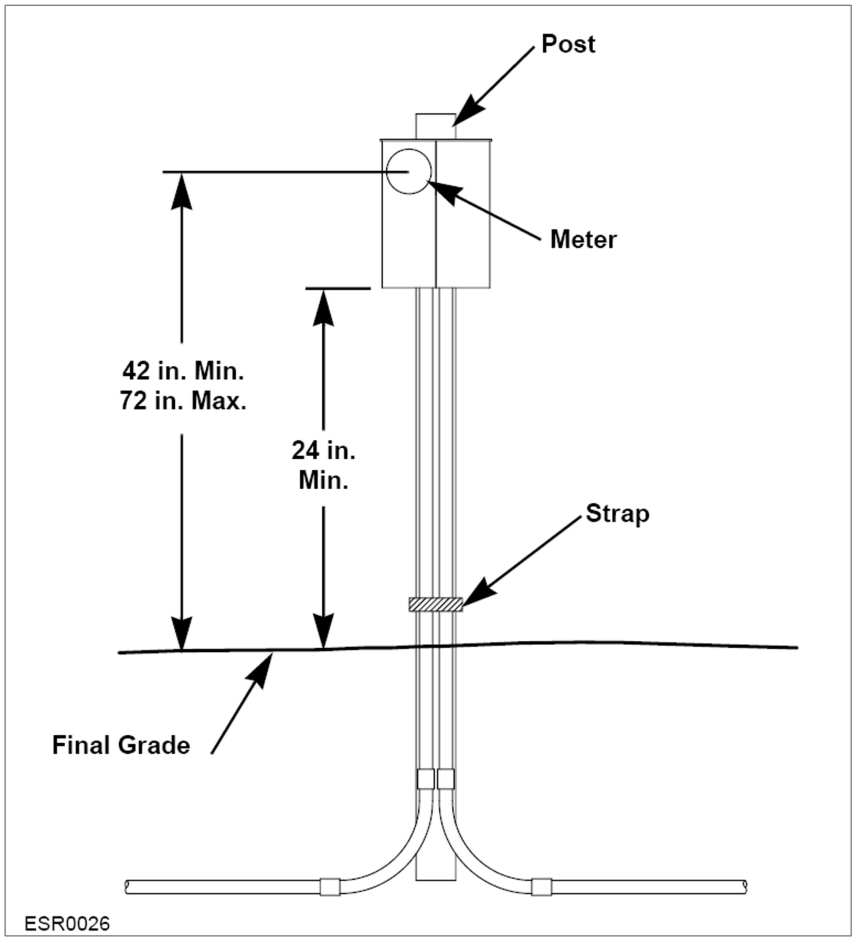

Figure 64: **Underground Post-Mounted Service for a Mobile Home**

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 Homes

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 5.2, "Meter 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.*

9.2.2 Mobile Homes

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 65**) or a customer overhead service drop (shown in **Figure 66**):

- 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.

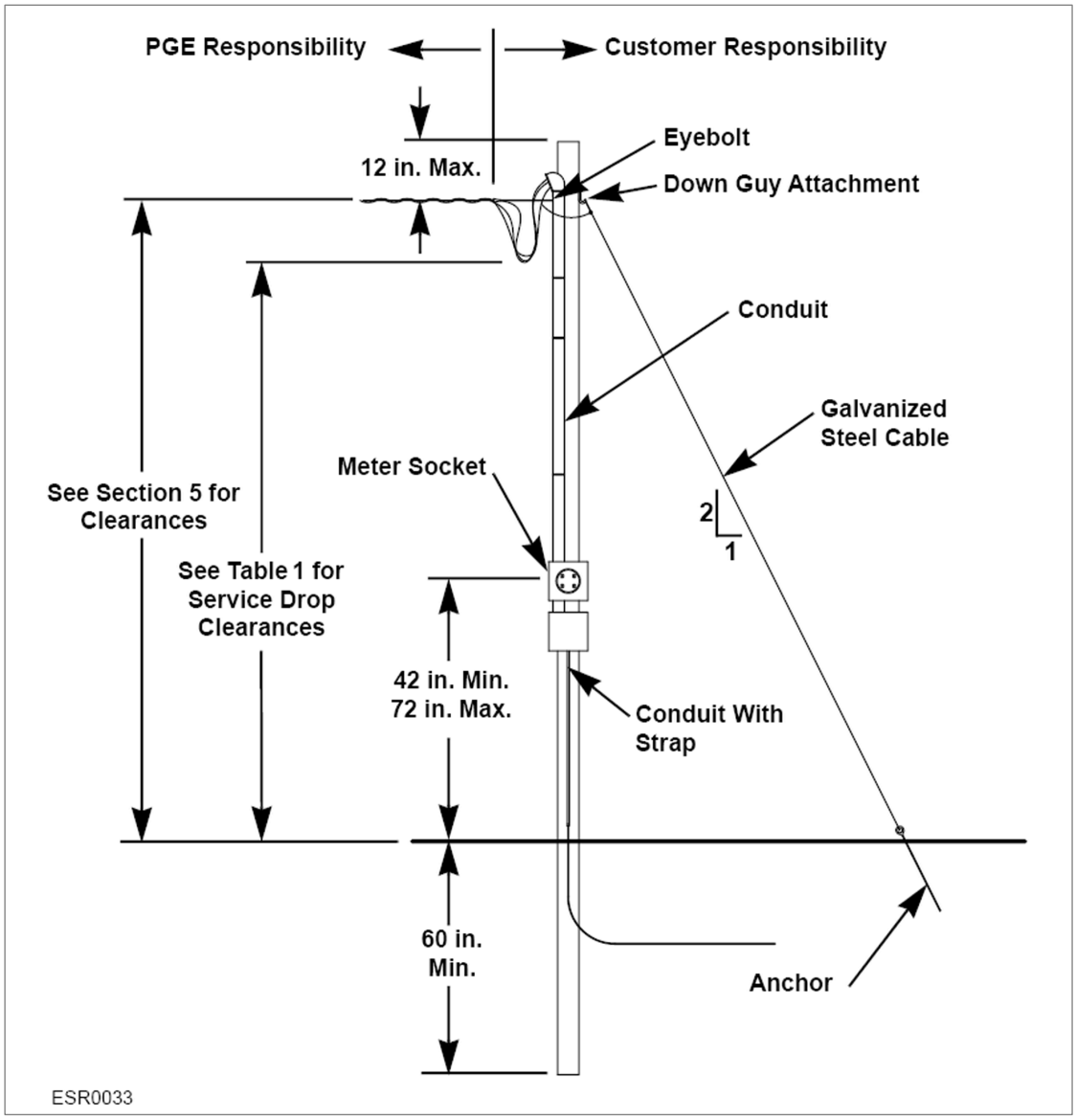

Figure 65: Overhead Service to a Mobile Home with a Customer Underground Service Lateral

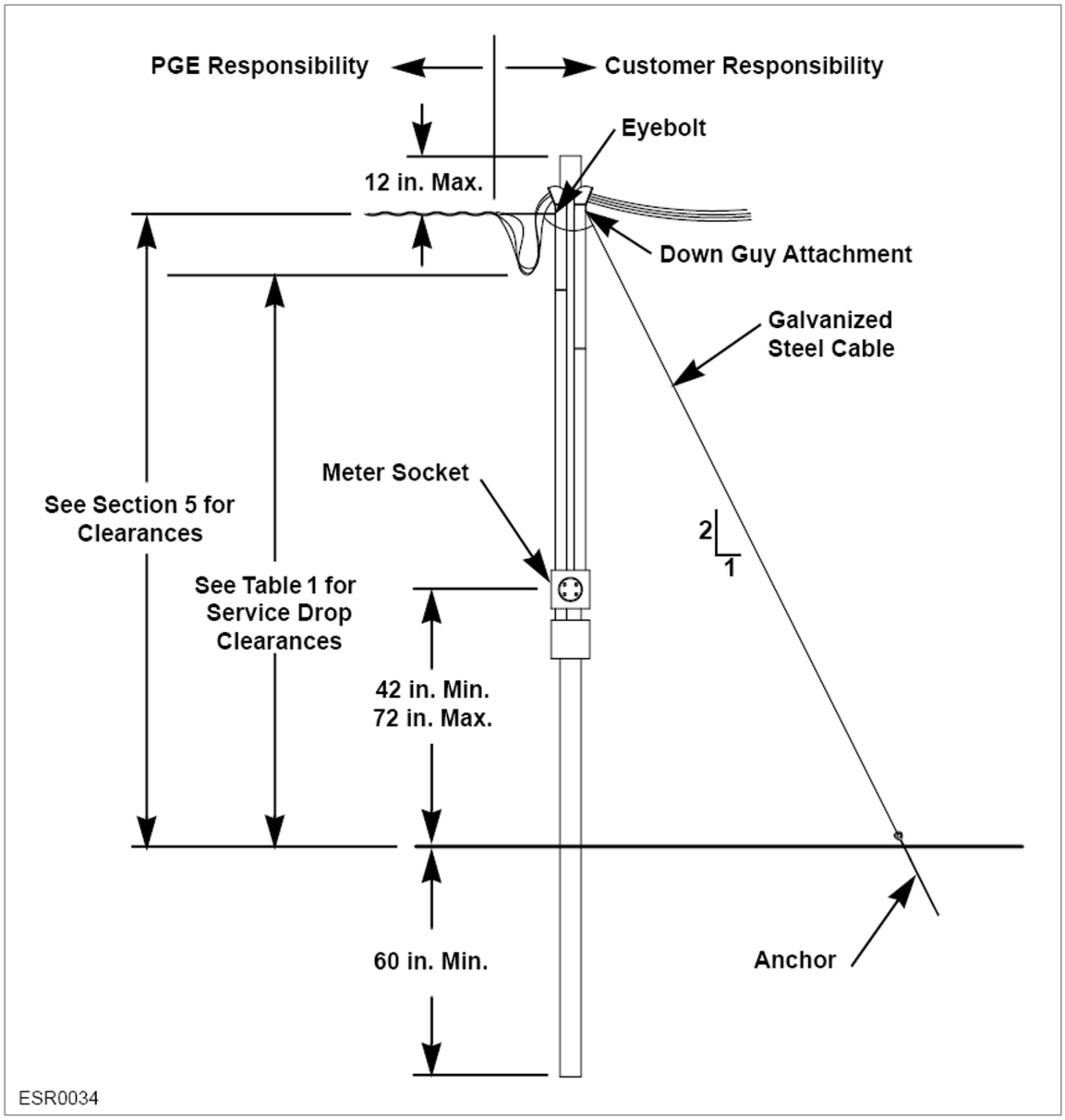

Figure 66: Overhead Service to a Mobile Home with a Customer Overhead Service Drop

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

TOPICS IN THIS SECTION

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 customers must coordinate their service requirements with PGE. They must provide factory-produced submittal drawings of switchboards before any equipment is purchased or installed.

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 5.2, "Meter Location Criteria."

Direct-connect metering is required for single-phase services at 400 A (320 A continuous) or lower, or three-phase services at 200 A or lower (see 10.3, "Direct-Connect Meter"). CT metering is required for single-phase services over 320 A and three-phase services over 200 A (see 10.7, "Current Transformer Metering, 800 A Maximum."

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 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 5.6.8 on page 86 for barrier post dimensions.) Meter sockets, terminal cabinets, current transformer cabinets, and transformers should be located away from landscape irrigation sprinklers.

For meters located in electrical equipment rooms, see Section 13, *Electrical Equipment Rooms and Interior Installations*.

Before power is connected, all 480 V services, multi-tenant installations, structures with multiple service, and services with customer generation must be permanently and visibly labeled as such. See 3.9.8, "Required Labelling" for labelling 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 21** for direct-connect meter socket requirements.

Figure 67 shows direct-connect meter sockets for a single-phase service. **Figure 68** 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 21: 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	

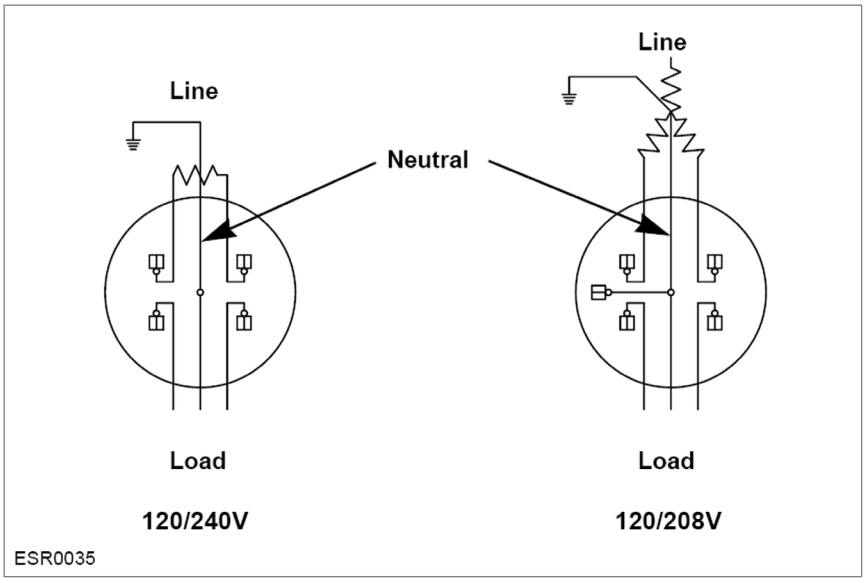

Figure 67: Direct-Connect Meter Sockets, Single-Phase, 3-Wire Service

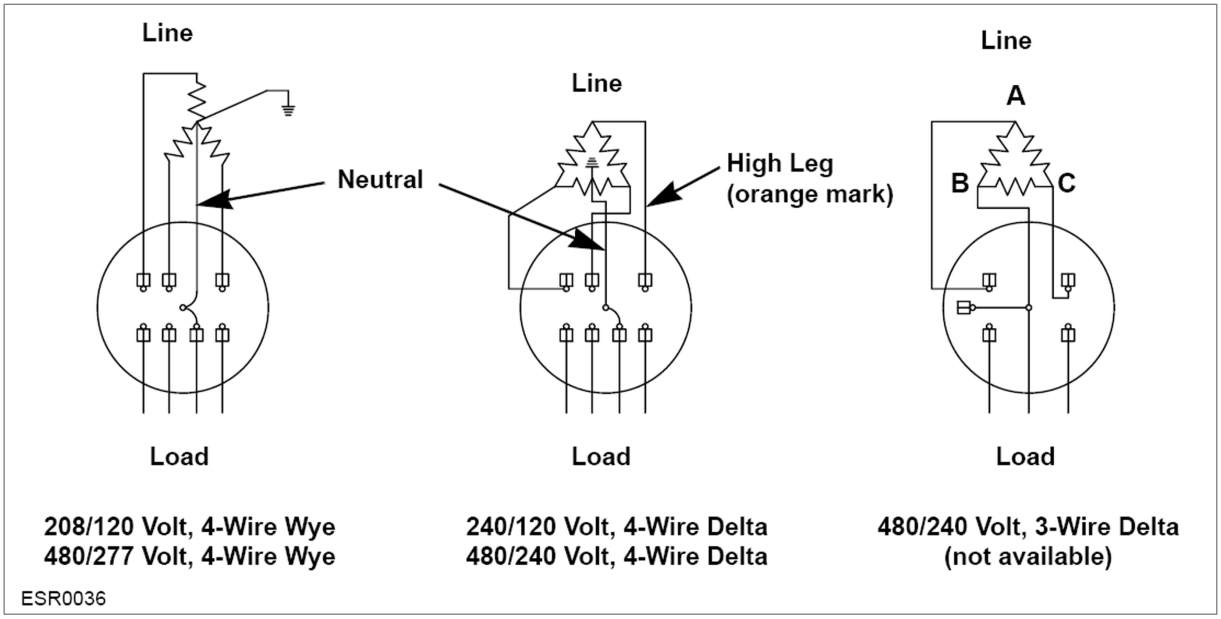

Figure 68: **Direct-Connect Meter Sockets, Three-Phase Service**

10.3.1 Direct-Connect Meter Safety Socket

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

Figure 69 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 these uses:
  - Temporary construction
  - Residential pumps, gates, outdoor lighting, barns, and outbuildings.

Contact PGE for more information on these requirements.

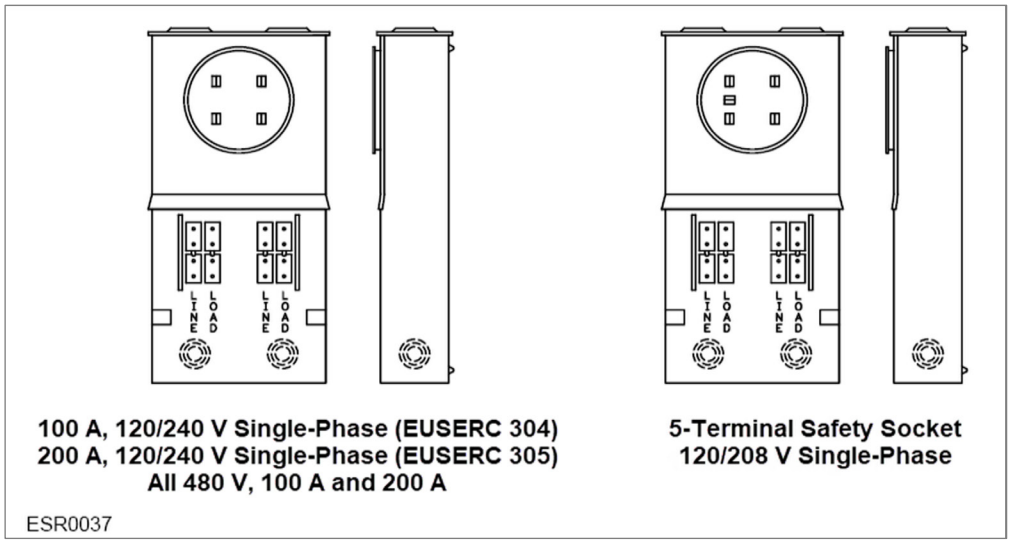

Figure 69: Commercial and Large Residential Single-Phase, Direct-Connect Meter Safety Sockets

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 20** on page 126 or EUSERC 343 in **Figure 70** below.

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

- **Table 22** lists the minimum dimensions for pull boxes with 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 8.2.1, "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 20**.

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

- **Figure 19** on page 67 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 pulling section is not allowed.

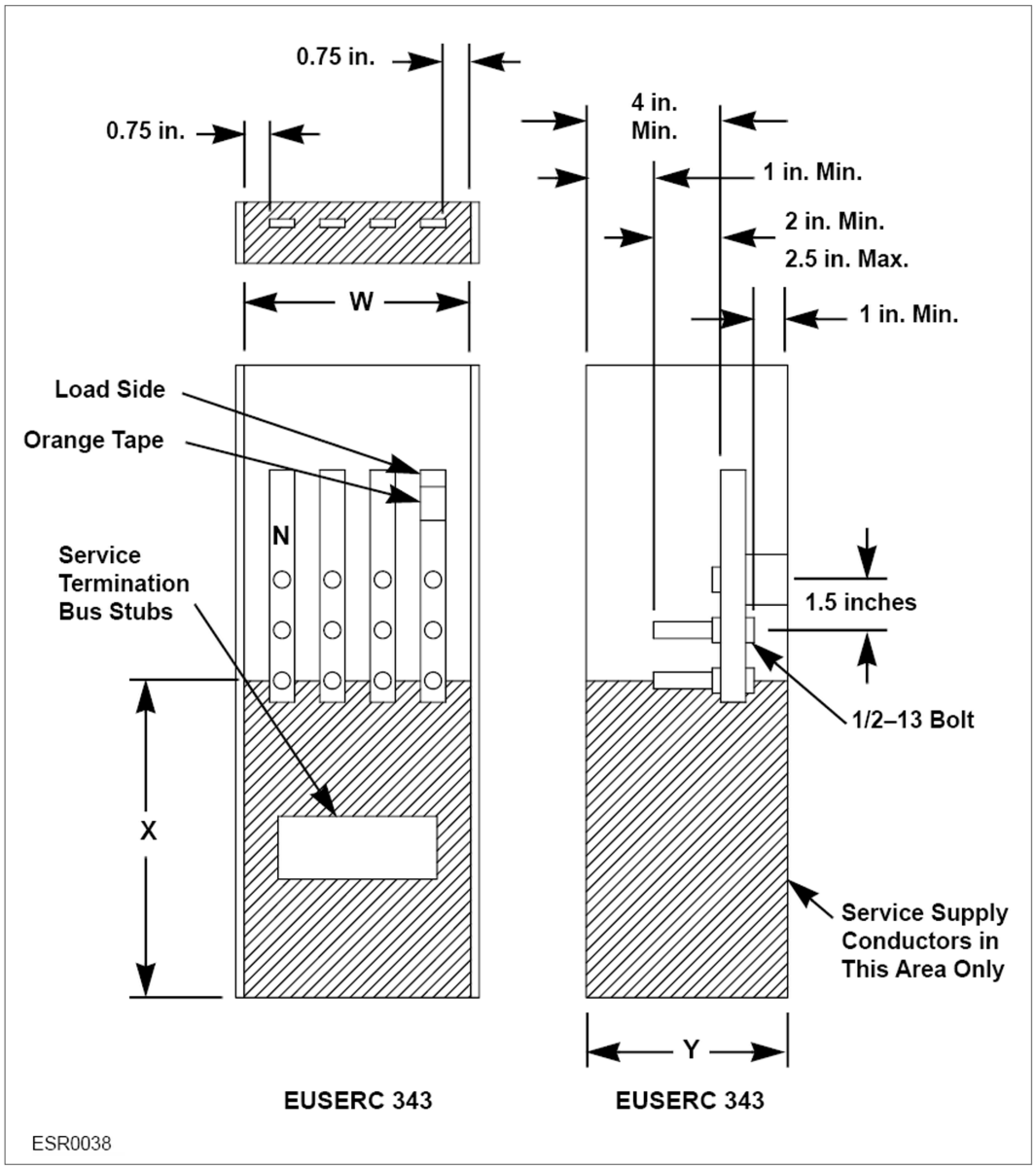

Figure 70: Pull Box with Terminating Facilities, 0 to 600 V, 0 to 1200 A (EUSERC 343, 347)

Table 22: 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 23**.

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

Table 23: 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 8.2.1, "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 4** on page 47).
- 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 10.6.

Figure 71 shows a 0 to 200 A commercial pedestal. **Table 24** lists minimum pedestal dimensions.

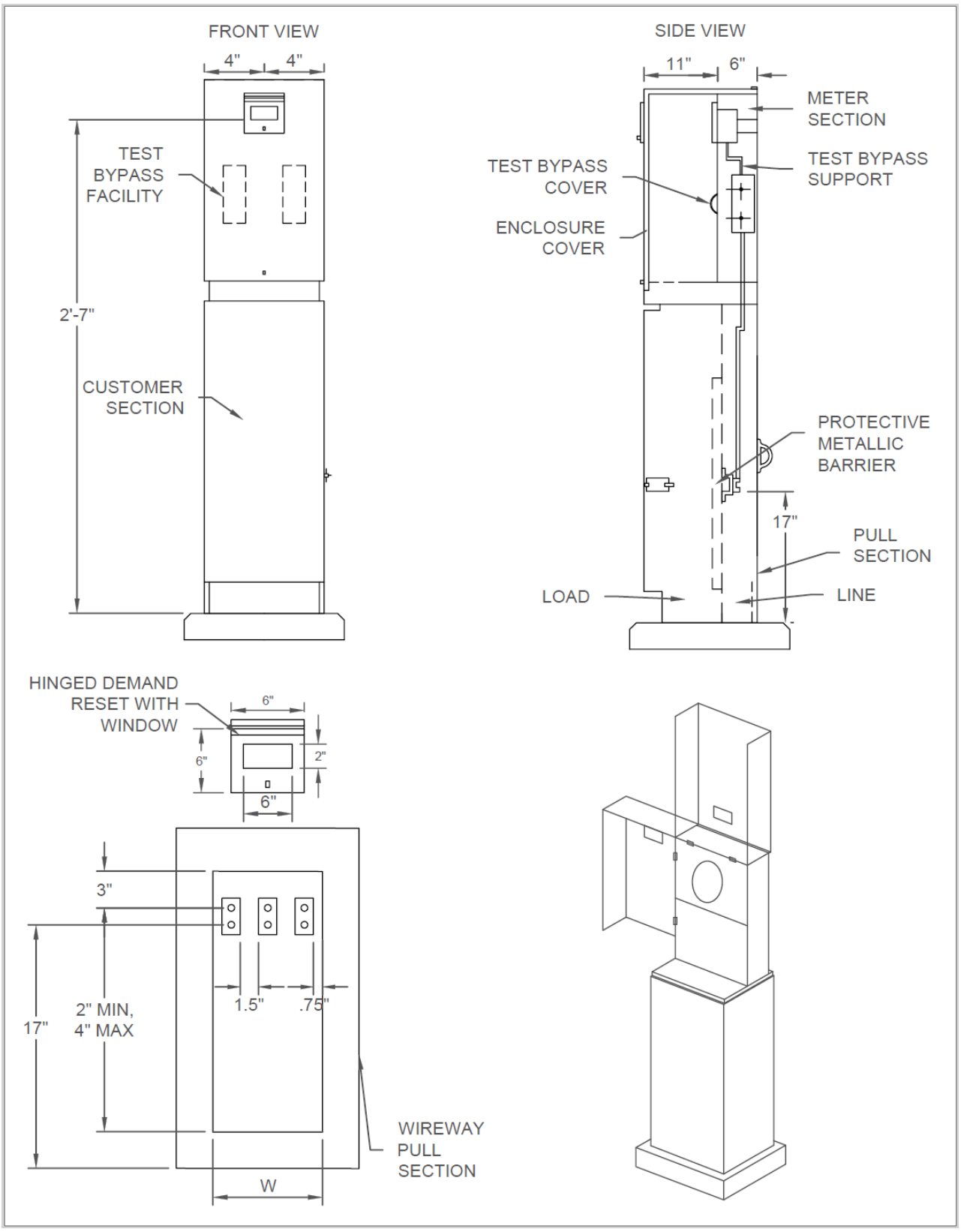

Figure 71: Commercial Pedestal, 0 to 200 A (EUSERC 308)

Table 24: 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.
- The meter socket enclosure must be hinged to allow front, sides, and back to be rotated back or laterally as a single unit to expose the meter socket and test bypass sections.
- 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 10.6.

Figure 72 shows a 100 A commercial, three-phase pedestal (EUSERC 304), and **Figure 73** shows a 200 A commercial, three-phase pedestal (EUSERC 305).

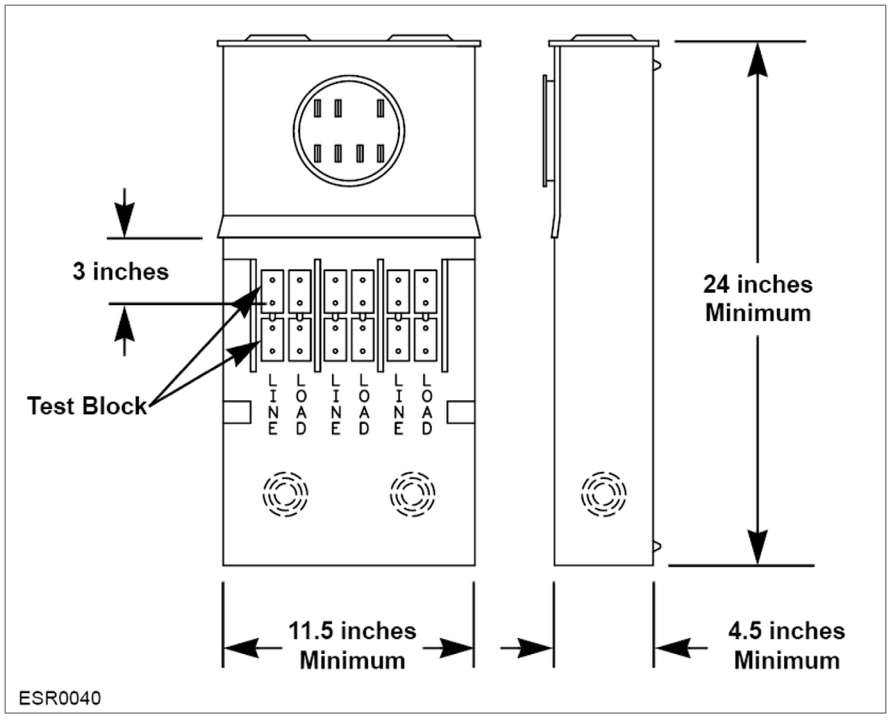

Figure 72: 100 A Commercial, Three-Phase, Direct-Connect Meter Safety Socket (EUSERC 304)

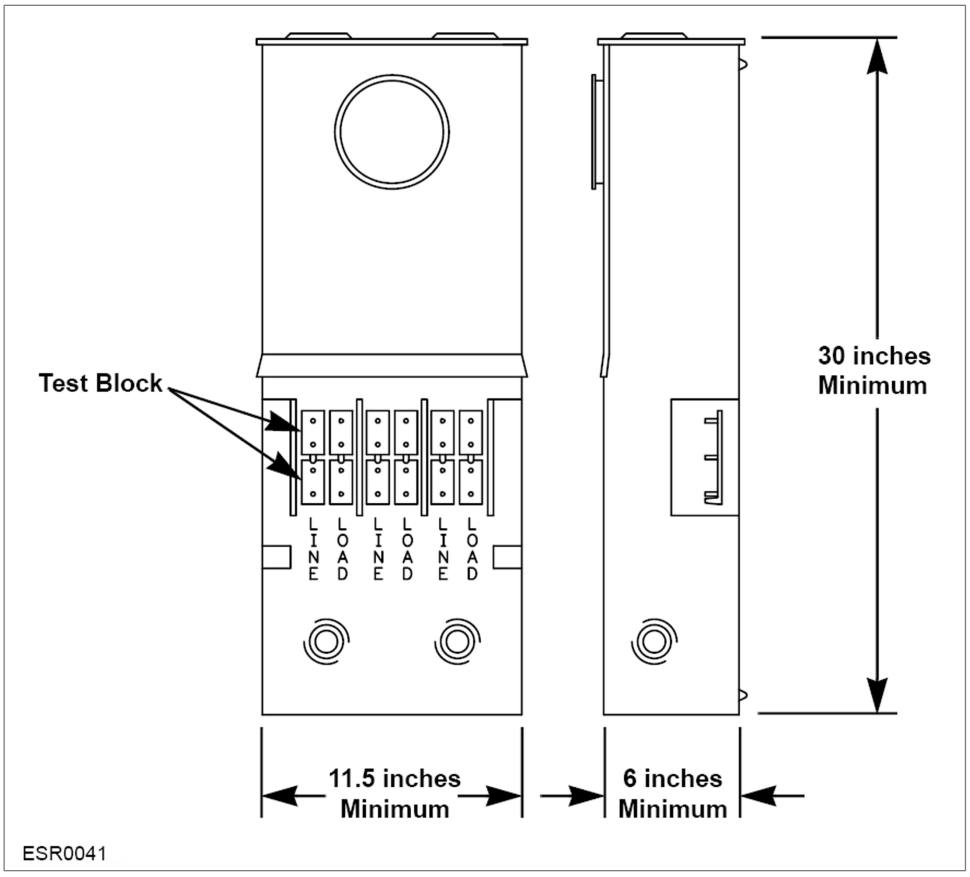

Figure 73: 200 A Commercial, Three-Phase, Direct-Connect Meter Safety Socket (EUSERC 305)

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 10.6.

Follow this additional requirement when installing commercial ganged meter sockets, such as the one shown in **Figure 74**.

- 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 must have the bus extension drilled for landing lugs.

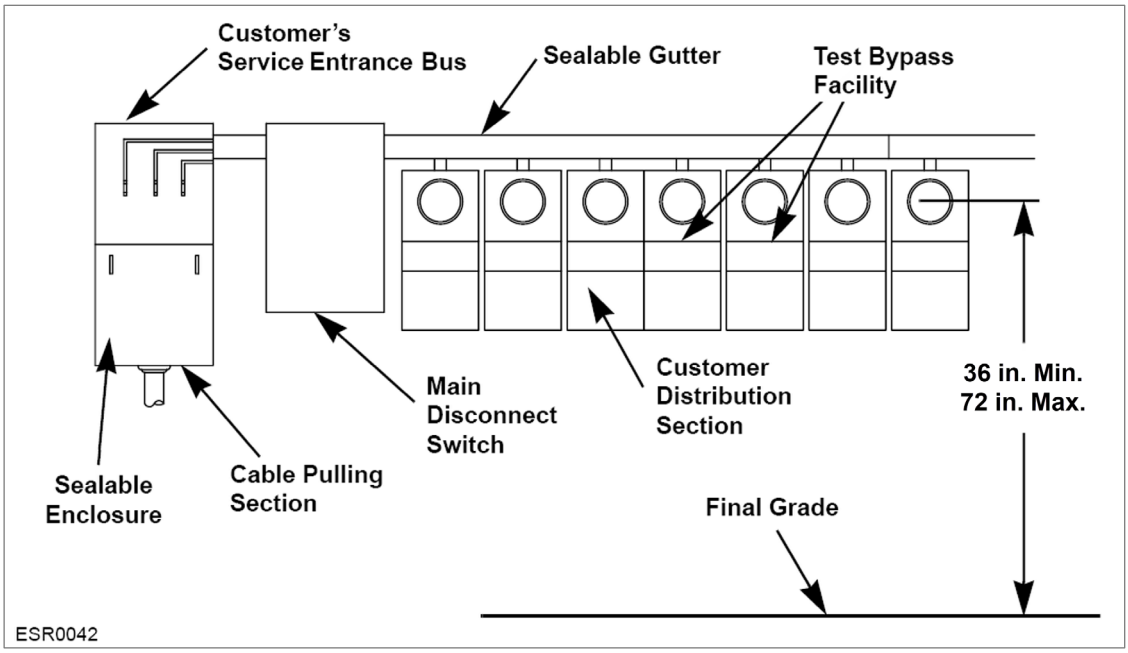

Figure 74: Commercial Ganged Meter Sockets

10.6.4 Commercial Module Meter Sockets

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

Figure 75 shows a commercial module meter socket installation (EUSERC 304, 305, and 347), and **Figure 76** 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.

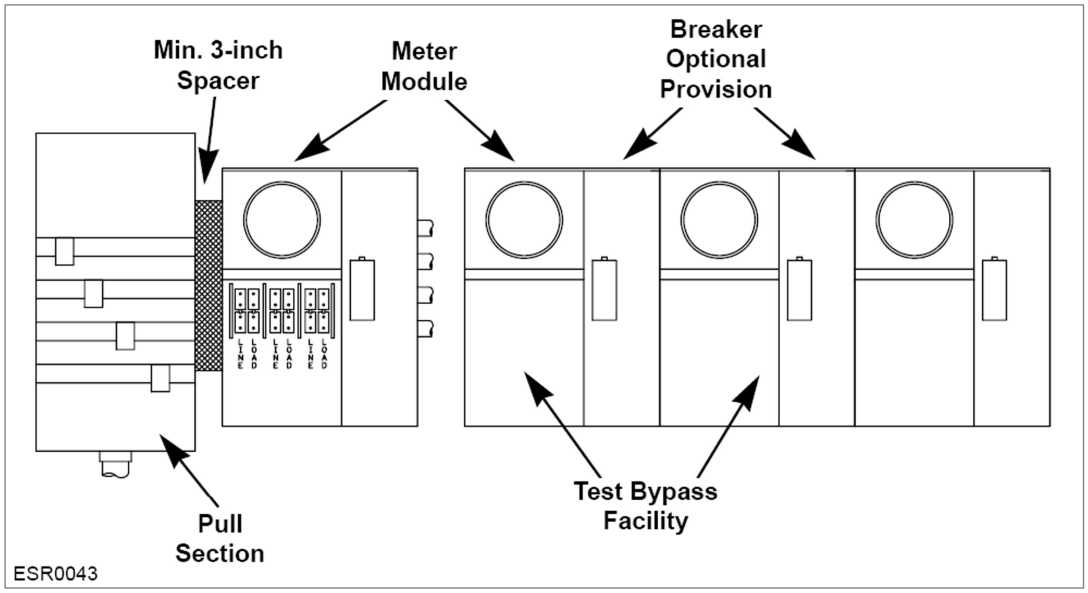

Figure 75: Commercial Module Meter Sockets (EUSERC 304, 305, 347)

Figure 76: **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 10.6.

Figure 77 shows a combination current transformer (CT)/direct-connect wall-mount metering, 0 to 800 A. **Figure 78** 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*.

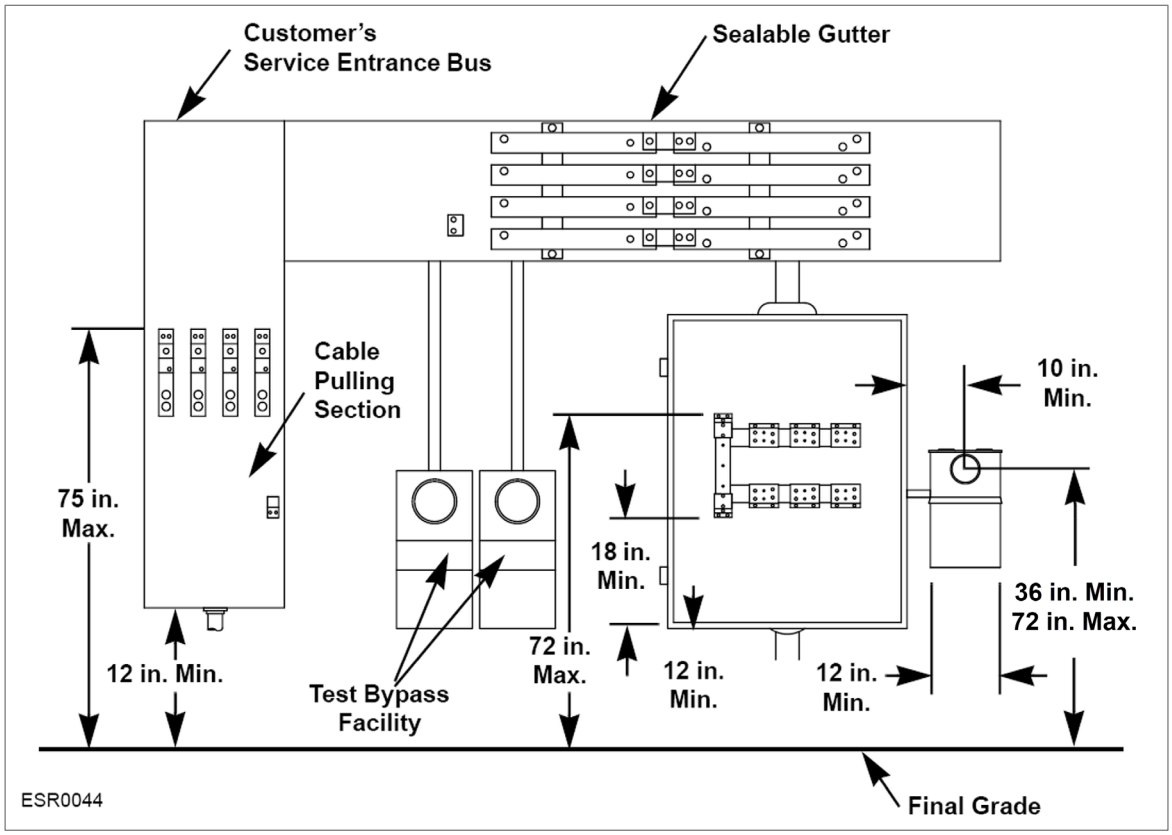

Figure 77: Combination Current Transformer/Direct-Connect, Wall-Mount Metering, 0 to 800 A

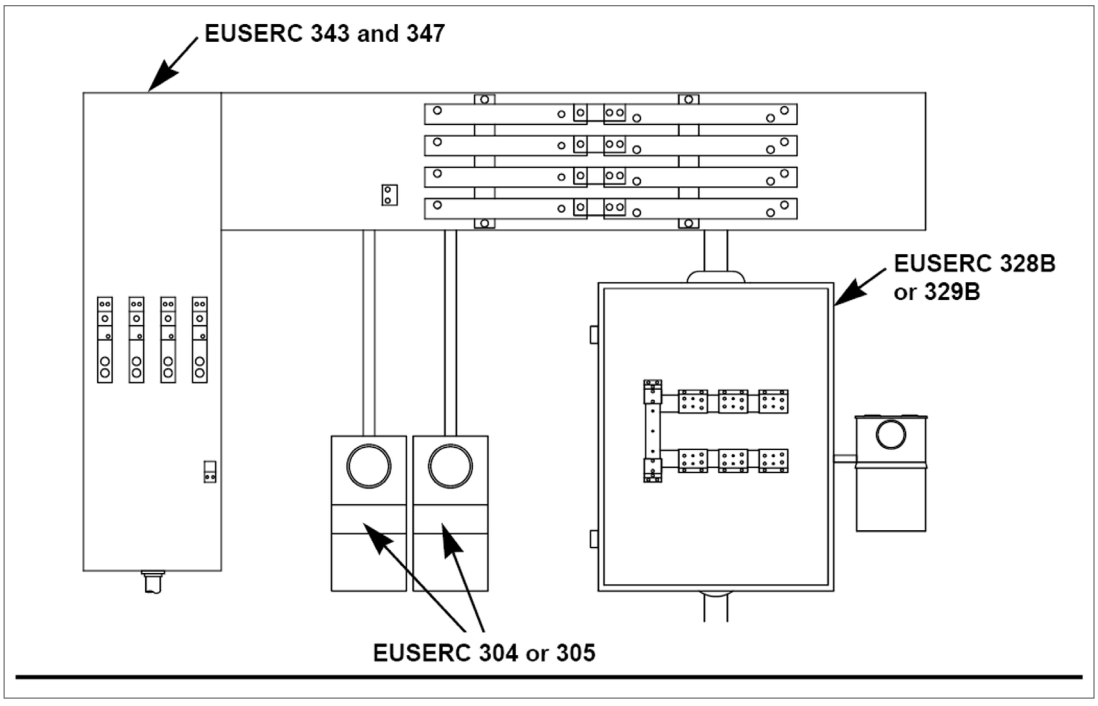

Figure 78: EUSERC Identifications for Combination Current Transformer/Direct-Connect, Wall-Mount Metering, 0 to 800 A

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 5.2, "Meter 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 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 5.6.8, "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 10.7.

Figure 79 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 79** 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.

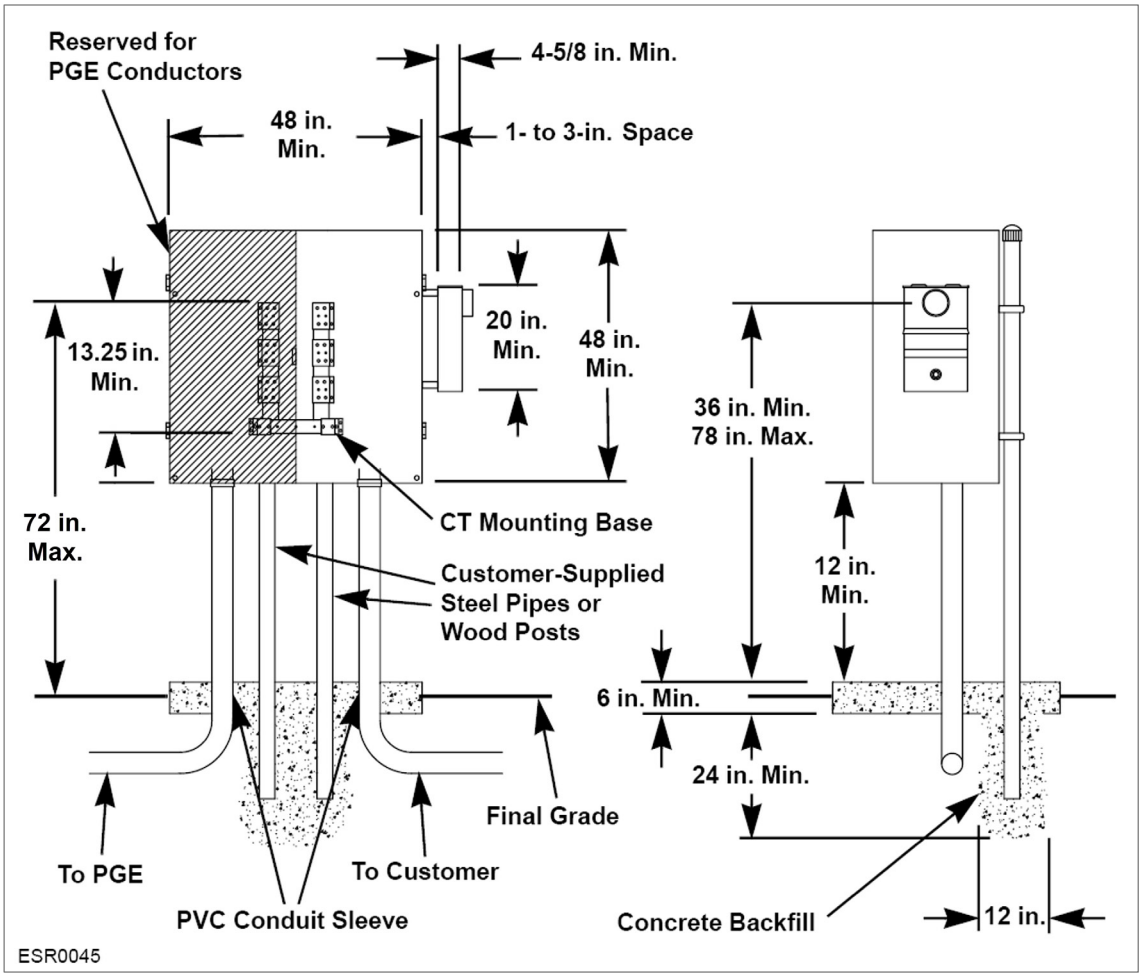

Figure 79: Current Transformer Metering, Post Mounted, 600 V, 800 A Maximum

10.7.2 Current Transformer Metering, Wall-Mounted

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

Figure 80 and **Figure 82** show wall-mounted current transformer metering, 600 V, 800 A maximum (EUSERC 329B). **Figure 81** shows a horizontal installation, and **Figure 83** 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 5.2, "Meter Location Criteria."

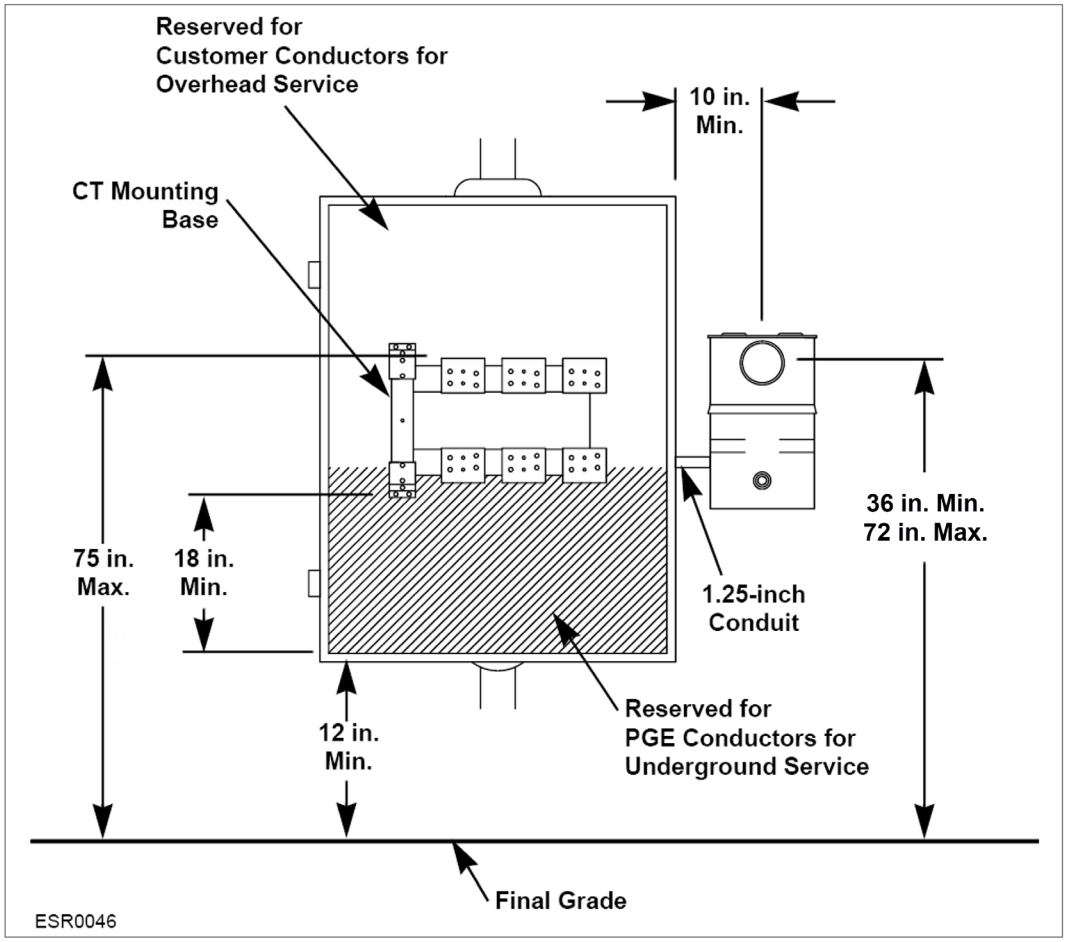

Figure 80: Current Transformer Metering, Horizontal, Wall Mounted, 600 V, 800 A Maximum (EUSERC 329B)

Figure 81: **Typical Horizontal Current Transformer Metering Installation**

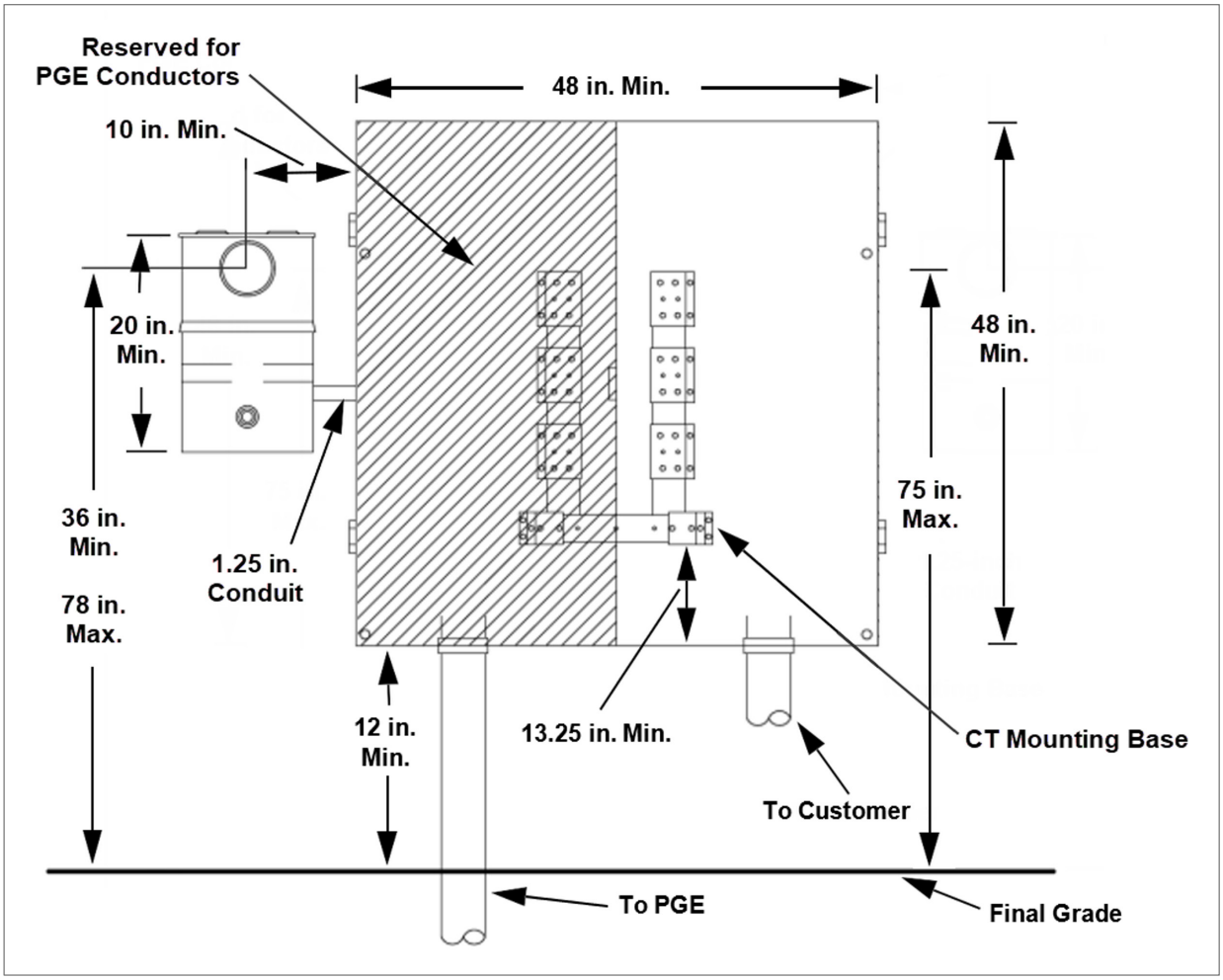

Figure 82: **Current Transformer Metering, Vertical, Line and Load Same Side, 600 V, 800 A Maximum (EUSERC 329B)**

Figure 83: **Typical Vertical Current Transformer Metering Installation**

10.7.3 Current Transformer Cabinet

Figure 84 shows a current transformer (CT) cabinet, 800 A maximum and 0 to 600 V (EUSERC 316, 317, and 318). **Table 25** 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 22** on page 139 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 19** on page 67. 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*.

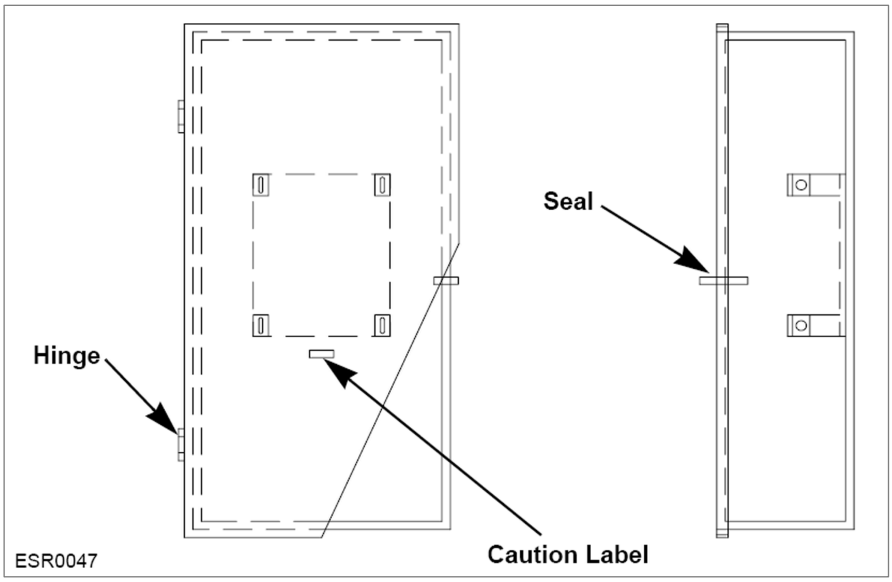

Figure 84: Current Transformer Cabinet, 800 A Maximum, 0 to 600 V (EUSERC 316, 317, 318)

Table 25: 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 6.3.4, “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 85** shows the dimensions of the enclosure and **Table 26** 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.

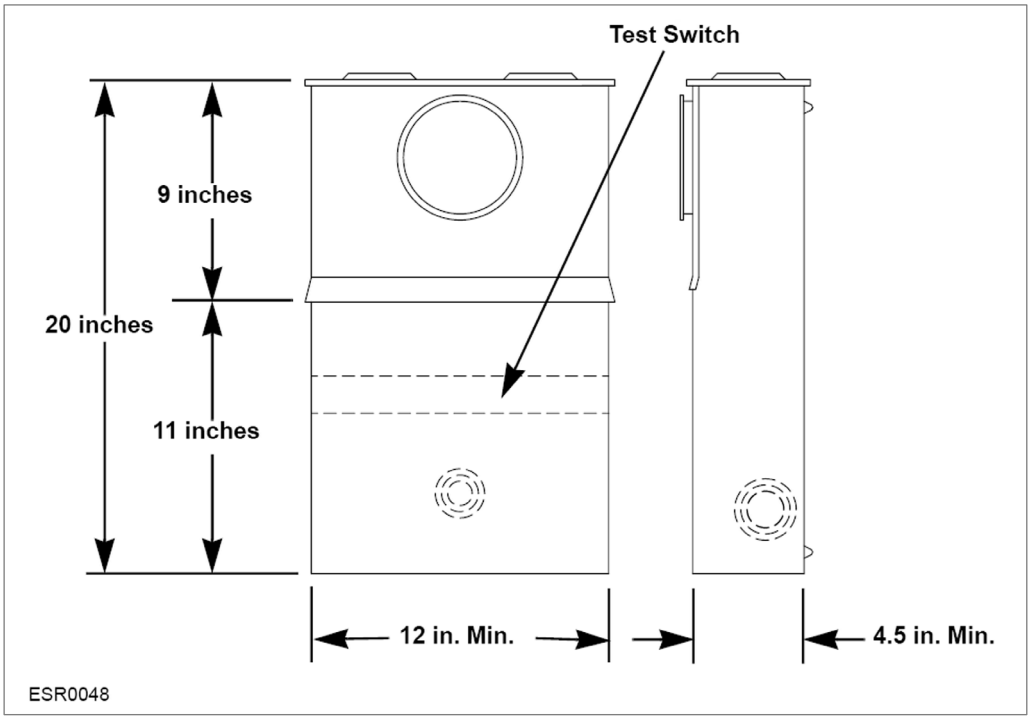

Figure 85: Current Transformer Meter Socket Enclosure

Table 26: 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 86 shows a transformer mounting base for installation in a current transformer (CT) cabinet, single-phase, 3-wire, 800 A maximum (EUSERC 328B). **Figure 87** shows a typical single-phase CT installation.

Figure 88 shows a transformer mounting base for installation in a CT cabinet, three-phase, 4-wire, 800 A maximum (EUSERC 329B).

Figure 89 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 5.2, "Meter 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.

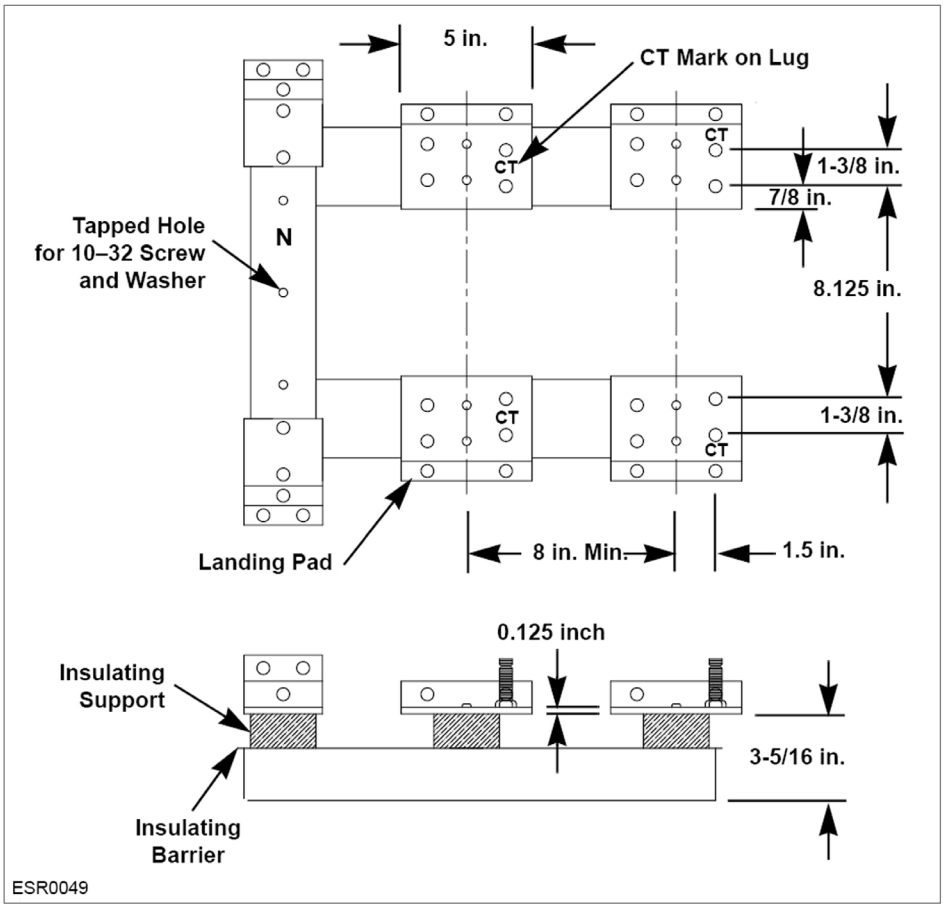

Figure 86: Transformer Mounting Base for Installation in a CT Cabinet, Single-Phase, 3-Wire, 800 A Maximum (EUSERC 328B)

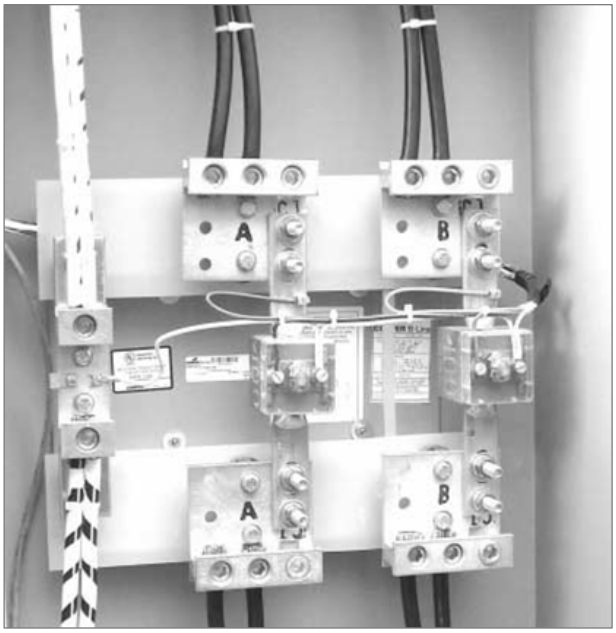

Figure 87: Typical Single-Phase CT Installation

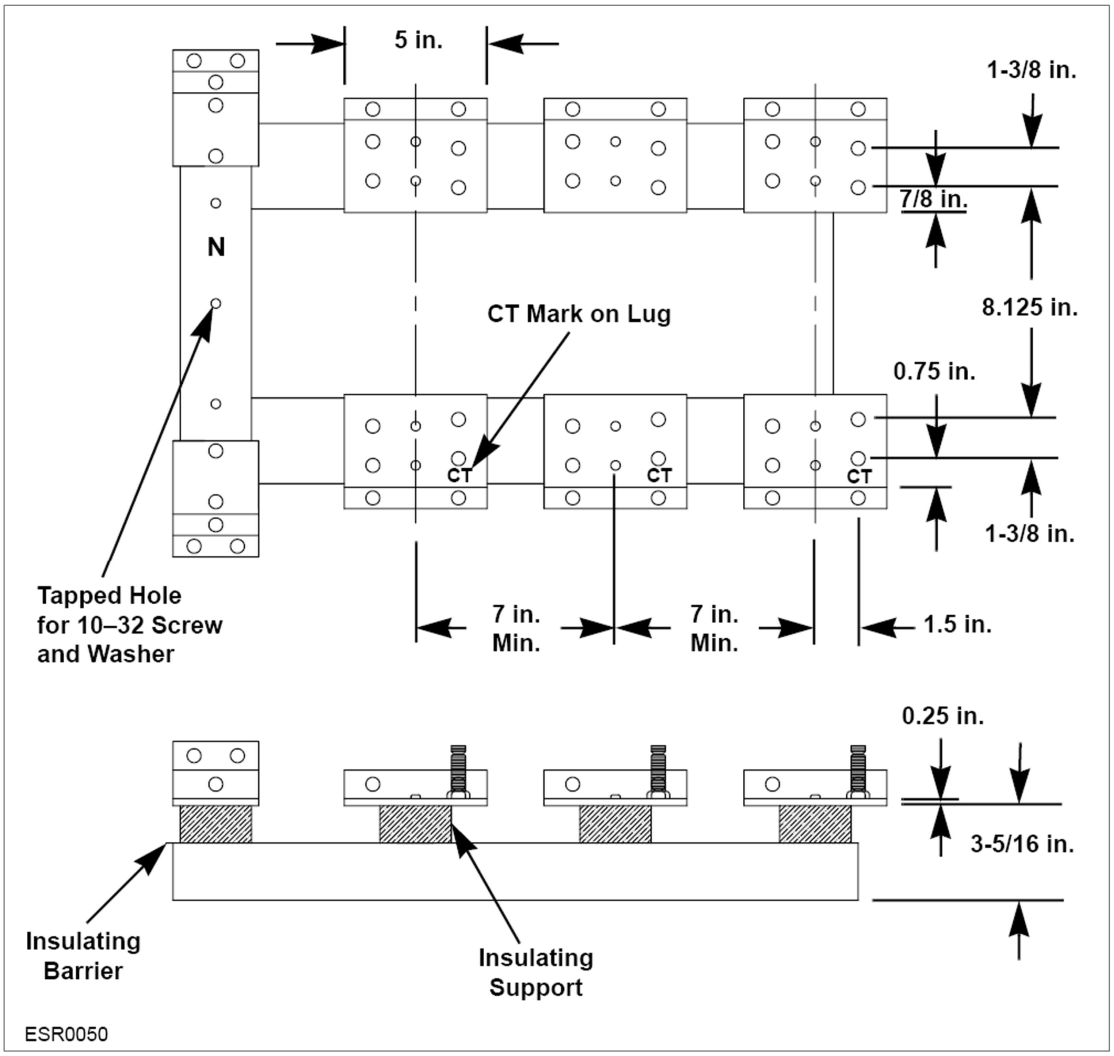

Figure 88: Transformer Mounting Base for Installation in a CT Cabinet, Three-Phase, 4-Wire, 800 A Maximum (EUSERC 329B)

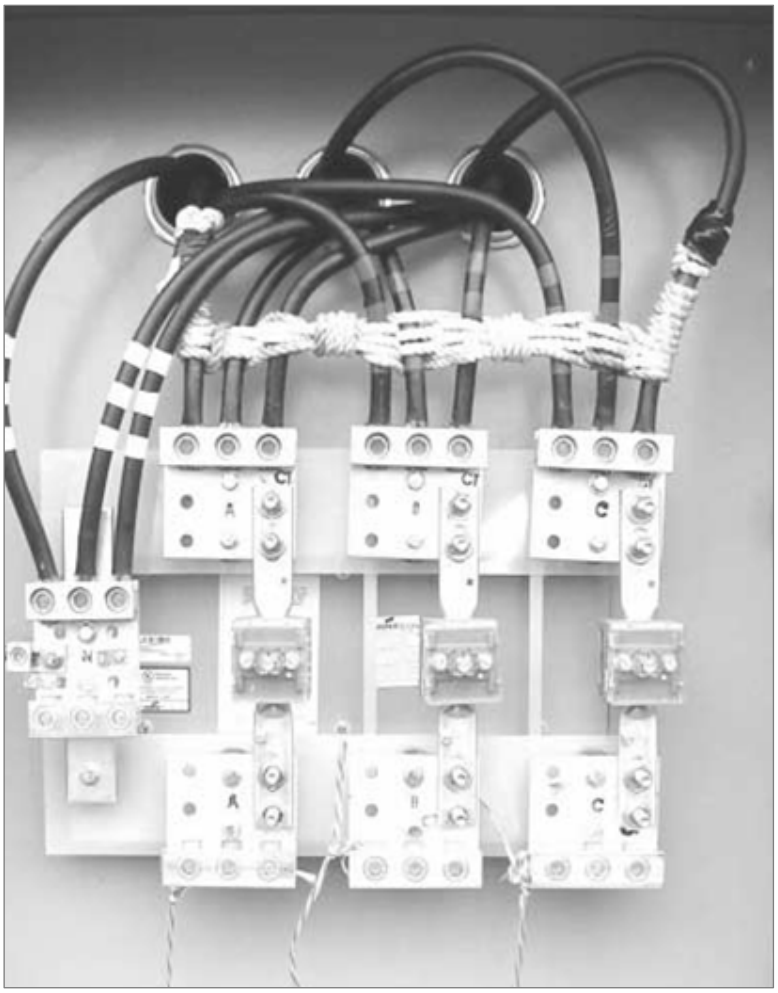

Figure 89: Typical Three-Phase CT Installation

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

TOPICS IN THIS SECTION

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 5.2, "Meter Location Criteria." In addition:

- For at-grade installations, PGE line crews require 8 feet of working clearance in front of the termination sections for pulling in conductors. This clearance must be opposite the enclosure or within 30 degrees of vertical separation.
- For installations where the conduit enters from the back or side, at least 10 feet of clear workspace is required.
- For all underground services terminating in a pull section, at least10 feet of clear workspace is required.

11.2 *Meter Location*

IMPORTANT: *PGE must confirm the location for all meters through an on-site visit.*

Meters must comply with the accessibility and location requirements in Section 5, *Clearances and Location Requirements*. 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 meter equipment is installed in a location subject to vehicle traffic, the customer must install and maintain a PGE-approved barrier post. (See **Figure 35** on page 88 for barrier post dimensions.) Meter sockets, terminal cabinets, current transformer cabinets, and transformers should be located away from landscape irrigation sprinklers.

When a meter is located in an electrical equipment room, see Section 13, *Electrical Equipment Rooms and Interior Installations* for detailed requirements.

Before power is connected, all 480 V services, multi-tenant installations, structures with multiple service, and services with customer generation must be permanently and visibly labeled as such. See 3.9.8, “Required Labelling” for labelling 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.*

11.3 *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.

11.3.1 Indoor Switchboard Metering

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

Follow these additional requirements when installing indoor switchboard metering (EUSERC 325 and 326), such as that shown in **Figure 90**:

- 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 5.2, "Meter 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 91**.
- 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 92** for details.

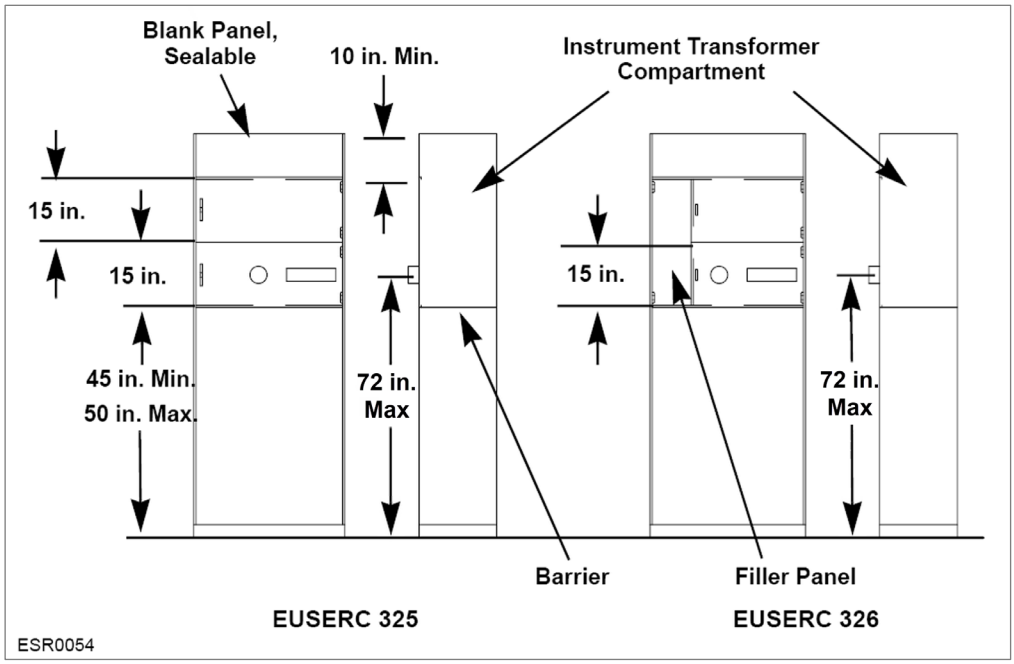

Figure 90: Indoor Switchboard Metering (EUSERC 325 and 326)

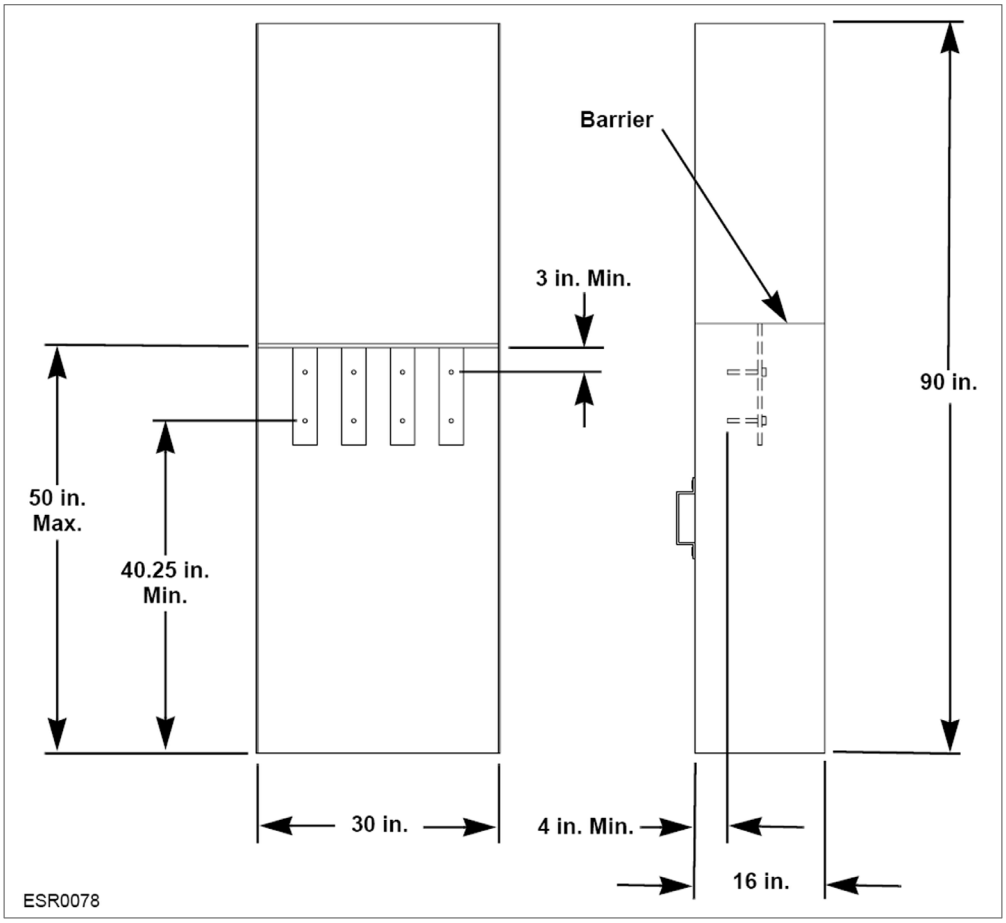

Figure 91: Load Section of an Indoor Switchboard (EUSERC 327)

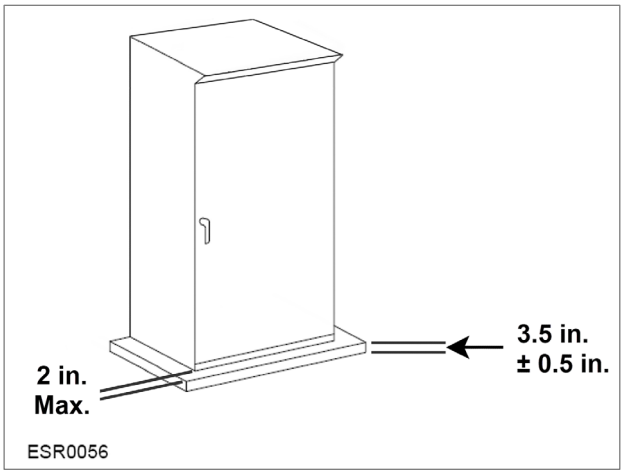

Figure 92: Concrete Pad in Front of Cabinet (Indoor Metering)

11.3.2 Outdoor Switchboard Metering

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

Follow these additional requirements when installing outdoor switchboard metering (EUSERC 354), such as that shown in **Figure 93**:

- 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 100** on page 172) 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 94** for details.
- Barrier posts are required if the switchboard is exposed to vehicular traffic. For more information, see 5.6.8, "Barrier Posts."

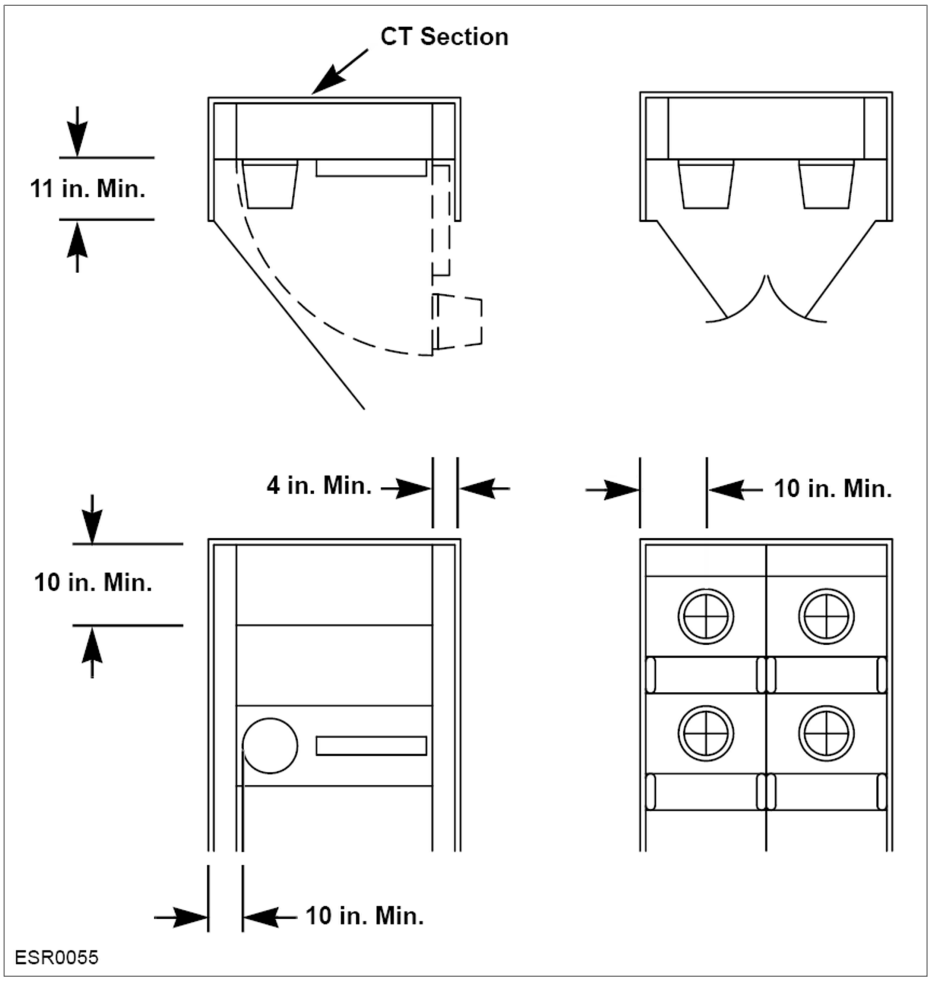

Figure 93: Outdoor Switchboard Metering (EUSERC 354)

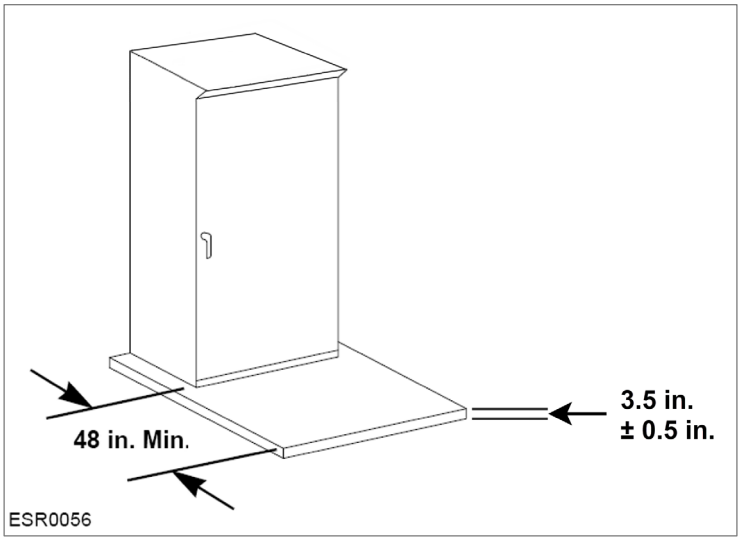

Figure 94: Concrete Pad in Front of Cabinet (Outdoor Metering)

11.3.3 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.

11.3.3.1 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.

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

Figure 95 shows a pull box with terminating facilities 0 to 600 V, 0 to 1200 A (EUSERC 343A, 347). See **Figure 19** on page 67 for meter clearances for multiple-meter installations.

Table 27 lists minimum dimensions for pull boxes with terminating facilities (EUSERC 343A).

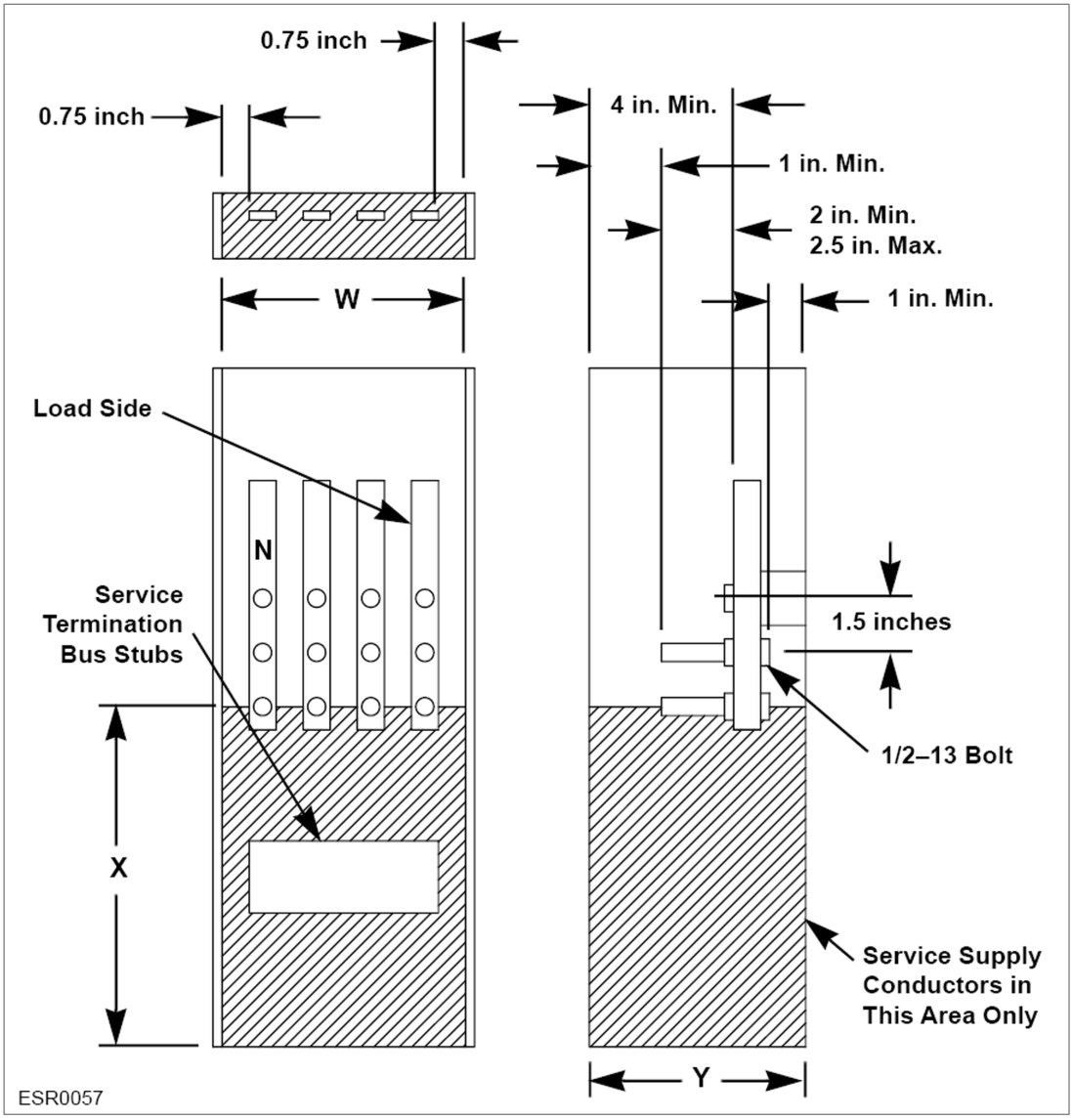

Figure 95: Pull Box with Terminating Facilities 0 to 600 V, 0 to 1200 A (EUSERC 343A, 347)

Table 27: 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

11.3.5 Commercial Multiple-Metering, Floor-Mounted Switchboard

Note: Commercial multiple metering can include any combination of direct-connect and CT-rated meters.

Follow these requirements when installing commercial multiple metering, floor-mounted switchboards, such as that shown in **Figure 96**:

- 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 4** on page 47 shows an example label.
- All 480 V services, multi-tenant installations, structures with multiple services, and services with customer generation must be permanently and visibly labeled as such. See 3.9.8, "Required Labelling" for labelling 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 97** (or refer to EUSERC 345) and **Table 28**.
- The customer must provide an acceptable concrete pad for all switchboard metering service sections and pull boxes.
- If a freestanding unit will be capable of expanding beyond six meter sockets to accommodate load growth, the initial installation must include a main disconnect.
- For meter stacks downstream of switchboard:
  - A main disconnect must be located in front of all metered branches containing more than six meters in the same location as the meter bank.
  - The meter center disconnect may be located on the switchboard if the meter center is co-located with the switchboard.

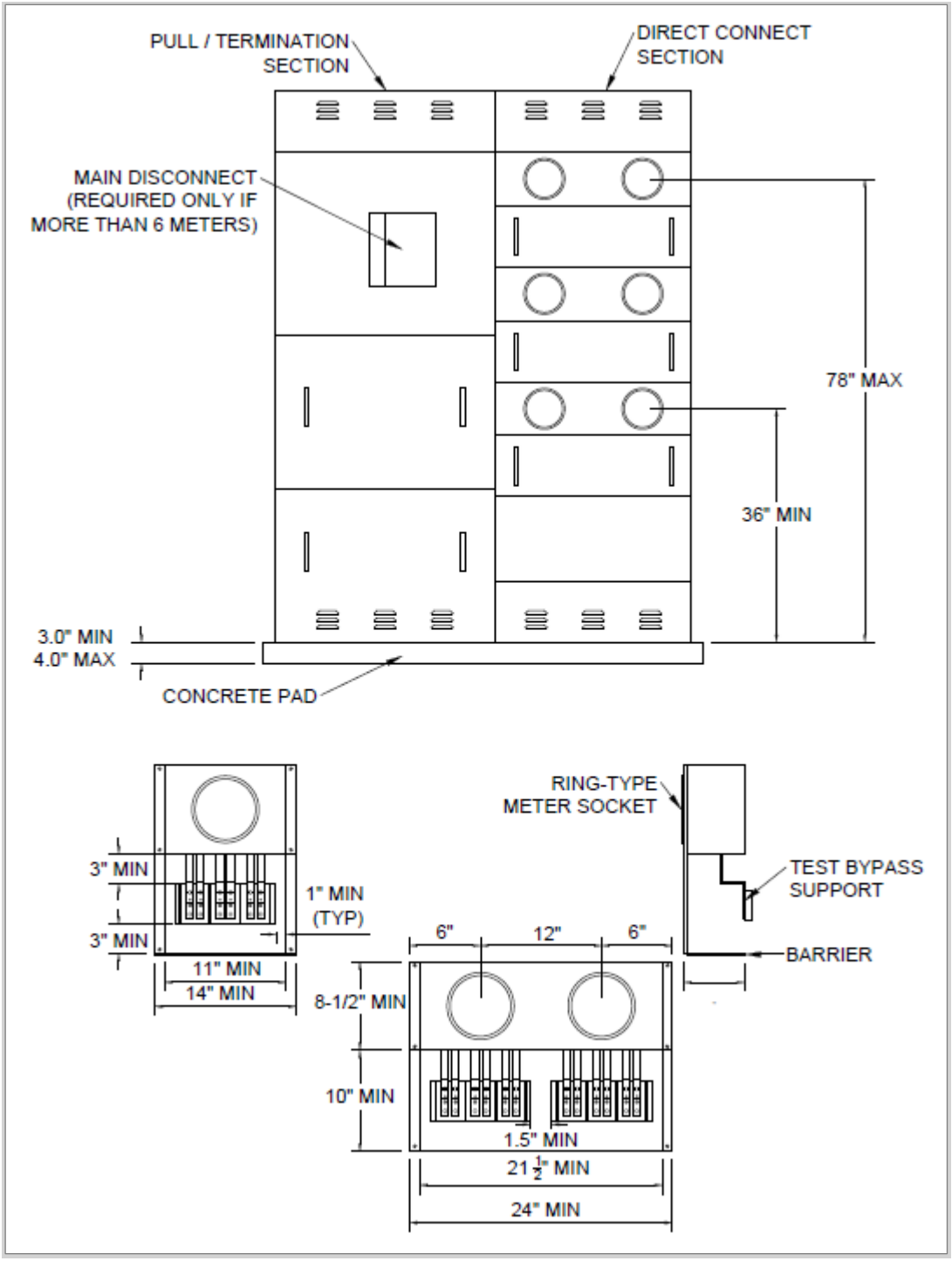

Figure 96: Commercial Multiple Metering Floor-Mounted Switchboard, 1201 A and Higher (EUSERC 306, 345)

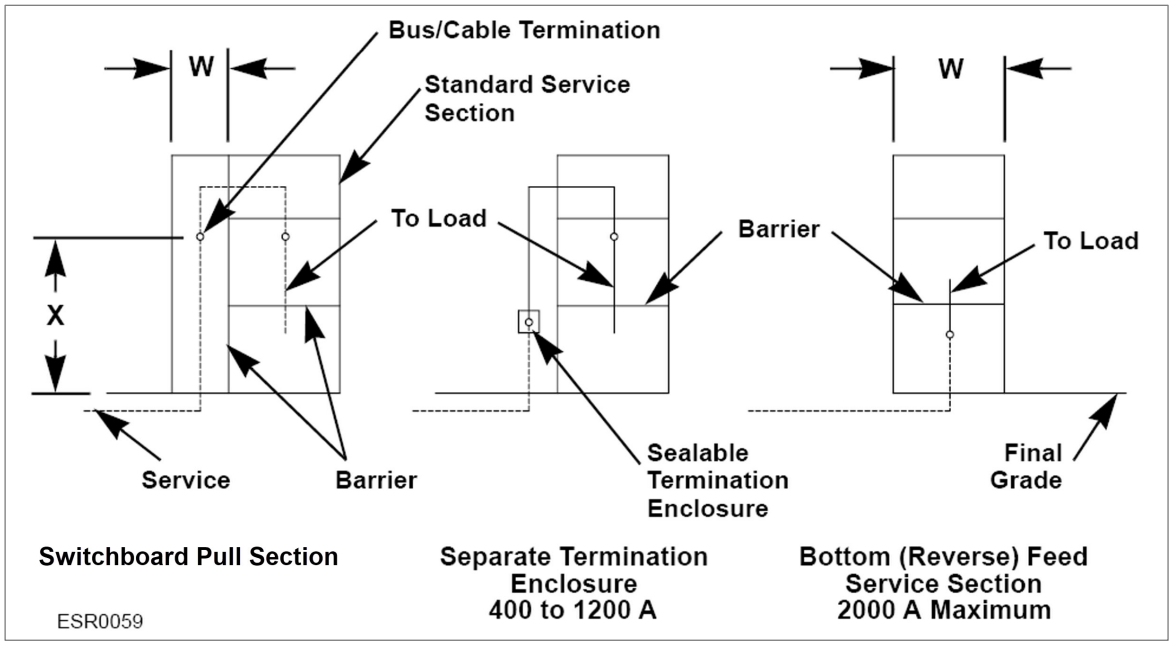

Figure 97: Underground Service Termination Switchboard Service Section, 400 to 3000 A, 0 to 600 V (EUSERC 345)

Table 28: Minimum Pull Section Dimensions (Applies to Figure 97 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.

11.3.6 Mixed-Use Multiple-Metering, Floor-Mounted Switchboard

Note: Mixed-use multiple metering can include any combination of direct-connect meters, CT-rated meters, and residential meter stacks.

Follow these requirements when installing mixed-use multiple metering, floor mounted switchboards, such as that shown in **Figure 98**:

- For meters installed on the switchboard, the requirements listed in 11.3.5, “Commercial Multiple-Metering, Floor-Mounted Switchboard” must be met.
- For meter stacks downstream of the switchboard:
  - A main disconnect must be located in front of all metered branches containing more than six meters.
  - If a meter bank is located in a separate electrical room, a disconnect must be installed in front of the meter bank in the same location.

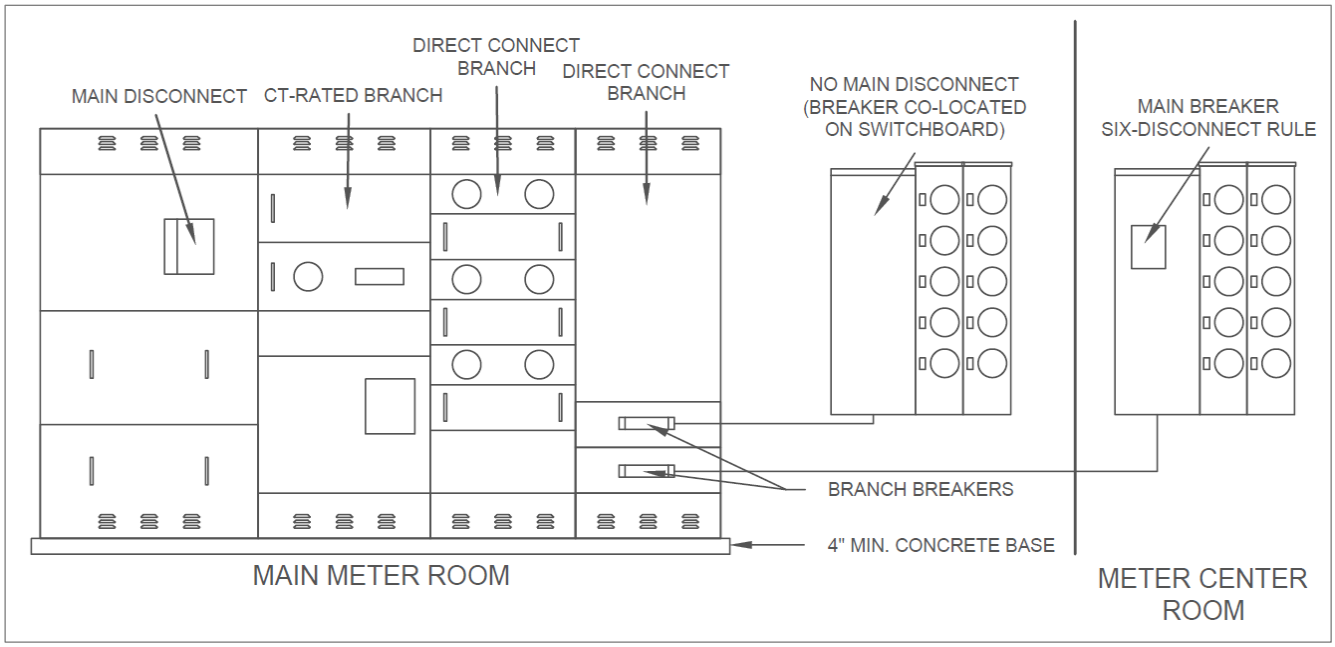

Figure 98: Mixed-Use Multiple Metering with Direct-Connect Meters, CT-Rated Meters, and Residential Meter Stacks

11.3.7 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 97** 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 97** 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 28** above.
- The customer must provide a drawing with the dimensions of the proposed service equipment.
- A minimum 10-foot clear workspace is required in front of the pull section and opposite the direction of cable entry.
- Consult PGE for services higher than 2000 A.
- Refer to EUSERC 347 for bus/cable termination.
- Refer to EUSERC 343 for sealable termination enclosure.

11.3.8 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 99** shows a pull section with back-entry conduits at the top or bottom.
- **Figure 100** shows a pull section with side-entry conduits at the lower end of the section.

Table 29 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 99** and **Figure 100** 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 101** shows a pad drain for freestanding switchboard.

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

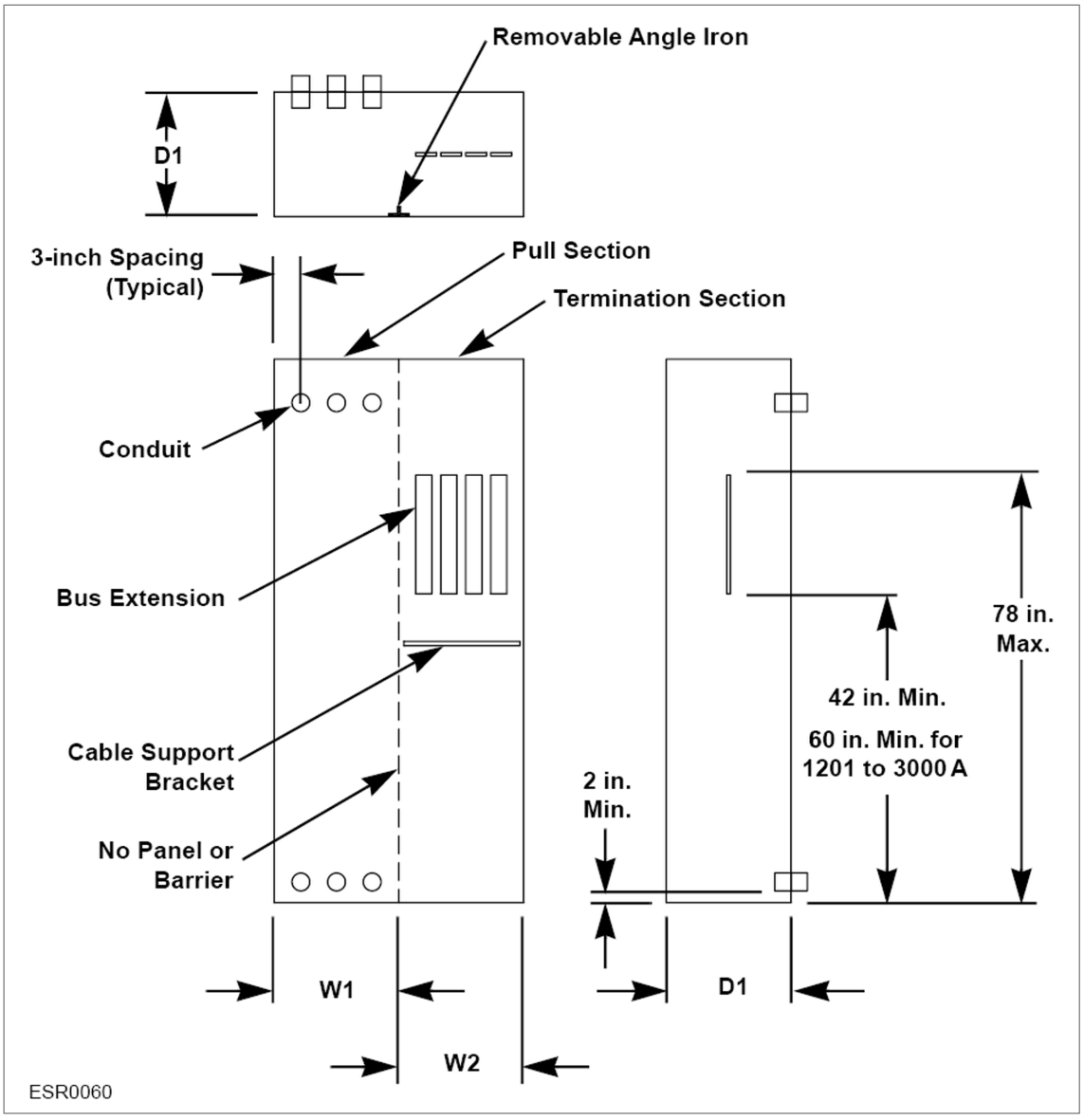

Figure 99: Underground Service Termination in a Pull Section Below Ground Level, Showing Pull Section with Back-Entry Conduits at the Top or Bottom

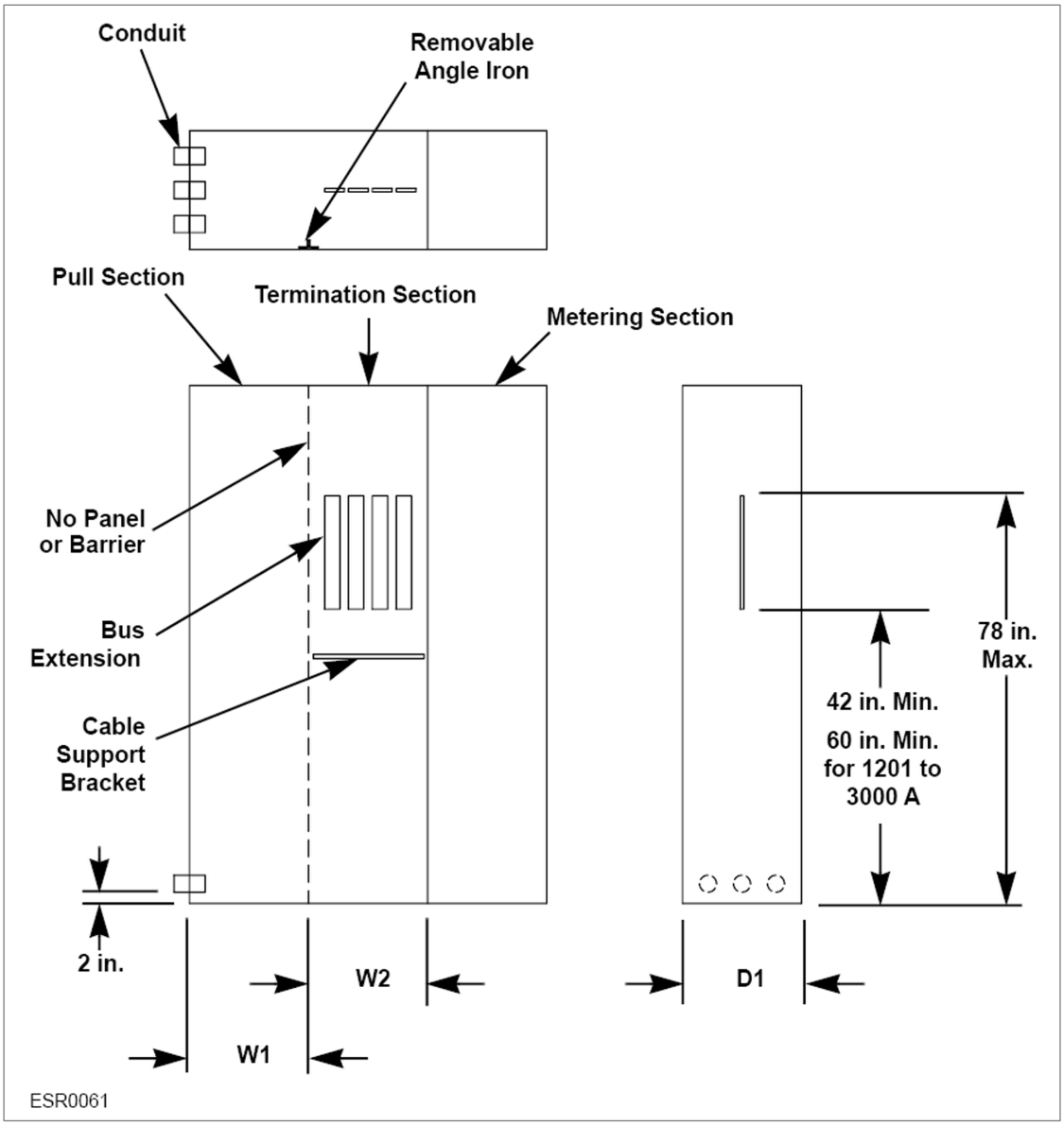

Figure 100: Underground Service Termination in a Pull Section Below Ground Level, Showing Pull Section with Side-Entry Conduits at the Bottom

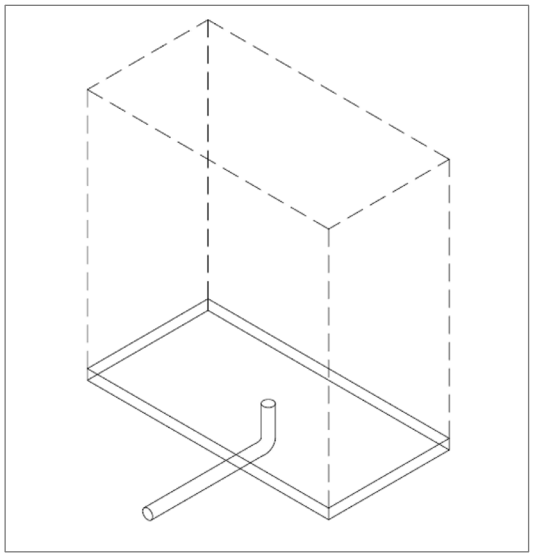

Figure 101: Pad Drain for Freestanding Switchboard

Table 29: 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

11.3.9 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 102**:

- 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.

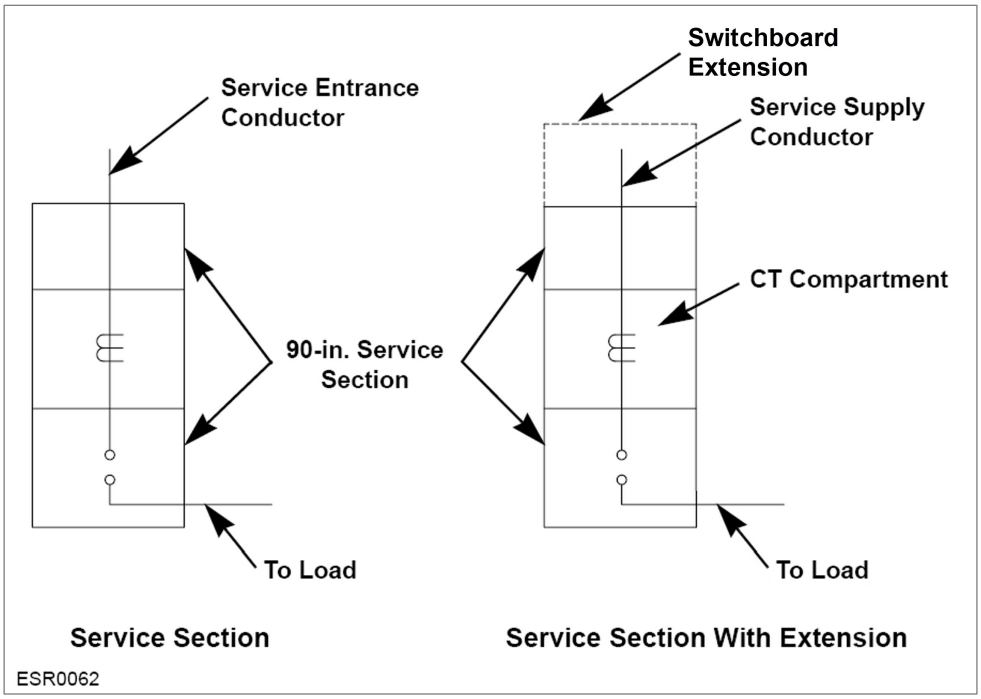

Figure 102: Overhead Service Termination Switchboard Service Section, 0 to 600 V (EUSERC 348)

11.3.10 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 103**:

- 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 10.7.4, "Current Transformer Metering Conduit."

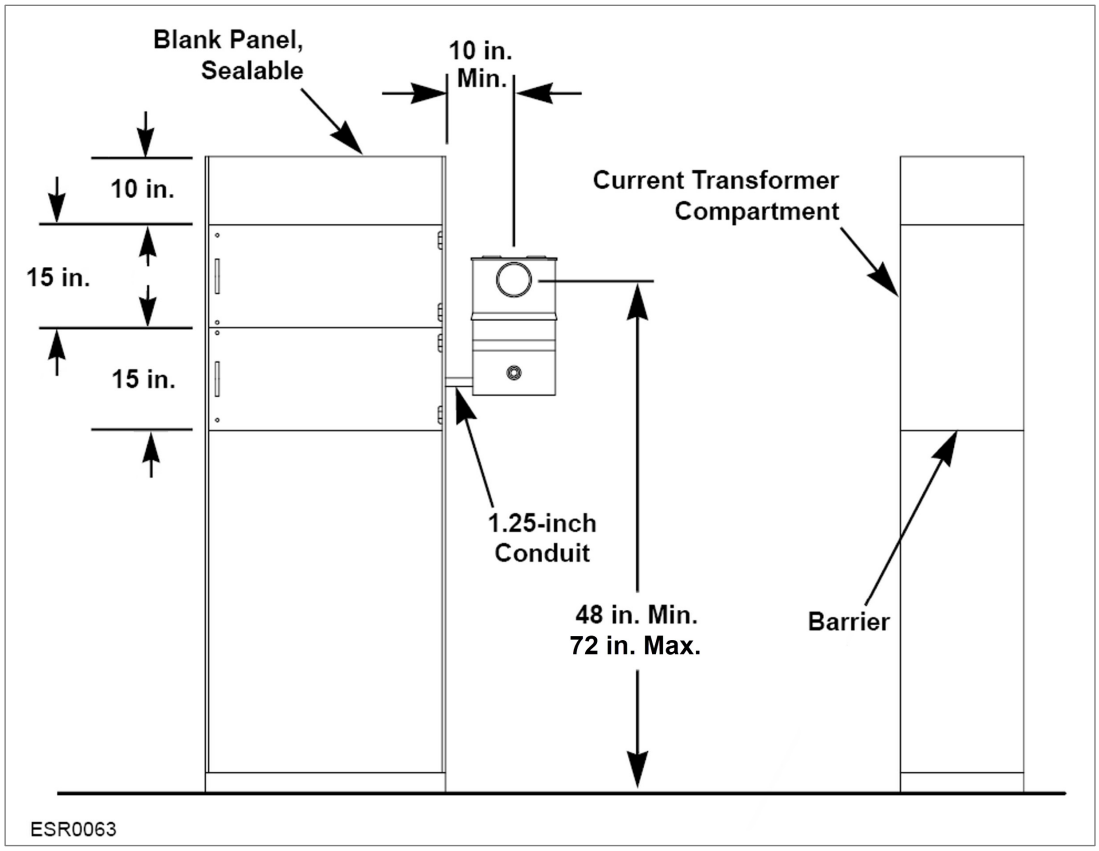

Figure 103: Switchboard with Remote Meter Enclosure (EUSERC 325, 339)

11.4 *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.

11.4.1 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 11.4.

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 104**.

- Bus arrangements and supports must be provided as shown in **Figure 104.** 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.

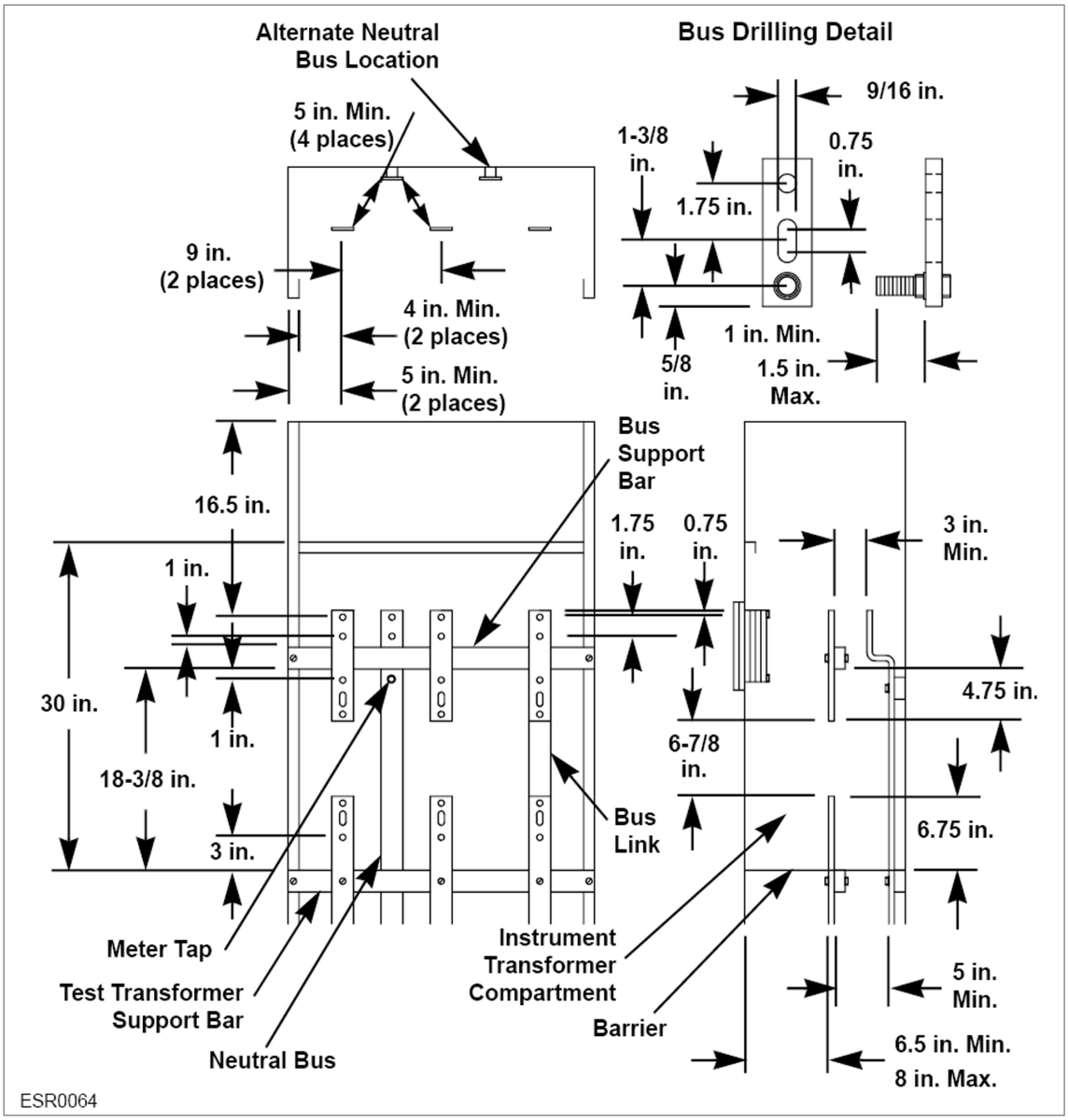

Figure 104: Switchboard Current Transformer Compartment, 0 to 1000 A, 0 to 600 V, Three-Phase, 4-Wire Service (EUSERC 320)

11.4.2 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 11.3.

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 105**.

- 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.

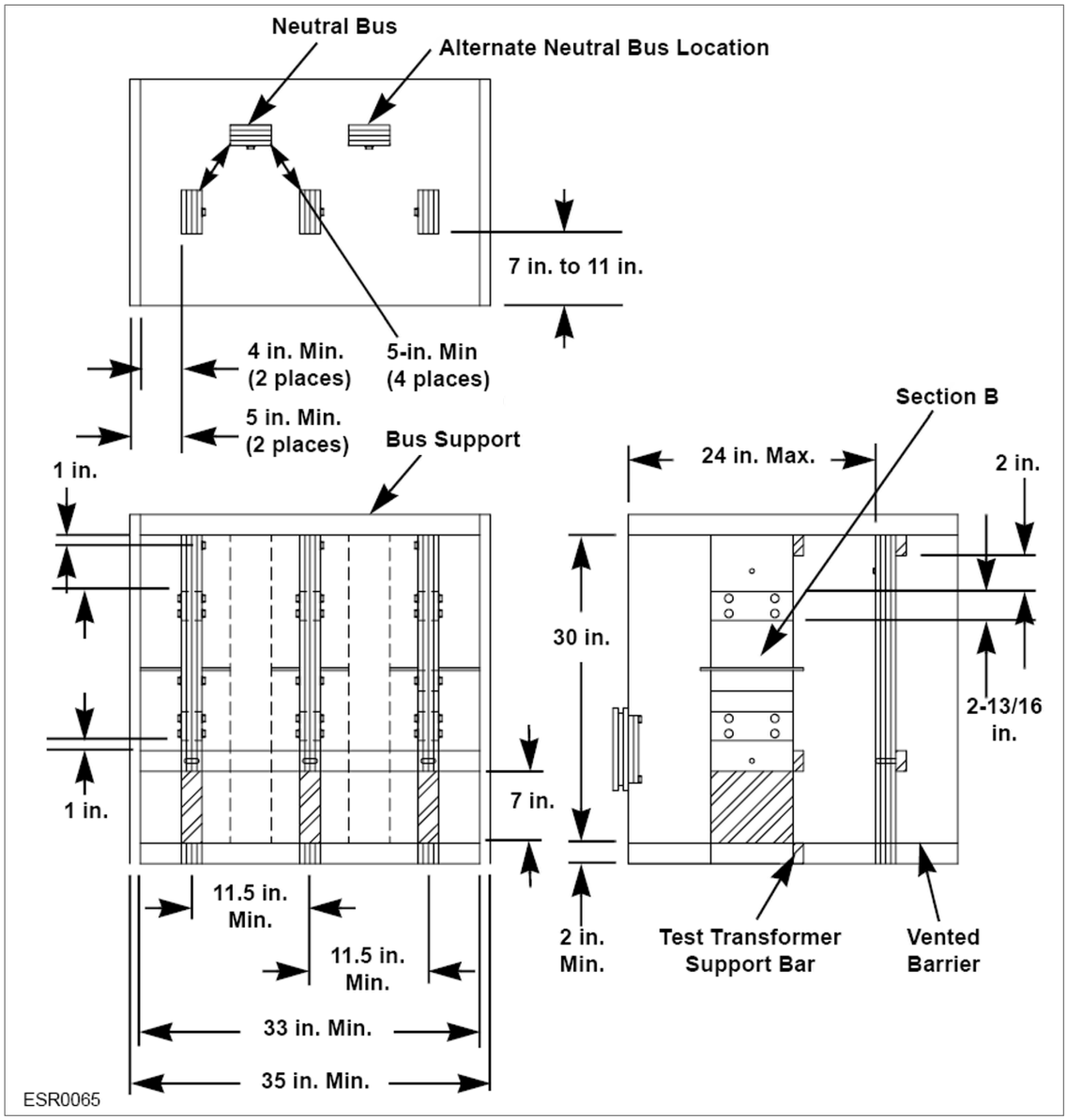

Figure 105: Switchboard Current Transformer Compartment, 1001 to 3000 A, 0 to 600 V, Three-Phase, 4-Wire Service (EUSERC 322)

12 Agricultural and Other Pole-Mounted Services

TOPICS IN THIS SECTION

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 106**:

- 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 5** on page 66.
- 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 3.10.3, "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.

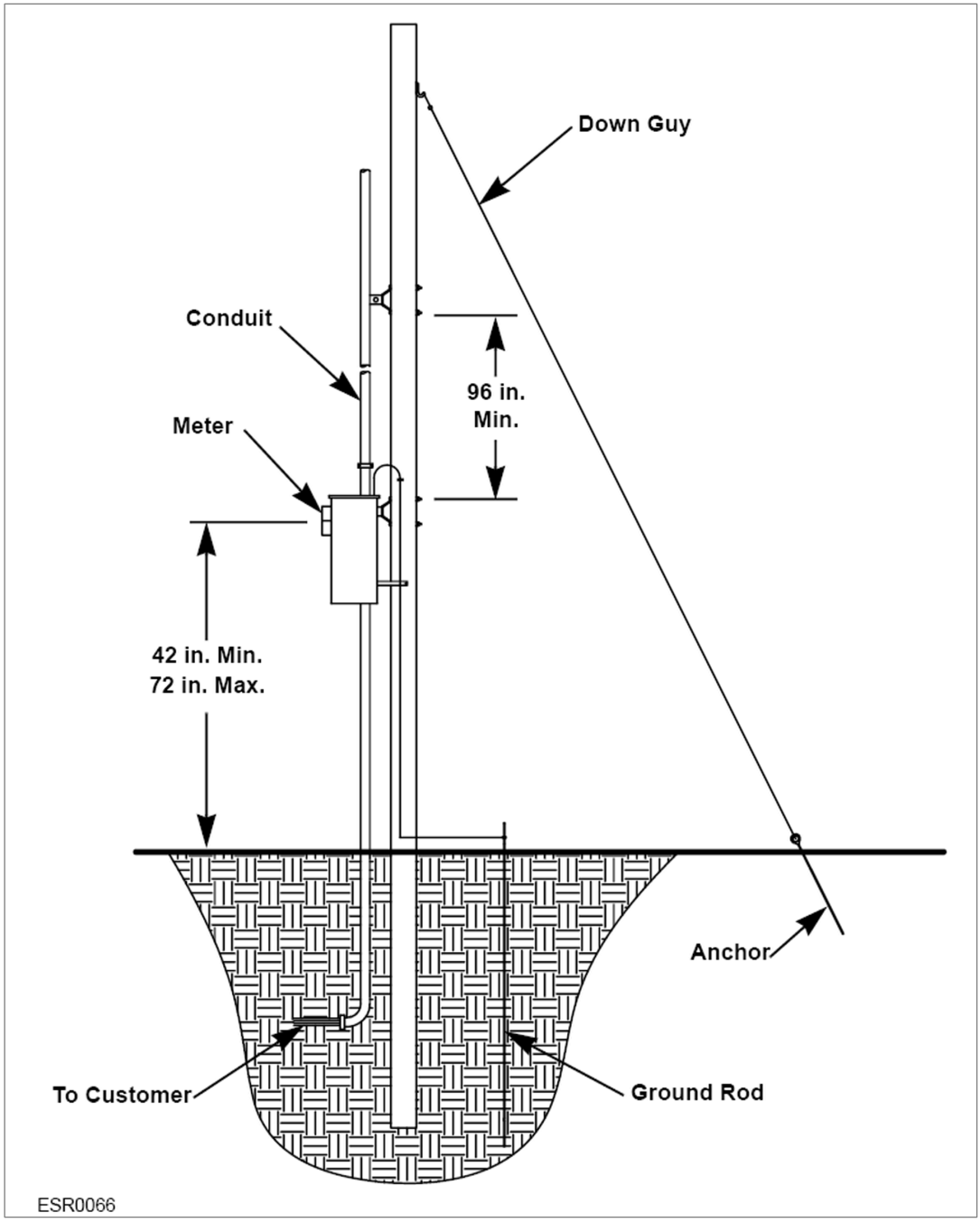

Figure 106: Irrigation Pumping Overhead Metering, Direct Connect

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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 107**:

- 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.

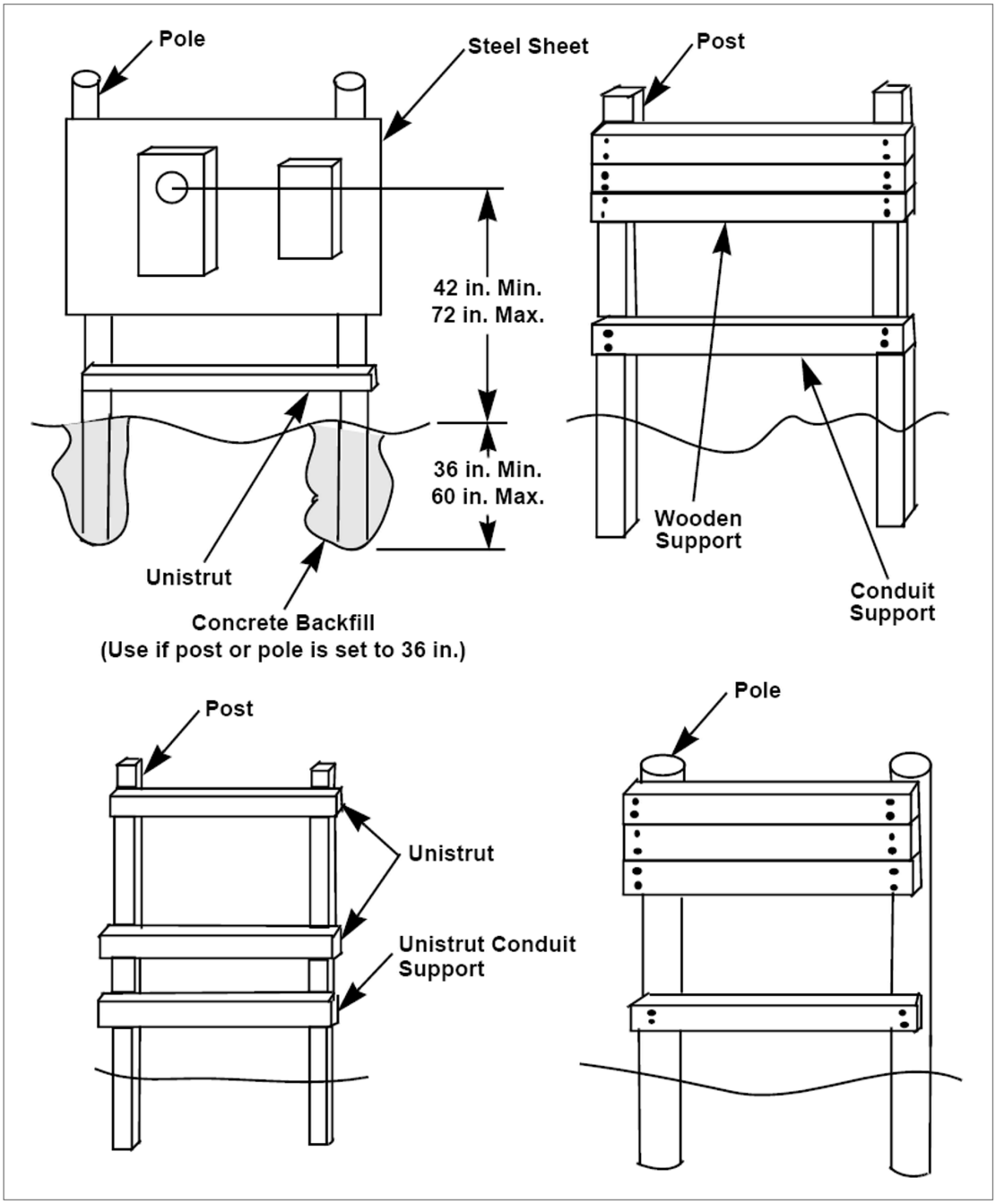

Figure 107: Underground Irrigation Pumping Service Backstop Options

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 108**:

- 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 5** on page 66 for 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.*

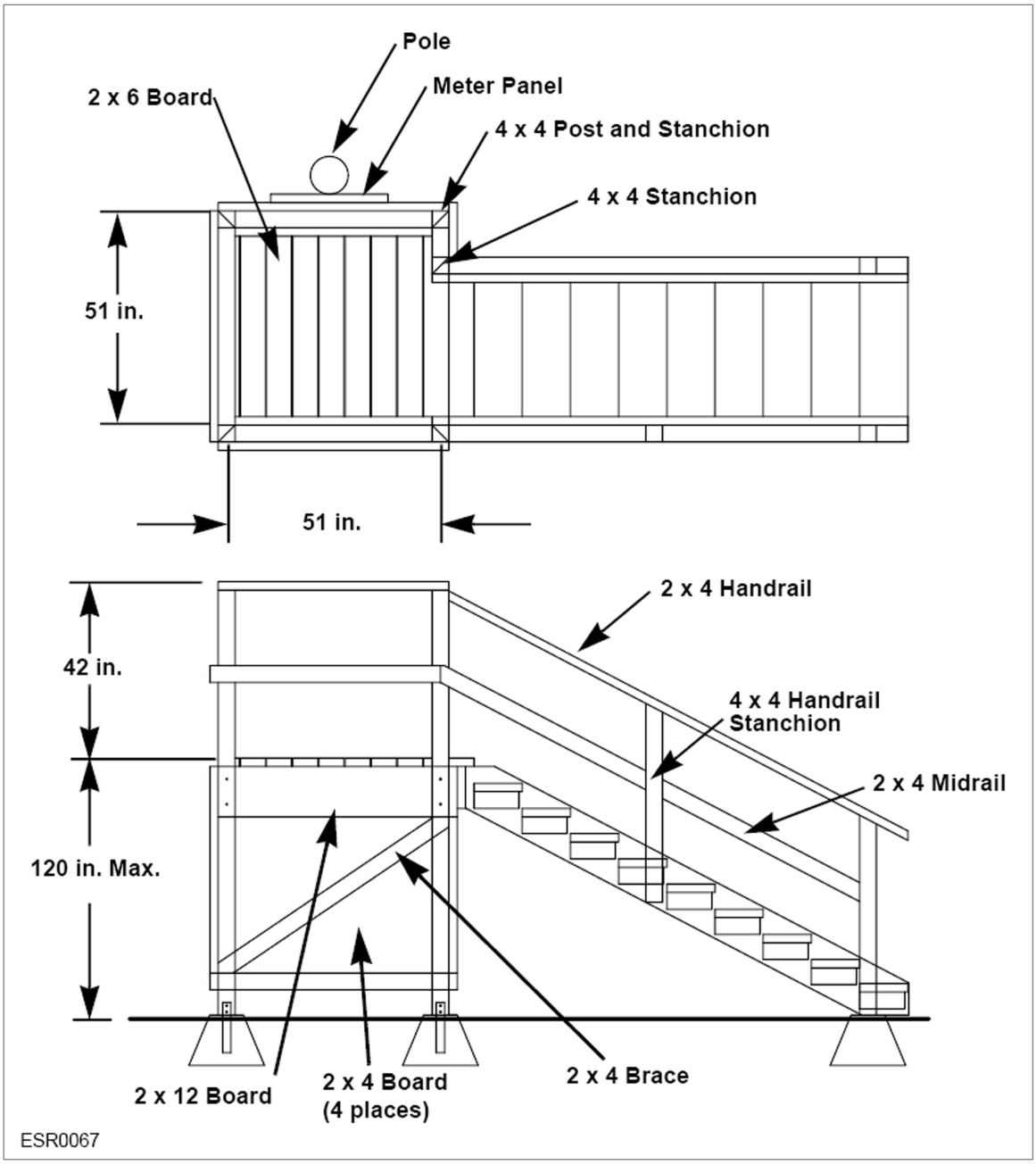

Figure 108: Typical Meter Access Platform

13 Electrical Equipment Rooms and Interior Installations

TOPICS IN THIS SECTION

13.1 *General Requirements*

An electrical equipment room containing PGE meter(s), instrument transformer(s), and/or cable termination is permitted ***only*** when a customer demonstrates to PGE that no acceptable outdoor alternative exists.

The PGE electrical equipment room must be located on an outside wall at the ground level and the door must open to the outside of the building.

In addition to those listed above, these requirements must be met:

- The metering equipment location must be accessible to PGE employees for 24 hours a day, 7 days a week for reading, testing, and replacing meters.
- The electrical room must not be used for storage. It may contain PGE, customer-owned electrical, telecommunications, and/or security and fire alarm equipment ***only***.
- No elevation changes are permitted within the electrical equipment room.
- Windows are not permitted in electrical equipment rooms.
- The room must be illuminated.
- At a minimum, the room's walls must be finished with drywall and taped.
- Enclosure(s) containing PGE instrument transformers and all switchboard enclosures must rest on a reinforced concrete slab on grade.
- If applicable, all PGE metering equipment must be installed in accordance with local jurisdiction floodplain requirements.
- Customers are responsible for providing a means of communication path to PGE's AMI network. Since steel and concrete buildings pose communication path challenges, PGE may require the installation of a conduit path from the electrical room to the exterior of the building.

Electrical Equipment Room Checklist

Room Location and Access Door

- ☐ The electrical room must be on an outside wall at the ground floor. The door must open to the outside of the building. Consult with a PGE Design Project manager if this requirement cannot be met.
- ☐ 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 13.3.
- ☐ The metal door must be installed, open outward, and be equipped with a panic bar before receiving electric service. See 13.2.
- ☐ The door must be at least 36 inches wide x 78 inches high. See 13.2.
- ☐ There must be 36 inches of clear space in front, back, and to the sides of the access door.
- ☐ The electrical equipment room and layout has been approved by PGE.

Workspace

- ☐ Clear space in front of electrical cabinets with doors must meet minimum clearance requirements based on equipment placement. See 13.2.
- ☐ A minimum workspace of 78 inches high x 48 inches wide x 48 inches deep in front of meter equipment is required by PGE.
- ☐ 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).
- ☐ No elevation changes are permitted within the electrical equipment room.

Storage

- ☐ The electrical room must not be used for storage.
- ☐ Only PGE and customer electrical equipment, telecommunications equipment, required conduit, and security and fire alarm systems are permitted in the room.

Electrical Panels, Switchboards, Transformers, and CT Cabinets

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

Miscellaneous

- ☐ The electrical room must be illuminated. See 13.1.
- ☐ At a minimum, the walls must be finished with dry wall and taped. See 13.4.
- ☐ The switchboard and metering equipment must be installed in accordance with the floodplain requirements of the local jurisdictions, if applicable. See 13.4.

13.2 *Egress Doors*

All doors leading out of electrical equipment rooms (egress doors) must meet these requirements:

- Egress doors must be at least 36 inches wide and 78 inches high.
- Egress doors must swing outward and be equipped with panic hardware. This requirement must be met before service will be provided.
- Egress doors must be constructed of metal and meet the fire rating required by the local jurisdiction.

  Note: Windows are not permitted on egress doors.

- At least 36 inches of clear space is required in front, back, and to the sides of an egress door.

13.3 *Room Access (Keys and Lockboxes)*

Customers must provide a single key that opens all of the electrical equipment rooms on the site that contain PGE metering equipment.

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, and the access code provided to PGE.
- The room is equipped with a PGE-provided lockbox that contains a key to the door of the PGE electrical equipment room. The lockbox must be located within 10 feet of the door and in clear sight.

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 the installation. PGE will install the top portion of the lockbox after the final inspection is complete.

13.4 *Room Walls, Floors, and Elevation*

- Any room that contains PGE electrical equipment must be illuminated and accessible to PGE personnel.
- Windows are not permitted in electrical equipment rooms.
- At a minimum, the room's walls must be finished with drywall and taped.
- The walls must be sheet-rocked and taped, and the ceiling must meet the requirements of local and state building codes and fire codes.

  Consult PGE and the local jurisdiction for fire ratings for zoning, as well as water mitigation strategies for electrical equipment rooms.
- Floors must be concrete. Enclosures that contain PGE instrument transformers and all switchboard enclosures must rest on a reinforced concrete slab on grade.
- No elevation changes are permitted within an electrical equipment room.

13.5 *Workspace Requirements for Electrical Equipment Rooms*

13.5.1 Workspace Entrance Requirements for Electrical Equipment Rooms

In addition to the general requirements in 13.1, 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.
- 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.

Follow the workspace requirements in 13.5.2 through 13.5.3.2 for PGE electrical equipment rooms that have one or two enclosures.

Table 30: Workspace Requirements for an Enclosure

If …	And This …	Then …
The enclosure is 600 V or less to ground.	There is an entrance to and egress from each end of the workspace in front of the enclosure.	There must be at least 48 inches in front of the enclosure. *and* There must be at least 48 inches between the front of the enclosure and the closest doorway opening.
	There is a single entrance to and egress from the workspace in front of the enclosure.	There must be at least 96 inches in front of enclosure. *and* There must be at least 48 inches between front of enclosure and closest doorway opening.

- PGE line crews requires 8 feet of working clearance in front of termination sections to pull in conductors for at grade installations. This clearance can be achieved using a door that is opposite the enclosure or within 30 degrees of vertical separation.

  An exterior door located opposite the termination section could be opened to achieve an 8-foot clearance if the following are true:

  - The door(s) must open to the exterior of the building.
  - The door(s) must be able to be locked in the open position.
  - The clearance cannot be achieved via a door that is not opposite the enclosure or within 30 degrees of the vertical separation.

  For below-grade installations, refer to 11.3.7 for working clearance requirements.

13.5.2 Electrical Equipment Rooms with One Enclosure

13.5.2.1 One-Enclosure Rooms with Two or More Entrances to the Workspace and One Door

Note: The requirements in this section are in addition to those in 13.1.

These workspace requirements apply to PGE electrical rooms that have one enclosure with two or more entrances to the workspace and one door, as shown in **Figure 109**:

- 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.
- There must be at least 48 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.
- The doorway width must be at least 36 inches.
- For an enclosure with a workspace with two or more entrances and one door, 8 feet of clearance is required in front of the termination section.

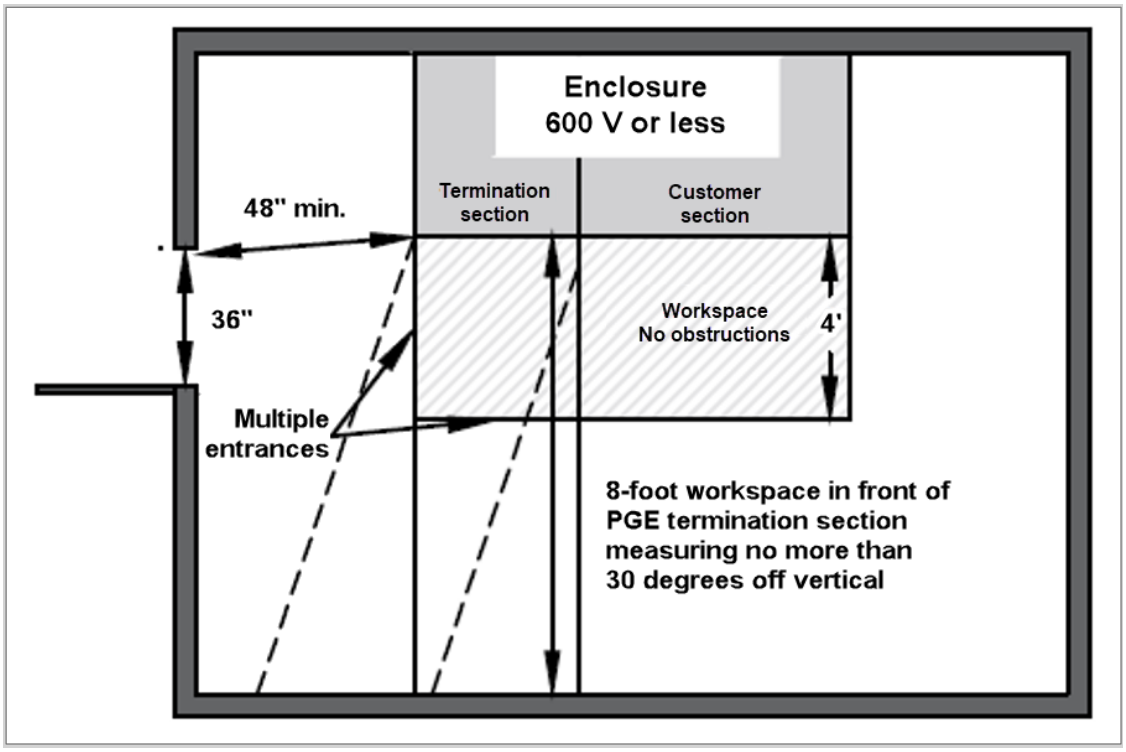

Figure 109: One-Enclosure Room with Two or More Entrances to the Workspace and One Door

13.5.2.2 One-Enclosure Rooms with One Entrance to the Workspace and One Door

Note: The requirements in this section are in addition to those in 13.1.

These workspace requirements apply to PGE electrical equipment rooms that have one enclosure with one entrance to the workspace and one door, as shown in **Figure 110**:

- 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.
- The doorway width must be at least 36 inches.
- For an enclosure with a workspace with one entrance and one door, 8 feet of clearance is required in front of the termination section.

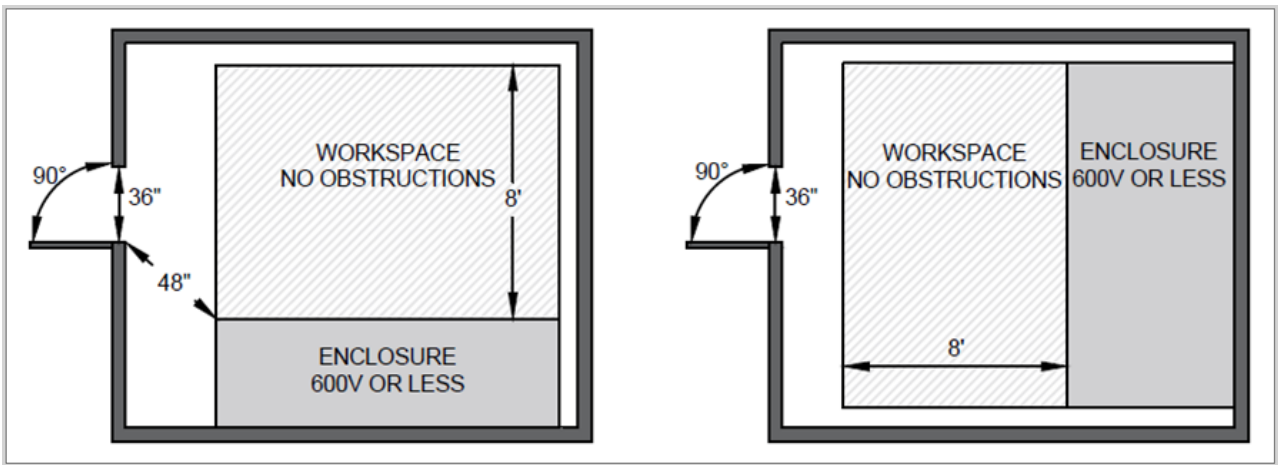

Figure 110: One-Enclosure Room with One Entrance to the Workspace and One Door

13.5.3 Electrical Equipment Rooms with Two Enclosures

13.5.3.1 Two-Enclosure Rooms with One Entrance to the Workspace and One Door

Note: The requirements in this section are in addition to those in 13.1.

These workspace requirements apply to PGE electrical equipment rooms that have two enclosures with one entrance to the workspace and one door, as shown in **Figure 111**:

- 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.
- The doorway width must be at least 36 inches.

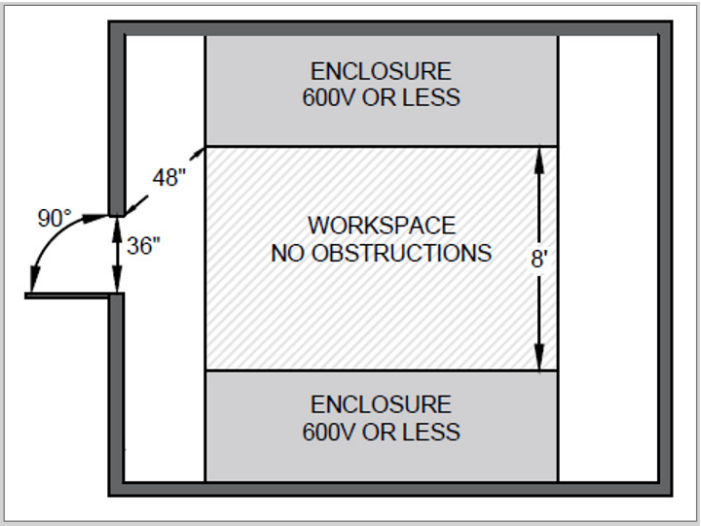

Figure 111: Two-Enclosure Room with One Entrance to the Workspace and One Door

13.5.3.2 Two-Enclosure Rooms with Two Entrances to the Workspace and Two Doors

Note: The requirements in this section are in addition to those in 13.1.

These workspace requirements apply to PGE electrical equipment rooms that have two enclosures with two entrances to the workspace and two doors, as shown in **Figure 112**:

- 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.
- For a room with two enclosure with two entrances and two doors, 8 feet of clearance is required in front of the termination section.

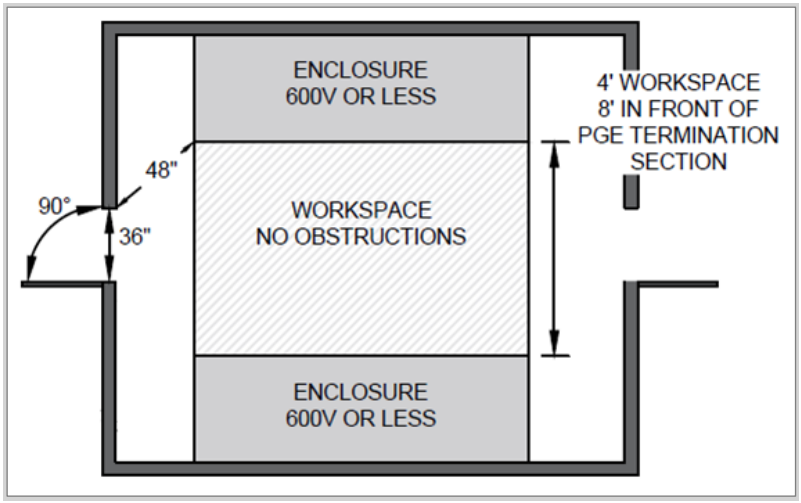

Figure 112: Two-Enclosure Room with Two Entrances to the Workspace and Two Doors

13.6 *Interior Installation without a Dedicated Electrical Room*

Wherever possible, PGE equipment will be installed in a dedicated electrical room. When PGE approves an indoor location, these locations must be safe, convenient, and/or readily accessible. If the equipment cannot be installed in a dedicated room, the following requirements must be met:

- Equipment must be located near an egress door with direct access to the exterior, as determined by PGE. The door must meet the requirements in 13.3, "Room Access (Keys and Lockboxes)."
- Equipment must be isolated and separated from any plumbing that contains flanges and/or valves.
- Where equipment is exposed to vehicular or forklift traffic, barrier posts are required according to the requirements in 5.6.8, "Barrier Posts."
- Any room that contains PGE electrical equipment must be illuminated and accessible to PGE personnel.
- Indoor meters cannot be located in a show window, closet, bathroom, over a sink or laundry tub.
- PGE will install service connections to customer's metering equipment only at the main or entry floor level.

13.7 *Installation Not Located on the Exterior of the Building*

An electrical room located below grade will require an exception from PGE's Metering Department. PGE will not terminate service cables above the ground level.

Every door in the path of egress from the PGE electrical room to the exterior of the building must meet requirements listed in 13.3, "Room Access (Keys and Lockboxes)."

13.8 *Meter Center Rooms without PGE Cable Termination*

For mixed-use or large multi-family services, PGE prefers that meter centers be collocated in the main PGE electrical equipment room where PGE conductors are terminated. If meter centers are not collocated in this room, meter center rooms must adhere to the workspace requirements listed in 13.2, "Egress Doors."

All doors leading out of electrical equipment rooms (egress doors) must meet these requirements:

- Egress doors must be at least 36 inches wide and 78 inches high.
- Egress doors must swing outward and be equipped with panic hardware. This requirement must be met before service will be provided.
- Egress doors must be constructed of metal and meet the fire rating required by the local jurisdiction.

  Note: Windows are not permitted on egress doors.

- At least 36 inches of clear space is required in front, back, and to the sides of an egress door.

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's Service Coordination team (Service.coordinators@pgn.com). The phone and fax numbers for Service Coordination can be found in the *Preliminary Information* section.

Instructions for obtaining the forms for new or upgraded service can be found in Appendix B and Appendix C. This appendix provides the requirements for formatting and submitting electronic files.

1. Submit a request for service on the PowerPartner portal (https://portlandgeneral.force.com/powerpartner/s/login/) or call the Service Coordination team (Service.coordinators@pgn.com) to submit a request.
2. The Design Project Manager (DPM) assigned to your project will provide you with an email address. The format for PGE email addresses is:

   firstname.lastname@pgn.com
3. Provide computer-aided drafting (CAD) files with civil engineering drawings of the site plan and profile with the footprint of the building and preferred locations of electric equipment. PGE accepts AutoCAD 2013 or later. PGE will use your files in the original survey coordinate system or datum; please specify this on the drawing. Updates to these files are requested at milestones in the project.
4. 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
5. 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.
- Manufacturer specifications should ***not*** be included in the drawing package. They must be submitted separately.

6. 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.

7. 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.

8. On occasion, PGE may request a hard copy of the full set of drawings, along with a cover letter. If requested, send the drawing 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

Updates to Your Drawing Package

PGE needs to be able to easily see what has changed in your drawing package. 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 changed in the second file.

- In your email, itemize all data that has changed.
- In the drawing, indicate where revision has changed using the cloud method, or place revision numbers next to affected portions of the drawing.

IMPORTANT: *Non-itemized changes may result in inaccurate reviews or gear approval which, upon discovery, may require re-review and different gear at the customer's expense.*

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) on the PowerPartner portal (https://portlandgeneral.force.com/powerpartner/s/login/).
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 113** on page 198 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.org. In the Portland metro area, call 503-246-6699.

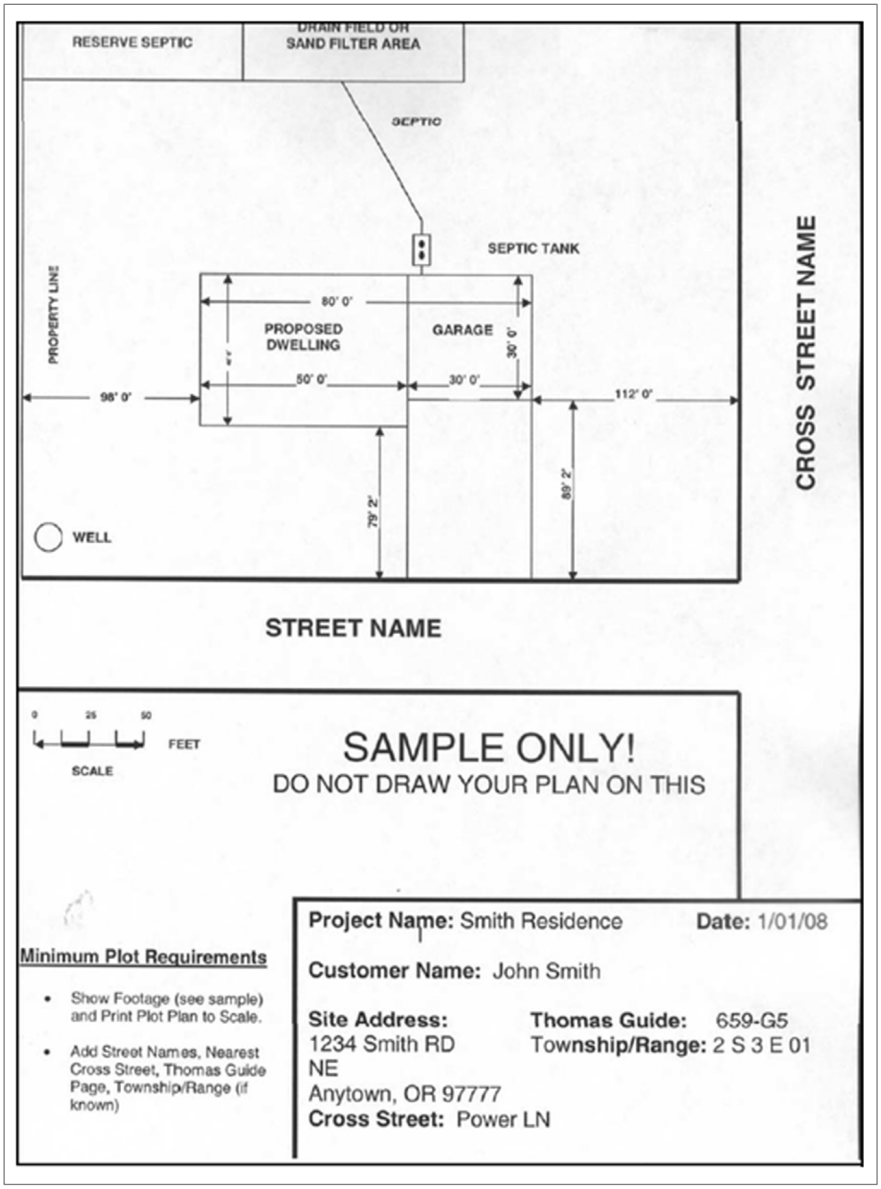

Figure 113: **Example Plot/Site Plan**

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.

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* on the PowerPartner portal (https://portlandgeneral.force.com/powerpartner/s/login/).
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.

Appendix C Commercial Service

Obtaining New Commercial Electric Service

Customer Responsibilities

1. Obtain building permits and electrical permits from the appropriatecity, county, or other jurisdiction. Obtain easements and tree-trimming permits if required.
2. Complete the *Request for New Commercial Service* form) on the PowerPartner portal (https://portlandgeneral.force.com/powerpartner/s/login/).
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.

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 on the PowerPartner portal (https://portlandgeneral.force.com/powerpartner/s/login/)
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.

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Gray highlighting is used to mark new, updated, and moved content.
Highlighting does not indicate the importance of the text.

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