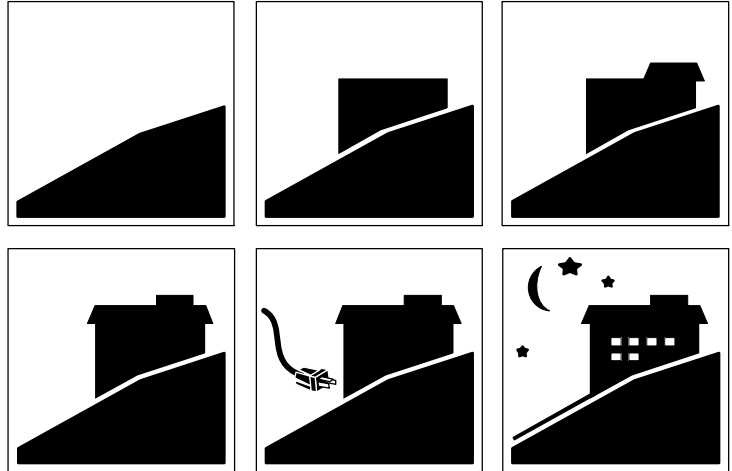

June 2011



Electric Service Handbook

Commercial/Industrial and Multifamily Projects
Permanent & Temporary Service

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Puget Sound Energy

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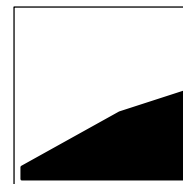


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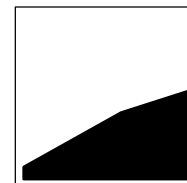
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Back Pocket

Excavation Requirements for Joint Utility Mainline Trench Form 2809

Installation Requirements for Underground Services Form 3061

Preface



This handbook is your guide to Puget Sound Energy's (PSE) requirements **for new electric service installations of less than 600 volts** for commercial, industrial, multifamily, and nonresidential applications.

This handbook provides most, but not all, of the information and requirements that you will need. It does not include all possible standards and specifications required by PSE, state, federal, or local code requirements. If you need additional information, please call **PSE Customer Service at 1-888-225-5773**, your local government agency, or *state inspector*.

What this handbook contains

This handbook contains information on service installations for:

- Commercial and industrial buildings
- Apartment complexes
- Community wells
- Condominium complexes
- Barns and shops

If the type of service you need is not addressed in this handbook, please contact PSE's **Customer Construction Services (CCS) at 1-888-321-7779**.

PSE's service availability

General boundaries for PSE's gas and electric service territory are available on **PSE.com**. A *CCS Representative* can help you to determine the closest available service line and can provide you with cost information for establishing new service.

Glossary of terms used in this handbook

For your convenience, glossary words appear in bold italics throughout the text the first time they appear (e.g., *meter pole*).

Electrical service equipment inspection

Once your service equipment is installed, the State of Washington or the city with jurisdiction over your area requires that your installation pass an electrical inspection before PSE can connect you to the system. It is **your responsibility** to request this inspection.

Codes and jurisdictions

This handbook shall not be interpreted to conflict with the regulations of the State of Washington or other regulatory bodies having jurisdiction. PSE's metering requirements may be more stringent. Local codes and requirements related to the planned work should be addressed before any construction begins.

Scheduling

Engineering, scheduling, and construction of the work will vary depending upon the complexity of the job and the volume of work requested by PSE customers. Contact your *CCS Representative* at **1-888-321-7779** for current construction scheduling.

Other electric service information

Any of Puget Sound Energy's handbooks are available, free of charge, from PSE.

How to contact Puget Sound Energy

Please direct any technical questions regarding the information in this booklet, to PSE's **Customer Construction Services Department** at **1-888-321-7779**.

You may also visit **PSE.com**, our web site for online applications, construction videos, energy efficiency programs, as well as other helpful information.

If you have any general billing questions regarding your account or questions about gas or electric service installation, please call **Customer Service** at **1-888-225-5773**.

PSE's service providers

PSE contracts with two partner companies to provide construction and engineering services. Your *Project Manager* and the employees who install your service may work for these service providers on PSE's behalf.

Overview: New Permanent and Temporary Electric Service Hookup to Existing PSE Power Facilities for Commercial/Industrial and Multifamily Projects

This information applies only if PSE has existing power facilities in your area. If electric power is not readily available, please call:

CUSTOMER CONSTRUCTION SERVICES

1-888-321-7779

Customer Responsibilities:

- Determine if you need overhead or underground service.
- Contact PSE to establish an account, and order your service.
- Obtain an electrical work permit.
- Determine the service rating you want (for example, 200 amp or 400 amp).
- Determine an approved meter location.
- Notify other utilities of your project.
- Call 811, at least two working days before you dig, or via the web (click ITIC at callbeforeyoudig.org).
- Prepare job site by providing a clear path/trench for your service line for proper vault entrance requirements per PSE standards.
- Obtain an approved electrical inspection.
- **After** the electrical inspection has been completed and approved, request PSE to install and energize your system.

Puget Sound Energy's Responsibilities:

- Determine if engineering is required.
- Install your overhead or underground permanent service line conductors.
- Install your meter and energize your system.

Scheduling:

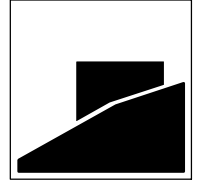
- If engineering is not required, services are typically energized 3 to 5 days after you have passed your inspection.

Service Charge:

- Charges vary due to the type of service you request and the type of system we have in your area. Contact your *CCS Representative* for current rate information.

Chapter 1

Steps to a Smooth Permanent Service Installation



The installation process

Before a permanent service is energized, you are required to complete the following:

- Establish an account with PSE by calling **Customer Service** at **1-888-225-5773**.
- Determine the type of service needed and if that service will be underground or overhead.
- Install required service equipment and underground service cable (if applicable).
- Obtain an electrical inspection.
- Call PSE and request that your service be energized.

Setting up an account

Before PSE can provide new service, you must establish an account. Simply call **Customer Service** at **1-888-225-5773**. They will request billing information and the address for the new service from you. If you wish, we can initiate your *temporary service* order at the same time.

Submitting an application for service

Call **Customer Construction Services (CCS)** at **1-888-321-7779** and submit *Electric Service Application Permanent Non-Residential 201E (Form 1378)* or *Electric Service Multi-Family Development 400E (Form 4409)*. All forms can be downloaded at **PSE.com**.

When you fill out the application, make sure that it is as complete as possible, and include a copy of each of the following items (if applicable) with the application:

- Legal description of the property
- Title insurance policy, recorded warranty deed, or real estate contract
- Site plan
- Landscaping plan
- Water main plan
- Sewer main and profile plans
- Road and storm drainage plan
- Road cross section plan
- Streetlight requirements

NOTE: Several of the above plans may be included in one drawing.

Service voltages

We offer the following standard voltages for nonresidential customers:

Table 1 Service voltages available from PSE

Service Type	Voltage
Single-phase	120/208 V, 3 wire * 120/240 V, 3 wire †
Three-phase	120/208 V, 4 wire 277/480 V, 4 wire

* Available only if 120/208 *secondary voltage* exists at the location at the time you apply for service.

† Available for loads up to a maximum demand of 100 kW.

Locating underground utilities

Locating existing underground utilities – *call before you dig!*

If you are trenching or excavating, underground locates are required by law. Call for underground utility locates **two full working days before you dig** by calling 811, **1-800-424-5555**, or callbeforeyoudig.org (refer to *RCW 19.122*).

The service will notify each member utility, or a locating service, who will locate the underground facilities in your area. **This service is free.** *Table 2* shows the color code for marking the location of each utility.

Once all utilities are located, hand dig within 24 inches of the locate marks to expose all utilities to be crossed.

Table 2 Color codes for locating utilities

Color	Utility
White	Proposed excavation
Pink	Temporary survey markings
Red	Electric power lines, cables, conduit, and lighting cables
Yellow	Gas, oil, steam, petroleum, or gaseous materials
Orange	Communication, alarm or signal lines, cables, or conduit
Blue	Potable water
Purple	Reclaimed water, irrigation, and slurry lines
Green	Sewers and drain lines

NOTE: Use white paint to mark the area where you want utility locations.

Cost for service

Contact your *CCS Representative* to determine the cost for service.

Additional service costs

Voltage flicker and size of transformer

Commercial/industrial customers—If the system will serve a facility that is purposely built to serve a single specific customer, and that customer will operate the facility and is knowledgeable about flicker, then the system shall be designed to deliver no more than 3 percent voltage flicker at the *point of service*.

Multifamily customers—If a transformer is built to serve multiple customers, a maximum of 3 percent or less is specified at the point of service. This is common to all customers.

In your *Application for Service (Form 1378, 4414, or 4409)*, you must provide PSE with the locked rotor starting currents for the largest single-phase and three-phase motors. After we determine the size of transformer required to serve the new load of the facility, we will calculate the percent voltage flicker (from the motor's starting current) at the point of service and provide that number to you.

If this voltage dip exceeds PSE's limits based on facility type, the transformer size must be increased to compensate for this. You will be responsible for the difference in cost of the larger transformer, or you will need to install sufficient controls to bring flicker back within PSE's limits.

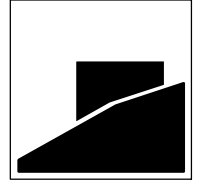
NOTE: We will size PSE's facilities to provide a level of voltage flicker that is normally acceptable to customers. If you need to be served with a higher quality of service, contact your *CCS Representative*.

Voltage drop calculations

You are responsible for calculating the overall voltage drop to your facility and determining what is an acceptable level for your facility. If you determine that the voltage drop is unacceptable, **you must determine** a solution. Some possible solutions are:

- Run separate services from PSE's transformer for motor loads.
- Modify or upgrade your equipment or underground service cables (if applicable).
- Pay PSE to increase the size of our transformer.
- Pay PSE to provide a second transformer.

Chapter 2



Permanent Underground Services

This chapter provides you with information on PSE's underground service installation. Please follow these requirements to avoid a delay in your service hookup. If you have any questions about this information, call **Customer Construction Services (CCS)** at **1-888-321-7779**.

Service equipment installation responsibilities

Puget Sound Energy

PSE is responsible for furnishing, installing, and maintaining the primary voltage system equipment. This equipment includes primary conduit and cables, service conductor connectors at the transformer, current transformers, meter(s), and meter wiring.

Customer

You are responsible for furnishing, installing, and maintaining all required *service entrance equipment*, including the *service entrance conduits** from the *meter socket* or current transformer enclosure to PSE's designated *point of delivery*.

For services where current transformers (CTs) are required, you will also need to run conduit from the CT enclosure to the meter base. Refer to *Chapter 4, Section 3, Current Transformer (CT) Metering (up to 800 amps)* for more information.

NOTE: PSE will supply, install, and maintain the CTs and meter wiring.

* **DO NOT** run a grounding wire to PSE's point of connection at the transformer or handhole. PSE will not connect it.

Preparing for your service hookup

The following list will help you prepare your project for the installation of an underground service. After you complete these items, PSE will connect your service and install the metering equipment.

1. Check for any local ordinances/covenants that may prevent you from obtaining an underground service.
2. Complete *Electric Service Application Permanent Non-Residential 201E (Form 1378)* or *Electric Service Multi-Family Development 400E (Form 4409)*.
3. Supply site drawings and load information to your *CCS Representative* (refer to *Chapter 1, Submitting an Application for Service*).
4. Contact CCS to determine where your underground service will originate.

Continued on next page

5. Determine an approved meter location (refer to *Chapter 4, General Metering Requirements* section, *Meter locations*).
6. If required by CCS, provide an easement for any permanently installed PSE equipment located on your property.
7. Provide payment for any preconstruction costs determined by your *CCS Representative*.
8. Provide all excavation for PSE's facilities and get an approval for the proper vault entrance location of your conductor/conduit.
9. Provide service conductors.
10. Install required service entrance equipment.
11. Connect the meter sockets and permanently label them to indicate the part of the premises they serve, such as unit number.
12. Obtain an approved electrical inspection.
13. Call CCS at **1-888-321-7779** to initiate a connection and energize your new service.

Cable limits for transformers

The maximum number of secondary conductors allowed for a specific transformer size is limited to those listed below in *Table 3*.

Table 3 Maximum cable runs per transformer

Transformer Size and Voltage (PSE-provided)	Maximum Allowed Cable Runs (Customer-provided)
45 thru 300 kVA, 120/208 V secondary	12 Runs #2 – 500 mcm OR 10 Runs 501 – 750 mcm
45 thru 300 kVA, 277/480 V secondary	12 Runs #2 – 500 mcm OR 10 Runs 501 – 750 mcm
500 thru 750 kVA, 120/208 V secondary	18 Runs #2 – 500 mcm OR 14 Runs 501 – 750 mcm
500 thru 750 kVA, 277/480 V secondary	12 Runs #2 – 500 mcm OR 10 Runs 501 – 750 mcm
1000 kVA, 120/208 V secondary	24 Runs #2 – 500 mcm OR 18 Runs 501 – 750 mcm
1000 kVA, 277/480 V secondary	18 Runs #2 – 500 mcm OR 14 Runs 501 – 750 mcm
1500 thru 2500 kVA, 277/480 V secondary	24 Runs #2 – 500 mcm OR 18 Runs 501 – 750 mcm

Customer-provided trenches

Trench width for PSE facilities

The minimum trench width is 18 inches; however, the excavator may need to increase the trench width depending on the other conduits/lines being installed in the trench.

When **increasing the trench width**, remember to allow a minimum of 12 inches of horizontal separation between PSE’s electrical conduits/cables and gas lines.

PSE will allow customer-owned facilities within an electric power trench, if the following minimum horizontal *clearances* from PSE facilities are maintained:

- 18 inches minimum for customer-owned tight-line sewer (not tile), natural gas lines, propane gas lines, fuel oil lines, and water mains up to 6 inches in diameter.
- 12 inches minimum for **water service**, irrigation pipes, lighting, security and electric supply circuits, communications lines, culverts, and closed system roof drains/storm drains (not French drains).

Figure 1 illustrates PSE’s width and depth requirements for primary cable voltage line extension trenches on private property with and without a gas line present.

For trenching requirements with a gas line present, refer to *Excavation Requirements for Joint Utility Mainline Trench (Form 2809)*.

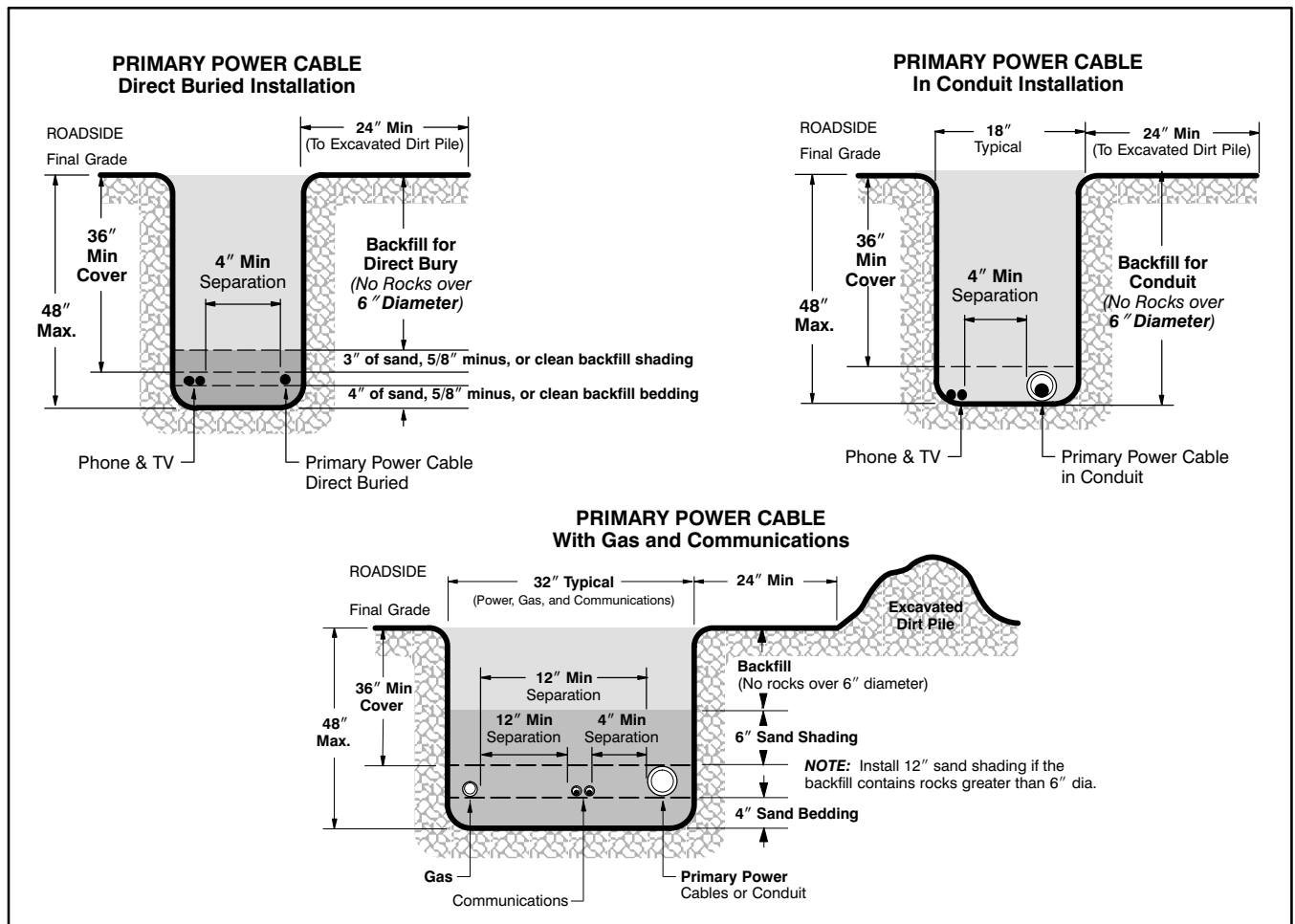


Figure 1 Typical joint utility trench with primary voltage cable on your private property (cross-section view)

Trench excavating requirements for PSE facilities

The following requirements for the trench must be met before power conduits/cables will be installed.

- When you trench in the right-of-way on PSE's behalf, the governing jurisdictions issue public roadway use permits to PSE. PSE requires that you provide a signed *Excavation Requirements & Final Grade Certification* document that is supplied by your PSE *Project Manager*.
- For trench work provided by you within a public right-of-way or a PSE easement, PSE requires that you use a Washington State licensed and bonded contractor and complete and sign a PSE trenching agreement form.
- The trench shall be excavated according to the trench detail, and PSE's work sketch.
- The trench shall be straight and the trench bottom shall be smooth, level, and free from debris, garbage, sharp objects or rocks larger than 4 inches.
- If PSE cable will be direct buried, you must provide at least 3 inches of sand bedding on the bottom of the trench.
- Excavated or loose material shall be placed at least 2 feet from the field edge of the trench.
- Water shall be removed by pumping or draining.

Trench backfill and restoration

PSE will **not** energize its facilities until the backfill is complete.

You are responsible for the following:

- Providing a minimum 3-inch layer of sand, 5/8-inch minus, or clean backfill (with rocks no larger than 5/8-inch and no sharp objects) placed below and above direct buried cables. The remaining trench shall be backfilled with soil that is free of rocks larger than 6 inches and foreign objects.
- If the cable is in conduit, backfill the trench with soil that is free of foreign objects and rocks larger than 6 inches. Bedding and shading with a 3-inch layer of sand, 5/8-inch minus, or clean backfill is not required.

NOTE: If a natural gas line is in the trench, you must provide a 6-inch or 12-inch layer of sand above (depending on the backfill soil conditions), and a 4-inch layer of sand bedding below the utilities before backfilling, as illustrated in *Excavation Requirements for Joint Utility Mainline Trench (Form 2809)*.

- Completing backfill as soon as practical after facilities are placed and inspected.
- Carefully placing backfill to prevent damage or movement of the cables or conduit.
- Cost of damages to PSE facilities caused by improper backfill or compaction.
- Relocation costs due to change in grade or alignment.

Vault excavation requirements

You are responsible for the following:

- Excavating the vault or handhole location. The most commonly used vault types and the required excavation dimensions are shown in *Figures 2–5*.
- Removing debris and leveling the bottom of the excavation with a 6-inch base of crushed rock.
- Backfilling the excavation to finished grade at 2 inches below the vault top (if in a landscaped area), or backfilling flush with the grade (if in a hard-surfaced area).
- Installing a felt joint around the vault top or cover when concrete is poured up to the vault (i.e., when the vault is to be in a sidewalk).

Conduit installed at vaults

You are responsible for the following:

- Grouting around your service conduits that enter into PSE vaults (except for the vault types shown in *Figure 4*).
- Sealing service entry conduit at PSE’s vault to prevent water from entering into your service panel.
- Contacting CCS for entry location approval and procedures prior to extending conduit or conduit bends into existing service vaults.

NOTE: Refer to the *Customer wiring to energized PSE transformers* section of this chapter for the proper procedure for entering a PSE vault.

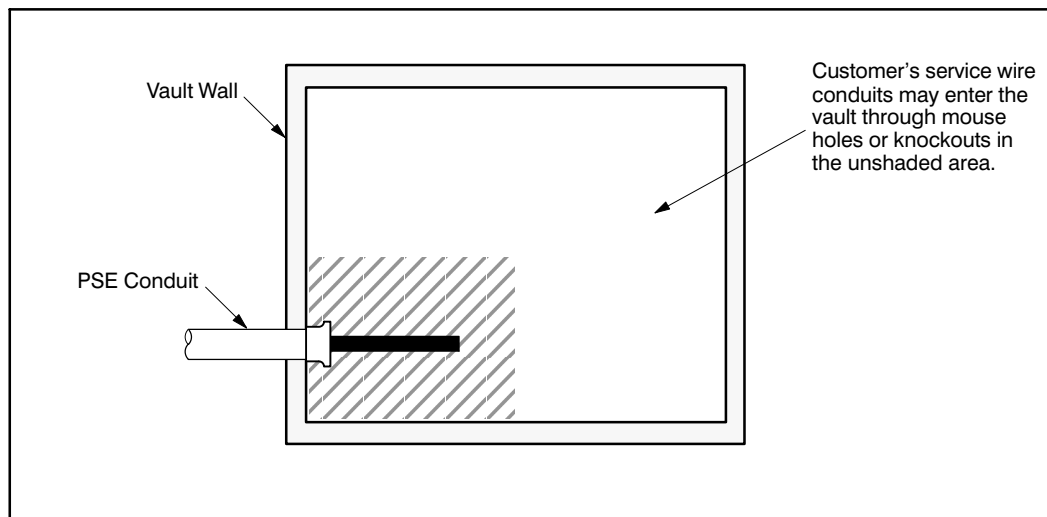


Figure 2 Location of customer conduit in PSE vaults

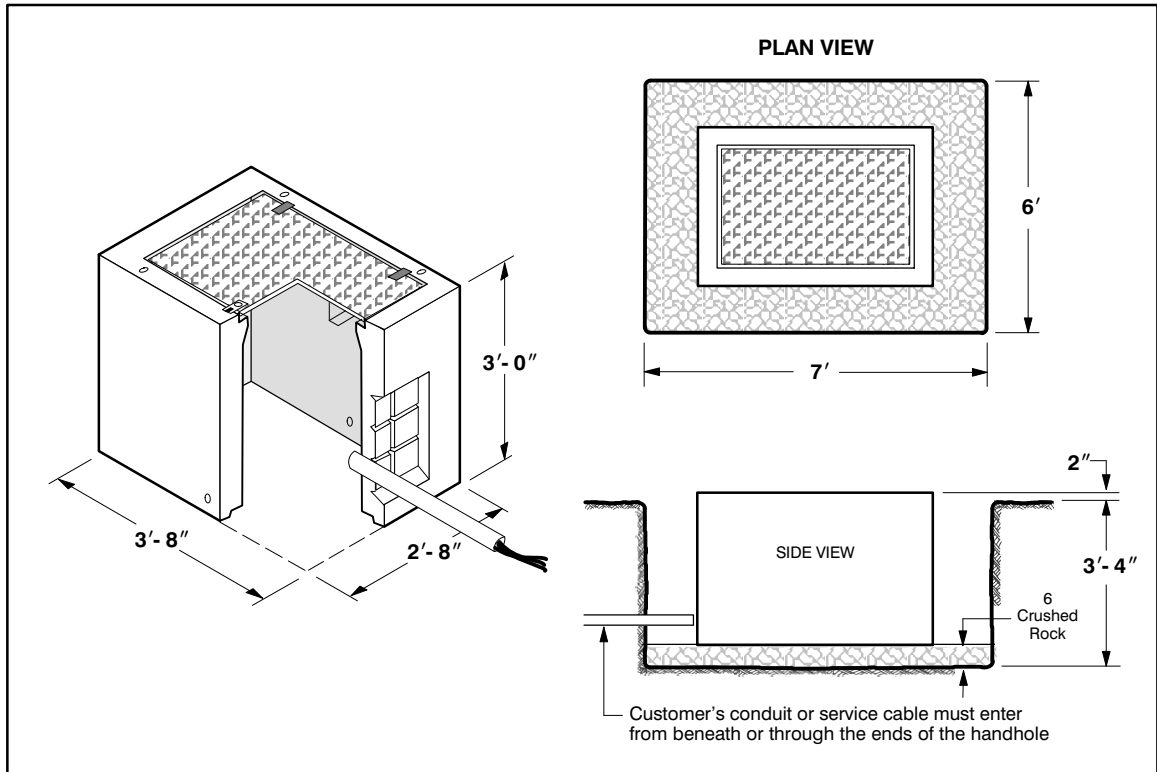


Figure 3 Minimum dimensions and excavation requirements for a small, secondary connection handhole

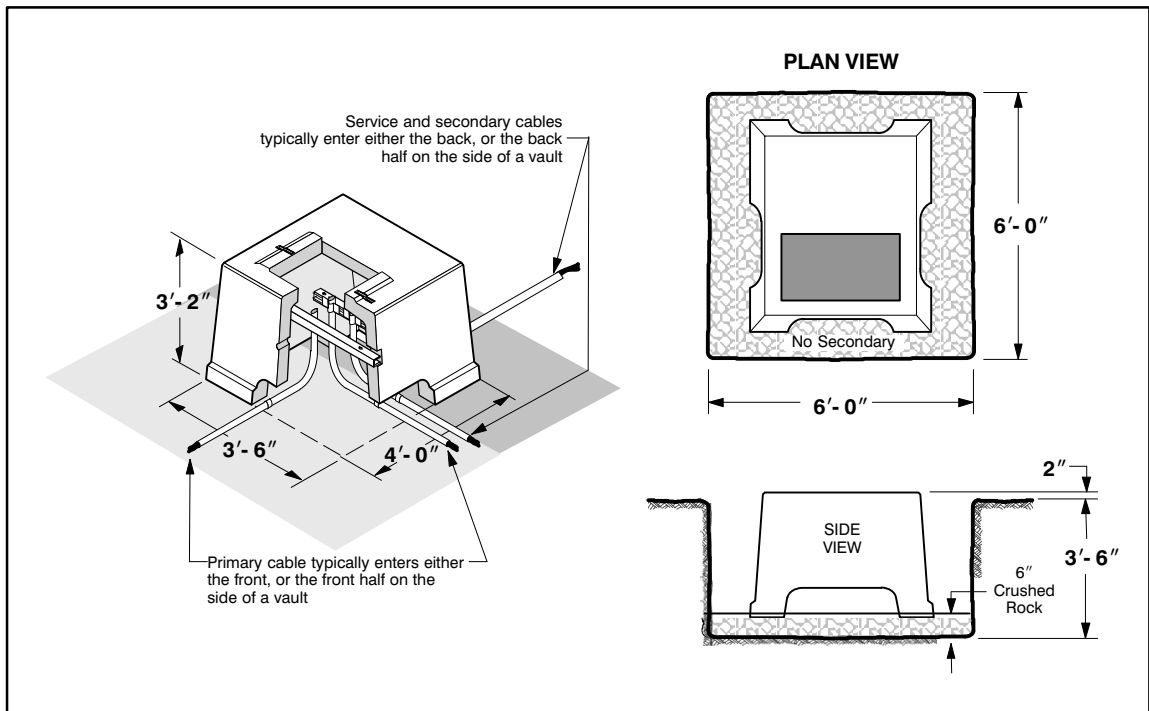


Figure 4 Minimum dimensions and excavation requirements for a single-phase padmount transformer vault

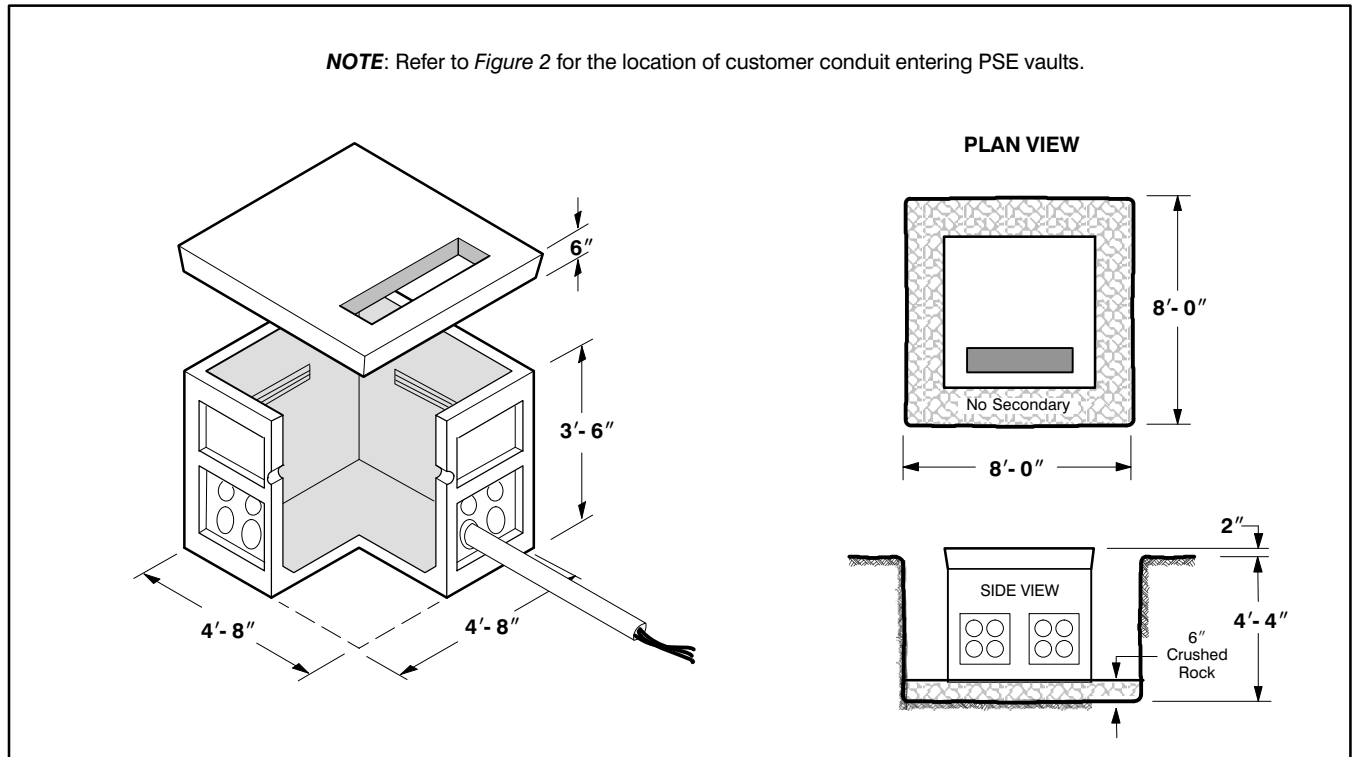


Figure 5 Minimum dimensions and excavation requirements for a three-phase padmount transformer vault, 300 kVA or less

Attaching a customer's service line to a power pole

When the power pole is on private property

As a commercial customer, you may attach, own, and maintain up to two service conduit risers on a PSE power pole (see *Figure 6*), when the pole is located on private property. Three or more conduit service risers require an underground connection handhole (see *Figure 7*).

If no other risers exist on the pole, attach the first 10 feet of the conduit riser(s) in location 3 (see the plan view of *Figure 6*). For the location of other riser(s) contact your *CCS Representative* or your *Project Manager* for approval prior to installation.

NOTE: All installation work performed on the pole above 10 feet from grade shall be done by electric utility crews.

When the power pole is in a city/county/state right-of-way

When PSE's power pole is within a governmental right-of-way, PSE will install a secondary handhole on your property to provide a point of service (see *Figure 7*). Call CCS for coordination and guidance before attaching service conduits to PSE power poles within a governmental right-of-way.

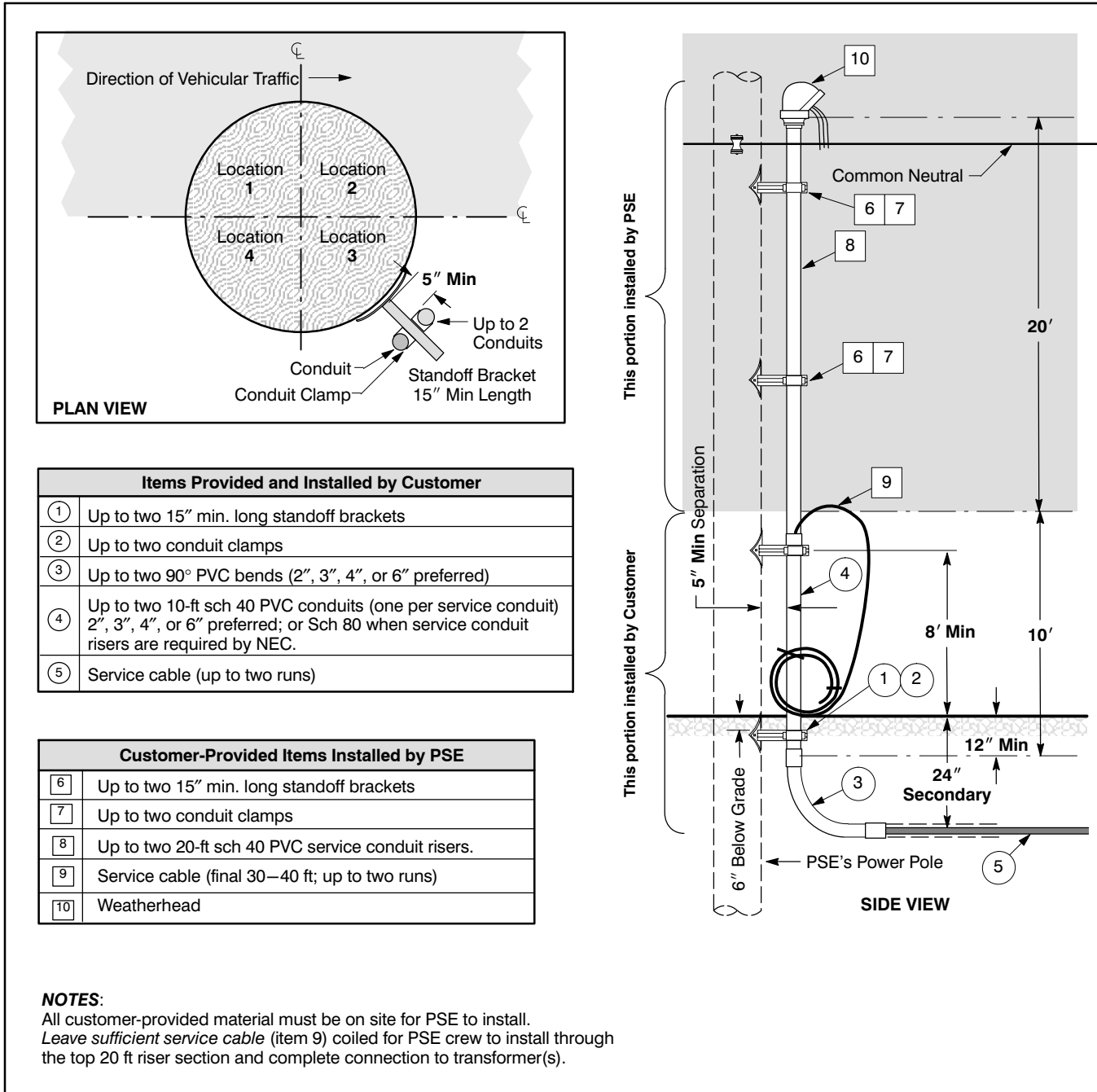


Figure 6 PVC conduit riser placement when pole is on private property only

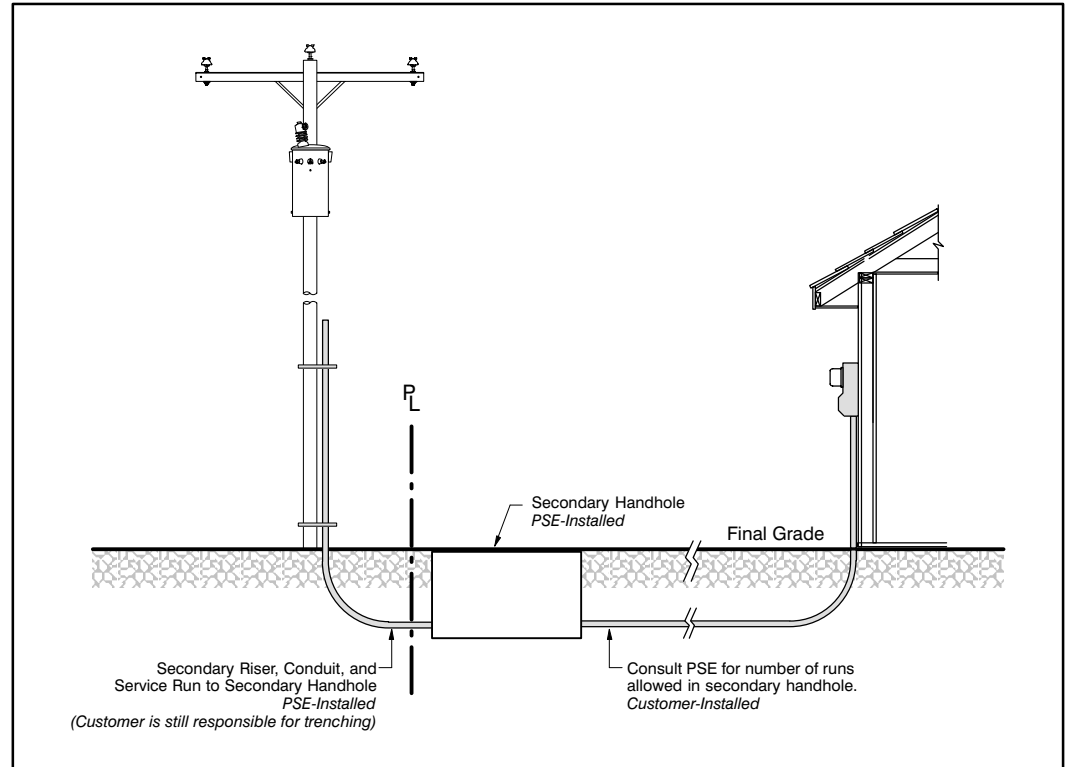


Figure 7 PSE-installed underground connection handhole

Racking of cable in vaults

The following applies to 7 x 7 x 6-foot vaults for three-phase padmount transformers of 500 kVA and greater, where 12 or more runs of 500 kcmil or larger cables are installed.

Cable ladder

In all 7 x 7 x 6-foot vaults, PSE will install a 30-inch x 4-foot ladder with 6-inch spacing between rungs. The cable ladder will be positioned approximately 19-inches from the left side of the vault wall under the cable access hole.

Cable supports

Cable support racks and arms, that hold cables along the perimeter of the vault wall, are recommended but not required by PSE.

If cable supports are installed, they shall extend a maximum of 2 feet from the vault wall. The customer may install as many cable supports as they consider necessary.

Cable training and identification

The requirements for cable training and identification are shown below.

- The cable shall extend a minimum of 7 feet above the transformer pad.
- All cables shall be bundled together by phase.
- Cables shall be zip tied to the cable ladder rungs.
- The neutral conductor shall be positioned on the cable ladder (see *Figure 9*).
- The cable shall be marked with colored tape to indicate its phase.

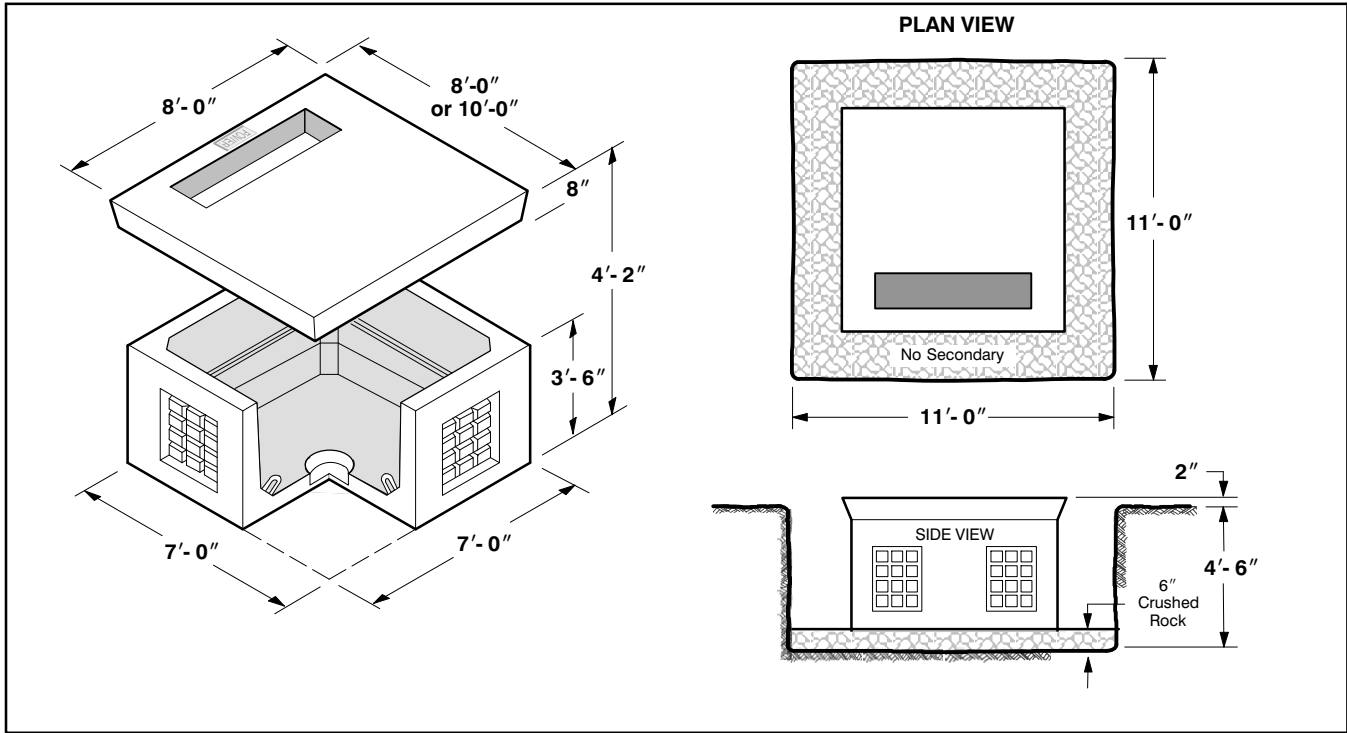


Figure 8 Minimum dimensions and excavation requirements for a three-phase padmount transformer vault, 500 kVA and larger

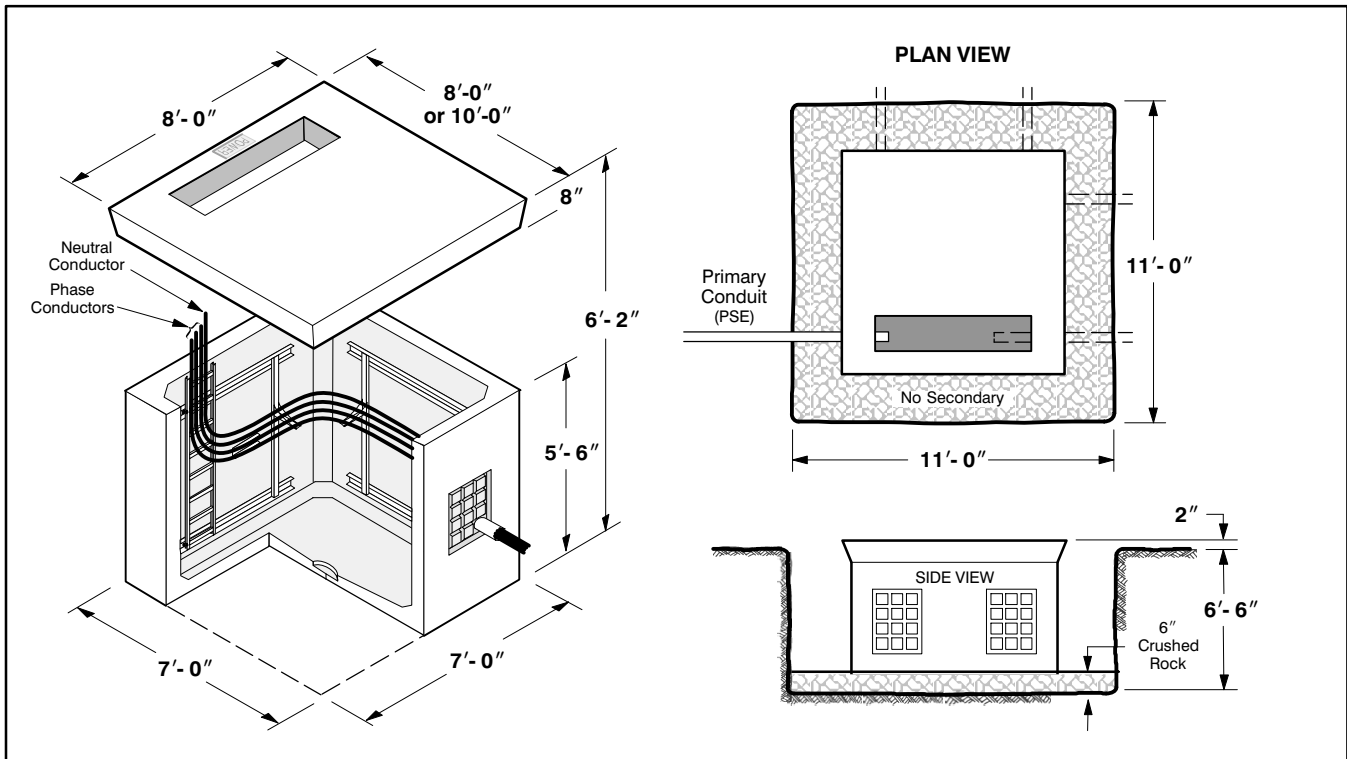


Figure 9 Racking of cable in vaults

Customer wiring to energized PSE transformers

Before installing commercial service underground cable into any energized transformer, coordinate the work with PSE to ensure a safe installation.

Single-phase minipad transformers

Your electrician may insert conduit 2 inches into an energized minipad transformer handhole's wire access holes (located at its base), without a PSE journeyman's on-site assistance.

For single-phase padmount transformer vaults with unistrut construction, you may, at your discretion, provide a minimum 24-inch radius PVC bend for PSE to attach to the unistrut.

Work that involves inserting or pulling cable into the minipad handhole shall be done only:

- After the transformer has been de-energized.
- With the on-site assistance of a PSE journeyman.

To train the cable and mark the runs:

- Mark the cables and group them together.
- Label the conductors with the location and service address.
- Leave no more than 8 feet of cable coiled in the vault, neatly installed and taped together.

Three-phase padmount transformers

The customer's electrician may install and grout conduit into a vault wall or insert/pull cable into three-phase transformer vaults only:

- After the transformer has been de-energized.
- With the on-site assistance of a PSE journeyman.

To train the cable and mark the runs:

- Label each cable's phase and the neutrals.
- Leave no more than 15 feet of cable coiled in the vault.

Transformer locations

PSE will install padmount transformers using the clearances listed in *Table 4* and shown in *Figures 10* and *11*.

Clearances between padmount transformers and structures must be measured from the metal portion of the transformer closest to the building or structure, including any building overhangs, within the following clearances:

Table 4 Clearances for padmount transformers

Feature	Clearance distance
Combustible walls or roof (including stucco)	10 feet (3 ft from a combustible wall if using a reduced-flammability transformer). See <i>Figure 10</i> .
Noncombustible walls (including brick, concrete, steel, and stone), provided the side of the transformer facing the wall does not have doors. Materials that pass UBC Standard 2-1 or ASTM E136-79 are considered to be noncombustible.	3 feet. See <i>Figure 10</i> .
Fire sprinkler valves, standpipes, and fire hydrants	6 feet. See <i>Figure 11</i> .
Doors, windows, vents, fire escapes, and other building openings	10 feet. See <i>Figure 11</i> .
The water's edge of a swimming pool or any body of water	15 feet. See <i>Figure 11</i> .
Individual domestic and irrigation wells	100 feet. See <i>Figure 11</i> .
Facilities used to dispense or store LP, hazardous liquids or fuels	20 feet. See <i>Figure 12</i> . 10 feet. See <i>Figure 12</i> .
Gas service meter relief vents	3 feet. See <i>Figure 11</i> .

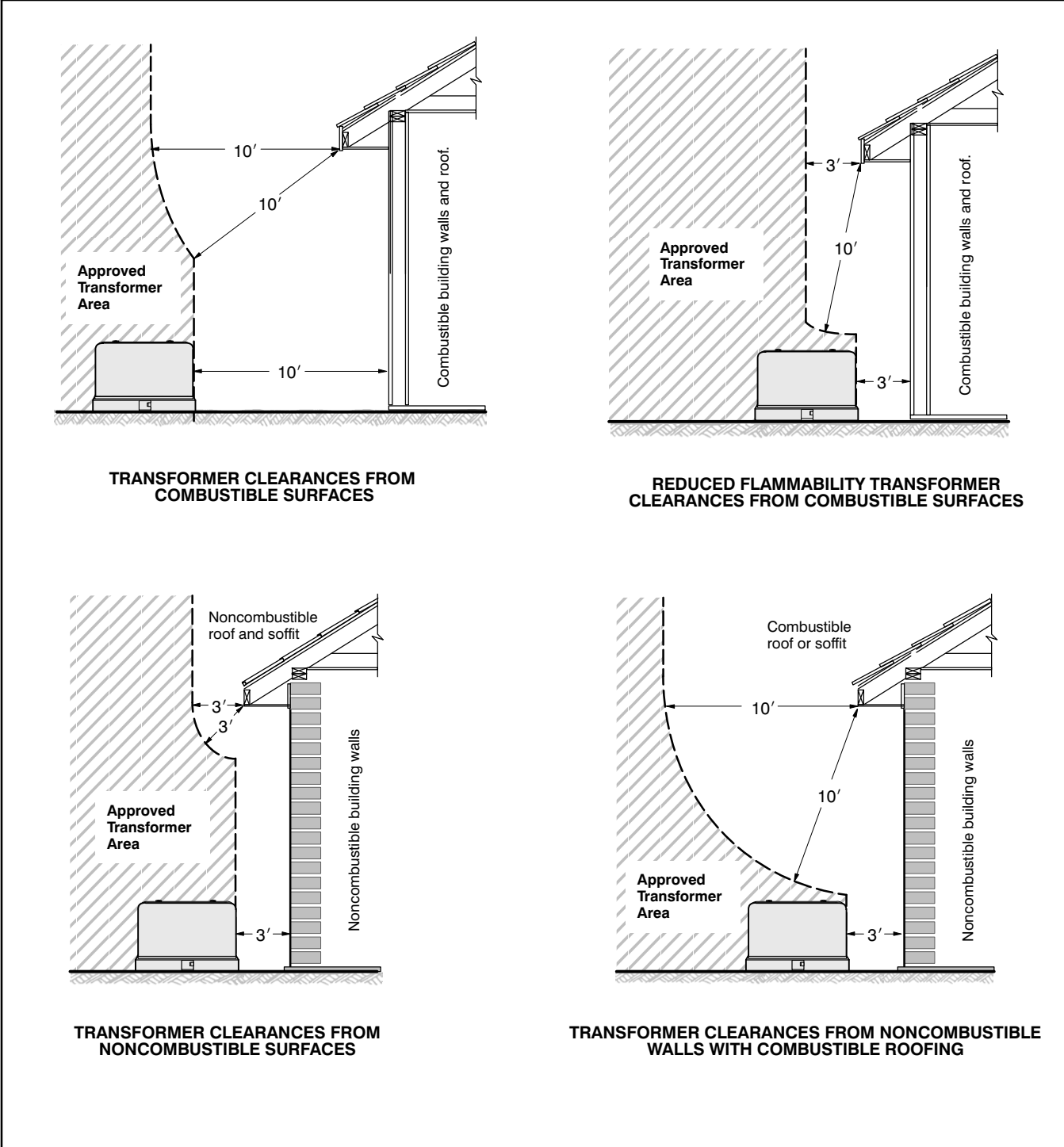


Figure 10 Clearances for transformers from structures

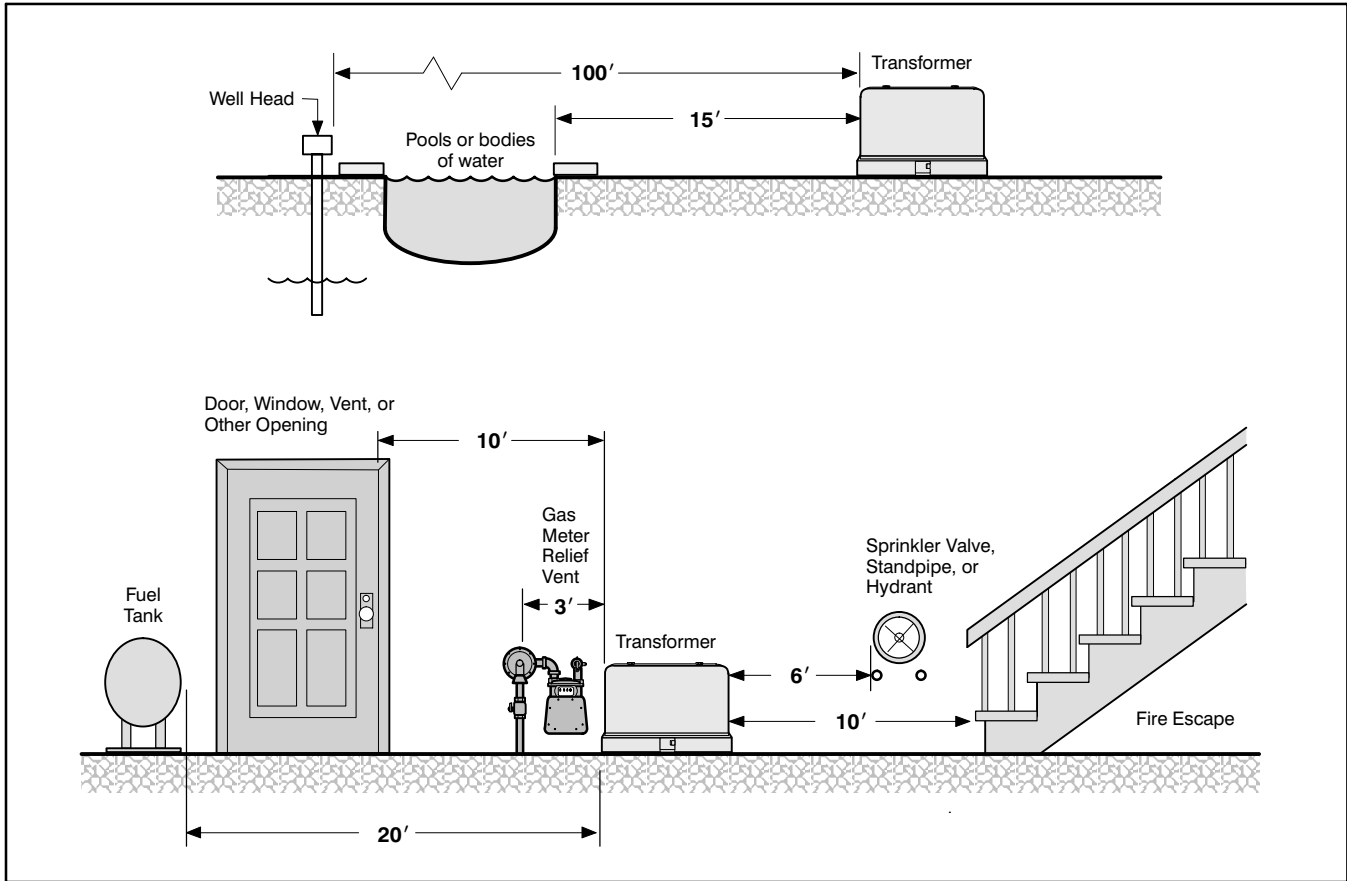


Figure 11 Clearances for transformers

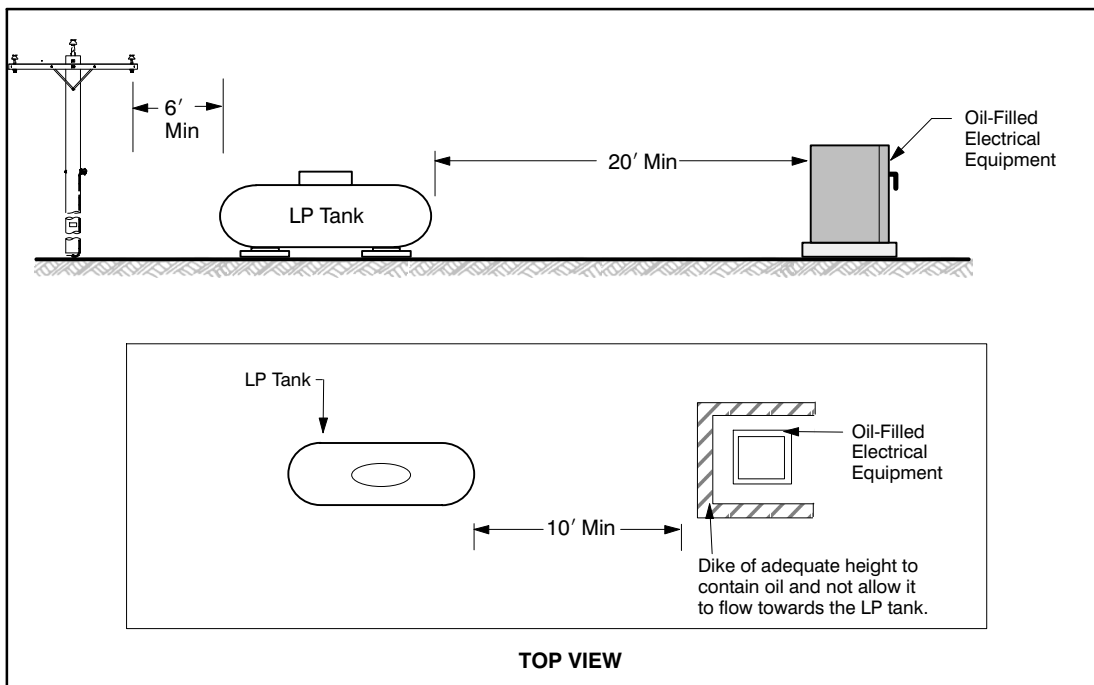


Figure 12 Minimum clearances from oil-filled equipment to LP, hazardous liquid, or fuel tanks

Landscaping and other obstacles

Landscaping and other obstructions shall not encroach on the clearances shown in *Figures 13 and 14*.

Working space

A clear and level working area equal to the full width of the equipment operating compartments shall extend a minimum of 10 feet from the compartment opening for padmount equipment and 6 feet in front of subsurface equipment in vaults (see *Figures 13 and 14*).

A minimum of 3 feet of clear working area for subsurface equipment and 18 inches for padmount equipment (see *Figures 13 and 14*) shall be provided on the sides of the electrical equipment without operating compartments (including sides with cooling fins).

A clearance of 36 inches is required on padmounted equipment with cooling fins (see *Figure 14*).

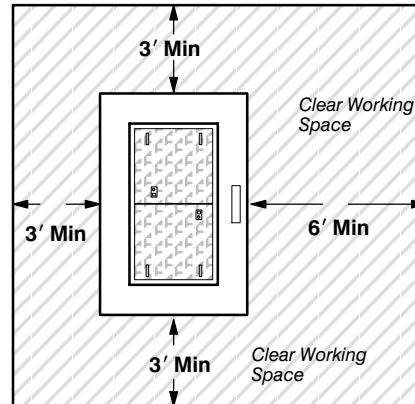


Figure 13 Plan view of subsurface equipment clear working space

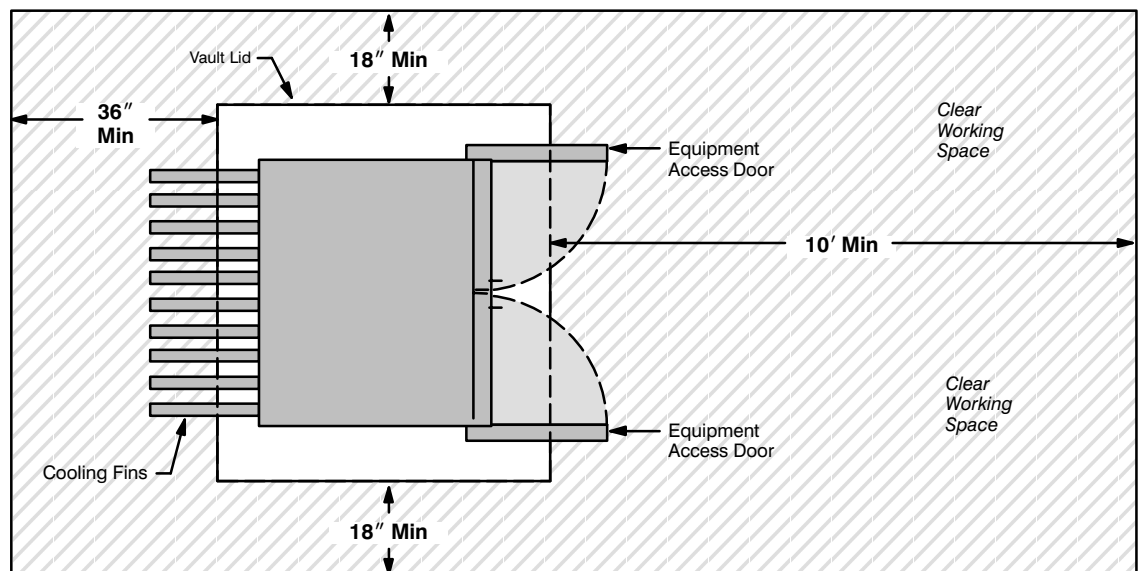


Figure 14 Plan view of padmount equipment clear working space

Guard posts for padmount and subsurface equipment

Washington Administrative Code (WAC) requires *guard posts* around padmounted equipment that is exposed to vehicular traffic. PSE guard post location requirements are shown in *Figure 15*. **You are required** to supply and install these guard posts or pay PSE to supply and install them.

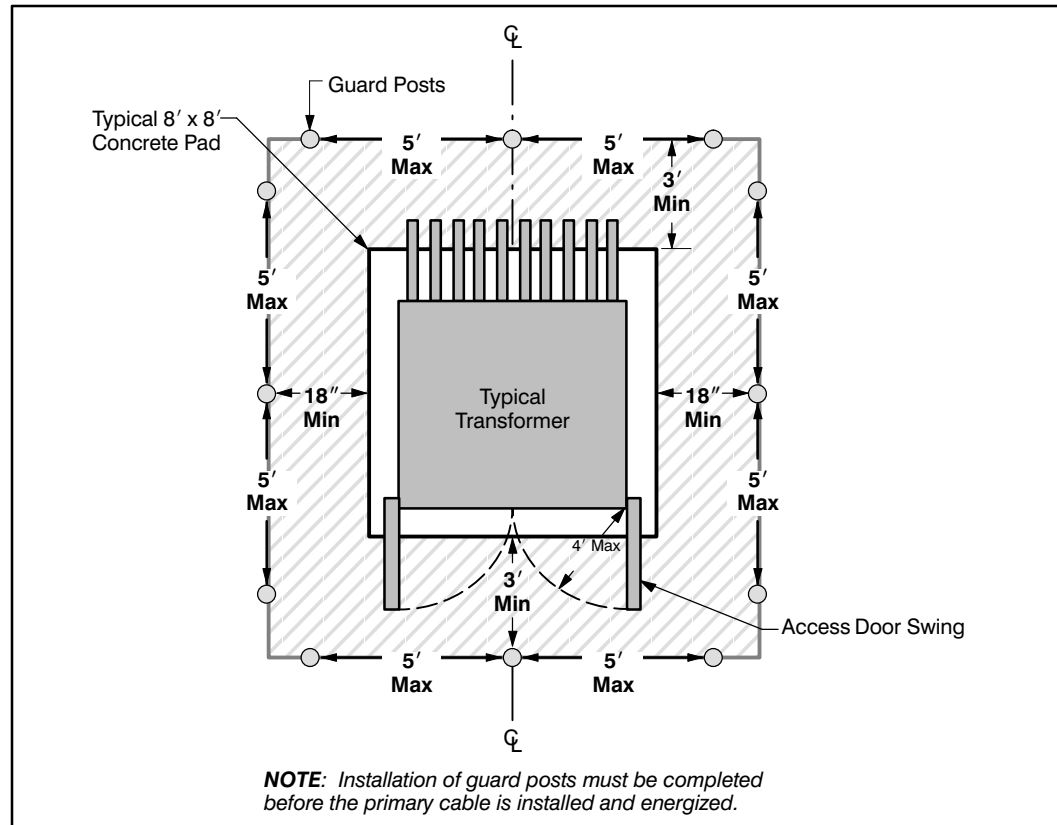


Figure 15 Guard post location requirements

Approved guard posts

The following styles of guard posts are approved for PSE transformers:

- Schedule 40 or better galvanized steel pipe filled with concrete, 6 feet x 4 inches in diameter. The concrete shall have a minimum compressive strength of 3,000 psi after 28 days. The exposed section of the post shall be painted traffic yellow.
- Precast steel-reinforced concrete post, 6 feet x 9 inches in diameter. These posts are available from Utility Vault Company, Auburn, WA; or Hanson Inc., Tacoma, WA. The exposed portion of the post shall be painted traffic yellow.
- Set the post 30 inches deep in undisturbed soil. If soil has been disturbed, use concrete to stabilize the post.
- Backfill the holes with concrete.

Figure 16 illustrates both styles of guard posts.

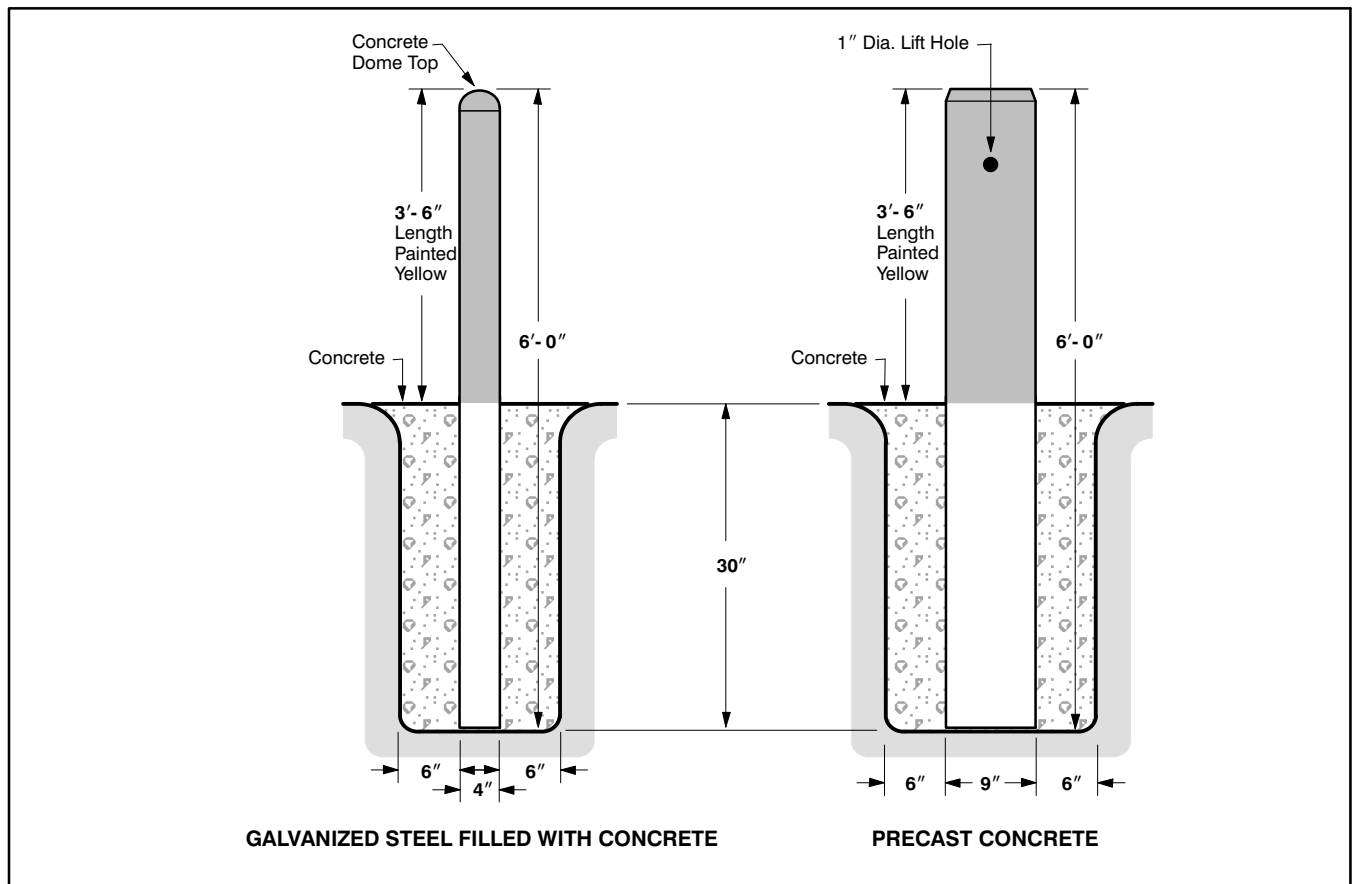


Figure 16 Typical guard posts

Fault current levels

The most commonly used padmounted transformers installed by PSE are shown in *Tables 5, 6, and 7.*

The tables below also show the maximum available short-circuit current at the transformer's secondary connection point.

NOTE: Always use the next larger size transformer to allow for future system expansion or upgrade.

Table 5 Maximum short circuit current (in amps) for single-phase transformers, padmounted

Type	Secondary Voltage	kVA	R/X	120 V Winding		240 V Winding	
				Min %Z	Fault Current	Min %Z	Fault Current
1-Phase PM	240/120	25	0.8	2.23	9300	1.7	6100
		37.5	0.7	2.23	14000	1.7	9200
		50	0.6	2.23	18700	1.7	12300
		75	0.5	2.34	26700	1.8	17400
		100	0.5	2.30	36200	1.8	23100
		167	0.5	2.43	57300	1.9	36600

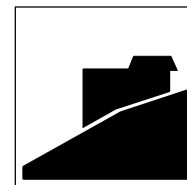
Table 6 Maximum short circuit current (in amps) for three-phase transformers, padmounted

Type	Secondary Voltage	kVA	R/X	Minimum %Z	3 Phase &/or L-G Fault Current
3-Phase PM	208Y/120	45	0.8	1.65	7600
		112.5	0.3	1.65	19000
		150	0.3	1.55	26900
		225	0.2	2.15	29100
		300	0.3	2.10	39700
		500	0.2	2.30	60300
		750	0.1	5.32	39100
		1000	0.1	5.32	52200
	480Y/277	45	0.8	1.65	3300
		112.5	0.3	1.65	8200
		150	0.3	1.55	11600
		225	0.2	2.15	12600
		300	0.3	2.10	17200
		500	0.2	2.30	26200
		750	0.1	5.32	17000
		1000	0.1	5.32	22600
		1500	0.1	5.32	33900
		2000	0.1	5.32	45200
2500	0.1	5.32	56500		

Table 7 Maximum short circuit current (in amps) for Y-Y grounded transformers

Type	Secondary Voltage	kVA	R/X	Min. %Z	3 Phase &/or L-G Fault Current
Three 1-phase OH & UG Banks	208Y/120	30		2.10	4,000
		45	0.9	2.00	6,200
		75	0.8	1.70	12,200
		112.5	0.7	1.70	18,400
		150	0.6	1.70	24,500
		225	0.5	1.80	34,700
		300	0.5	1.80	46,300
		500	0.5	1.90	73,000
Three 1-phase OH & UG Banks	480Y/277	30		2.10	1,700
		45	0.9	2.16	2,500
		75	0.8	1.90	4,800
		112.5	0.7	1.70	8,000
		150	0.6	1.70	10,600
		225	0.5	1.80	15,000
		300	0.5	1.80	20,100
		500	0.5	1.90	31,700
		1000		2.20	54,600
		1500		2.30	78,500

Chapter 3



Permanent Overhead Services

This chapter provides you with information on PSE's permanent overhead service installation. Please follow these requirements to avoid a delay in your service hookup. If you have any questions about this information, call **Customer Construction Services (CCS)** at **1-888-321-7779**.

Service equipment installation responsibilities

Puget Sound Energy

PSE is responsible for furnishing, installing, and maintaining the primary system equipment, overhead service wire, current transformers, meter(s), and meter wiring.

Customer

You are responsible for furnishing, installing, and maintaining all required *service entrance equipment*, including the *service entrance conductors* from the *meter base/socket* or current transformer enclosure to PSE's designated *point of delivery*. The point of delivery for overhead service is at the connectors on the weatherhead.

For services where current transformers (CTs) are required, you will also need to run conduit from the CT enclosure to the meter base. Refer to *Chapter 4, Section 3, Current Transformer (CT) Metering (up to 800 A)* for more information.

Preparing for your service hookup

The following list will help you prepare your project for the installation of an overhead service. After you complete these items, PSE will install the metering equipment and connect your service.

1. Check for any local ordinances/covenants that may prevent you from obtaining an overhead service.
2. Complete *Electric Service Application Permanent Non-Residential 201E (Form 1378)* or *Electric Service Multi-Family Development 400E (Form 4409)*. All forms can be downloaded at **PSE.com**.
3. Supply site drawings and load information to your *CCS Representative* (refer to *Chapter 1, Submitting an Application for Service*).
4. Contact CCS to determine where your overhead service will originate.
5. Determine an approved meter location (refer to *Chapter 4, Section 1, General Metering Requirements, Meter locations*).

Continued on next page

6. Verify that the *service mast* height requirements have been met.
7. Provide and maintain a path, clear of obstructions, between PSE's pole and your service mast.
8. Provide payment for any preconstruction costs determined by your *CCS Representative*.
9. Install the required service equipment.
10. Provide and install service entrance conductors (leave a minimum of 18 inches exposed at the weatherhead).
11. Connect the meter bases/sockets and permanently label them to indicate the part of the premises they serve, such as unit number.
12. Obtain an approved electrical inspection.
13. Call CCS at **1-888-321-7779** to initiate connection and energize your new service.

Service mast requirements

All requirements for the installation of the service mast are located in the National Electric Code (NEC) and the Washington Administrative Code (WAC) 296-46B. The following are PSE-specific requirements.

Height requirements

PSE can assist you with determining the proper service mast height. Call CCS at **1-888-321-7779** for assistance.

Clearances from gas meters

A minimum horizontal clearance of 3 feet is required between electric service equipment and the natural gas meter pressure relief vent.

Additional mast supports

Additional mast supports, typically a *guy* or a brace, are required for any service line over 100 feet in length.

Screw-in service knobs

For new or altered overhead service lines, **you must provide** a substantial *point of attachment* that meets NEC requirements.

Older screw-in type service knobs attached to the home's wall are often inadequate to support modern triplexed service lines. PSE may prohibit use of service knobs if deemed inadequate.

Installing the service equipment

List of customer-provided service entrance equipment

You are responsible for installing the following:

- Meter base/socket
- Current transformer (CT) enclosure and conduit between the meter base/socket, if required
- Service mast
- Insulated clevis for service attachment
- Service entrance conductor
- Ground rods

NOTE: PSE will install the service line and meter, as well as CTs and meter wiring if they are required.

Terrain considerations for meter base/socket locations

Meter base/socket locations are covered in *Chapter 4, Section 1* of this handbook. However, consider the type of terrain the electrical service line will cross when choosing a meter location. PSE strongly suggests avoiding service line routes that cross a driveway. Service lines crossing driveways can be hit by vehicles, causing damage to the service equipment or structure.

Contact CCS at **1-888-321-7779** for the minimum height clearance requirements of overhead service wires.

If the service line will pass through any trees, **you are required** to prune those trees to provide a clear path for the service line. **You are also responsible** for regular tree pruning, and if necessary, tree removal to keep the path clear.

Customer-owned meter pole

Meter pole requirements

If a meter pole is required for the project, it is your responsibility to purchase and install it. The meter pole must meet the following requirements:

- Be sound, round, and made out of wood
- Fully pressure treated
- Class 6 or better
- 30 feet long minimum (25 feet with prior approval)
- Minimum diameter of 5-1/2 inches at the top
- Butt gain cut 12 feet from the bottom of the pole

NOTE: Multiple meter installations shall be approved by PSE's Meter Department.

Meter pole locations

Meter poles must be:

- Accessible for reading and testing the meter
- Installed within 30 feet of the commercial building (typically)

Meter pole installation

Meter pole installations must be:

- Buried a minimum of 10 percent of the pole’s length plus 2 feet. If soil conditions are poor, use crushed rock as a substitute for backfill to stabilize the pole.
- Guyed if the service line crosses a public road or if the distance between the meter pole and PSE’s pole is greater than 70 feet. A push brace or pole key brace may be used if guy space is not available.

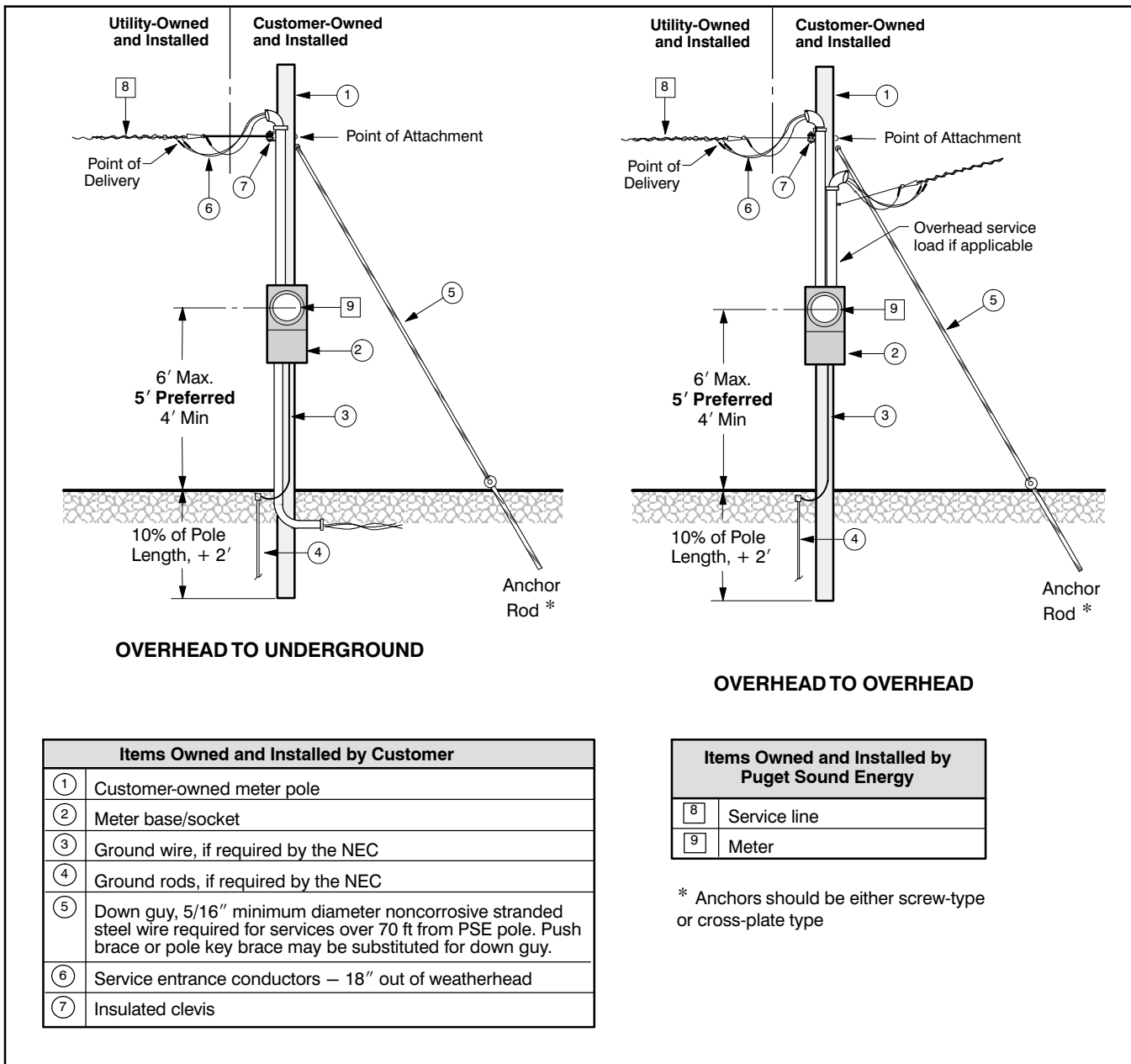


Figure 17 Permanent overhead meter pole installation

Chapter 4



Meter Installation

In this chapter

This chapter provides you with information on PSE's metering requirements. Please follow these requirements to avoid a delay in your service hookup. If you have any questions about this information, call **Customer Construction Services (CCS)** at **1-888-321-7779**.

NOTE: Services of 400 A or greater require the approval of PSE's Meter Department. PSE's *Project Manager* will coordinate this process.

This chapter is divided into three sections:

Section 1: General Metering Requirements

Meter installations requirements such as meter location, clearances, and multiple meter installations.

Section 2: Self-Contained Metering Requirements

For single-phase service 400 A or less, and three-phase services 200 A or less.

Section 3: Current Transformer (CT) Metering Requirements (up to 800 A)

For services up to 800 A and switchboard metering for services over 800 A.

Other contacts

If you have Net Metering or cogeneration questions please call **425-462-3459**.

Section 1: General Metering Requirements

Metering equipment responsibilities

Puget Sound Energy

PSE will furnish, install, and maintain the following equipment:

- Revenue meters
- Current transformers (CT)
- CT meter wiring
- The connectors where your service line interconnects with PSE's equipment.

Customer

You will be responsible for furnishing, installing, and maintaining the following equipment (located beyond the *point of delivery*):

- *Meter bases/sockets*
- All necessary wiring and connections (except CT meter wiring)
- Switches
- Enclosures
- Conduit
- Protection equipment

Other customer responsibilities

Installing or removing meters by a qualified electrician

Only authorized and qualified PSE personnel shall cut *seals* and remove or install meters.

However, under emergency conditions, exceptions may be granted to qualified electricians by contacting Customer Service at **1-888-225-5773**.

When this occurs, the qualified electrician shall accept all liability for damage or alteration to equipment, injury to persons or property, and loss of revenue to PSE from the time the seal is removed until 72 hours after PSE has been notified that the equipment is ready to be resealed. The customer or contractor shall promptly notify PSE when repairs or modifications are complete.

WARNING: Use extreme caution when removing and installing meters. Depending upon the type of service or meter base, removal of the meter does **not** necessarily de-energize service.

Inspections and approvals

Before a new service is energized, the installation shall be inspected and approved by the governing city or state electrical inspector.

Sealing provisions on enclosures

CT enclosures, switchgear, gutters that contain unmetered conductors, and metering equipment shall have provisions for sealing.

Service conductors

Metered circuits shall not enter raceways or enclosures containing unmetered circuits, except for *meter loops* on poles.

All conductors shall be securely fastened in their terminals. Aluminum conductor connections require *corrosion inhibitor* (electrical joint compound).

Grounding

All meter bases/sockets, enclosures, and conduit shall be bonded and grounded in accordance with Articles 230 and 250 of the latest edition of the NEC.

When *self-contained* meter bases/sockets are used, the neutral conductor shall be connected to the neutral terminal in the socket.

Customer equipment

The customer's load monitoring equipment shall be installed only on the load side of PSE's metering. No customer equipment shall be allowed inside a meter or current transformer enclosure. This includes customer load monitoring and control devices.

NOTE: Meter base/socket and current transformer enclosures shall not be used as a junction box.

Current-limiting fuses

Current-limiting fuses to protect the customer's electrical system from high fault current shall not be installed in meter bases/sockets, instrument transformer enclosures, or PSE's distribution transformers. They may be installed in the customer's service panel or in a separate enclosure between the socket and the panel. The separate enclosure may be on the supply side of the meter bases/sockets in multiple meter installations if the enclosure has sealing provisions.

Meter locations

Preferred locations

You are required to provide a location to install metering equipment. The meter location must be free from obstruction, corrosive atmosphere, abnormal temperature or vibration, and must be convenient to PSE's distribution system.

All meters, meter equipment, and CT enclosures shall be installed at ground-level locations (except high-rise residential structures), that are accessible 24 hours a day, 7 days a week for meter reading, maintenance, testing, and installation or removal.

The meter base/socket shall be installed outside on schools, churches, halls, or other similar structures which may be locked during normal business hours.

NOTE: All meter locations shall be subject to approval by PSE.

Locations to avoid

Meters shall not be installed at any of the following locations:

- Below the first level of a building.
- In commercial occupancies they do not serve.
- Any place where safety may be compromised.
- On poles owned by PSE.
- On any line pole occupied solely by the telephone company, except to serve telephone company equipment.

Meter location requirements for manufactured commercial structures (school portables, industrial modular office, etc.)

If you are installing an overhead service to a manufactured commercial structure, our service equipment can be installed on the manufactured commercial structure or on a customer-owned meter pole.

Meter bases/sockets installed on manufactured commercial structures are required to be:

- Located on an outside wall of your structure and accessible for reading and testing.
- Installed 4 to 6 feet above finished grade with a service mast that meets NEC requirements.
- The proper type for the service (see *Table 8*).

Meter bases/sockets **must not be installed:**

- In a breezeway.
- In an area that is subject to being fenced.

Electrical equipment room requirements

Meter bases/sockets may be located inside an electrical equipment room that shall be used solely for power and communication equipment.

NOTE: The electrical equipment room shall be accessible 24 hours a day, 7 days a week. Additionally, the equipment room shall be well lit and **not used for storage**.

You must provide the following:

- A door that leads directly to the outside, or with prior approval from the PSE Meter Department, directly off the lobby of the structure's main entrance. The size of the door shall be a minimum of 2 feet 8 inches x 6 feet 8 inches.
- A location near the door for installation of a **keybox**, a key fitting the equipment room door for the keybox, and a sign on the exterior of the door stating "Electrical Room." If multiple equipment rooms are needed, each equipment room door shall have a dedicated key box with key. If door locks are changed, contact CCS to coordinate the exchange of new keys.
- A 2-inch conduit, from each electrical equipment room to a NEMA 3R enclosure used for the automated meter reading (AMR) antenna. The conduit shall have a maximum of 360 degrees in total bends and be no more than 25 lineal feet total length. If a single meter is installed within the equipment room, the total length of the conduit may be extended to 70 lineal feet. Contact CCS if the conduit length is greater than 25 feet. Antenna enclosure requirements are shown in *Figure 18*. A 1/8-inch minimum pull string is to be provided in the conduit.
- A NEMA 3R antenna enclosure shall be located on the first story outside wall 8 to 10 feet aboveground for buildings with one meter room.

- If the building has multiple aboveground equipment rooms (allowed in high-rise residential only) where meters are located, a 2-inch conduit pathway connecting all of the equipment rooms shall be provided for the AMR antenna cable. From the top level equipment room, provide a 2-inch conduit to a NEMA 3R enclosure mounted on the roof of the building. Mount the enclosure above the building facade and other obstructions. Preferred locations are adjacent to or on top of the rooftop mechanical room or within antenna farm locations (see *Figure 18*).
- A 2-foot-square piece of 3/4-inch plywood shall be mounted on the wall of the meter room for an AMR repeater. Mount the plywood 4 to 6 feet above the floor near the antenna conduit entry location into the room. Provide a dedicated 120 V receptacle adjacent to the plywood.

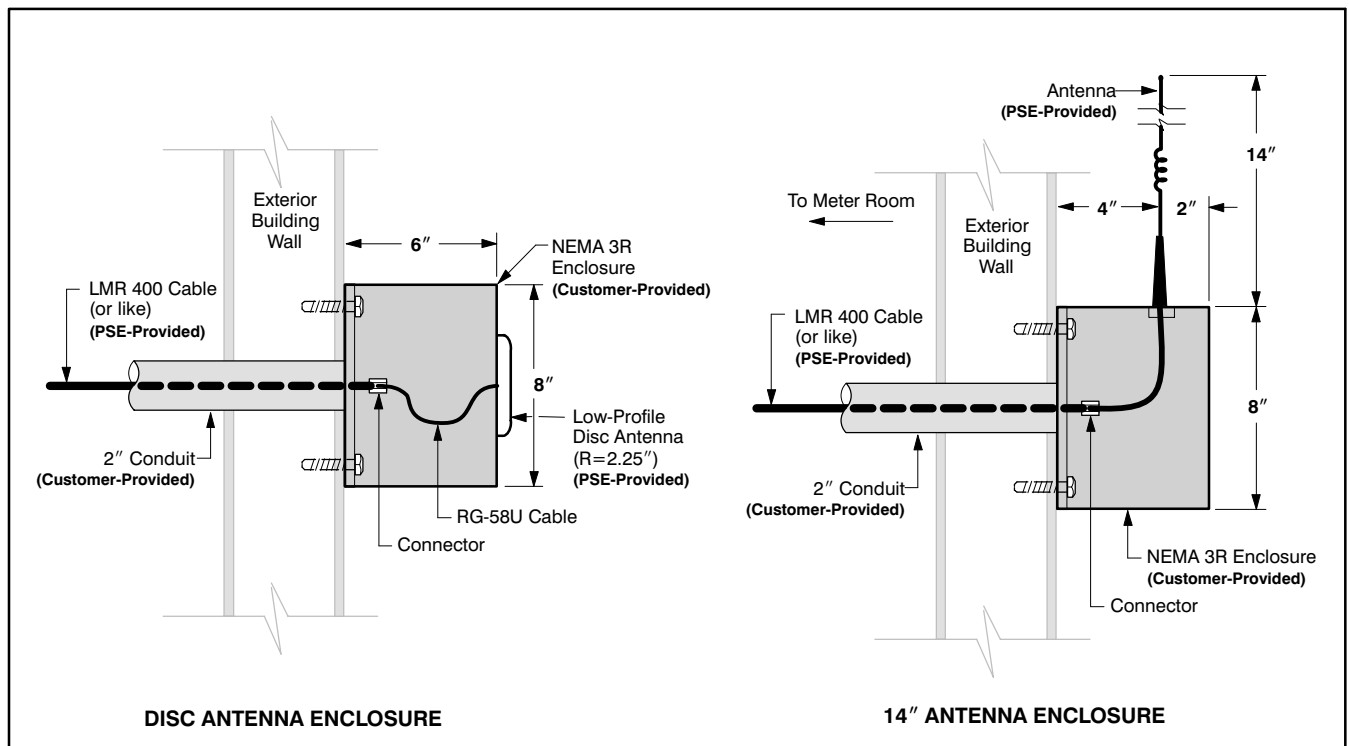


Figure 18 Typical 8 in. x 8 in. x 6 in. exterior wall-mounted AMR antenna installations

Meter room locations in high-rise buildings

Meter rooms in high-rise buildings shall be coordinated with the PSE Meter Department during the design stage of construction, and approved prior to construction. Meter rooms may be allowed on every third floor within high-rise residential buildings.

Meter bases/sockets

General requirements

Meter bases/sockets and enclosures shall be acceptable to PSE, accepted by an approved testing laboratory, and must fulfill these requirements:

- All meter bases/sockets shall be ring-type and shall include either a screw-type locking ring (preferred) or a stainless steel snap ring.
- Sockets for *nonresidential* loads require a **manual block bypass**. Automatic circuit closures or lever bypasses are not acceptable.
- Any meter base/socket containing energized equipment shall be covered and sealed with a transparent cover plate if a meter is not installed.
- Meters shall be installed only in sockets that are level, plumb, and securely fastened to the structure.
- All unused openings of the meter base/socket enclosure shall be closed with plugs that are secured tightly in place from inside the enclosures before a meter is installed.
- All meter equipment exposed to weather shall be rain-tight according to the National Electrical Manufacturer's Association (NEMA) 3R minimum.
- Terminals shall be marked with a conductor range for aluminum or copper conductors. When aluminum conductors are used, the socket must be approved and clearly marked by the manufacturer for that use.

CAUTION: Strands shall not be removed to make conductors fit undersized terminals. Meter bases/sockets shall not be jumped to provide power.

Determining meter base/socket type

To determine meter base/socket types for specific voltages and amperage ratings use *Table 8*.

Meter base/socket clearances

NOTE: The center of the meter base/socket is always the point of reference.

For...	Clearance
Base/Socket height	Meter base/socket height shall be 4 ft minimum to 6 ft maximum (5 ft preferred) above finished grade or floor (see <i>Figure 19</i>).
Working space	<ul style="list-style-type: none"> ■ Working space in front of metering equipment (including current transformer enclosures) shall be at least 3 ft wide and 3 ft deep, measured from the front of the enclosure or meter face (see <i>Figure 19</i>). Plants, shrubs, and trees shall not be planted in this space. ■ The center of all meter base/socket enclosures shall be a minimum of 10 inches from adjacent walls, ceilings, or other similar obstructions (see <i>Figure 19</i>). ■ All service equipment, including disconnect switches, shall be a minimum of 10 inches from the meter's center. ■ Building siding shall not cover or overlap the meter base/socket.

Continued on next page

For...	Clearance
Minimum clearance from gas meter	The diagrams and the measurements provided in <i>Installation Requirements for Underground Services (Form 3061)</i> , provided in the back pocket of this handbook, show the required minimum distances between building features and the relief vent.
Recessed meters	When a meter base/socket enclosure is recessed in the building wall, a flush-type socket is required. Recessed meter bases/sockets require a clearance of 10 inches in all directions from the center of the meter and the closest portion of the wall (see <i>Figure 20</i>).

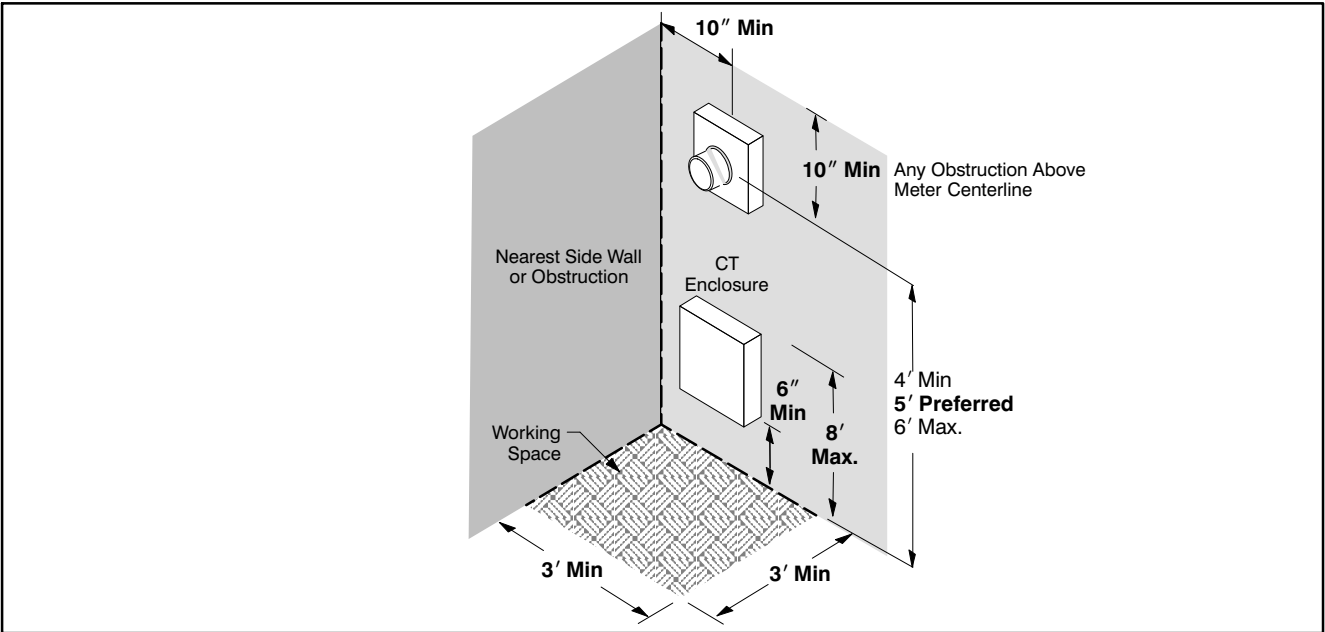


Figure 19 Meter base/socket minimum clearances

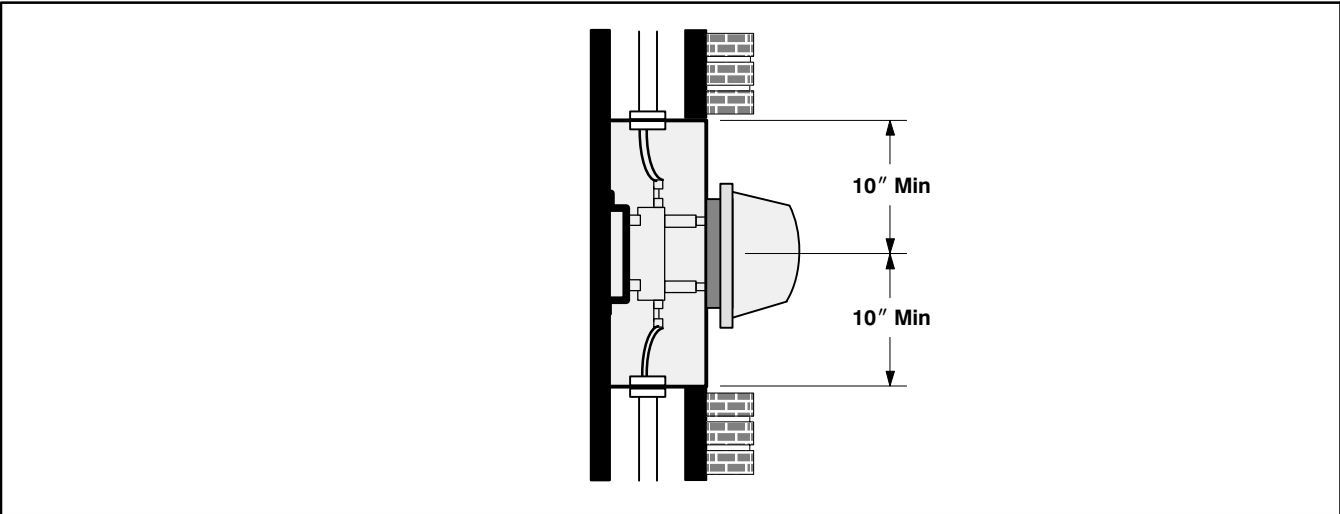


Figure 20 Minimum clearances for recessed meters

Remote metering

Normally, a meter base/socket and associated devices (current transformers, etc.) are attached to a permanent or fixed structure, such as a building, that contains the load being served. If there is no permanent or fixed structure for the load, then remote metering is allowed. Remote metering consists of a meter on a meter pedestal, typically located within 30 feet of the load or the PSE equipment that serves the customer.

Remote metering is allowed only for city, county, or state streetlights and traffic lights, homeowners' associations, and railroads. All remote metering requires PSE's Meter Department approval before construction begins. Contact CCS if you require remote metering.

Meter pedestal requirements for remote metering

Meter pedestals must meet the specifications of *EUSERC* Section 300 (Metering and Service Equipment 0 – 600 V), and drawings 308 or 309, with the following additional specifications for the meter base/socket:

- The meter base/socket shall be a 200 A Form 12S with the fifth jaw in the 9 o'clock position.
- The test bypass safety disconnect shall meet EUSERC drawings 311 or 312.
- For drawing 309, the dimension from the center of the meter base/socket to the inside top flange should be a minimum of 10 inches.
- Enclosed metering for protection from vandalism, state or city traffic, and streetlighting must meet EUSERC drawings 300, 308 or 309 and PSE pedestal clearance and socket requirements (10 inches minimum from the center of the meter to the inside flanges on the sides and top of the pedestal, and 10 inches minimum from the meter base/socket to the door).
- Drawings shall be submitted for approval by the manufacturer, noting the EUSERC and PSE drawings and specifications used.
- Meter pedestals shall be on structures such as masonry, concrete, or metal.
- Meter pedestals exposed to vehicular traffic (other than those used for traffic management loads) shall be protected by guard posts as described in *Chapter 3, Guard posts for padmount and subsurface equipment*.
- Single-phase remote services 60 A or less can be mounted on a 6 x 6-inch fully pressure-treated wood post. The minimum height of the meter shall be 3 feet.

Meter pedestal location

The metering pedestal must be located so that the access for the metering and pull section are free of surrounding obstructions, with at least 36 inches of working space clearance in front of the equipment.

Remote service requirements based on service ampacity

Remote services 800 A or less for nonresidential loads shall be mounted on permanent support structures that are made of galvanized steel pipe with unistrut cross-braces, concrete, or masonry blocks. Support structures made of wood (treated or not) are unacceptable.

Continued on next page

- The customer shall provide a 3-foot x 3-foot x 3-inch thick concrete pad surrounding the meter or holes 2-feet-deep that are filled with concrete to anchor the structure.
- The minimum height of the meter shall be 3 feet.
- Other requirements specified in this handbook for meter bases/sockets and CT enclosures apply.

Remote services greater than 800 A – Remote services 800 A or greater require EUSERC outdoor switchgear. Ask your *CCS Representative* for more information.

Multiple meter installations

Multifamily

On *residential* multimeter panels, the minimum spacing between socket centers shall be 7-1/2 inches horizontally, 8-1/2 inches vertically, and the center line shall be a minimum of 3 feet and a maximum of 6 feet above the floor or finished grade.

Multimeter installations serving *residential* living units shall comply with the equipment arrangement requirements are shown in *Figure 21*.

Meter base/socket jumpers shall not be used to serve house meters. House meters shall be served in the following ways:

- A dedicated set of service entrance conductors.
- A tap on the bussing of residential multimeter panels.
- All-in-one factory assembled multimeter panels.

NOTE: PSE requires house meters to have manual block bypasses.

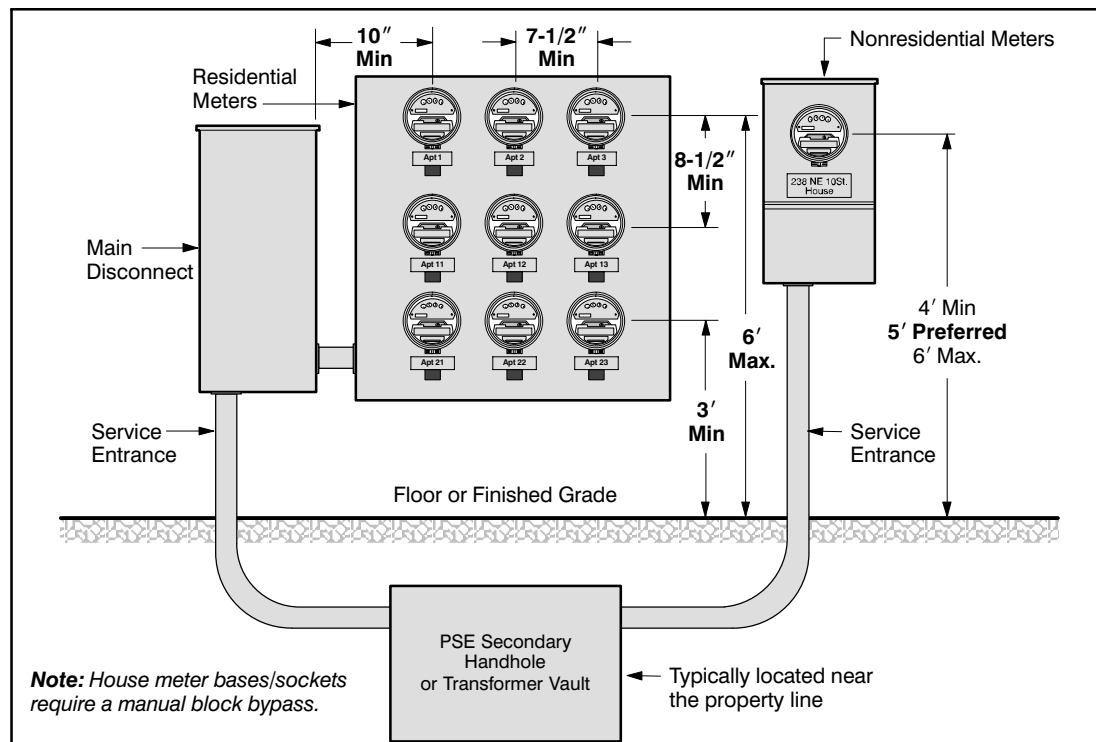


Figure 21 Typical factory-built residential multimeter panel for multifamily complex

Nonresidential

On nonresidential multiple meter panels, the minimum spacing between socket centers shall be 12 inches horizontally, 12 inches vertically, and the meter shall be a minimum of 3 feet and a maximum of 6 feet above the floor or finished grade.

Meters shall be adequately protected from mechanical damage. Factory-built multiple meter equipment shall be approved by the PSE Meter Department. A typical example of a nonresidential multiple meter installation is shown in *Figure 22*.

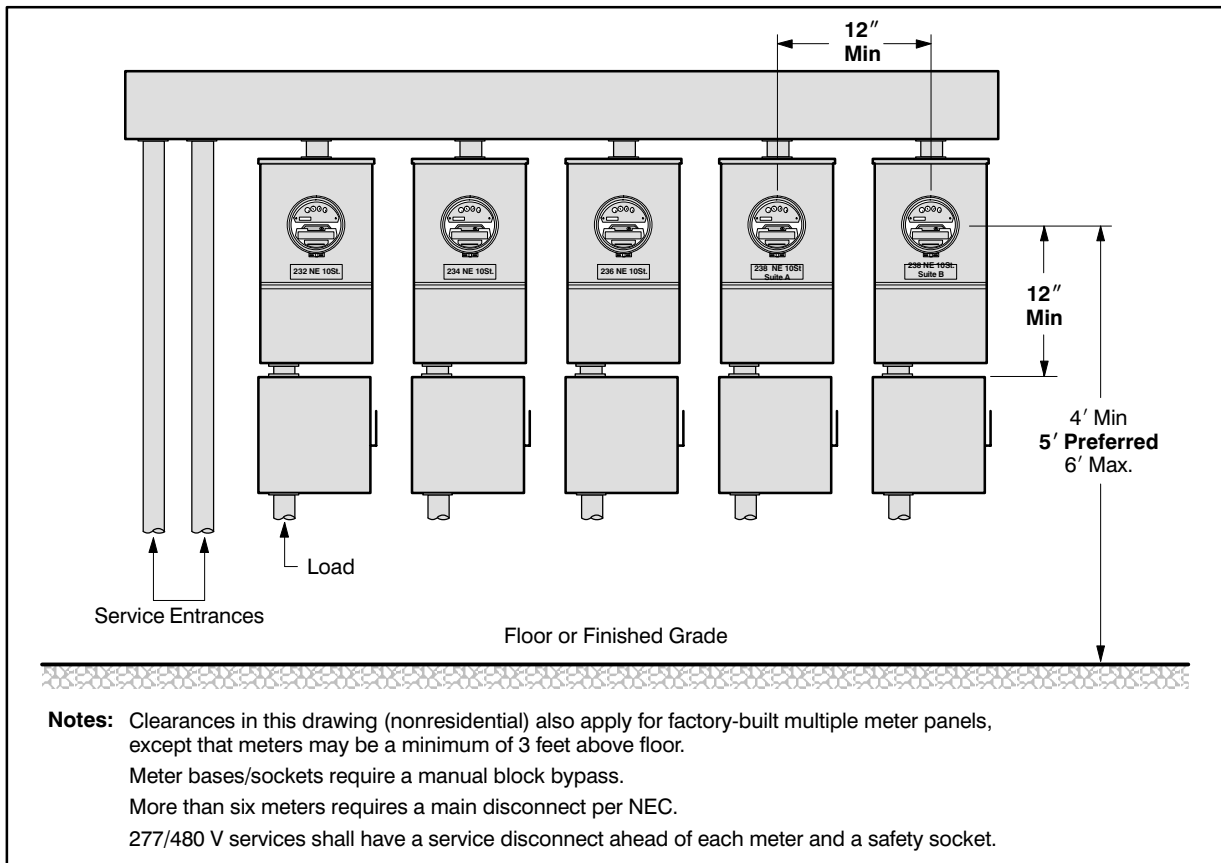


Figure 22 Typical multiple nonresidential meter installations for services 200 A or less

Multiple meter base/socket labeling

Meter bases/sockets shall be permanently labeled to indicate the part of the premises they serve (i.e., unit number). PSE requires engraved phenolic nameplates or adhesive die-cut labels at least 1-inch high. Service will not be established until marking is complete.

NOTE: Felt-tip pens and label maker tape are **not** considered permanent marking.

Section 2: Self-Contained Metering Requirements

Single-phase services: 400 A or less and Three-phase services: 200 A or less

Meter base/socket main disconnect combinations

Meter base/socket and circuit breaker combinations are acceptable for 0–320 A, single-phase, and 0–200 A, three-phase services, provided the meter base/socket section meets PSE’s manual block bypass, sealing, equipment sequence, and dimensional requirements.

Manual block bypass requirements

All *self-contained* nonresidential meter bases/sockets (except single-phase temporary services and Rate Schedule 8) require a manual block bypass (see *Table 8*). Automatic circuit closures or lever bypasses are **not** acceptable.

NOTE: Schedule 8 is used for single-family customers that have a separate service for well pumps (serving no more than two residences), barns, outbuildings, or other loads on the same property as the residence. For this type of service PSE will install the secondary service line.

Disconnecting means

All 277/480 V self-contained meters 200 A or less shall have an accessible **disconnecting means ahead of each meter(s)**.

Single-phase 480 V streetlight metering requires a disconnect ahead of the meter.

Safety sockets

A safety socket is required for self-contained 480 V sockets (see *Table 8*).

Load balancing

When 120/208 V, three-phase transformers provide single-phase service, it is your responsibility to identify the service conductors and balance the load on the transformer.

Service conductor connections

Service conductor connections should meet these requirements:

- Line-side conductors shall always be connected to the top terminals of the meter base/socket.
- You are responsible for ensuring that the connection of service entrance conductors in the meter base/socket are inspected and tightened before the service is energized.
- Where *safety sockets* are used, circuit-connecting nuts shall be properly torque (see *Figure 23*).

NOTE: Meters will not be installed unless these connections are tight.

- Meters will not be installed if conductors place undue strain on the terminal facilities.
- Terminals shall be rated for the size of conductor to be used.
- Service conductors shall be arranged in the socket to avoid interfering with the meter installation or operation of the manual block bypass (see *Figures 24–26*).

CAUTION: Strands shall not be removed to make conductors fit undersized terminals.

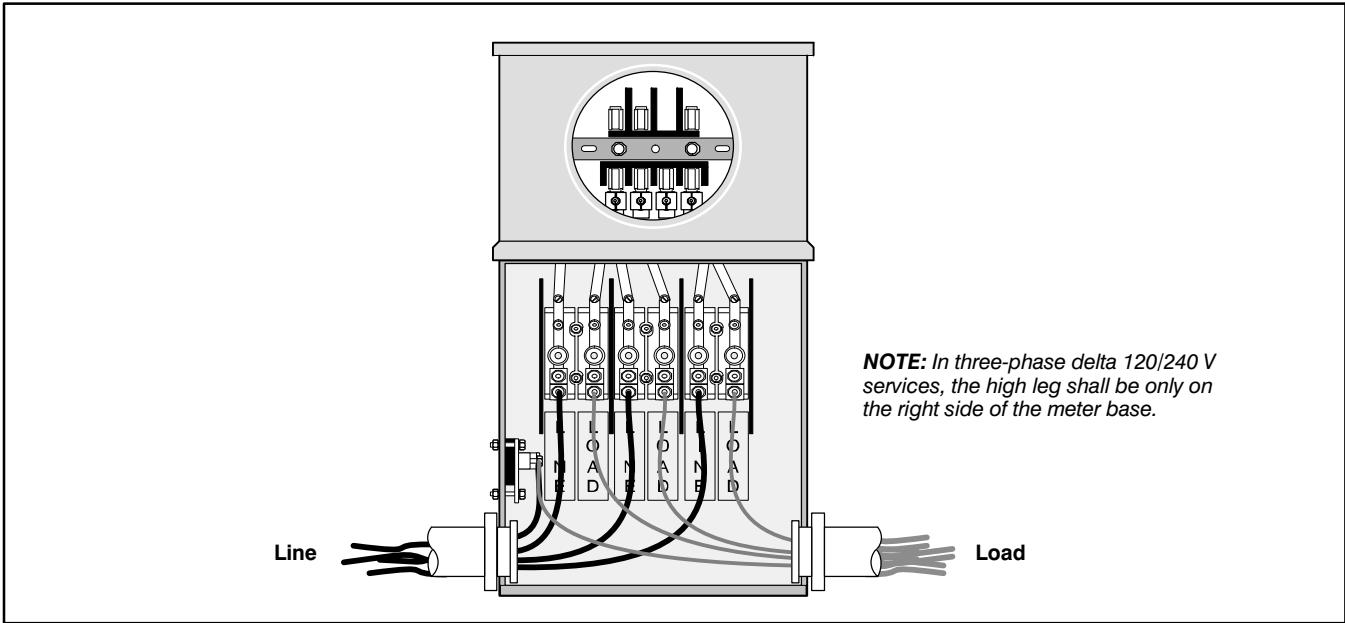


Figure 23 Typical safety socket

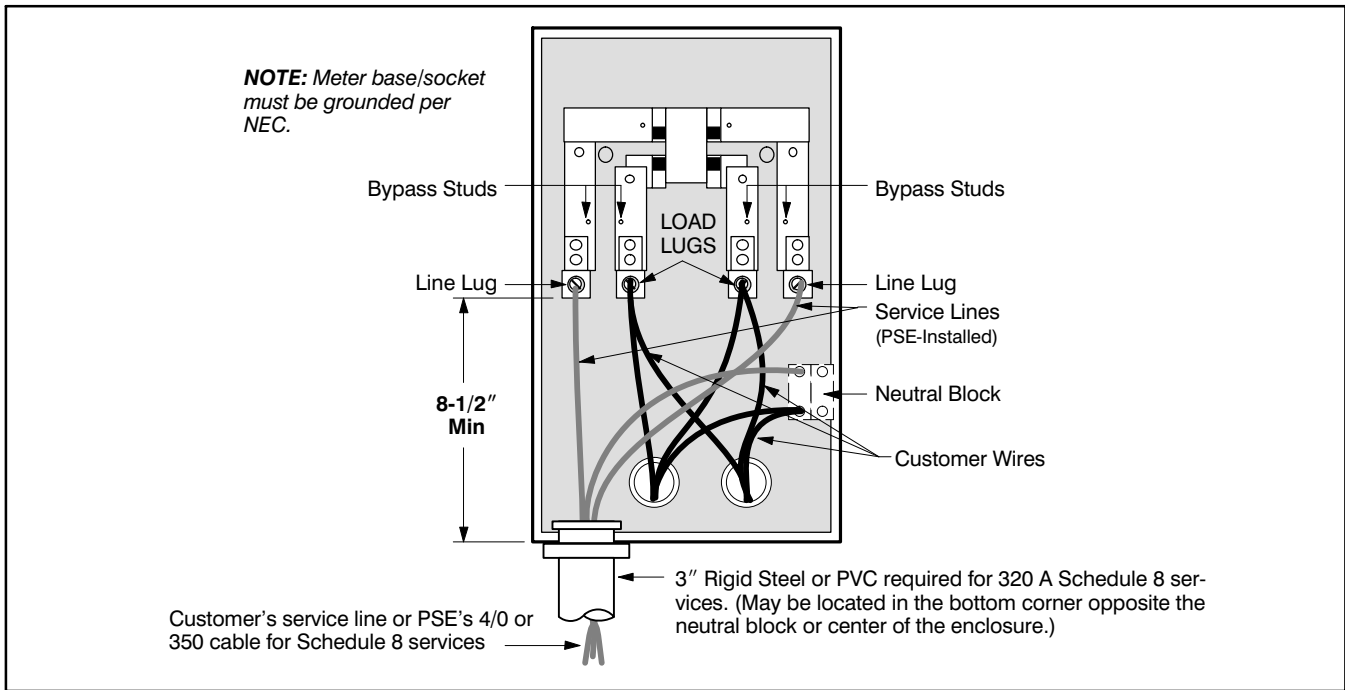


Figure 24 Typical arrangement of service conductors for underground commercial single-phase 320 A service

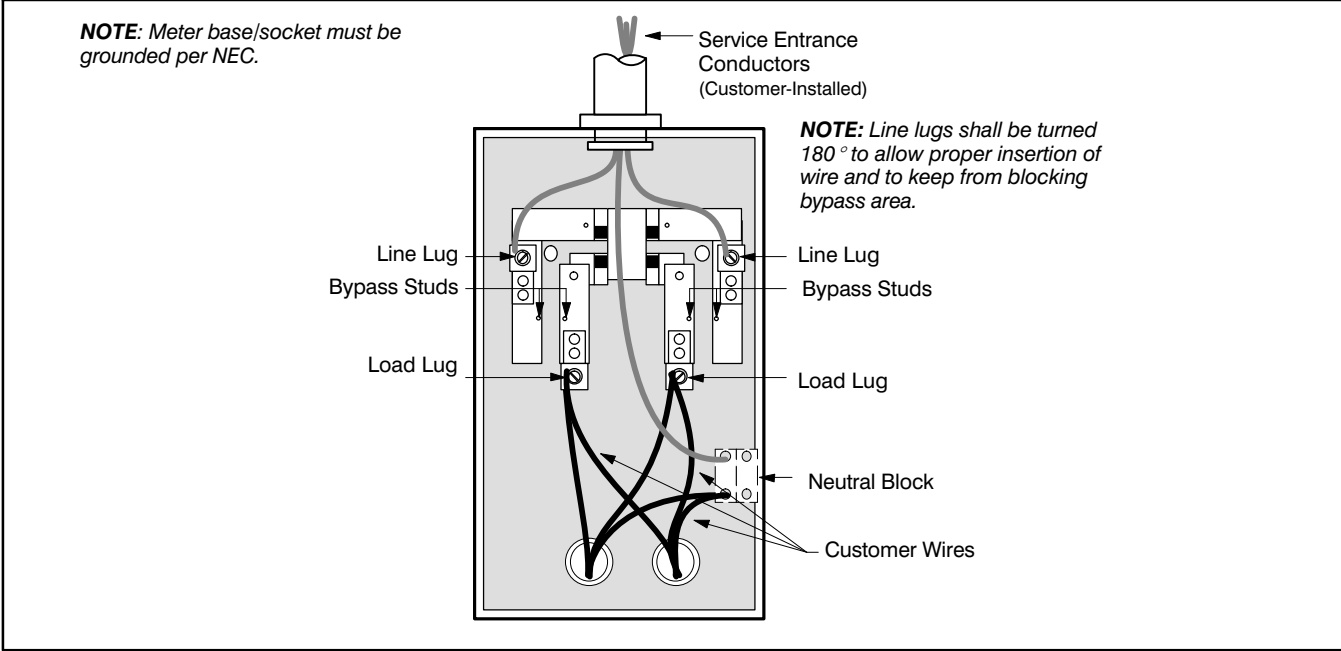


Figure 25 Typical arrangement of service conductors for overhead commercial single-phase 320 A service

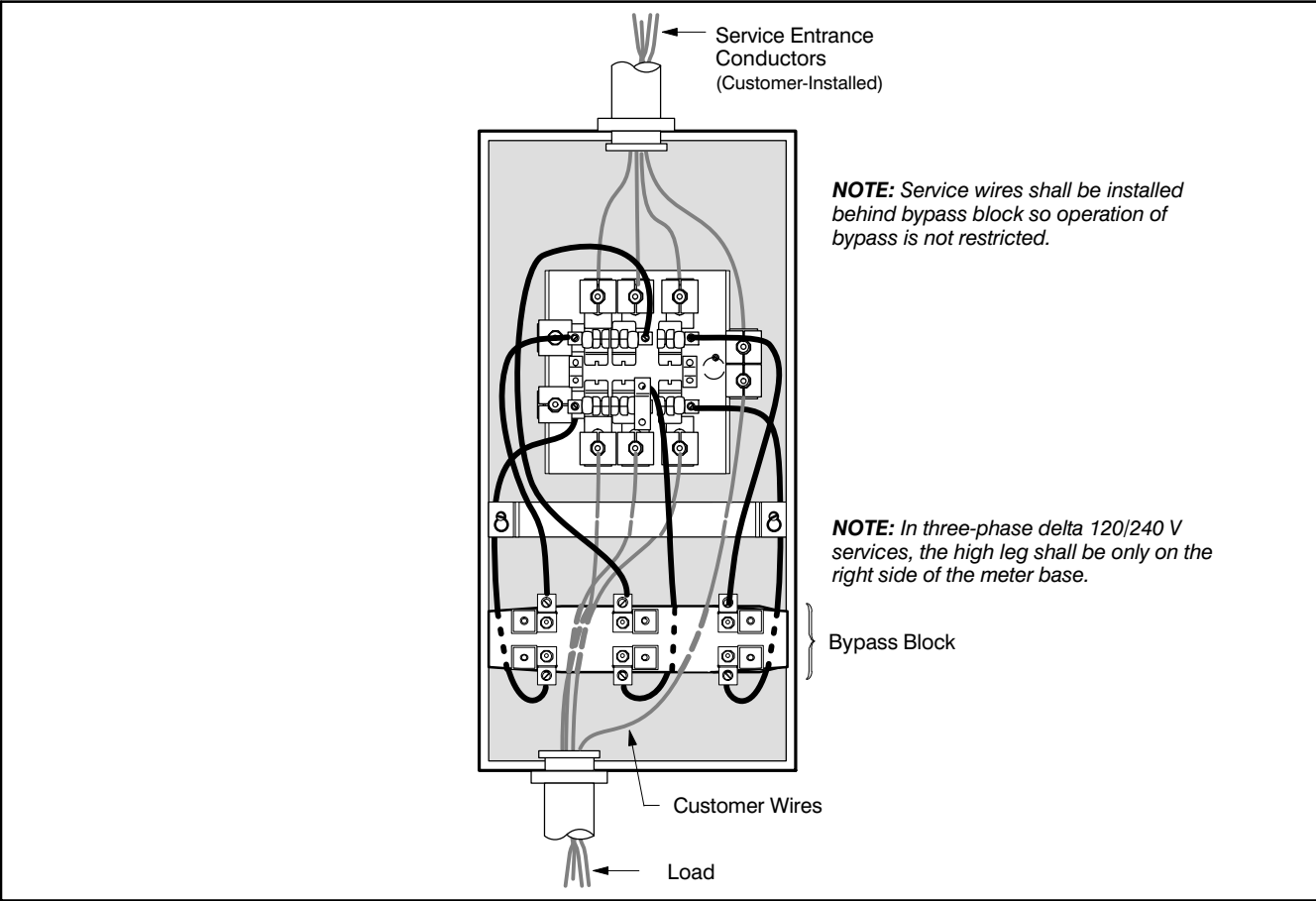


Figure 26 Typical arrangement of service conductors for 120/208 V three-phase self-contained 200 A service

Self-contained meter base/socket requirements

Single-phase services: 400 A or less

A manual block bypass is required on all commercial services. Automatic circuit closures, sliders, and lever bypasses are **not** acceptable.

Single-phase services: 200 A or less

A self-contained meter base/socket shall be installed on all new and remodeled single-phase services (120/240 V or 120/208 V), where the current-carrying capacity of the service entrance conductors does not exceed 200 A, as specified in NEC (see *Table 8, Meter Base/Socket Configuration A*).

Single-phase services: 201 to 400 A

Two options are available:

1. A self-contained 320-A meter base/socket with a manual block bypass is required on all new and remodeled single-phase services (120/240 V) over 200 A, where the current-carrying capacity of the service entrance conductors does not exceed 400 A, as specified in the NEC (see *Table 8, Meter Base/Socket Configuration A*).
2. Current transformer metering is available at additional cost; contact PSE's CCS office (see *Table 8, Meter Base/Socket Configuration B*).

Single-phase services: 120/208 V, 200 A or less

A 5-terminal meter safety socket shall be installed where the fifth terminal is placed in the nine o'clock position connected to the socket neutral bus conductor (see *Table 8, Meter Base/Socket Configuration C*).

Single-phase streetlight services: 120/240 V or 240/480 V pedestals

A 5-terminal meter safety socket shall be installed where the fifth terminal is placed in the nine o'clock position connected to the socket neutral bus conductor (see *Table 8, Meter Base/Socket Configuration C*).

NOTE: 240/480 V services require an accessible disconnect ahead of the meter.

Three-phase services: 200 A or less

All three-phase services

A manual block bypass is required on all commercial services. Automatic circuit closures, sliders, and lever bypasses are **not** acceptable.

The neutral (grounded conductor) shall be connected or tapped to the third terminal from the left on the lower terminals (see *Table 8, Meter Base/Socket Configuration D*).

Three-phase services: 120/240 V, four-wire delta (Restricted — available only for existing services)

In addition to the requirements for all three-phase services, the high-leg (power leg) shall be connected through the right-hand terminals of the socket.

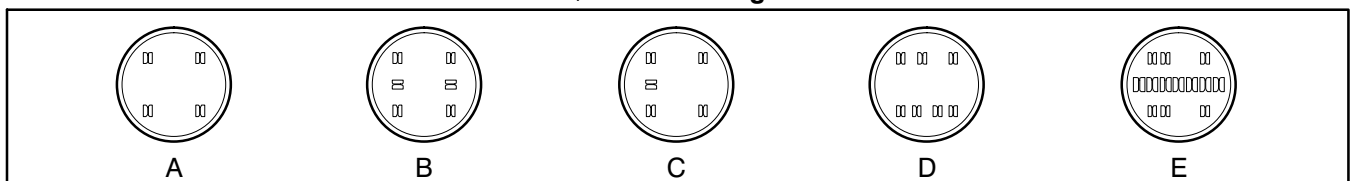
Three-phase services: 277/480 V

An accessible disconnect ahead of each meter base/socket and a safety socket with a manual bypass are required.

Table 8 Single-phase (nonresidential only) and all three-phase meter base/socket types

Voltage	Wires	Service Capacity Amp	No. of Terminals	Meter Socket Config. *	Manual Block Bypass Required?	Accessible Disconnect Ahead & Safety Socket Required?	Socket
SINGLE-PHASE NONRESIDENTIAL							
120/240	3	up to 200	4	A	Yes	No	Self-contained socket
120/240	3	201 to 320	4	A	Yes	No	Self-contained 320 A socket
120/240	3	above 320	6	B	n/a	n/a	Instrument transformer rated with provision for test switch
120/208	3	up to 200	5	C	Yes	No	Preferred arrangement
120/240	3	up to 200	5	C	Yes	Safety socket only	Streetlight applications only
240/480	3	up to 200	5	C	Yes	Yes	Streetlight applications only
ALL THREE-PHASE							
120/208	4	up to 200	7	D	Yes	No	Self-contained socket
120/208	4	above 200	13	E	n/a	n/a	Instrument transformer rated with provision for test switch
120/240	4	up to 200	7	D	Yes	No	Self-contained socket (RESTRICTED APPLICATION) — High leg on right terminals
120/240	4	above 200	13	E	n/a	n/a	Instrument transformer rated with provision for test switch (RESTRICTED APPLICATION)
277/480	4	up to 200	7	D	Yes	Yes	Self-contained safety socket
277/480	4	above 200	13	E	n/a	n/a	Instrument transformer rated with provision for test switch

*** Meter Base/Socket Configurations**



Section 3: Current Transformer (CT) Metering Requirements (up to 800 A)

Single-phase services: over 400 A and Three-phase services: over 200 A

Puget Sound Energy's installation responsibilities

PSE is responsible to provide and install:

- *Instrument transformers*
 - Meters and test switches
 - Metering circuits (wiring)
-

Customer's installation responsibilities

Provisions for current transformers shall be made when the current-carrying capacity of the service entrance conductors exceeds 400 A single-phase or 200 A three-phase, as determined by the NEC.

Meter base/socket

You are responsible to provide and install the meter base/socket.

Metering circuit conduit

You are responsible to provide and install the metering circuit conduit. Metallic conduit (EMT or Rigid) or Schedule 80 PVC conduit is required between the meter base/socket and CT enclosure.

- The conduit shall be sized as follows:
 - Single-phase: 1 inch minimum
 - Three-phase: 1-1/4 inches minimum
- Conduit shall be as short as possible and shall not exceed 50 feet in length or 360 degrees in bends.
- A pull string is required in any meter conduit over 25 feet.
- When metallic conduit (EMT or Rigid) is used, grounding bushings shall be used at both ends.
- Conduit shall run from the CT enclosure and enter the test switch portion of the meter base/socket.

NOTE: Metering circuit conduit shall not contain condulets, junction boxes, or flex conduit. The preferred method of installing conduits entering the CT enclosure is shown in *Figure 27*.

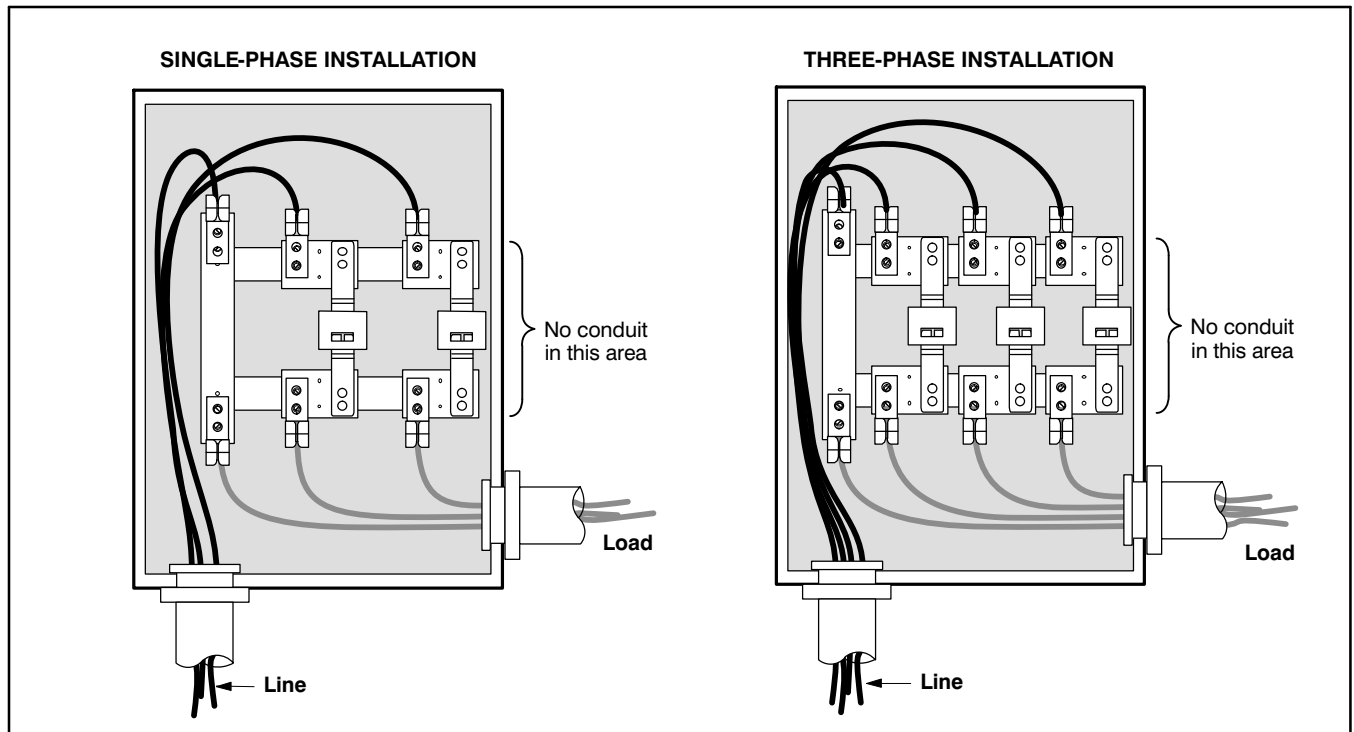


Figure 27 Preferred method of conduit installation in a single-phase and three-phase CT enclosure

CT enclosure

You are responsible to provide and install a CT enclosure ahead of the main disconnect on the outside of the structure, or in an approved electrical room (see *Table 9*).

- Enclosures **shall not** be mounted in crawl spaces, attics, any confined areas, or mounted on ceilings.
- CT enclosures require a minimum front clearance of 36 inches.
- Hinged CT enclosure doors **shall not** block a safe exit while open.
- The top of the CT enclosure shall be a maximum of 8 feet above the floor or finished grade; the bottom shall be a minimum of 6 inches above the floor/grade.
- The CT enclosure **shall not** be used as a junction box or bus gutter.
- The CT enclosure covers **shall not** open vertically. Covers shall open horizontally, right to left.

Table 9 CT enclosure dimensions (minimum)

Phase	Switch Ampacity	No. of Transformers	Width	Height	Depth
1 *	401-800	2	24"	48"	11"
3 *	201-800	3	36"	48"	11"
3 †	Over 800	3	†	--	--

* Enclosure with a side-opening single-hinged door is required when cabinet dimension are greater than 24" x 48".

† Services over 800 A require a switchboard designed to EUSERC specifications. Refer to the Remote Metering section in this chapter for more information. Services from 201-800 A may be switchboard designed to EUSERC specifications. Drawing must be submitted to PSE's Meter Department.

Mounting the CT

You are responsible to do the following:

- Install a CT mounting base on services of 800 A or less (see *Figures 28 and 29*).
- Provide and install two bolt lugs on the line and load sides of each phase and the neutral bus.

NOTE: An instrument transformer enclosure shall contain only the main service conductors. A maximum of four main service conductors may be served off the load side of each current transformer mounting bracket, as long as the lugs are not stacked and do not restrict the mounting of CTs. Use “stair-step” lugs if more than two conductors are terminated at each CT. A gutter or junction box is required if there are more than four main service conductors.

- All new CT brackets or rebuilt CT enclosures shall be 50 kA fault current rated.

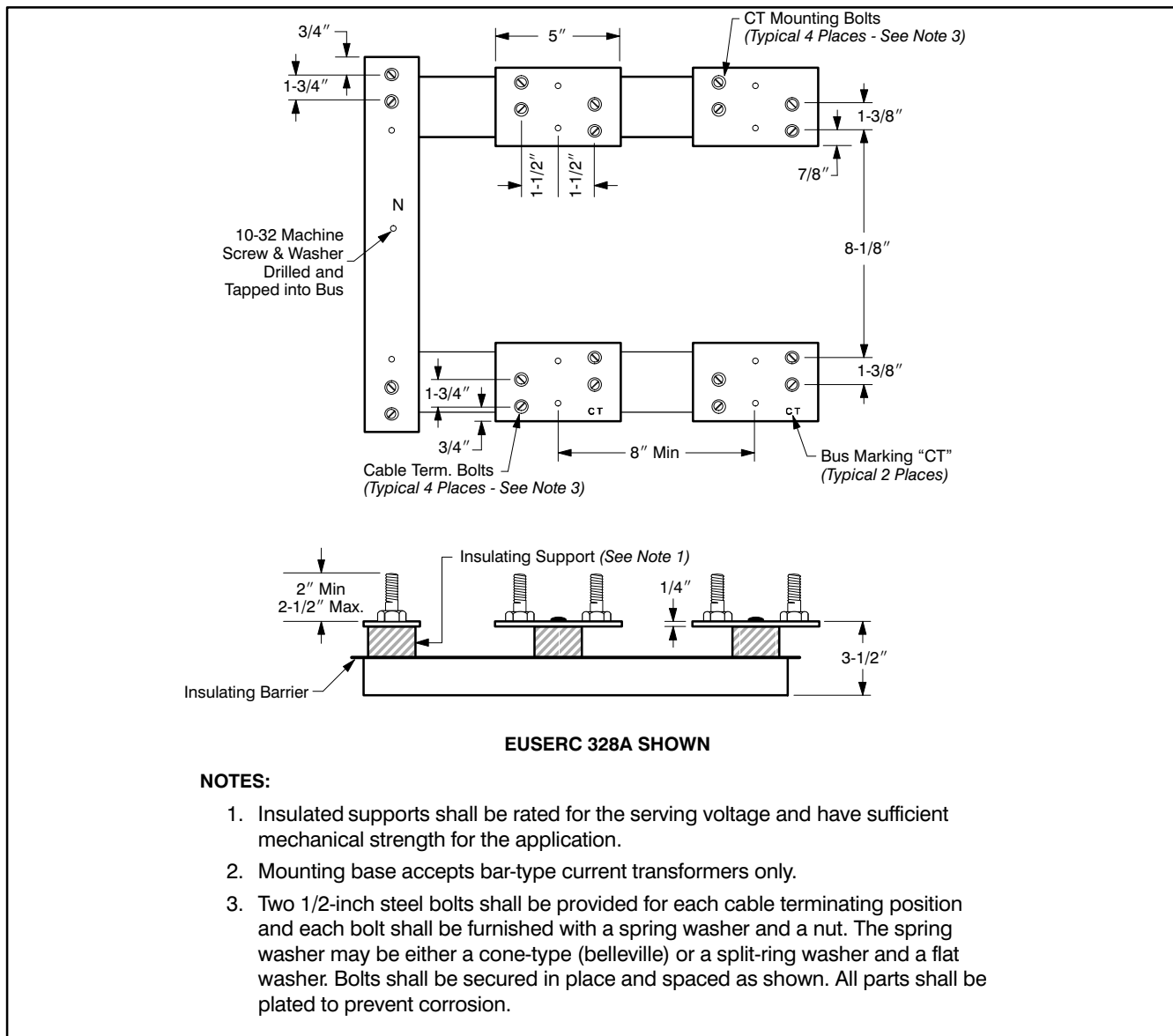


Figure 28 Single-phase CT mounting base bracket. EUSERC 328A (shown) or 328B

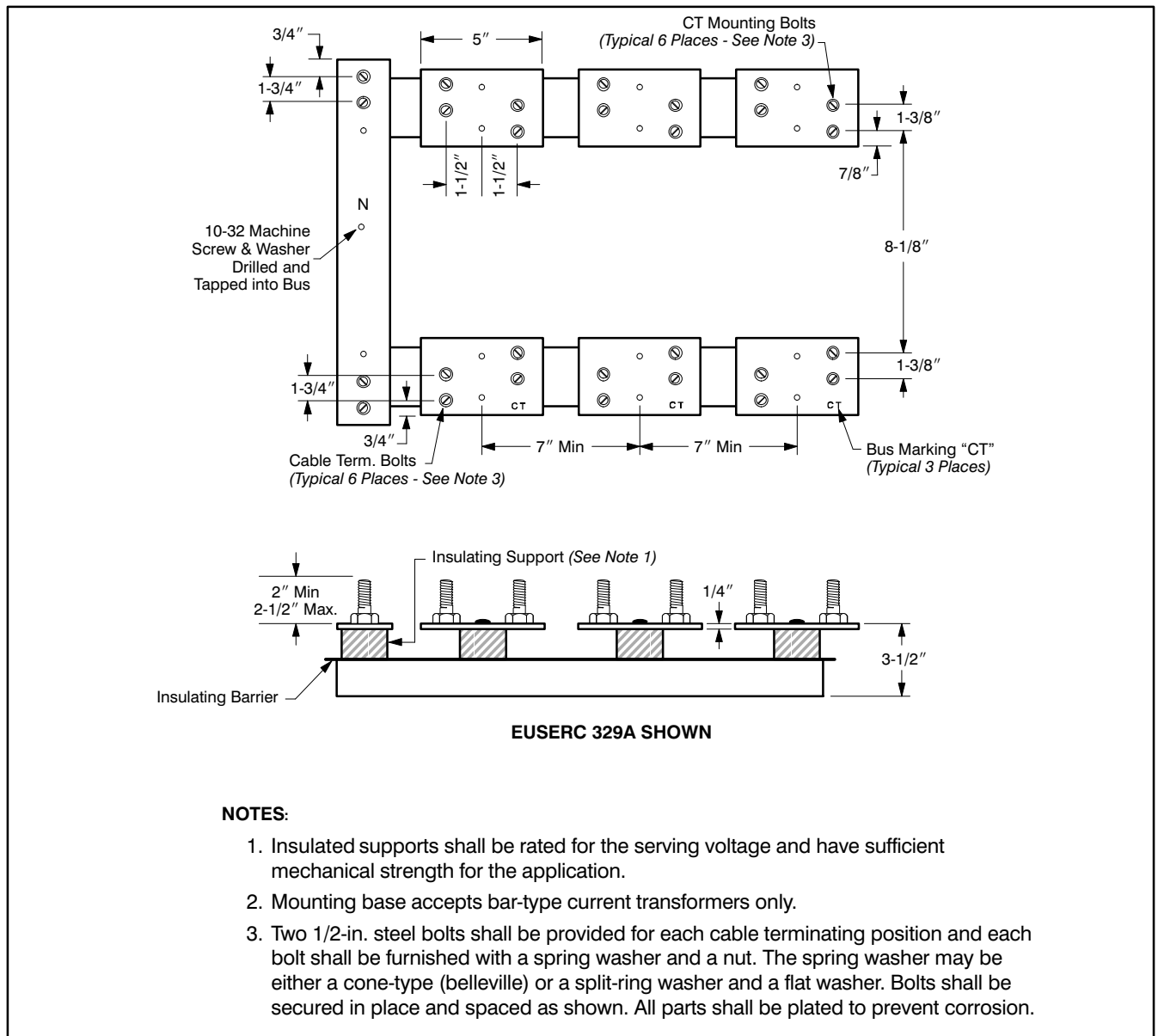


Figure 29 Three-phase CT mounting base bracket. EUSERC 329A (shown) or 329B

Customer requirements for switchboard metering (over 800 A)

A custom-built switchboard constructed to Equipment Utility Service Requirements Committee (EUSERC) specifications is required for services over 800 A. Switchboard metering may be used on services from 201-800 A, at your discretion.

Approval drawings required

Approval drawings shall be submitted for all switchboard metering prior to shipment from the manufacturer. One set of drawings shall be sent directly to the PSE Meter Department for their required approval.

Three-phase services

Three-phase services require 13-terminal meter bases/sockets mounted on the switchboard according to EUSERC 332 (see *Figure 31, Diagram B*), or mounted remotely and connected with approved conduit. The conduit shall terminate in the CT compartment and the test switch portion of the meter base/socket (see *Figure 31*).

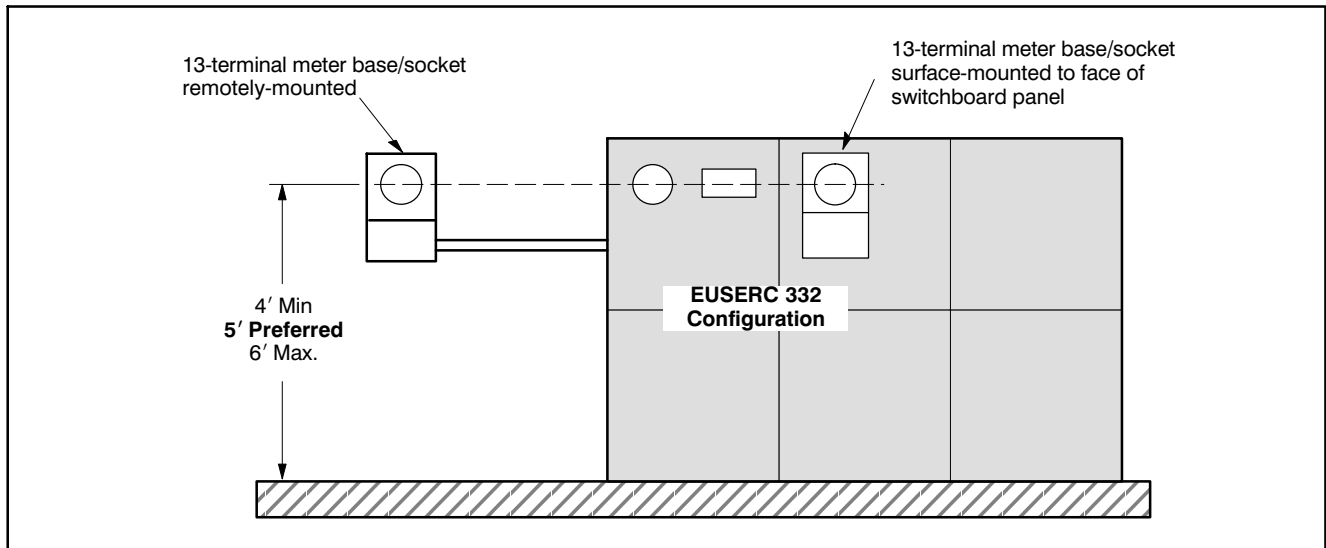


Figure 30 Options for switchboard meters

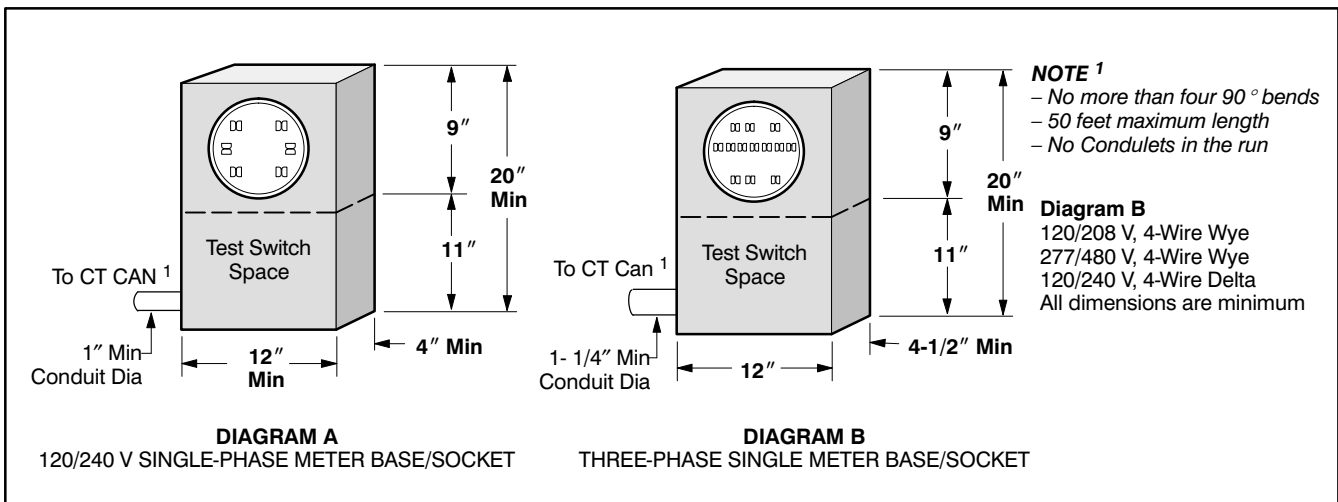
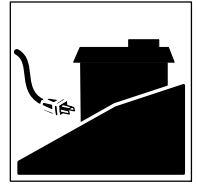


Figure 31 Instrument-rated CT meter bases/sockets

Chapter 5



Temporary Services

What this chapter contains

In this chapter you will find answers to questions such as:

- What are the installation requirements for underground and overhead service?
- What are the trenching requirements?
- How do I locate existing underground utilities before I dig?
- How do I get my temporary service energized?

Three-phase temporary service

If you require three-phase temporary service, your *Project Manager* will contact PSE's Meter Department.

Definition

A temporary (temp) service is a means of supplying electricity to your site for less than one year. Typically, a temp service provides power for the construction phase of your project, while provisions are being made for your permanent power system. Temp service is provided underground or overhead depending on available PSE facilities.

Obtaining your temporary service from existing power facilities

The following information applies to your temp service installation:

- Determine if you need overhead or underground service (see *Preface, Figure 1*).
- Call PSE and establish an account with PSE and place your temp service order.
- Obtain an electrical work permit.
- Order underground utility locate service by calling 811, at least two working days before you dig, or via the web (click ITIC at callbeforeyoudig.org).
- Prepare the job site and install your temp service equipment (service post, pedestal, and meter base).
- Obtain an electrical inspection approval of your temp service equipment (this is done by you or your contractor).
- Call PSE to request that your temp service be connected and energized after your electrical inspection is complete.
- Apply for permanent service.
- At your request, we will check your site to determine if engineering is required.

If you have any questions, please call **Customer Construction Services (CCS)** at **1-888-321-7779**.

Scheduling

Most temp services are connected to existing power facilities and engineering is not required. In these cases temp services are typically energized 3 to 5 days after your installation has passed inspection. Depending on complexity and work volume, time frames will vary.

Customer charge for service

Charges vary due to the type of system we have in your area. Your *CCS Representative* will explain current temp service fees.

Temporary meter base/socket requirements

You are required to provide a meter socket with the following specifications:

- A ring-type socket that includes a screw-type, stainless steel, or aluminum meter ring (snap-type rings must be stainless steel).
- Rated 120/240 V
- Single-phase
- Minimum rating of 100 A
- Maximum rating of 200 A
- Four jaws
- Underwriters Laboratory (*UL*) *approved*

NOTE: A 120/208 V single-phase service requires a 5-terminal meter base with the fifth terminal tied to the neutral bus conductor. A 277/480 V three-phase service requires an accessible disconnect ahead of each meter socket and a safety socket with a manual bypass.

If you would like a service of 201 A or greater, refer to the metering requirements in the *Electric Service Handbook for Commercial/Industrial/Multifamily Projects Permanent & Temporary Services*.

Temporary underground services

Temp underground service is available in PSE's service area where the existing power facilities are installed underground.

The process and cost of obtaining your temp underground service can vary, depending on the location of our existing facilities. If there is a power stubout, handhole, pedestal, or transformer located on your property (see *Preface, Figure 1*), engineering may not be required. Simply install your temp service facilities (see *Figure 32 and Figure 33*), obtain an electrical inspection, and call PSE to connect your temp service.

Meter location

To properly locate your temp meter pedestal, set the meter pedestal on your property no more than 5 feet from the transformer, stubout, handhole, or pedestal.

If a distance greater than 5 feet is required, please contact a *CCS Representative* for approval prior to construction.

Trenching and excavation requirements

It is the **customer's responsibility** to provide the trenching needed to connect to a power stubout (shown in *Figure 32*). The cable you provide is to be sized according to the NEC and have a minimum 24 inches of backfill coverage.

NOTE: A 4-foot-square excavation is required at the stubout to provide working room for our personnel to splice your cable to ours.

If the connection point to PSE facilities is a handhole, pedestal, or transformer; trench up to the nearest side and leave your wires exposed. If you discover any other conductors while digging your trench, please leave them covered. If further trenching is required, our personnel will complete it.

Remember to order underground utility locate service by calling 811, at least two working days before you dig, or via the web (click ITIC at callbeforeyoudig.org).

NOTE: Any trenching within 24 inches of existing underground facilities, must be done by hand.

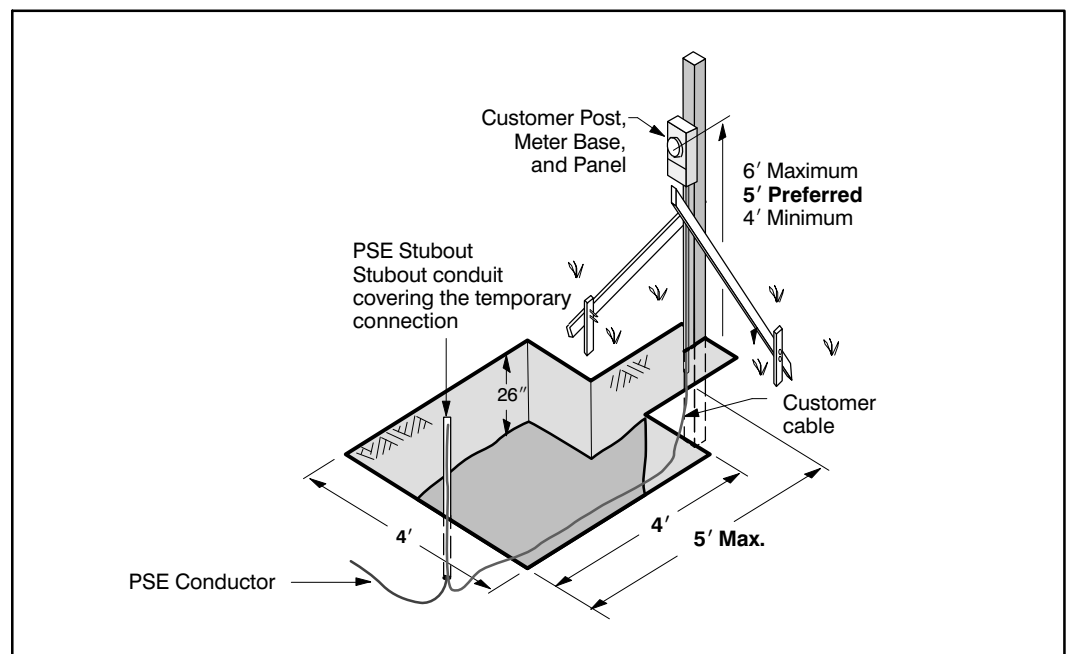


Figure 32 Trenching requirements for power stubout

Underground temporary service installation process

The following items must be completed before energizing your underground temp service:

1. Contact a *CCS Representative* at **1-888-321-7779**, and request your temp underground service.
2. Obtain an electrical work permit from the inspecting agency.
3. Order underground utility locate service by calling 811, at least two working days before you dig, or via the web (click ITIC at callbeforeyoudig.org).
4. Install your meter pedestal and meter base/socket in the appropriate location (see *Figures 32 and 33*).
5. Provide the appropriately sized conductor from your meter socket to PSE's connection point. Please leave 5 feet of extra cable at the stubout or handhole, and 10 extra feet at a transformer. Consult the NEC for the appropriate cable sizes.
6. Obtain and pass an electrical inspection.
7. Trench up to and expose the PSE connection point at the stubout, handhole, or transformer.
8. If trenching is provided, cover your cable except in the work pit where our personnel will be splicing your cable to ours.
9. After the above items are complete, call CCS at **1-888-321-7779** and inform a *CCS Representative* that your installation has been inspected and that you are ready for your temp service.

This installation shows a safe temp service. **Do not deviate from the installation standards without approval from your CCS Representative.** Doing so may extend the time frame for your service hookup.

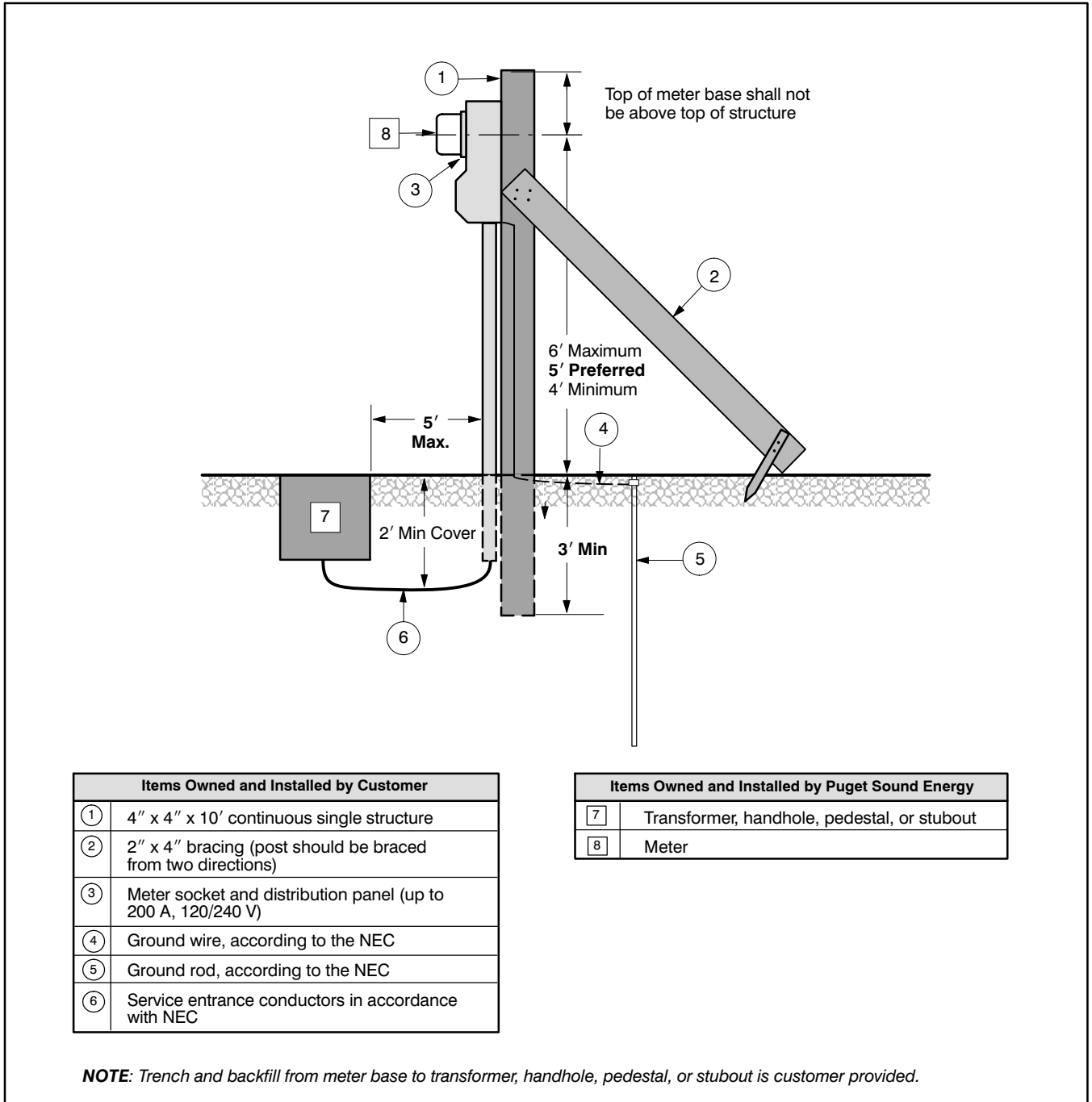


Figure 33 Temporary underground service installation

Temporary overhead services

Temp overhead service is available anywhere in PSE's service area where the existing electrical system is installed overhead.

The process and cost of obtaining your temp overhead service can vary depending on the location of our existing facilities. The least complicated and cheapest way a temp service can be installed is if a transformer is located on a pole alongside your property (see *Preface, Figure 2*). If this is the case, engineering may not be required. All you have to do is install your temp service equipment, have it inspected, and call **Customer Construction Services (CCS)** at **1-888-321-7779** to order your service. Once the above items are completed, your service will be connected within a few business days.

Meter location

Your temp meter post should be located on your property and within 70 feet of the PSE pole that will serve you. This limitation ensures that your temp service pole can withstand the weight of the conductor. If a distance greater than 70 feet is required, or if PSE's pole is on the opposite side of the street, please call CCS for approval **prior to construction**. A taller, stouter post with additional bracing could be required.

Service line path requirements

In addition to the meter post distance limitation mentioned above, please consider the service line path requirements:

- The path that the service line will take should not cross property belonging to other individuals.
- If the service line will pass through trees or brush, clear a path to allow our service personnel to run the line and to allow the lines to hang without contacting trees or limbs. Maintaining this clear path is the **customer's responsibility**.
- The service line path should avoid areas where vehicular traffic will occur, unless your temp service post height is increased to provide adequate **clearance** (see *Figure 34*).

Clearance requirements

The National Electric Code (NEC) and the National Electric Safety Code (NESC) have established minimum clearance requirements to maintain safe heights for electrical conductors over various terrains.

Figure 34 shows the clearance requirements for the types of terrain most commonly encountered.

The NEC and NESC require the lowest point of a service conductor to be at least 12 feet aboveground. The bottom of the **drip loop** must be a minimum of 10 feet above the ground.

You are required to provide a **point of attachment** on your service pole that will allow PSE to install the conductor and maintain the required clearances.

If you need further details, please consult the current issue of the NEC, or contact the state or local electrical inspector for your area.

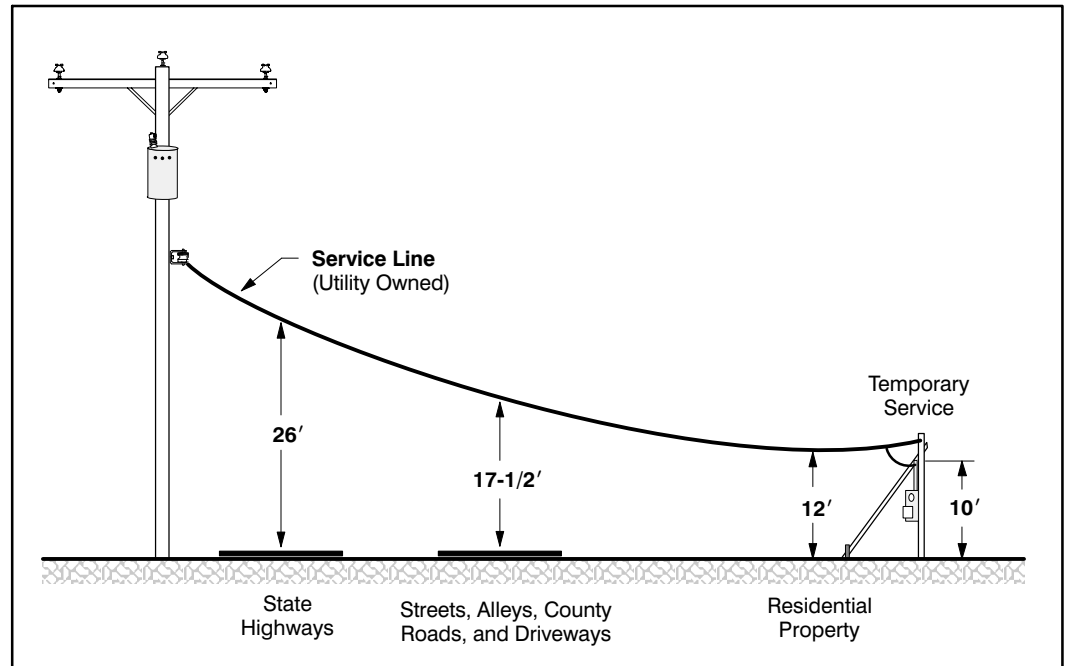


Figure 34 Minimum clearance requirements upon installation

Overhead temporary service installation process

The following items must be completed before we can energize your service:

1. Contact a *CCS Representative* and request your temp underground service.
2. Obtain an electrical work permit from the inspecting agency.
3. Install a *meter pole* and meter socket.
4. Obtain and pass an electrical inspection.
5. After these items are completed, call *CCS* and inform a *CCS Representative* that your installation has been inspected and that you are ready for temp service.

Figure 35 shows the standard temp overhead service installation that we recommend. The dimensions shown are the minimum acceptable.

This installation shows a safe temp service. **Do not deviate from the installation standards without approval from your *CCS Representative*.** Doing so may extend the time frame for your service hookup.

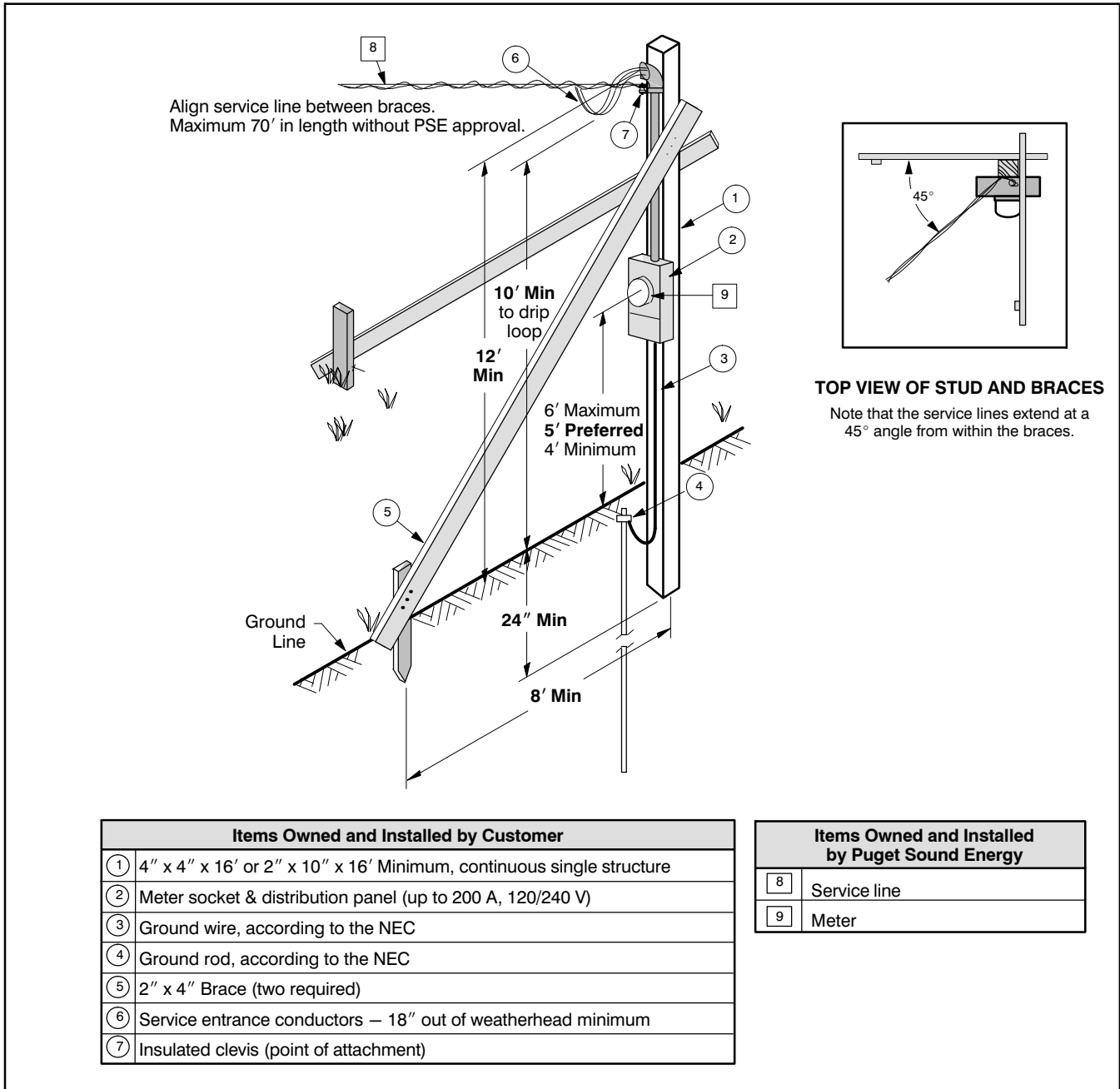


Figure 35 Temporary overhead service installation

Glossary



Clearance - A set distance between two objects.

Conduit - A listed or approved wireway with a smooth interior surface to permit easy drawing-in of the electrical conductors. A conduit may be metallic or nonmetallic, depending on its usage, in accordance with codes and Puget Sound Energy Standards.

Corrosion Inhibitor - Electrical joint compound used to retard oxidation of electrical connections.

Demand - The maximum average kilowatt load used by the customer for a specific period of time during the billing period.

Direct Burial - The installation of electrical conductors in a trench, without the use of conduit.

EUSERC - Electrical Utility Service Equipment Requirements Committee

Guard Post - A bollard or post designed to protect the meter installation or transformer from vehicular traffic.

Guying - Cables or braces used to relieve the strain of overhead conductors on masts and poles.

High Leg - (Also wild leg, delta leg) The phase leg that is at higher potential to ground than any other two-phase legs. This leg shall be identified in red.

High-rise Building - A structure meeting the definition set forth in the International Building Code.

Instrument Transformer - Current and/or potential transformers used in connection with metering equipment to monitor high current loads and/or high voltage potentials.

Keybox or Keycards - Permanently installed, locked box with keys enclosed, or a keycard screening monitor mounted on the outside of a building, for accessing the customer's premises to read, install, service, or remove Puget Sound Energy meters and/or electrical equipment during reasonable working hours.

Manual Block Bypass (Circuit-Closing Block) - A provision for paralleling the meter circuit, allowing the meter to be removed without interrupting service to the customer.

Meter Jaw - A spring-loaded receptacle installed inside a meter socket, interfacing the terminals of the meter to the source and load conductors of the service.

Meter Loop - Any provision in which an electrical meter may be installed. Does not include the service disconnect device.

Meter Pole - A pole which supports the metering equipment owned and maintained by the customer.

Meter Base/Socket - The mounting device consisting of meter jaws, connectors, and enclosure for accommodating socket-type meters. The mounting device may be either a single socket or a trough to accommodate more than one mounting unit.

Multifamily Building - A single structure comprised of two or more independent dwelling units having permanent provisions for living, sleeping, cooking, and sanitation.

Municipal or State Inspector - The qualified representative of a city or the State of Washington Department of Labor and Industries, who has been authorized by governmental agencies to inspect electrical service installations on their behalf.

NEC - National Electrical Code

Nonresidential Buildings - All structures that are not residential buildings, multifamily buildings, or where portions of such building is intended for commercial, retail, or general public activities.

Point of Attachment - The point at which Puget Sound Energy's service conductors are attached to the customer's premises by an approved insulated clevis.

Point of Delivery - The location on the customer's premises where Puget Sound Energy's circuit and the customer's system are interconnected.

RCW - Revised Code of Washington

Safety Socket - A three-phase self-contained meter base socket with provisions to de-energize the meter base without disconnecting the load.

Seal - The locking device used to secure meter and/or service entrance equipment to ensure safety and security for the unit.

Secondary Voltage - The lower voltage, after transformation, used to supply the customer with electrical energy. Normally less than 600 V.

Self-Contained - In reference to meter sockets: a device designed and rated to continuously carry the entire capacity of the service entrance equipment through the meter.

Service Entrance Conductors - Those conductors which extend between the customer's load center and point of delivery.

Service Entrance Equipment - Service conduit, conductors, weatherhead, meter base, enclosures, service disconnect, and load center.

Service Mast - The conduit above the meter used to provide mechanical protection for the service conductors and to support the service drop from PSE's system.

Temporary Service - An electrical service installed by Puget Sound Energy to provide power to a customer on a temporary basis (12 months or less).

WAC - Washington Administrative Code

Notes

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