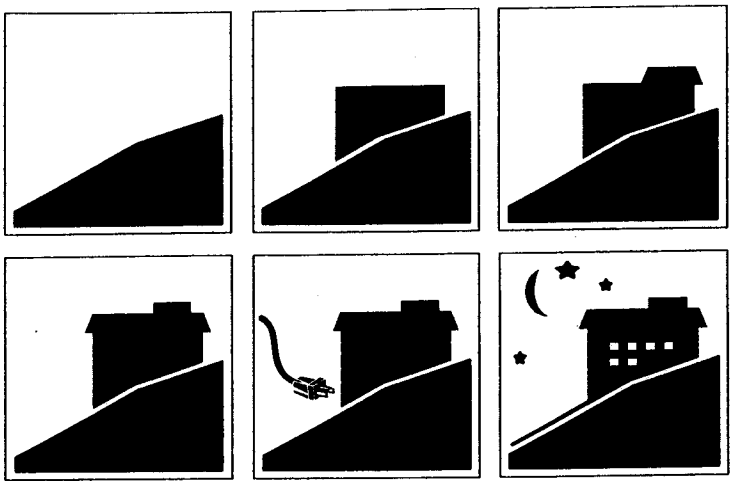
EXHIBIT NO. ___(GZ-4)
DOCKET NO. UE-051828/UE-051966
WITNESS: GREG ZELLER

BEFORE THE
WASHINGTON UTILITIES AND TRANSPORTATION COMMISSION

WESTERN VILLAGE, LLC, D/B/A WESTERN VILLAGE ESTATES, **Complainant,** **v.** **PUGET SOUND ENERGY, INC.** **Respondent.**	**Docket No. UE-051828**
WASHINGTON UTILITIES AND TRANSPORTATION COMMISSION, **Complainant,** **v.** **PUGET SOUND ENERGY, INC.,** **Respondent.**	**Docket No. UE-051966**

THIRD EXHIBIT TO THE PREFILED DIRECT TESTIMONY OF
GREG ZELLER, P.E.
ON BEHALF OF PUGET SOUND ENERGY, INC.

MARCH 8, 2006



August 2005

Electric Service Handbook

Commercial/Industrial/ Multifamily & Manufactured Housing Developments

PSE PUGET SOUND ENERGY

Form No. 1220 (Rev. 6)

Puget Sound Energy, Inc.
Standards & Compliance
P.O. Box 90868
Bellevue, WA 98009-0868
425-454-6363

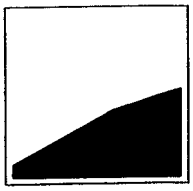
CUSTOMER SERVICE

Guarantee

Puget Sound Energy's pledge to you is simple:

- *We will connect new permanent service lines and meters when mutually agreed.*
- *We will reestablish existing gas and electric service when mutually agreed.*
- *We will keep gas equipment service appointments when mutually agreed.*
- *If we fail to keep these commitments, we will credit your account $50.*

Note: This guarantee applies in the absence of major storms, earthquakes, supply interruptions, or other adverse events beyond our control. In these cases, we will reschedule service appointments as quickly as possible.



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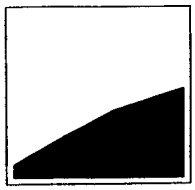


Introduction

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 manufactured housing developments, 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, contact please call our **Customer Access Center** 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
- Mobile home and manufactured housing parks
- 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 territory maps

For your reference, the Territory Maps in *Appendix A* provide general boundaries for PSE's gas and electric service. A ***Customer Construction Services (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.

Electrical inspections for most areas in the PSE service territory are done by the State of Washington Department of Labor and Industries. Electrical inspections are performed by city personnel in the following cities:

Bellevue	Mercer Island
Bellingham	Olympia
Des Moines	Redmond
Federal Way	Renton
Lacey	SeaTac

The phone numbers for all of these offices can be found in the blue Government pages of your local phone book.

NOTE: Electrical inspections conducted on tribal lands are performed by tribal personnel. Electrical inspections conducted on federal property are performed by the federal government.

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

The time needed for 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 *Customer Construction Services Representative* at **1-888-321-7779** for current construction scheduling.

Other electric service information

If you need ***temporary services*** during the construction of your facility, refer to PSE's *Electric Service Handbook for Temporary Service.*

If you need information on the installation of new or altered electrical services for single-family homes you will find it in the *Electric Service Handbook for Permanent Single-Family Residential Services.*

All of these 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 our website for the following information online:

- New construction services, applications, and other information via e-mail:
  www.pse.com/account/onlinecare/onlinecare.html
- To download a copy of this manual:
  www.pse.com/energy/brochuresonline.html
  and click on the "Construction Advisor" link.

If you have any general billing questions regarding your account or questions about gas or electric service installation, please call our **Customer Access Center** at **425-454-2000** or toll-free at **1-888-225-5773.**

PSE's Service Providers

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

Overview:
New Electric Service Hookup to Existing PSE Power Facilities
for Commercial/Industrial/Multifamily/Manufactured Housing Developments

This list is a quick reference of the basic information needed to bring a new electric service to your building. This information applies only if PSE has existing power facilities in your area. If electric power is not readily available, PSE will need to engineer your project. If you have any questions, please call:

CUSTOMER CONSTRUCTION SERVICES

Puget Sound Energy's ***Full Service*** *Number:* ***1-888-321-7779***

Customer Responsibilities:

- Determine if you want overhead or underground service.
- Obtain an electrical work permit.
- Determine the service rating you want (for example, 200 amp or 400 amp).
- Determine an approved meter location (*Chapter 5, Section 1*).
- Notify other utilities of your project.
- Call the Utilities Underground Location Center (UULC) two full working days prior to digging: **1-800-424-5555**
- Provide a clear path/trench for your service line and get approval of vault entrance location.
- Furnish all required service entrance equipment (*Chapter 5, Section 1*).
- Obtain an approved electrical inspection.
- Contact PSE to establish an account, and order your service (*Chapter 2*).
- After the electrical inspection has been completed and approved, notify PSE to energize your system.

Puget Sound Energy's Responsibilities:

- Install your overhead service line or connect your customer-provided underground service cable.
- Install your meter.
- Energize your system.

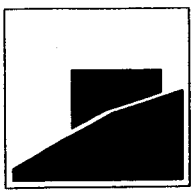
Scheduling:

- 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 *Customer Construction Services Representative* for current rate information.

Chapter 2



Steps to a Smooth Installation

The installation process

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

- Establish an account with PSE by calling the Customer Access Center 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 wire.
- Obtain an electrical inspection from your local governmental agency.
- Call PSE and request that your service be energized.

Setting up an account

Before PSE can provide new service, you must establish an account with us. Simply call our Customer Access Center 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. The fee to establish a new account is $5.00. This fee will appear on your first permanent service bill.

Submitting an Application for Service

Service can be obtained for your project by calling Customer Construction Services (CCS) at **1-888-321-7779** and submitting *Form 1378, Application for Electric Service, Nonresidential Project; Form 2799, Application for Service, Individual Residential Customer; or Form 1412, Application for Service, Multifamily Project* that is as complete as possible (forms are located in the back pocket of this handbook). Please 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
- Street light requirements

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

Service voltages

We offer the following standard voltages for nonresidential customers:

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*** is existing at the location at the time of applying for service.

† Available for loads up to a maximum demand of 100 kW. Larger loads may be served, if determined feasible by a PSE engineer. All motors shall be rated at 7-1/2 HP or less.

Locating underground utilities

If you are trenching or excavating, underground locates are required. Call the Utilities Underground Location Center (UULC) **two full working days before you dig**. The UULC ONE CALL number is: **1-800-424-5555** (refer to ***RCW*** 19.122).

The UULC will notify each member utility or a locating service, who will locate the underground facilities in your area. This service is free. The locator uses the following color codes to identify underground utilities:

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

NOTE: Any digging within 24 inches of the location marks must be done by hand.

Cost for service

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

Additional service costs

Voltage flicker and size of transformer

For multifamily buildings with elevators or significant commercial loads, PSE's voltage flicker standard requires that the maximum voltage dip for such buildings be limited to 2 percent or less at the ***point of service***.

For commercial/industrial customers, if a transformer serves an individual (single) commercial/industrial load, no flicker maximum is specified. If a transformer serves multiple customers, a maximum of 2 percent or less at the point of service common to all customers is specified.

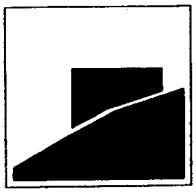
In your *Application for Service* (*Form 1378*, *2799*, or *1412*), you must provide PSE with the starting currents for the largest single-phase and three-phase motors. After we determine the size of transformer required to serve the facility's new load, we will calculate the percent voltage flicker (from the motor's starting current) at the point of service (transformer secondary bus) and provide that number to you. If this voltage dip exceeds 2 percent, the transformer size must be increased to reduce the dip to 2 percent or less. You will be responsible for the difference in cost of the larger transformer.

Voltage drop calculations

Because you own the underground service conductors, you are responsible for calculating the overall voltage drop to individual customers and determining what is an acceptable level (typically, no greater than 4 percent) for your facility. If you determine that the voltage drop is unacceptable, **you must decide** on a solution. Some possible solutions are:

- Run separate services from PSE's transformer for the residential and motor loads.
- Modify or upgrade your own equipment or service conductors.
- Pay PSE to increase the size of our transformer.
- Pay PSE to provide a second transformer.

Chapter 3



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 system equipment: 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 conductors*** * 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. See *Chapter 5, Section 3, Current Transformer (CT) Metering (up to 800 amps)* section for more information.

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

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

Multiple metered services

If a residential class customer installs a bus gutter or a meter-pak enclosure to set two meters (one meter for the house, the other for the shop, barn, garage, etc.) **on a single piece of property being billed to the same individual**, PSE will run a single service line at the customer's request provided that a single line will accommodate the kW load and limit the voltage drop and voltage flicker to within PSE's standards.

NOTE: PSE will **not** run a single service line to a bus gutter or meter-pak that serves multiple residential class customers residing on differing properties with separate legal ownership.

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. Contact CCS to determine where your underground service will originate.
3. Complete *Form 1378, Application for Electric Service, Nonresidential Project*; *Form 2799, Application for Service, Individual Residential Customer*; or *Form 1412, Application for Service, Multifamily Project* (forms are located in the back pocket of this handbook). Supply site drawings and load information to your *CCS Representative* (see *Chapter 2, Submitting an Application for Service*).

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

Cable limits

The maximum number of secondary conductors allowed for a specific transformer size is limited to those listed below in *Table 1.* Any other combinations should be confirmed with your *CCS Representative.*

Table 1 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

Service trench

Your service trench must meet state and local regulatory requirements.

Trench width for PSE facilities

Minimum trench width is 18 inches. 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, gas lines, and other utility-owned conduits/lines in the trench.

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.

See *Form 2809, Excavation Requirements for Joint Utility Mainline Trench*, for trenching requirements with a gas line present.

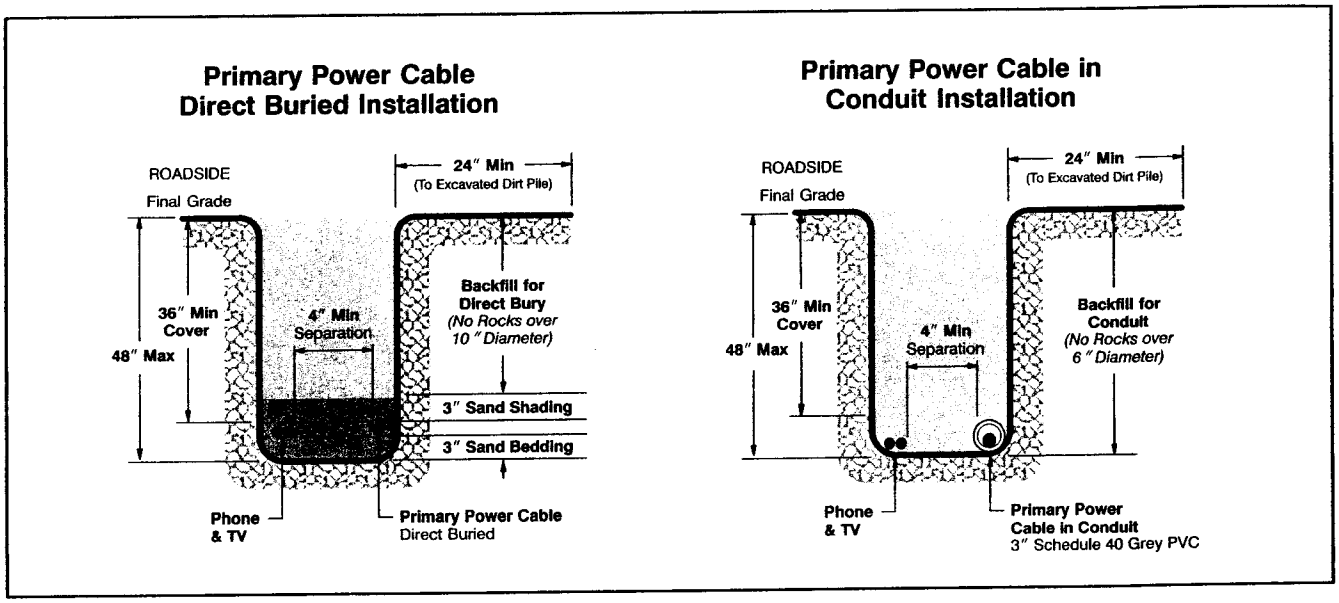


Figure 1 Typical joint utility trench with primary voltage cable on your private property (Cross Section View)

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 right-of-way on PSE's behalf, the governing jurisdictions issue public roadway use permits to PSE.
- 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 obstructions, sharp objects or rocks larger than 1/2 inch.
- 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.

NOTE: Trenches or vault excavations that are 4 feet deep or greater require special sloping. Contact your PSE *Project Manager* for these requirements.

Trench backfill and restoration

PSE will **not** energize its facilities until backfill is completed.

You are responsible for the following:

- Providing a minimum 3-inch layer of clean backfill (with rocks no larger than 1/2 inch and no sharp objects) placed above power cable or conduit(s). The remaining trench shall be backfilled with soil that is free of rocks larger than 6 inches and foreign objects.

  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 3-inch layer of sand bedding below the utilities before backfilling, as illustrated in *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.

CAUTION *Do* **not** *use a Hoe-Pac directly over the power conduit(s) until at least 30 inches of backfill is in place, so that the compactor will not damage the cables or conduit. Do* **not** *penetrate the soil deeper than 3 inches during compaction with a backhoe compactor.*

Vault excavation requirements

You are responsible to:

- Excavate the vault or handhole location. The most commonly used vault types and the required excavation dimensions are as shown in *Figures 2 through 5*.
- Supply and install 6 inches of crushed rock to be used as the vault base.
- Backfill the excavation to finished grade at 2 inches below the vault top.
- Install a felt joint around the vault top or cover when concrete is poured up to the vault, such as when the vault is to be in a sidewalk.
- Contact your *CCS Representative* for the proper installation procedure for vaults installed in concrete or asphalt where there is pedestrian or vehicular traffic.

Conduit installed at vaults

You are responsible to:

- Grout around service conduits that enter into PSE vaults (except for vault types shown in *Figure 3*).
- Seal service entry conduit to prevent water or other items from entering into your service panel at PSE's vault.
- Contact your local PSE Customer Construction Services (CCS) office for entry location approval and procedures when entering existing vaults with conduit.
- Install the service conduit a few inches into the single-phase transformer vault access hole (*Figure 3*), or elbow the conduit up inside the vault and attach it to the conduit strut support closest to the back of the transformer (*Figure 3*). Call your *CCS Representative* for PSE's standard method of attachment.

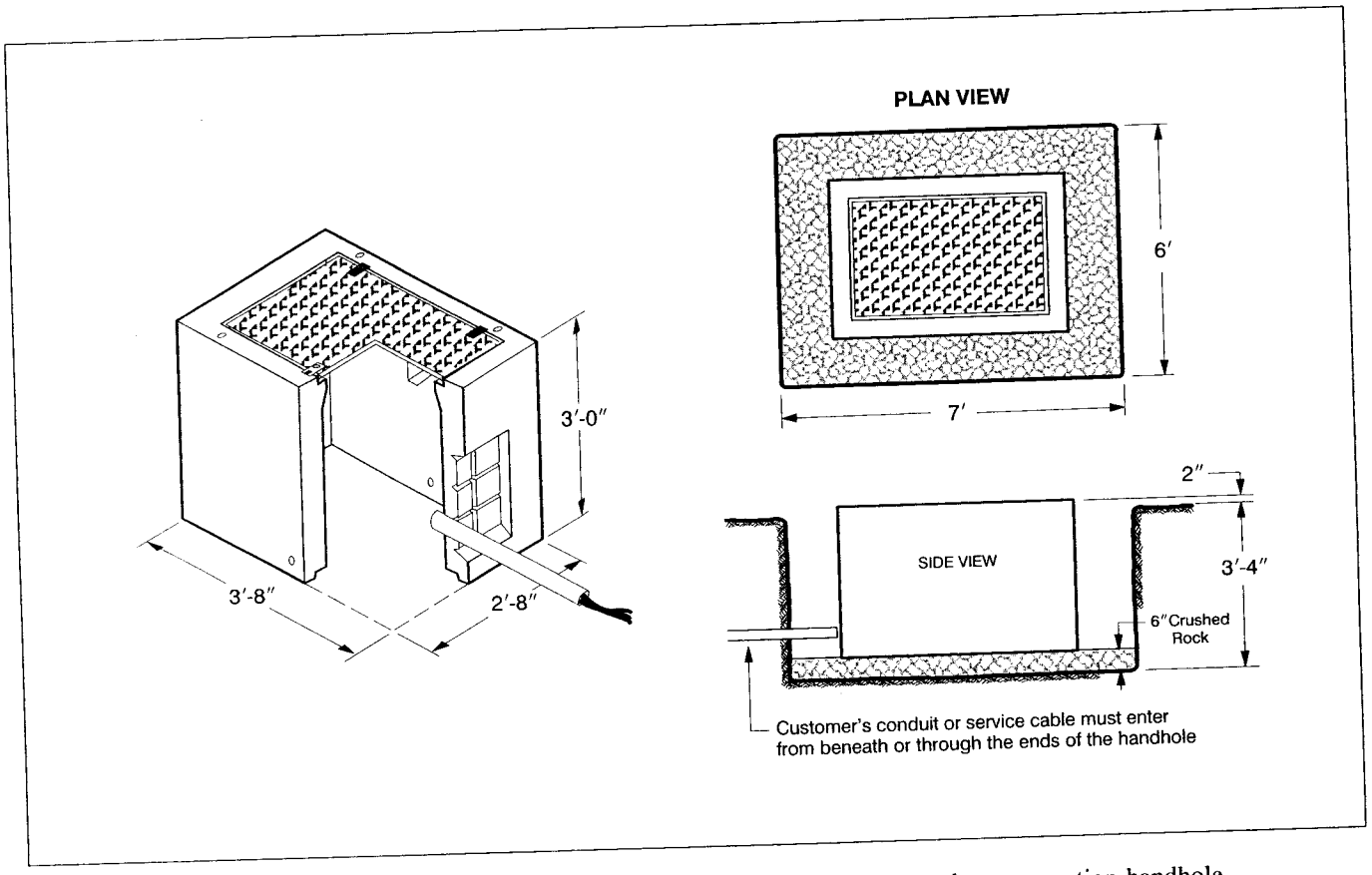


Figure 2 Dimensions and excavation requirements for a small, secondary connection handhole

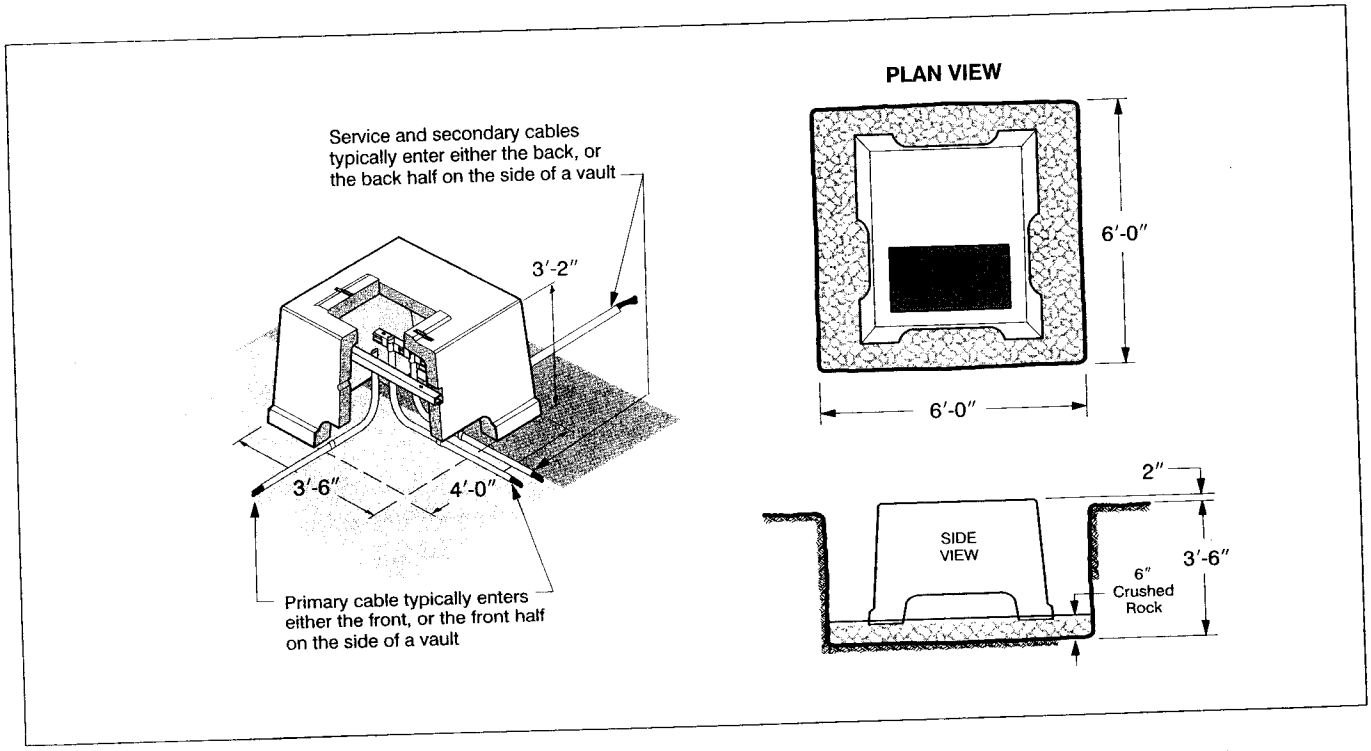


Figure 3 Dimensions and excavation requirements for a single-phase padmount transformer vault

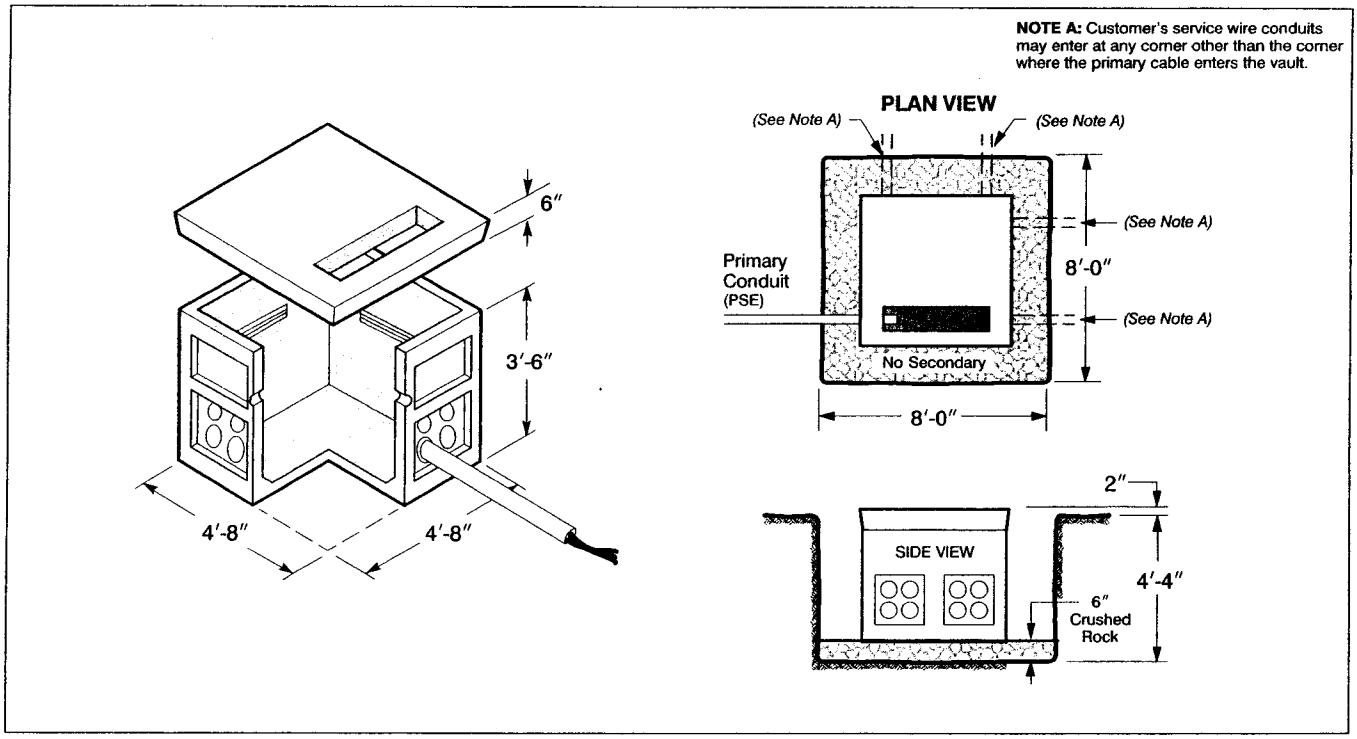


Figure 4 Dimensions and excavation requirements for a three-phase padmount transformer vault, 300 kVA or less

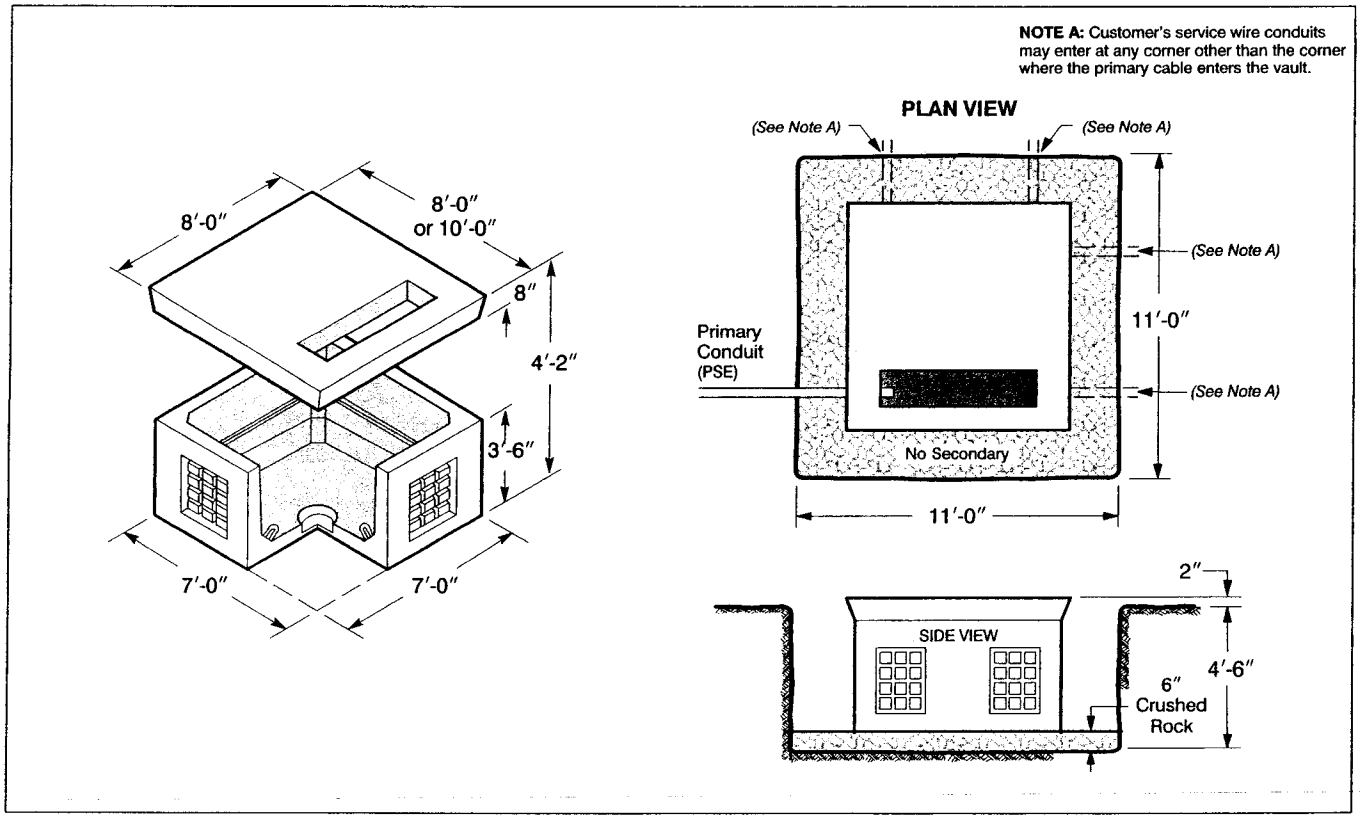


Figure 5 Dimensions and excavation requirements for a three-phase padmount transformer vault, 500 kVA and larger

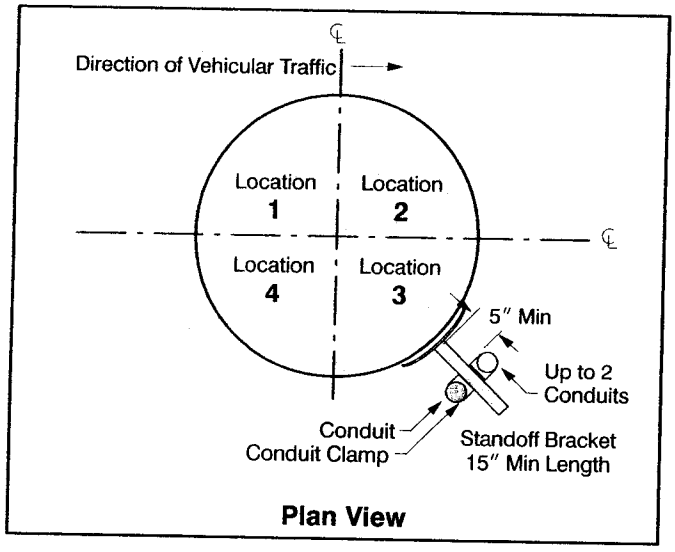
Customer service line conduit attached to PSE power pole

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

Attach conduit riser(s) in Location 3 shown in the Plan View of *Figure 6*, when no other risers exist on the pole. For the location of the riser(s) other than this, contact your *CCS Representative* or your *Project Manager* for approval prior to installation.

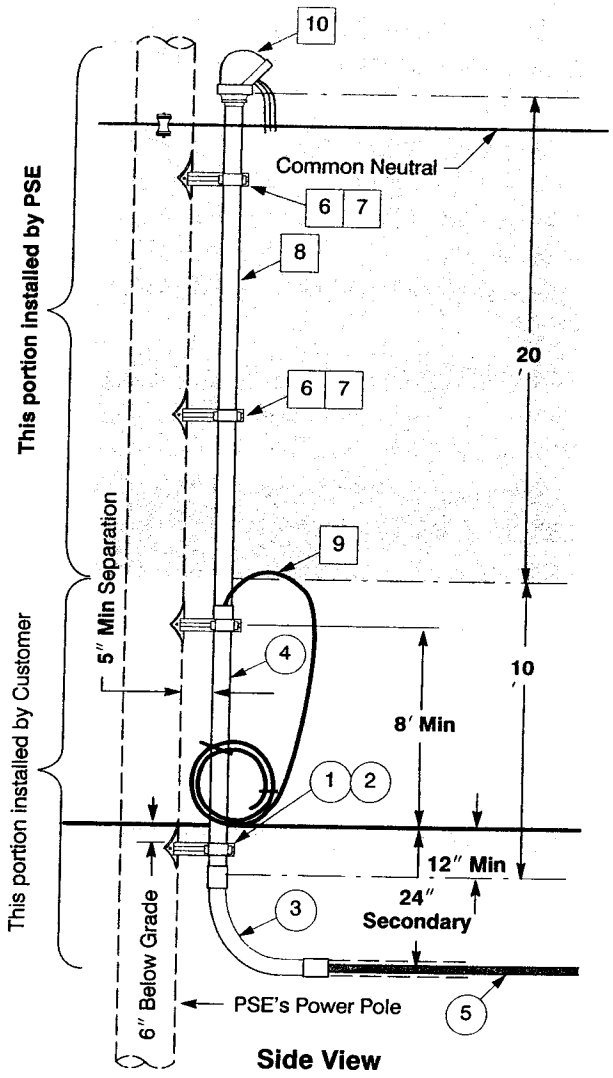
NOTE: All installation work performed on the pole above 10 feet from grade shall be done by electric utility crews.

When 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. Call PSE's Customer Construction Services for coordination and guidance before attaching service conduits to PSE power poles.



Items Provided and Installed by Customer	
①	Up to two 15″ min. long standoff brackets
②	Up to two conduit clamps
③	Up to two 90° PVC bends (2″, 3″, 4″, or 6″ preferred)
④	Up to two Sch 40 PVC 10 ft conduits (2″, 3″, 4″, or 6″ preferred), or Sch 80 when required by NEC.
⑤	Service cable (up to two runs)

Customer-Provided Items Installed by PSE	
6	Up to two 15″ min. long standoff brackets
7	Up to two conduit clamps
8	Up to two 20 ft sch 40 PVC conduits
9	Service cable (final 30–40 ft; up to two runs)
10	Weatherhead



NOTES:
All customer-provided material must be on site for PSE to install.
Leave service cable (item 9) coiled for PSE crew to install through the top 20 ft riser section.

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

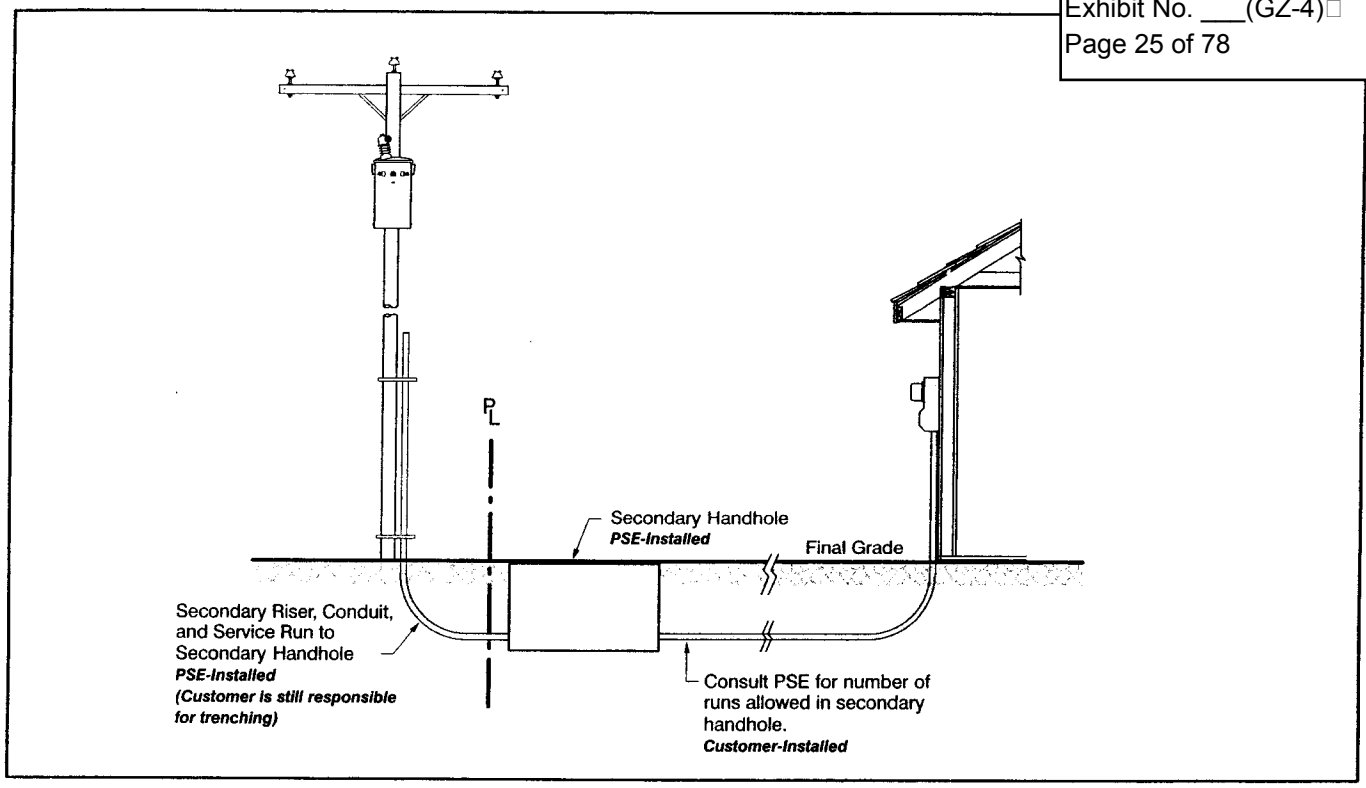


Figure 7 PSE-installed underground connection handhole

Customer wiring to energized PSE transformers

A customer's electrician who is installing commercial service wire and conduits into energized transformers shall coordinate such work with PSE to ensure a safe installation before the work begins. Depending upon the specific work being done, PSE will either de-energize the transformer, provide a journeyman lineman to assist with the installation, or allow the electrician to proceed with certain work unassisted.

Single-phase minipad transformers

The customer's 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, the customer shall provide a minimum 24-inch radius PVC bend for PSE to attach to the unistrut.

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

- After the transformer has been de-energized; or,
- 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 served.
- Leave no more than 8 feet of wire 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 wire into three-phase transformer vaults only:

- After the transformer has been de-energized; or,
- 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 2* and shown in *Figures 8* through *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 2 Padmount transformer clearances

Feature	Clearance Distance from Transformer
Combustible walls (including stucco)	10 ft (3 ft from a combustible wall using a reduced-flammability transformer)
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 ft
Fire sprinkler valves, standpipes, and fire hydrants.	6 ft
Doors, windows, vents, fire escapes, and other building openings.	10 ft
The water's edge of a swimming pool or any body of water.	15 ft
Individual domestic and irrigation wells.	100 ft
Facilities used to store hazardous liquids or gases (e.g., service station fuel storage tank filler openings or emergency generator fueling points).	10 ft
Facilities used to dispense or store hazardous liquids or gases (e.g., service station gas pumps or propane bulk dispensing tanks).	20 ft
Natural gas meter pressure relief vent opening.	3 ft

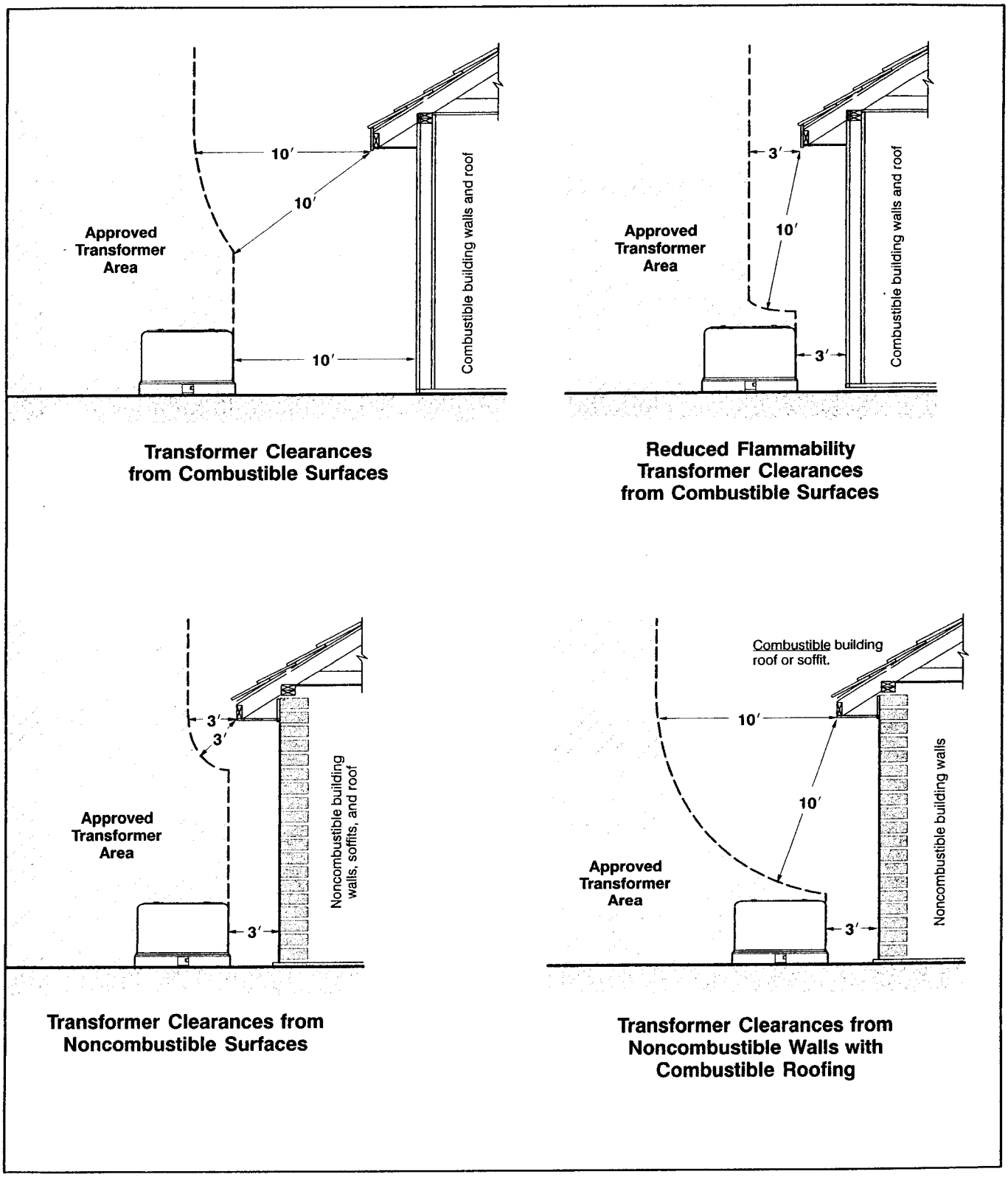


Figure 8 Clearances for transformers from structures

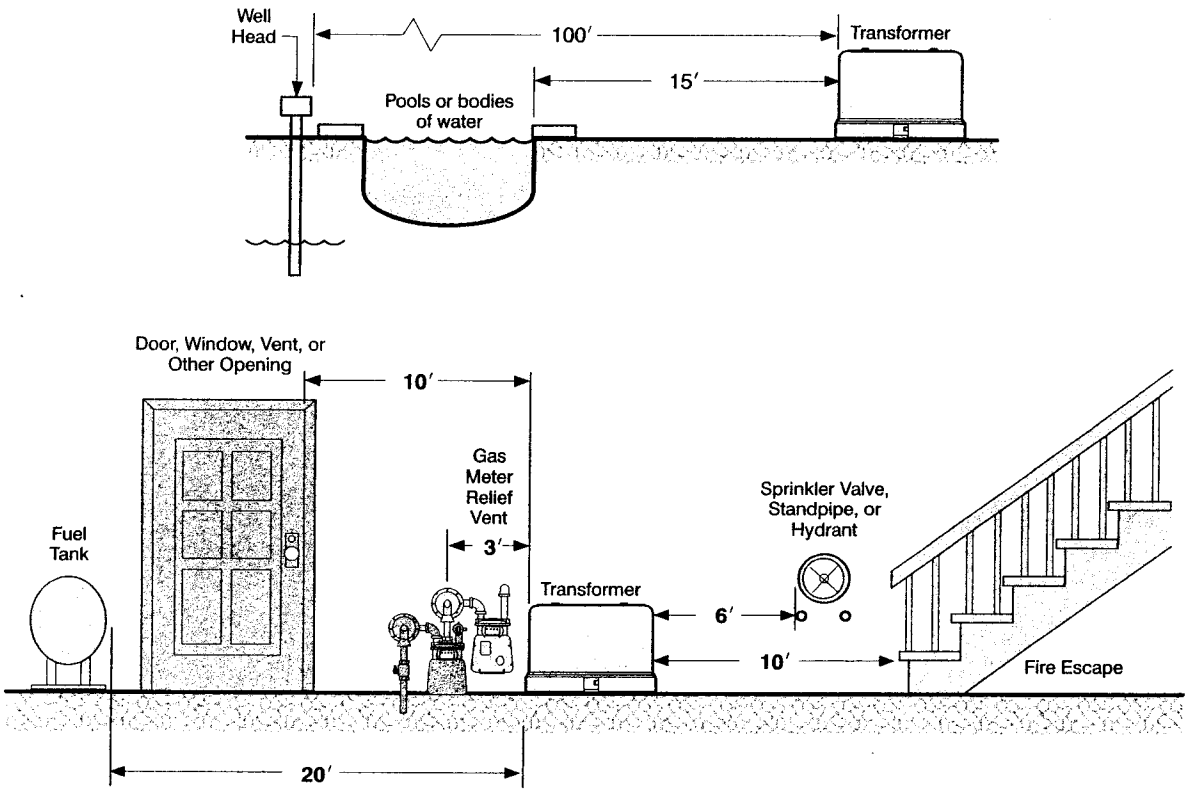


Figure 9 Clearances for transformers

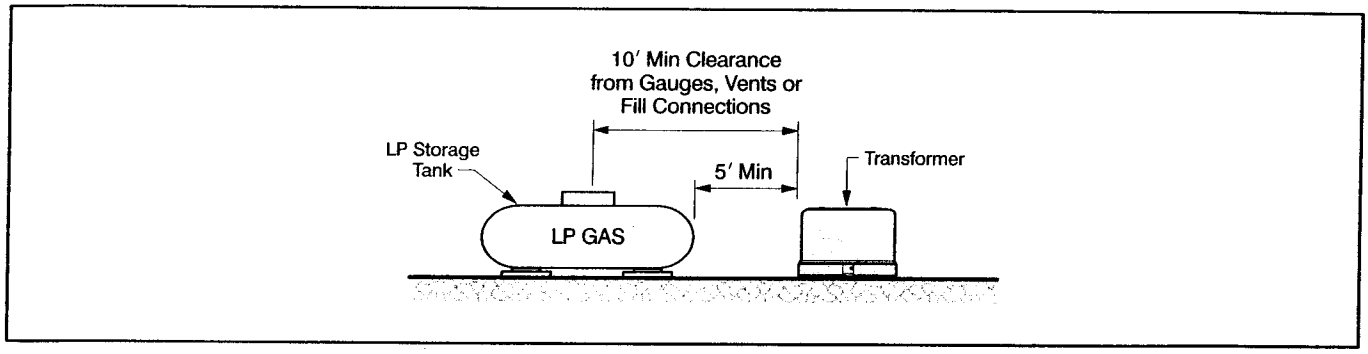


Figure 10 Minimum clearances from transformers to Liquified Propane (LP) and hazardous liquid storage tanks

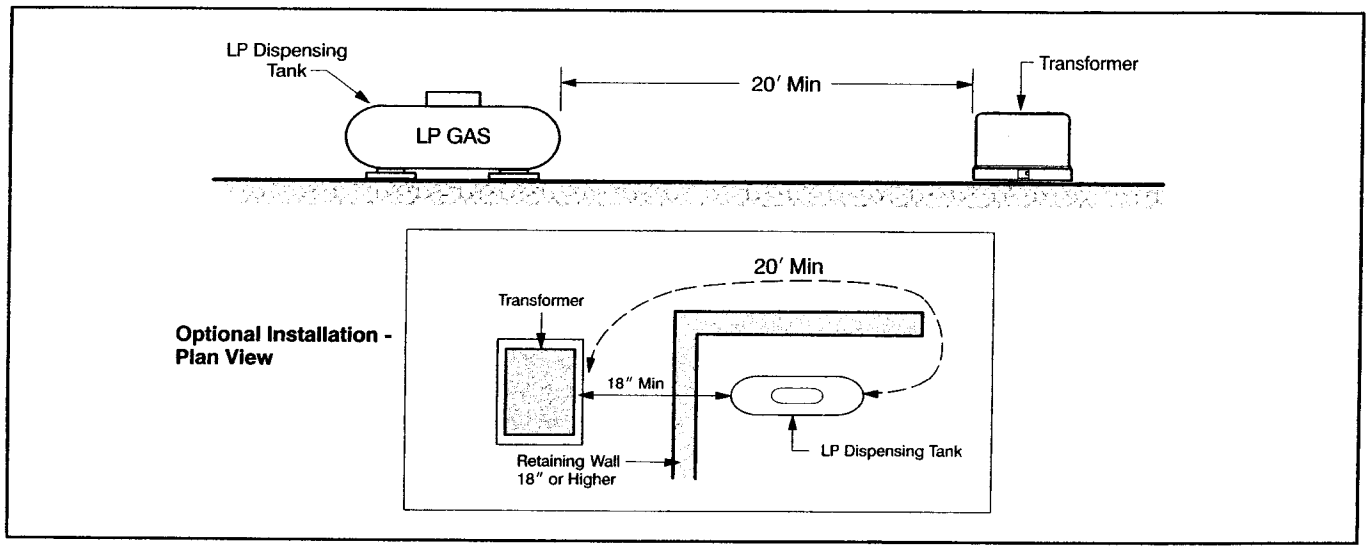


Figure 11 Minimum clearances from transformers to LP and hazardous liquid dispensing tanks

Landscaping and other obstacles

Landscaping and other obstructions shall not encroach on the clearances specified in *Figure 12*.

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 (*Figure 12*). A minimum of 3 feet of clear working area for subsurface equipment and 5 feet for padmount equipment (*Figure 13*) shall be provided on the sides of the electrical equipment without operating compartments (including sides with cooling fins).

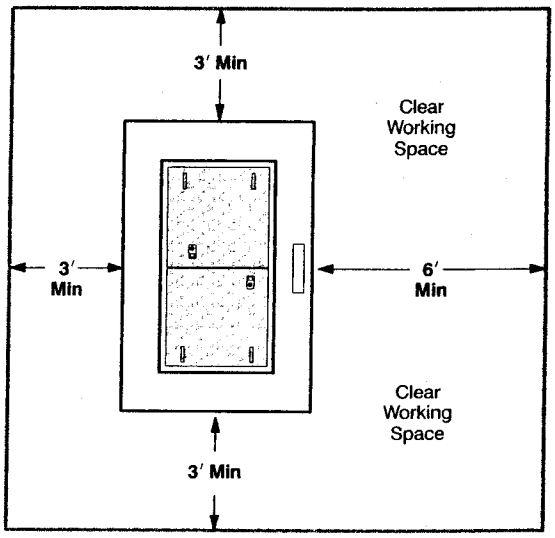


Figure 12 Plan view of subsurface equipment work space

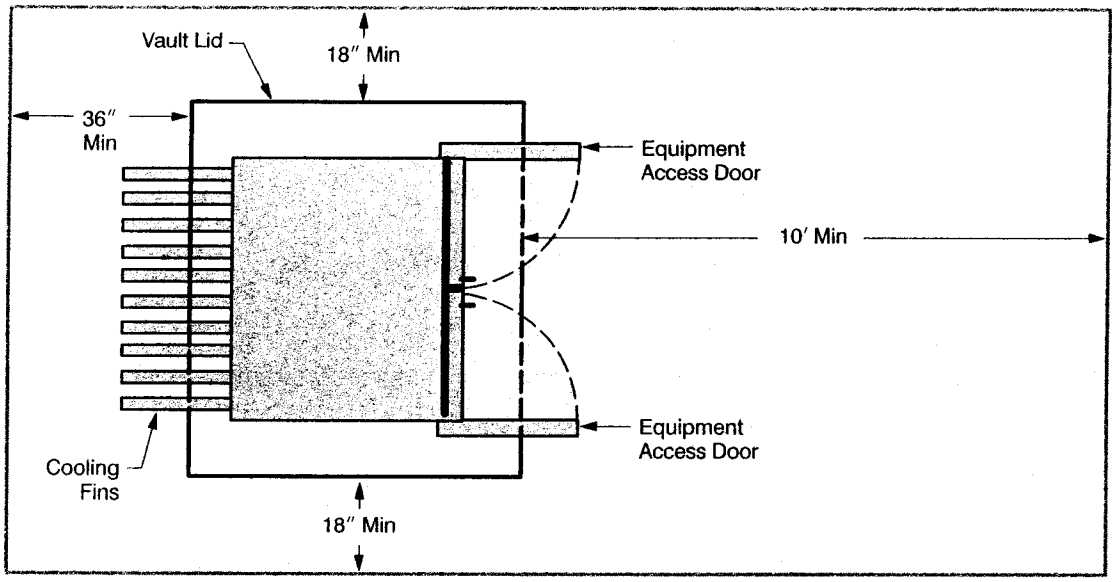
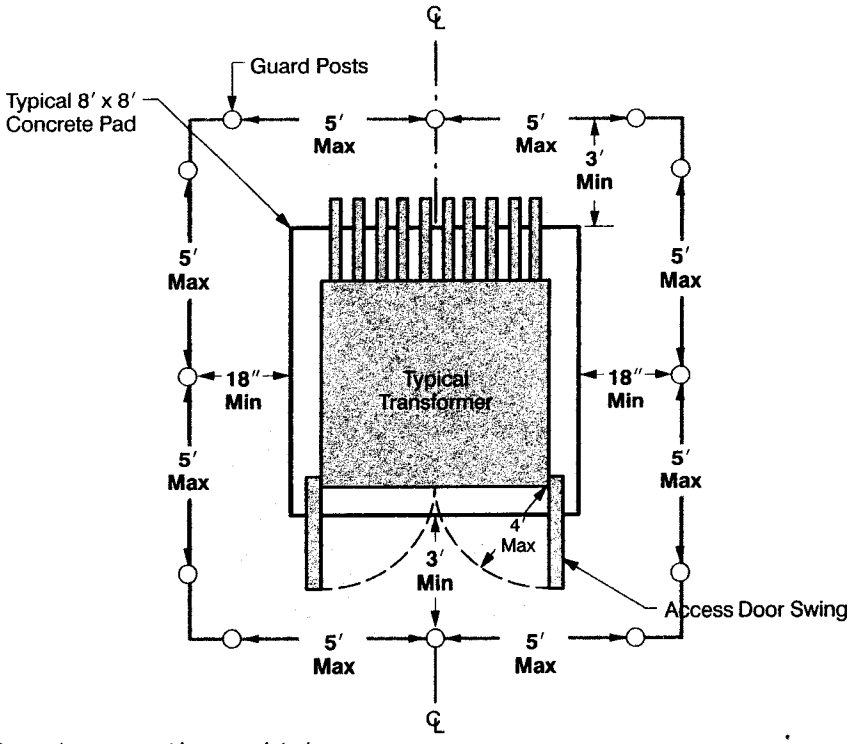


Figure 13 Plan view of padmount equipment work space

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 14.* **You are required** to supply and install these guard posts or pay PSE to supply and install them.



NOTE: Installation of guard posts must be completed before the primary cable is installed and energized.

Figure 14 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 diameter. The concrete shall have a minimum compressive strength of 3,000 psi after 28 days.
- Precast steel-reinforced concrete post, 6 feet x 9 inches diameter. Available from Utility Vault Company, Auburn, WA; or PIPE Inc., Tacoma, WA.
- Set post 30 inches deep in undisturbed soil. If soil has been disturbed, use concrete to stabilize the post.
- Backfill the holes with concrete.

Figure 15 illustrates both styles of guard posts.

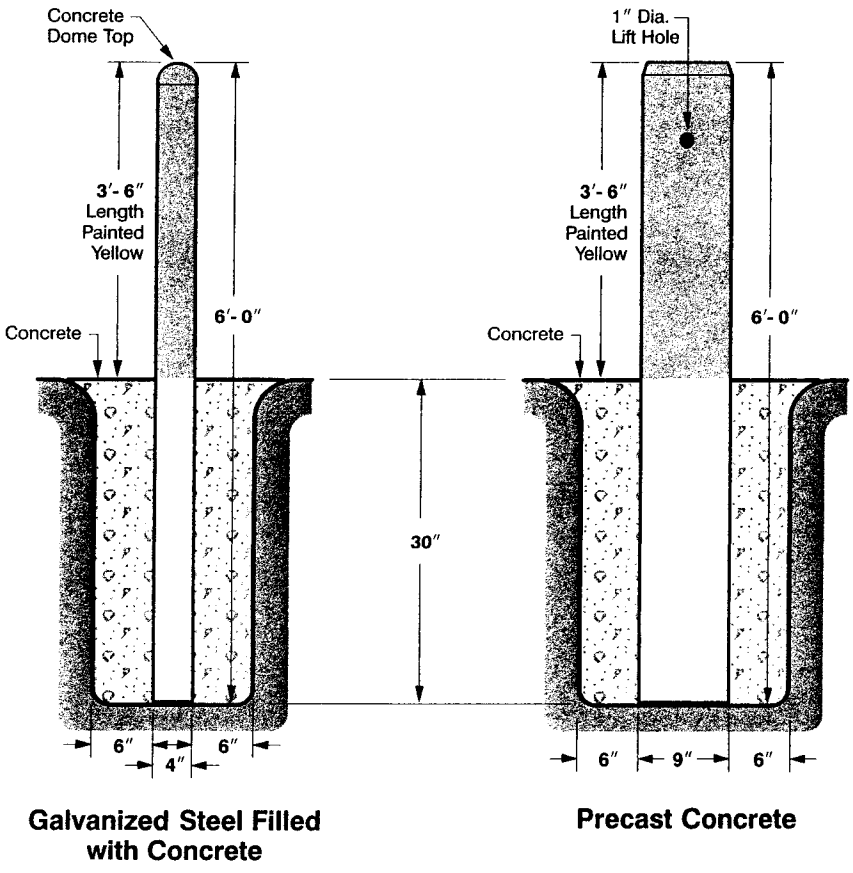


Figure 15 Typical guard posts

Fault current levels

The maximum available short-circuit current at the transformer's secondary connection point for most commonly used padmounted transformers installed by PSE, is shown in *Table 3*. For additional transformer types and sizes contact your *CCS Representative.*

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

Table 3 Maximum short circuit current (in amps) for PSE's most commonly used transformers

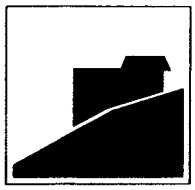
Single-Phase Transformers, Padmounted

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

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

Chapter 4



Overhead Services

This chapter provides you with information on PSE's 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 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. See *Chapter 5, Section 3, Current Transformer (CT) Metering (up to 800 amps)* 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. Contact CCS to determine where your overhead service will originate.
3. Complete *Form 1378, Application for Electric Service, Nonresidential Project*; *Form 2799, Application for Service, Individual Residential Customer*; or *Form 1412, Application for Service, Multifamily Project* (forms are located in the back pocket of this handbook). Supply site drawings and load information to your *CCS Representative* (see *Chapter 2, Submitting an Application for Service*).
4. Determine an approved meter location (see *Chapter 5, Section 1, Basic Metering Requirements, Meter locations*).
5. Verify that the ***service mast*** height requirements have been met.
6. Provide and maintain a path, clear of obstructions, between PSE's pole and your service mast.
7. Provide payment for any preconstruction costs determined by your *CCS Representative*.
8. Install the required service equipment.
9. Provide and install service entrance conductors. (Leave a minimum of 18 inches exposed at the weatherhead.)
10. Connect the meter sockets and permanently label them to indicate the part of the premises they serve, such as unit number.
11. Obtain an **approved** electrical inspection from a governmental agency.
12. Call Customer Construction Services at **1-888-321-7779** to coordinate the meter installation and service hookup.

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) 296-46A. 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 socket
- Current transformer enclosure and conduit between the meter socket, if required
- Service mast
- Insulated clevis for service attachment
- Service entrance conductor
- Ground rods

NOTE: PSE will install the service line and meter (also CTs and meter wiring, if required).

Terrain considerations for meter socket locations

Meter socket locations are covered in *Chapter 5, Section 1* of this handbook. However, a factor to consider when choosing a meter location is the type of terrain the electrical service line will cross. 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:

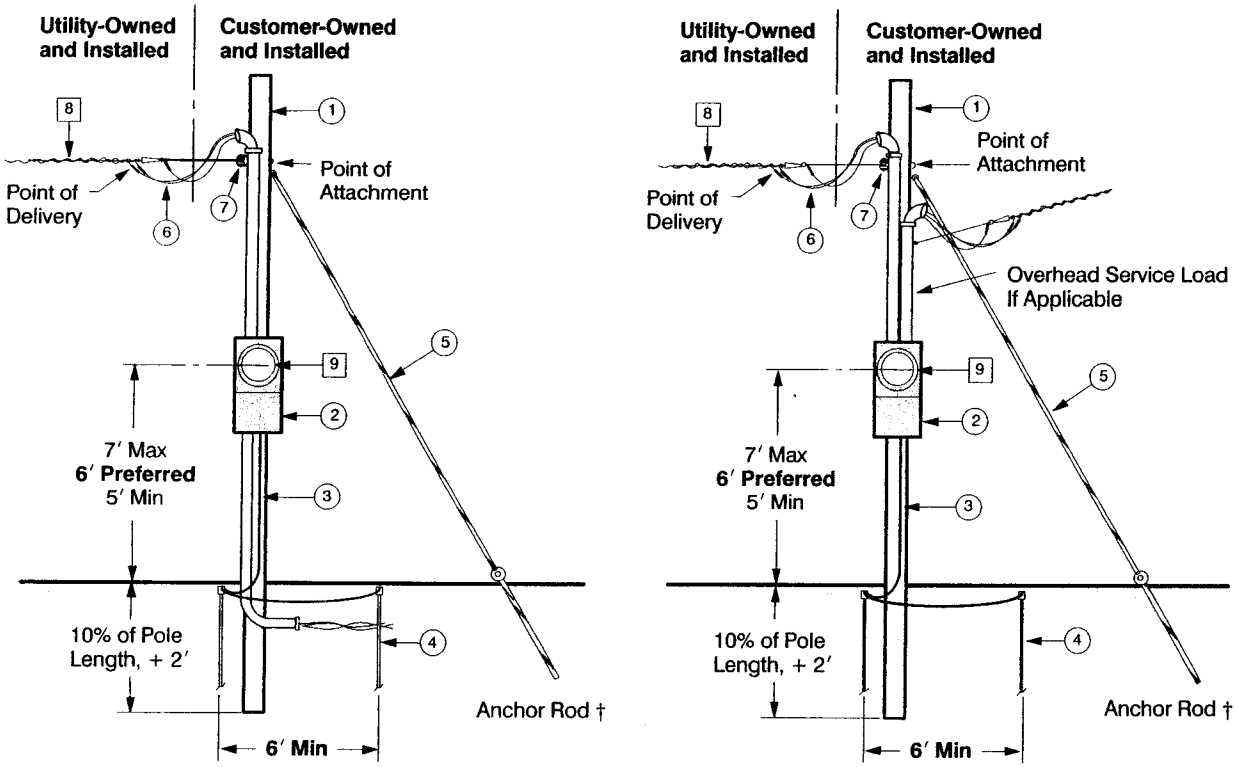
- Accessible for reading and testing the meter.
- Installed within 30 feet of the commercial building (typically).

For an example of an overhead meter pole installation see *Figure 16*.

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.



Items Owned and Installed by Customer	
1	Customer-owned meter pole
2	Meter socket and disconnect switch
3	Ground wire in accordance with NEC
4	Ground rods (2) (according to NEC) *
5	Down guy, 5/16″ minimum diameter noncorrosive stranded steel wire required for services over 70 ft from PSE pole. Push brace or pole key brace may be substituted for down guy.
6	Service entrance conductors – 18″ out of weatherhead
7	Insulated clevis

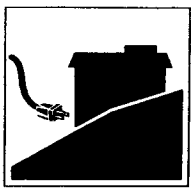
Items Owned and Installed by Puget Sound Energy	
8	Service line
9	Meter

* PSE also requires two ground rods to be installed at a "meter loop" installation, where the disconnect switch is located remotely (away from the meter base).

† Anchors should be either screw-type or cross-plate type.

Figure 16 Permanent overhead meter pole installation

Chapter 5



Meter Installation

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 amps or greater require the approval of PSE's Meter Department. PSE's *Project Manager* will coordinate this process.

In this chapter

This chapter is divided into three sections:

SECTION 1: **Basic Metering Requirements**
Requirements that pertain to all meter installations such as meter location, clearances, and multiple meter installations.

SECTION 2: **Self-Contained Metering**
Requirements for single-phase service 400 amps or less, and three-phase 200 amps or less.

SECTION 3: **Current Transformer (CT) Metering**
Requirements for services up to 800 amps and switchboard metering for services over 800 amps.

SECTION 1: Basic Metering Requirements

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

Installing or removing meters

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 either the PSE Meter Department or the Service Center Dispatcher.

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 the PSE has been notified that the equipment is ready to be resealed. The customer or contractor shall promptly notify PSE when repairs or modifications have been completed.

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

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

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 for commercial structures (including barns, pump houses, garages, and *any service that does not serve a living space*) shall be installed at a ground-level location that is readily accessible by PSE personnel during normal business hours for meter reading, maintenance, testing, installation, or removal.

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

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.

Multifamily "house meters"

Provide separate metering for common area loads as per the NEC.

Electrical equipment room requirements

Meter sockets may be located inside an electrical equipment room that shall be used solely for power and communication equipment. The electrical equipment room shall be well lit, accessible during normal business hours, and **not** be used for storage.

You must provide the following requirements:

- 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 by 6 feet 8 inches.
- A location near the door for installation of a ***keybox***, a key for the box, and a sign on the exterior of the door stating "Electrical Room."

- A 2-inch conduit, with 12-inch minimum radius elbows having no more than 360 degrees in total bends, from each electrical room above the first floor to the NEMA 3R enclosure to accommodate the AMR (automated meter reading) antenna cable (*Figure 17*). 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.
- A NEMA 3R enclosure with a separate conduit run shall be located outside on the building roof above all obstructions and building facades for each meter room on buildings with multiple meter rooms.
- A 2-foot-square piece of 3/4-inch plywood mounted 4 to 6 feet high on the meter room wall where the AMR antenna conduit is located.
- A dedicated 120 volt outlet beside the plywood in the meter room for the AMR repeater.

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.

Meter location requirements for manufactured buildings

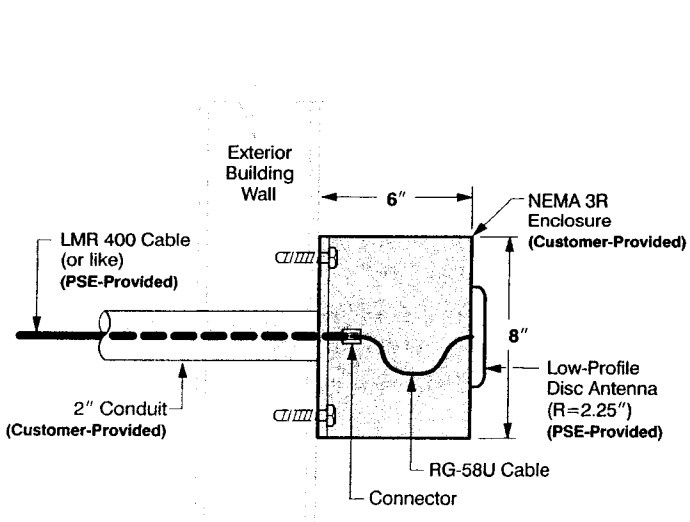
If you are installing an overhead service to a manufactured building, our service equipment can be installed on the manufactured building or on a customer-owned meter pole.

Meter sockets installed on manufactured buildings are required to be:

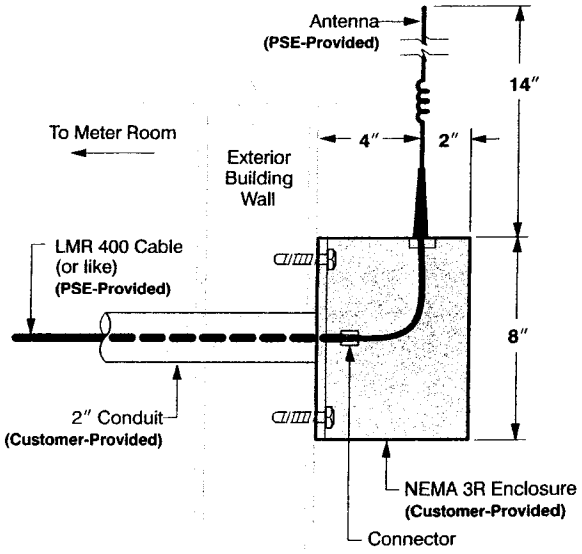
- Located on an outside wall of your building and accessible for reading and testing.
- Installed 5 to 7 feet above finished grade with a service mast that meets NEC requirements.
- The proper type for the service (see *Table 4,* located in *Section 2* of this chapter).

Meter sockets **must not be installed:**

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



Disc Antenna Enclosure



14″ Antenna Enclosure

Figure 17 Typical 8 in. x 8 in. x 6 in. exterior wall-mounted AMR antenna installations

Meter sockets

Physical requirements

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

- All meter sockets shall be ring-type and shall include either a screw-type locking ring (preferred) or a stainless steel snap ring.
- Any meter 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 socket enclosure shall be closed with plugs (rain-tight, if outside) that are secured tightly in place from inside the enclosures before a meter is installed.
- 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.
- All meter equipment exposed to weather shall be rain-tight according to the National Electrical Manufacturer's Association (NEMA) 3R minimum.

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

Meter socket types

Use *Table 4,* located in *Section 2* of this chapter, to determine meter socket types for specific voltages and amperage ratings.

Meter clearances

Socket height

Meter socket height shall be 5 feet minimum to 7 feet maximum (6 feet preferred) above finished grade or floor (*Figure 18*).

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

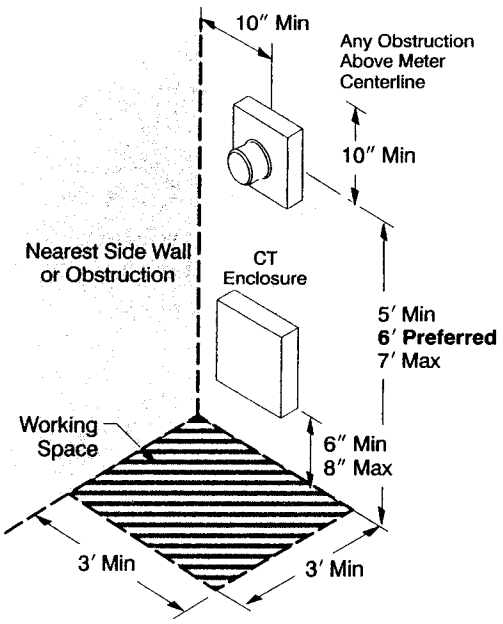


Figure 18 Meter socket minimum clearances

Working space

Working space in front of metering equipment (including current transformer enclosures) shall be at least 3 feet wide and 3 feet deep, measured from the front of the enclosure or meter face (*Figure 18*). Plants, shrubs and trees shall not be planted in this space.

The center of all meter socket enclosures shall be a minimum of 10 inches from adjacent walls, ceilings, or other similar obstructions (*Figure 18*).

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.

Minimum meter clearance requirements

Minimum clearances are measured from the relief vent on the gas meter set assembly or the relief valve stack. The relief vent or stack exhausts natural gas safely into the atmosphere in the event that the regulator on the meter fails to work properly. The diagrams and the measurements provided in *Form 3061, Installation Requirements for Residential Underground Services* (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 socket enclosure is recessed in the building wall, a flush-type socket is required. Recessed meter sockets require a clearance of 10 inches in all directions between the center of the meter and the closest portion of the wall (*Figure 19*).

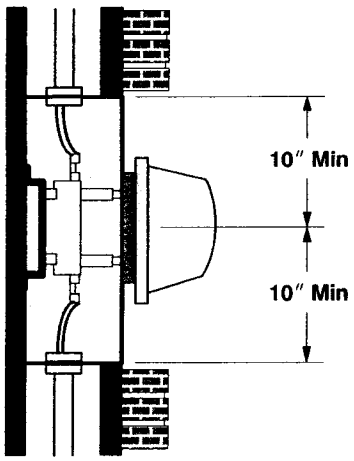


Figure 19 Minimum clearances for recessed meters

Remote metering

Normally, a meter 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.

Meter pedestal requirements

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 socket:

- The meter socket shall be a 200 amp 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 socket to the inside top flange should be a minimum of 10 inches.
- Enclosed metering for protection from vandalism, and 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 socket to the door).
- 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.
- 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. Wood posts are acceptable only for traffic management loads.
- 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.*

Special circumstances

- **Services less than 800 amps for commercial loads –** Structures must be either a permanent wall or a unistrut set in a concrete foundation with a 36 inches by 36 inches by 3 inches thick pad surrounding the meter. Treated wood posts are not allowed. The steel structure shall be galvanized posts or rigid galvanized struts. Unistrut shall be used for cross-braces and to mount the enclosures. The minimum height of the meter shall be 3 feet. Other requirements specified in this handbook for meter sockets and CT enclosures apply.
- **Services greater than 800 amps –** Remote services greater than 800 amps require special EUSERC outdoor switchgear. Ask your PSE *Project Manager* for more information.

Multiple meter installations

Multiple meter installations serving *residential* living units shall comply with the equipment arrangement requirements shown in (*Figure 20*).

Multiple meter installations serving *nonresidential* units shall comply with the equipment arrangement requirements shown in (*Figure 21*).

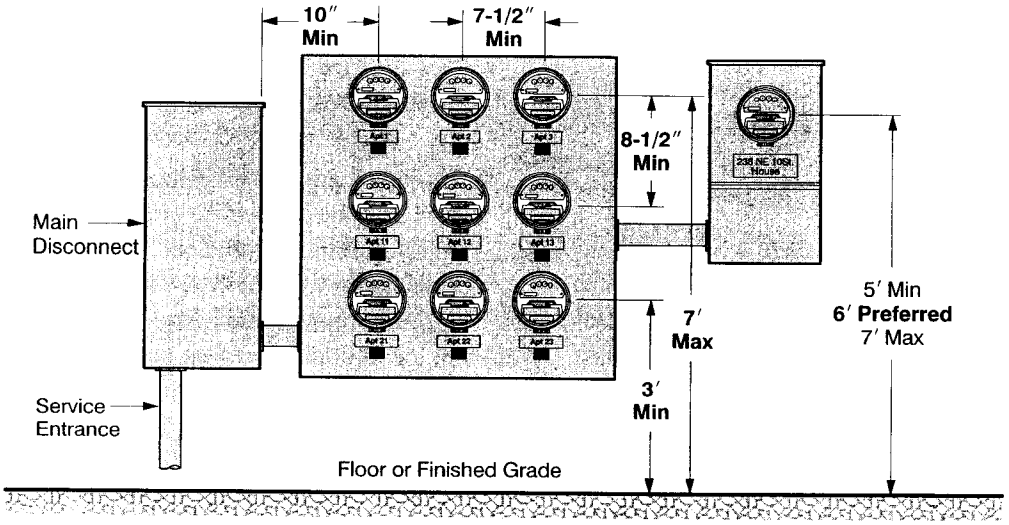
Manual block bypass

Sockets for *nonresidential* units require a ***manual block bypass***. Automatic circuit closures or lever bypasses are not acceptable.

Multiple meter socket labeling

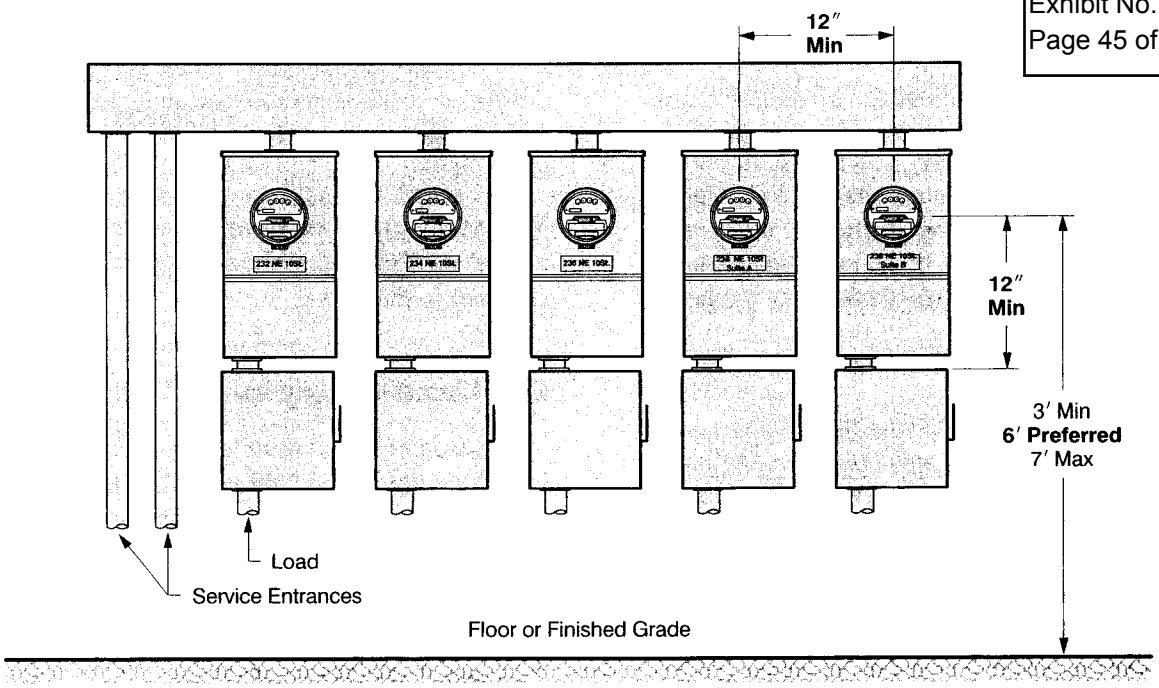
Meter sockets shall be permanently labeled to indicate the part of the premises they serve (i.e., unit number). PSE requires engraved phenolic nameplates or adhesive die-cut labels at least 1 inch high. Service will not be established until marking is complete.

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



Note: House meter sockets require a manual block bypass.

Figure 20 Typical factory-built multiple residential meter assembly for apartment complex



Notes: Clearances in this drawing (nonresidential) also apply for factory-built multiple meter panels, except that meters may be a minimum of 3 feet above floor.
Meter sockets require a manual block bypass.
More than six meters requires a main disconnect per NEC.

* *277/480 volt services shall have a service disconnect ahead of meter and a safety socket.*

Figure 21 Typical multiple nonresidential meter installations for services 200 amps or less

Factory-built multiple meter panels

Residential

On *residential* multiple meter 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 7 feet above the floor or finished grade (*Figure 20*).

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 7 feet above the floor or finished grade. Meters shall be adequately protected from mechanical damage.

Prior to shipment from the factory, the manufacturer shall submit *nonresidential* multiple meter panel drawings (*Figure 21*) to the PSE Meter Department for approval.

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 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 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.

Current-limiting fuses

Current-limiting fuses to protect the customer's electrical system from high fault current shall not be installed in meter 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 sockets in multiple meter installations if the enclosure has sealing provisions.

SECTION 2: Self-Contained Metering Requirements

Single-phase services, 400 amps or less, or three-phase services, 200 amps or less

Meter socket / main disconnect combinations

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

Manual block bypass requirements

All ***self-contained*** nonresidential meter sockets (except temporary services and Rate Schedule 8 *) require a manual block bypass (refer to *Table 4*). 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

277/480 volt self-contained meters 200 amps or less shall have the **disconnecting means ahead of the meter(s)**. When multiple meters are served by a single service, a single disconnecting means may be used or each meter may have its own disconnecting means.

Exception: Single-phase 480 volt streetlight metering does not require a disconnecting means ahead of the meter.

Load balancing

When 120/208 volt, 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 socket.
- You are responsible for ensuring that the connection of service entrance conductors in the meter socket are inspected and tightened before the service is energized.
- Where ***safety sockets*** are used, circuit- connecting nuts shall be properly torqued (*Figure 22*).

  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.

  CAUTION *Strands shall not be removed to make conductors fit undersized terminals.*
- Service conductors shall be arranged in the socket to avoid interfering with the meter installation or operation of the manual block bypass (*Figures 23* through *25*).

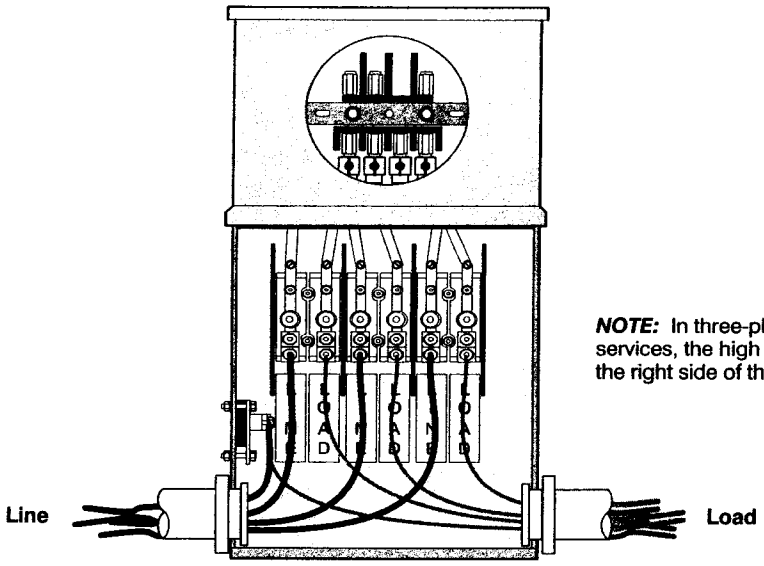


Figure 22 Typical safety socket

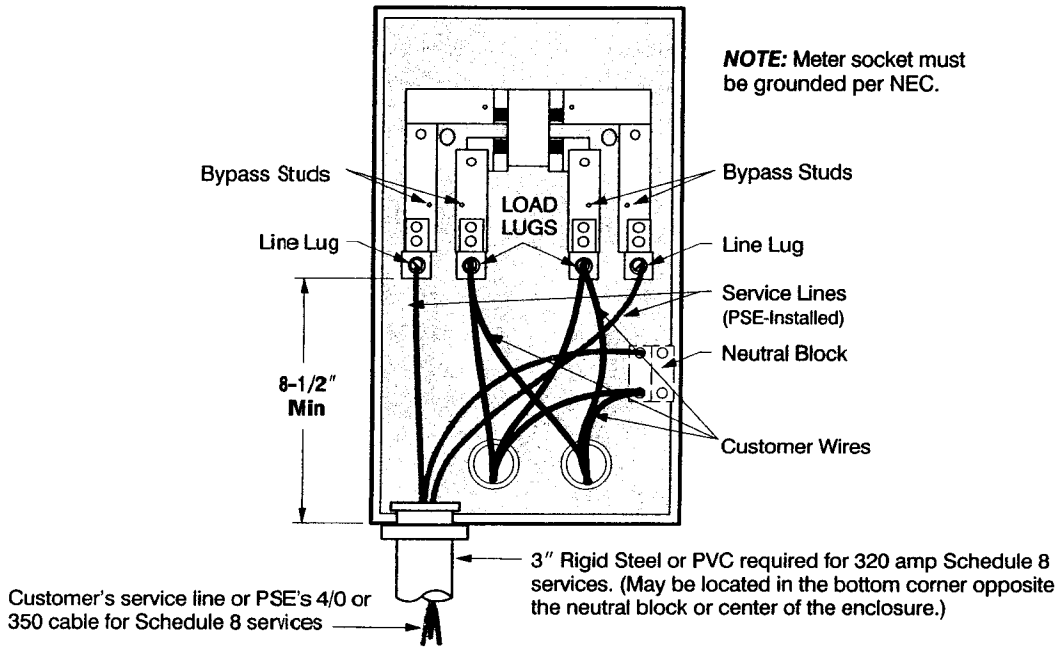


Figure 23 Typical arrangement of service conductors for underground commercial single-phase 320 amp service

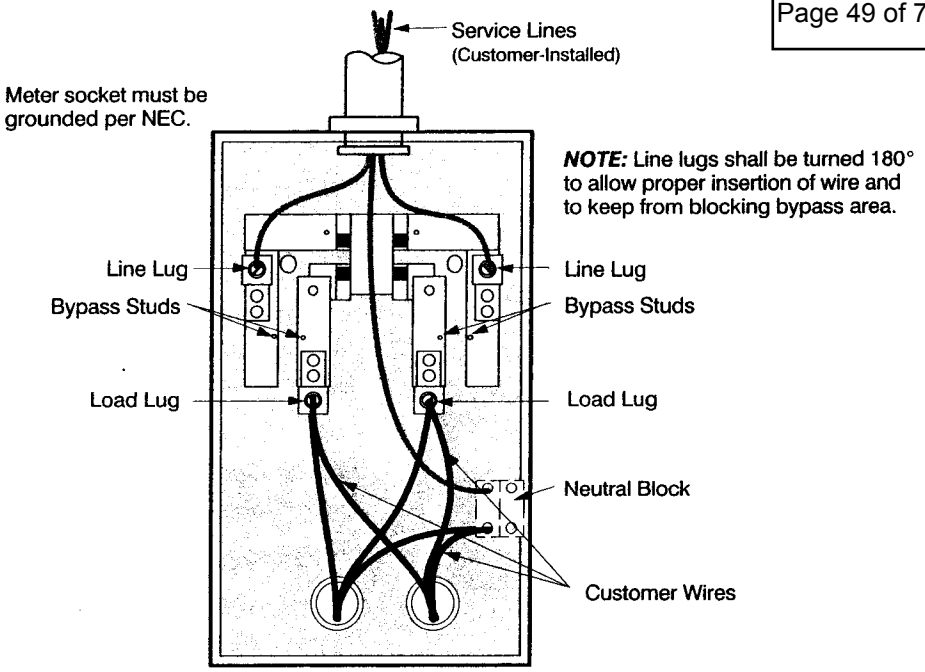


Figure 24 Typical arrangement of service conductors for overhead commercial single-phase 320 amp service

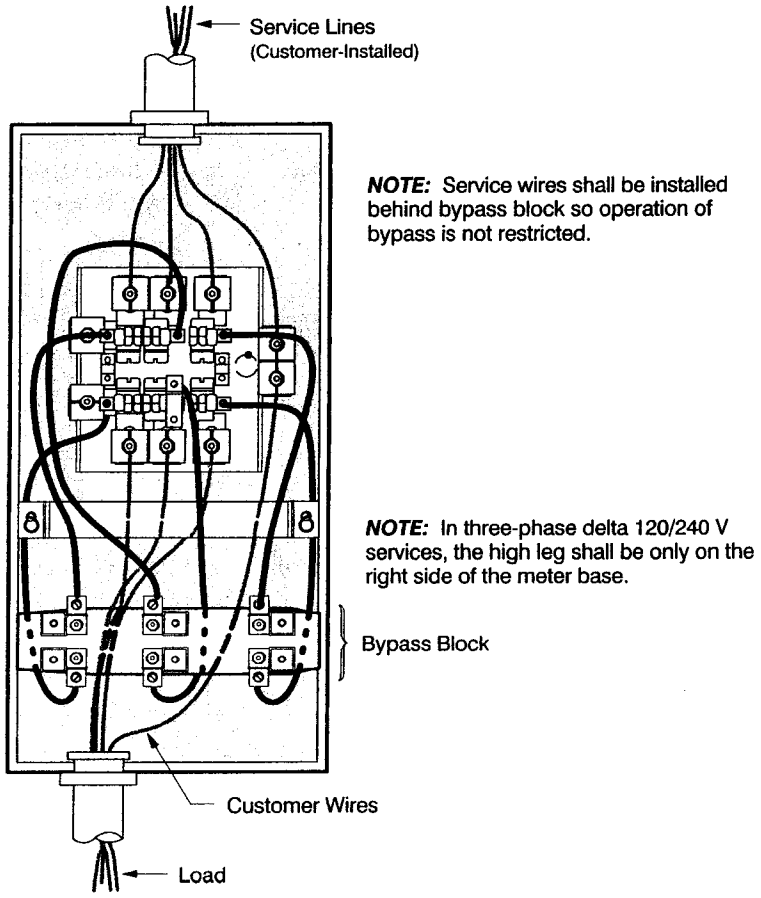


Figure 25 Typical arrangement of service conductors for 120/208 volt three-phase self-contained 200 amp service

Self-contained meter socket requirements

Single-phase services, 400 amps or less

Single-phase services: 200 amps or less

A self-contained meter socket shall be installed on all new and remodeled single-phase services (120/240 volt or 120/208 volt), where the current-carrying capacity of the service entrance conductors does not exceed 200 amps, as specified in NEC (refer to *Table 4, Meter Socket Configuration A*).

NOTE: Nonresidential services require manual block bypass.

Single-phase services: 201 to 400 amps

Two options are available:

1. A self-contained 320-amp meter socket with a manual block bypass is required on all new and remodeled single-phase services (120/240 volt) over 200 amps, where the current-carrying capacity of the service entrance conductors does not exceed 400 amps, as specified in the NEC (refer to *Table 4, Meter Socket Configuration A*).

   NOTE: Automatic circuit closures or a lever bypass are ***not*** acceptable.
2. Current transformer metering is available at additional cost; contact PSE's CCS office (refer to *Table 4, Meter Socket Configuration B*).

Single-phase services: 120/208 volt, 200 amps or less

A five-terminal meter socket shall be installed where the fifth terminal is placed in the nine o'clock position connected to the socket neutral bus conductor (refer to *Table 4, Meter Socket Configuration C*).

NOTE: Manual block bypasses are required for nonresidential services. Automatic circuit closures or lever bypasses are ***not*** acceptable.

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

A five-terminal meter socket shall be installed where the fifth terminal is placed in the nine o'clock position connected to the socket neutral bus conductor (refer to *Table 4, Meter Socket Configuration C*).

NOTE: Manual block bypasses and a safety socket are required for streetlight services. Automatic circuit closures or lever bypasses are ***not*** acceptable.

Three-phase services, 200 amps or less

All three-phase services

A seven-terminal meter base with a manual block bypass shall be installed where the service conductor capacity does not exceed 200 amps, as specified in the NEC.

The neutral (grounded conductor) shall be connected or tapped to the third terminal from the left on the lower terminals (refer to *Table 4, Meter Socket Configuration D*).

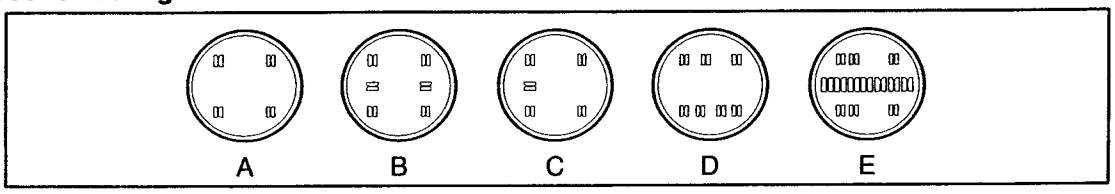
Three-phase services: 120/240 volt, four-wire delta *(Restricted — available only for existing services)*

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.

Table 4 Single-phase (nonresidential only) and all three-phase meter socket types

Voltage	Wires	Service Capacity Amp	No. of Terminals	Meter Socket Config.*	Manual Block Bypass Required?	Accessible Disconnect & 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 amp socket
120/240	3	201 to 320	6	B	n/a	n/a	Instrument transformer rated with provision for test switch — Additional cost option
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
120/240 240/480	3	up to 200	5	C	Yes	Safety socket only	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 Socket Configurations**



SECTION 3: Current Transformer (CT) Metering Requirements (up to 800 amps)

Single-phase services over 400 amps or three-phase services over 200 amps

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 amps single-phase or 200 amps three-phase, as determined by the NEC.

Meter socket

You are responsible to provide and install the meter 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 socket and CT enclosure.

- 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 enter the test switch portion of the meter socket and shall be sized as follows:
  - Single-phase: 1 inch minimum
  - Three-phase: 1-1/4 inches minimum

NOTE: Conduit **shall not** contain Condulets or junction boxes. **Do not use** flex conduit in meter circuits. The preferred method of installing conduits entering the CT enclosure is shown in *Figure 26*.

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 (*Table 5*).

- 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 5 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 is 36″ x 48″ or greater.

† Services over 800 amps require a switchboard designed to EUSERC specifications. Refer to the Remote Metering section in this chapter for more information. Services from 201-800 amps may be switchboard designed to EUSERC specifications. Drawing must be submitted to PSE's Meter Department (see page 44).

Mounting the CT

You are responsible to do the following:

- Install a CT mounting base on services of 800 amps or less (*Figures 27* and *28*).
- 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.

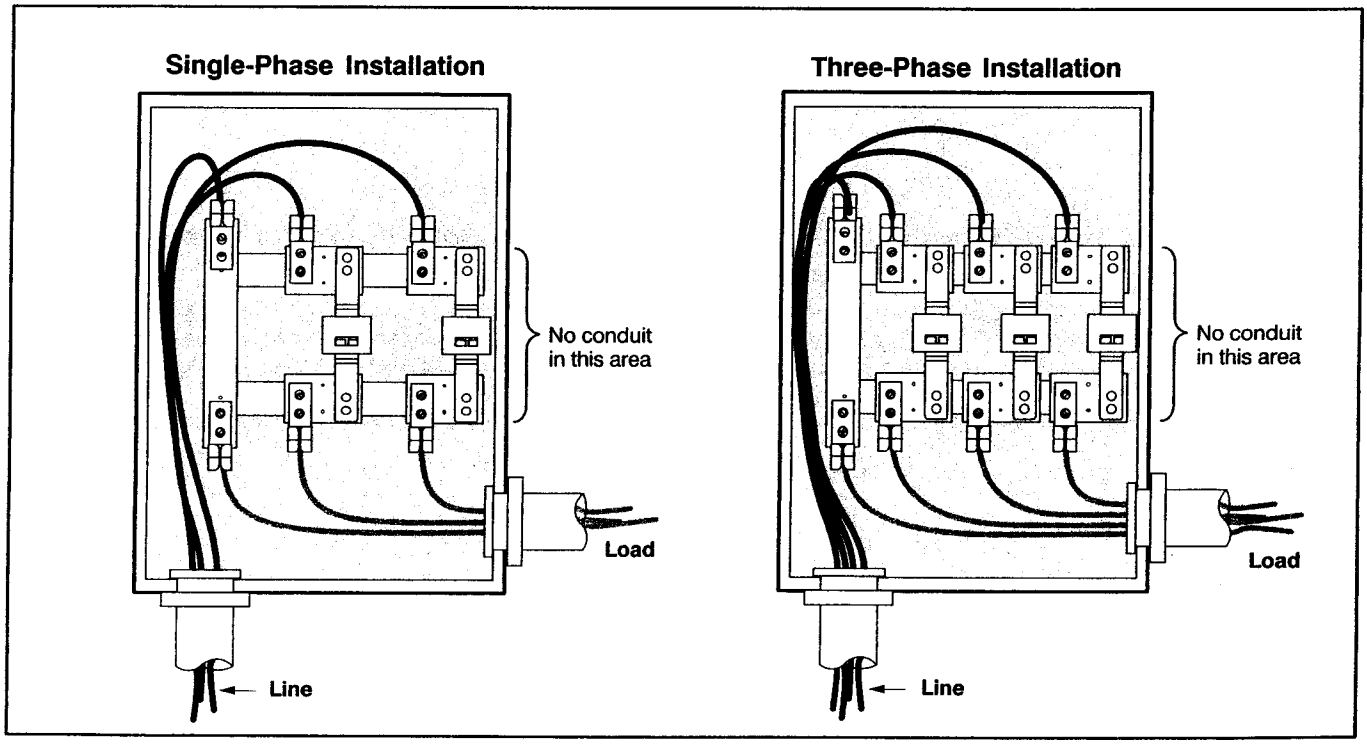
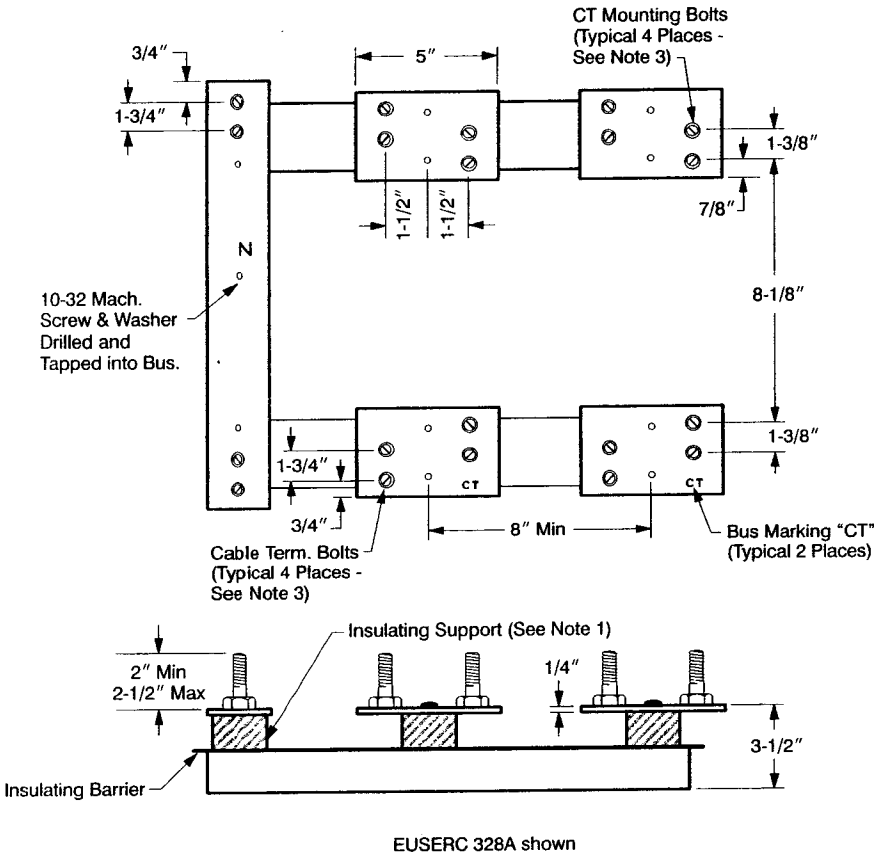


Figure 26 Preferred method of conduit installation in a single-phase and three-phase CT enclosure

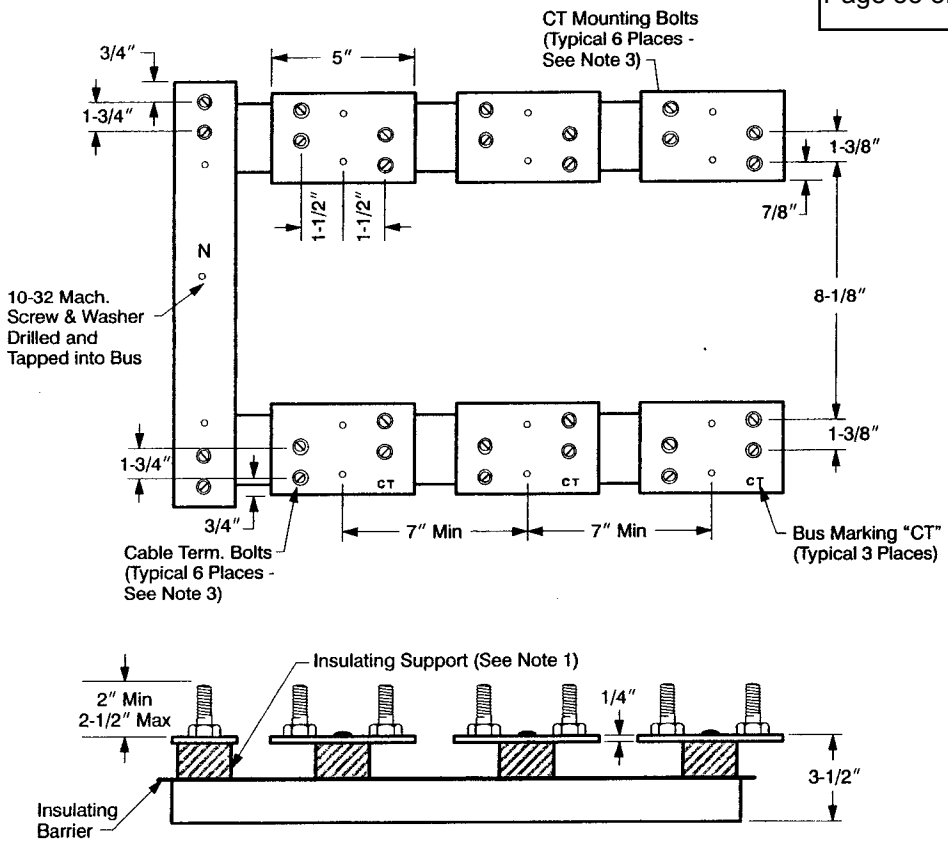


EUSERC 328A shown

NOTES:

1. Insulated supports shall be rated for the serving voltage and have sufficient mechanical strength for the application.
2. Mounting base accepts bar-type current transformers only.
3. Two 1/2-inch steel bolts shall be provided for each cable terminating position and each bolt shall be furnished with a spring washer and a nut. The spring washer may be either a cone-type (belleville) or a split-ring washer and a flat washer. Bolts shall be secured in place and spaced as shown. All parts shall be plated to prevent corrosion.

Figure 27 Single-phase CT mounting base bracket. EUSERC 328A (shown) or 328B



EUSERC 329A shown

NOTES:

1. Insulated supports shall be rated for the serving voltage and have sufficient mechanical strength for the application.
2. Mounting base accepts bar-type current transformers only.
3. Two 1/2-in. steel bolts shall be provided for each cable terminating position and each bolt shall be furnished with a spring washer and a nut. The spring washer may be either a cone-type (belleville) or a split-ring washer and a flat washer. Bolts shall be secured in place and spaced as shown. All parts shall be plated to prevent corrosion.

Figure 28 Three-phase CT mounting base bracket. EUSERC 329A (shown) or 329B

Customer's requirements for switchboard metering (over 800 amps)

A custom-built switchboard constructed to EUSERC specifications is required for services over 800 amps. Switchboard metering may be used on services from 201-800 amps, at your option.

Three-phase services

Three-phase services require 13-terminal meter sockets mounted on the switchboard according to EUSERC 332 (see *Figure 29, 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 socket (see *Figure 30*).

PSE-provided CTs may be installed by either the electrician or PSE.

Approval drawings are 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.

NOTE: PSE's Meter Department approval is required for all drawings.

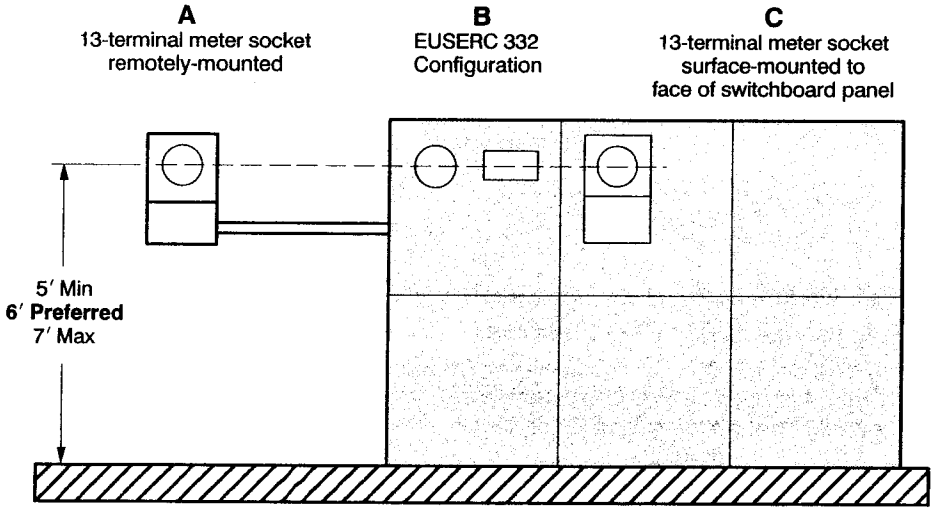


Figure 29 Options for switchboard meters

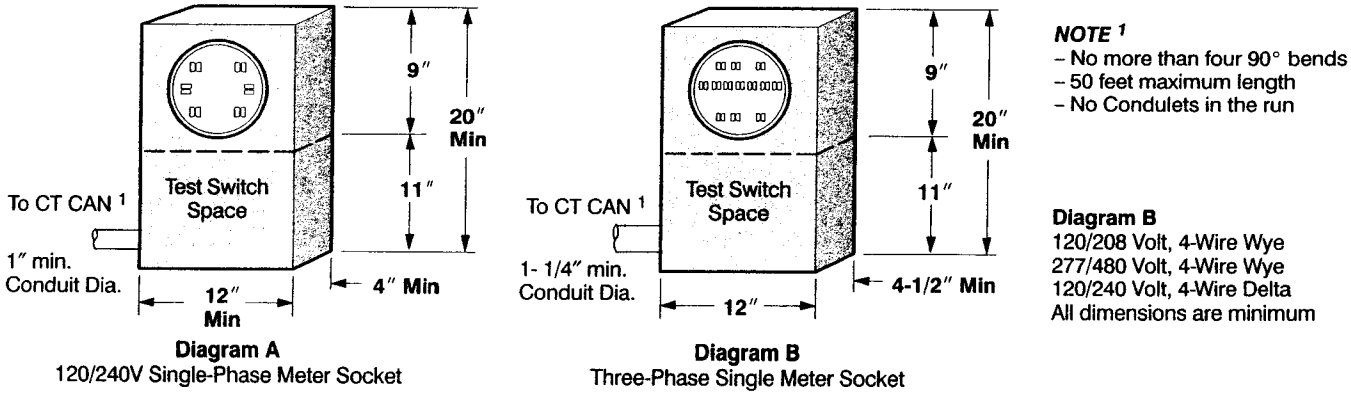


Figure 30 Instrument-rated (CT) meter sockets

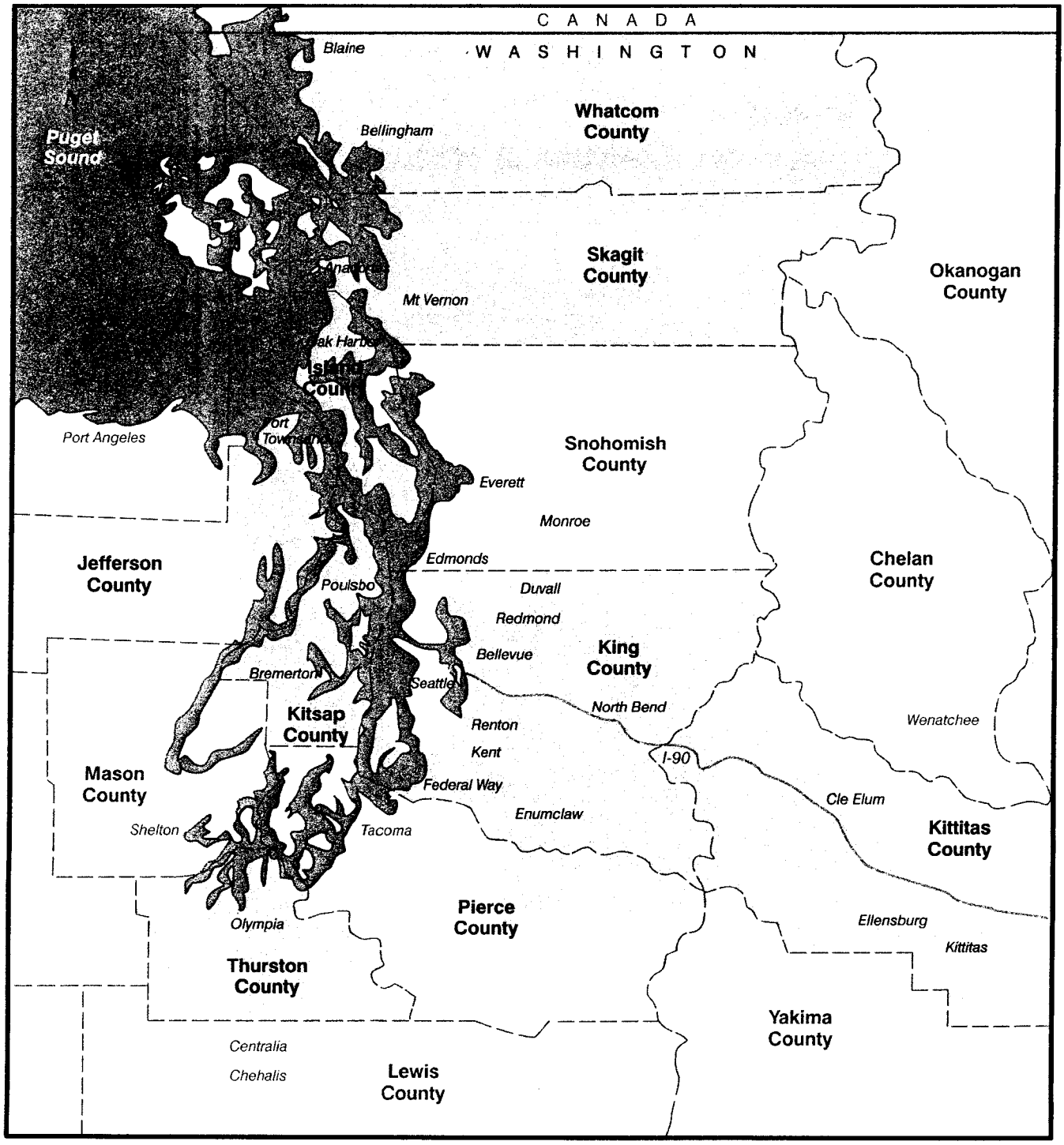
Appendix A

Exhibit No. ___(GZ-4)
Page 57 of 78

Puget Sound Energy's

Territory Maps for Electric & Natural Gas Service

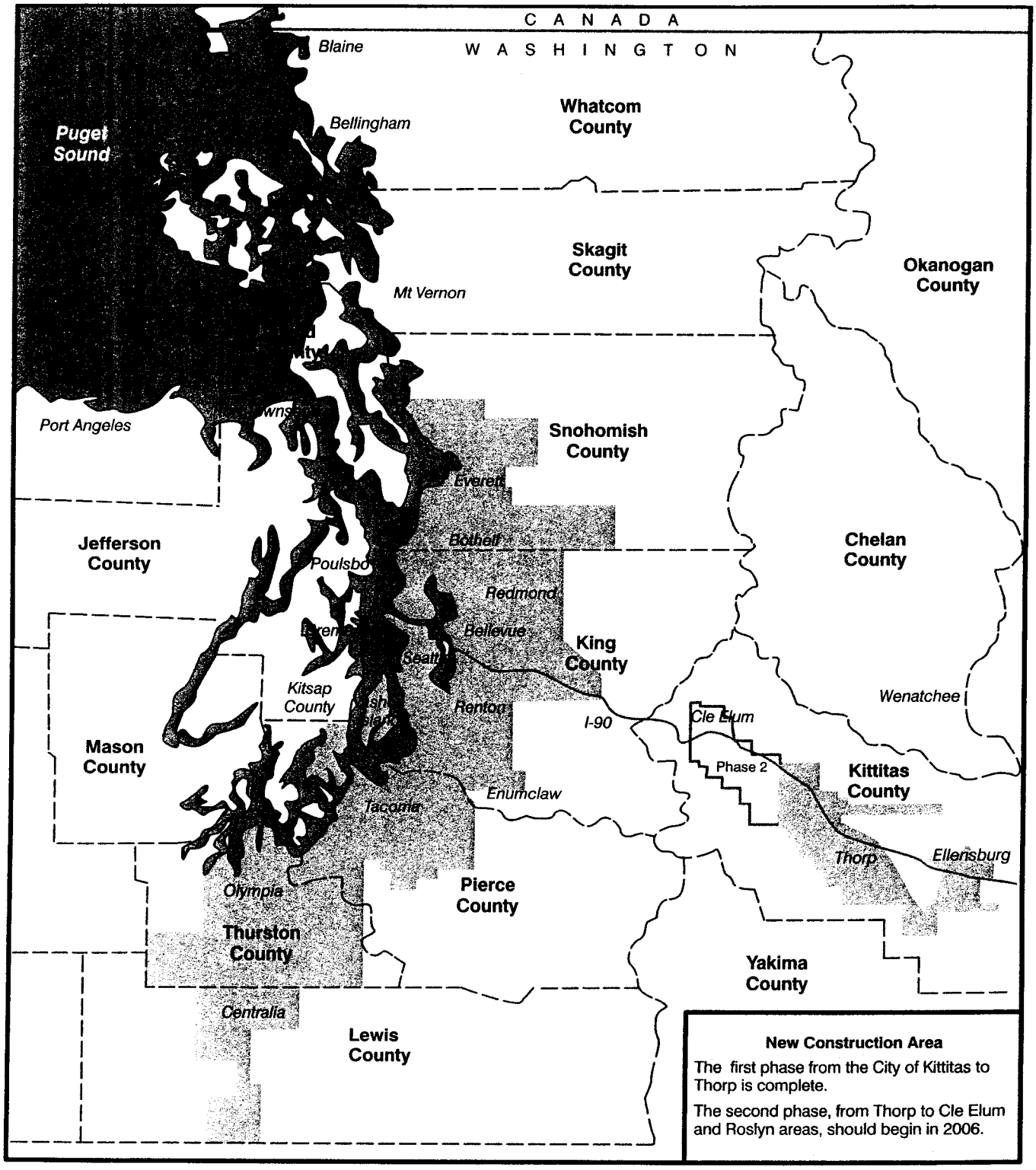
Puget Sound Energy's *Electric Service Territory*



PSE's Electric Service Territory

Exhibit No. ___(GZ-4)
Page 59 of 78

Puget Sound Energy's *Natural Gas Service Territory*



PSE's Natural Gas Service Territory

Glossary

Approved - Acceptable to the authority having jurisdiction.

Associated Equipment - As related to metering equipment, such as the meter wiring, instrument transformers, test switches, and reactiformers.

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.

Customer Construction Services Representative - The designated representative of Puget Sound Energy, responsible for design and/or coordination of new or revised services to PSE customers. The Customer Construction Services Representative responds to inquiries on policies, standards, practices, rates, and energy utilization.

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.

Enclosure - A sealable cabinet designed for surface or flush mounting, and provided with a frame, mat, or trim in which doors or removable covers are hung.

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.

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 Equipment - Any equipment associated with measuring electric energy.

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.

Metering Room - A permanently dedicated and secured room, used for the installation and maintenance of the customer's electrical metering equipment. *This room may not be used for storage.* The meter room must have a minimum door dimension not less than 2′8″ by 6′8″ and must provide all the clearances required.

Meter 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.

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

Neutral - The grounded conductor in a single-phase, three-wire or three-phase, four-wire system. The service conductor that is at zero potential to ground.

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

Revenue Meter - A device used to total the amount of electrical energy consumed by a customer.

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 volts.

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 Puget Sound Energy's system.

Standards - Authorized design principles applied to engineering, construction, and operation of Puget Sound Energy's electrical facilities.

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

Trough or Gutter - A sealable enclosure used as a raceway for metered conductors and as a terminating point for branching to multiple loads.

WAC - Washington Administrative Code

Notes

Notes

CONTRACTOR REFERRAL SERVICE
Phone: 1-800-562-1482

Contractor Referral Service helps you put it all together.

Our energy professionals will recommend pre-screened independent contractors in your area who can help with your energy-related home or business improvements. If you have a question, we'll help you find the answer. If you have a problem, we'll help you find a solution.

To learn more, call 1-800-562-1482 (option 2) or visit our Web site at www.ContractorReferralService.com

PUGET SOUND ENERGY a subsidiary of **PUGET ENERGY.**

Consumer Guide & Referral Request

❑ **Yes! Please have two independent contractors contact me for a free estimate on:**

❑ Furnaces	❑ Windows & Doors	❑ Remodeling
❑ Heat Pumps	❑ Insulation	❑ Commercial Lighting
❑ Water Heaters	❑ Siding	❑ Power Quality
❑ Gas Fireplaces	❑ Roofing	❑ Send Consumer/ Product Guide Only

Date: PSE Account:

Name:

Address:

City/State/Zip:

Day Phone: Evening Phone:

2811 (11/03)

Email:

❑ Yes, I am interested in receiving a free e-newsletter from PSE with energy saving tips

PSE PUGET SOUND ENERGY

Attn: Contractor Referral Service
BOT-01H

NO POSTAGE NECESSARY IF MAILED IN THE UNITED STATES

BUSINESS REPLY MAIL
FIRST-CLASS MAIL PERMIT NO.58 BELLEVUE, WA
POSTAGE WILL BE PAID BY ADDRESSEE

PUGET SOUND ENERGY
PO BOX 90868
BELLEVUE WA 98009-9869

PUGET SOUND ENERGY

APPLICATION FOR ELECTRIC SERVICE
NONRESIDENTIAL PROJECT

PROJECT NAME

NEW SERVICE ADDRESS | CITY | STATE | ZIP

OWNER NAME | PHONE ( )

ADDRESS | CITY | STATE | ZIP

OWNERS EMPLOYER | LENGTH OF EMPLOYMENT | SOCIAL SECURITY/TAX ID NO. | SPOUSE

CONTRACTOR/DEVELOPER | PHONE ( )

ADDRESS | CITY | STATE | ZIP

ELECTRICAL CONTRACTOR | CONTACT PERSON | PHONE ( )

ADDRESS | CITY | STATE | ZIP

ARCHITECT | PHONE ( )

ON SITE COORDINATOR | PHONE ( )

TYPE OF BUILDING AND USE

SIZE | TOTAL SQUARE FEET | NUMBER OF FLOORS

SECONDARY VOLTAGE | VOLTS | PHASE | WIRE

TYPE OF SERVICE DESIRED ☐ UNDERGROUND ☐ OVERHEAD

UNDERGROUND SECONDARY CONDUCTOR SIZE | NEUTRAL SIZE | NUMBER OF RUNS

GENERATORS

Are you installing back-up or emergency generation?

☐ Yes ☐ No

Generator output (KW, MW) _____

Will this generator operate full time?

☐ Yes ☐ No

Will this generator operate in parallel with PSE's distribution system? ☐ Yes ☐ No

MOVING EXISTING FACILITIES

WILL EXISTING POWER FACILITIES REQUIRE RELOCATION? (MARK ON SITE PLAN)

☐ Yes ☐ No

DESCRIBE

STREET LIGHTS

WILL STREET LIGHTS BE REQUIRED ☐ Yes ☐ No | BILLING AGENCY

ELECTRICAL LOAD IN kW

	1 PHASE	3 PHASE
Lighting		
Heating		
Cooling		
Elevators		
Other Motors		
Water Heating		
Cooking		
Miscellaneous		
Existing Load		
Total Conn Load		
Est. Total Demand		

OPERATING HOURS PER DAY | DAYS PER WEEK

PANEL SIZES (AMPS) AND NO. OF METERS PER PANEL

PANEL SIZES	NO. METERS

Main Panel Size _____ Amps

MOTOR DETAILS

HP	PHASE	NEMA CODE	LRC

DATES SERVICE NEEDED

CONSTRUCTION START DATE | DATE TEMPORARY SERVICE REQUIRED | DATE PERMANENT SERVICE REQUIRED

I affirm that the above information is correct to the best of my knowledge, and that I have been provided with a construction information sheet. I understand that any changes I make in the above information or attached drawings will increase the time required for Puget Sound Energy to provide service to my project, and that I might be liable for additional engineering and construction costs.

_____ SIGNATURE

_____ DATE

PUGET SOUND ENERGY

APPLICATION FOR SERVICE
MULTI-FAMILY PROJECT

☐GAS ☐ELECTRIC ☐BOTH

PROJECT NAME				INSIDE CITY LIMITS? ☐ Yes ☐ No
SERVICE ADDRESS	CITY		STATE	ZIP
OWNER NAME (FIRST, MI, LAST)	TAX ID NO.	OFFICE PHONE	CELL PHONE	E-MAIL
ADDRESS	CITY		STATE	ZIP
CONTR./DEV.	TAX ID NO.	OFFICE PHONE	CELL PHONE	E-MAIL
ADDRESS	CITY		STATE	ZIP
HVAC MECHANICAL CONTRACTOR	CONTACT PERSON	OFFICE PHONE	CELL PHONE	E-MAIL
ELECTRICAL CONTRACTOR	CONTACT PERSON	OFFICE PHONE	CELL PHONE	E-MAIL
ON SITE COORDINATOR/PROJECT SUPERVISOR		OFFICE PHONE	CELL PHONE	E-MAIL

DATE ROAD CROSSINGS NEEDED	DATE CURBS & PAVING SCHEDULED	DATE MAINLINE TRENCH NEEDED	DATE ELECTRICAL SERVICE REQUIRED	DATE GAS SERVICE REQUIRED	EXISTING POWER IS (Check One) ☐ Over-head ☐ Under-Ground	DISTANCE TO EXISTING POWER _____Feet

LOAD INFORMATION

Each Unit:

- ☐ Heat ☐ Electric _____ kW or ☐ Gas
- ☐ Water Heater ☐ Electric _____ kW or ☐ Gas
- ☐ Range ☐ Electric _____ kW or ☐ Gas
- ☐ Clothes Dryer ☐ Electric _____ kW or ☐ Gas
- ☐ Clothes Washer
- ☐ Dishwasher

Other Facilities/Common Areas:

- ☐ Recreation Room ☐ Electric _____ kW or ☐ Gas
- ☐ Laundry Room ☐ Electric _____ kW or ☐ Gas
- ☐ Pool ☐ Electric _____ kW or ☐ Gas
- ☐ Sauna/Jacuzzi ☐ Electric _____ kW or ☐ Gas
- ☐ Lighting Electric _____ kW
- ☐ Other Electric _____ kW

RELOCATION OF EXISTING ELECTRIC FACILITIES (MARK ON SITE PLAN)

☐ Yes ☐ No Describe: _____

RELOCATION OF EXISTING GAS FACILITIES (MARK ON SITE PLAN)

☐ Yes ☐ No Other Describe: _____

ELECTRICAL METERING INFORMATION

Secondary Voltage: _____ Phase: _____ Wire: _____ Main Panel(s) Size: _____

Number of Meters: _____ 1 Phase _____ 3 Phase

CUSTOMER PROVIDED CONDUCTOR INFORMATION

In order to best serve your needs, the following information will need to be completed by you or your gas/electrical contractor.
Incorrect or missing information may result in engineering delays and additional costs to your project.

RESIDENTIAL BUILDINGS INFORMATION FOR GAS AND/OR ELECTRIC

Building #	Building Address	How addressed?	# Units in Building	Avg. Sq. Ft. per unit	Total # Electric Meters	Panel Size of ea. Unit	# of cust. provided runs 3 or 4 wire conductor	Size of conductor	Total # of Gas Meters & Meter Location Comments

NON-RESIDENTIAL MOTOR LOADS & EQUIPMENT

Equipment Description	Horse-power	Running Current	Locked Rotor Current	Single or Three Phase	Voltage Required	Motor Nema Code	Main Panel Size	# of cust. provided runs 3 or 4 wire conductor	Size of conductor	Operation: Hrs/Day/Week/Year

STREET LIGHTING SERVICES

☐ I AM REQUESTING PSE INSTALLED STREET LIGHTING SYSTEM

STREET LIGHT INFORMATION

☐ STREET LIGHTS _____ TOTAL

☐ HOMEOWNERS ASSOCIATION _____

☐ OTHER: _____

_____

STREET LIGHT BILLING INFORMATION

NAME	
ADDRESS	
CITY	ZIP
PHONE	

☐ THE STREET LIGHTING SYSTEM WILL BE PRIVATELY BUILT & OWNED.

HOW MANY ELECTRIC METERS TO SERVE THE LIGHTING?_____

☐ THIS DEVELOPMENT WILL NOT HAVE STREET LIGHTING.

PSE's voltage flicker standard requires that the maximum voltage dip for multi-family buildings with elevators or significant commercial loads be limited to 2% or less at the point of service. (Secondary bus of PSE's transformer)

In the application for service the developer shall provide PSE with the starting currents for the largest 1-phase and 3-phase motor loads. After determining the size of transformer required to serve the new load, PSE will calculate the percentage voltage flicker at the point of service (transformer secondary bus) and provide that number to the customer. If this voltage dip exceeds 2% the transformer size must be increased to reduce the dip to 2% or less. The customer is responsible for the difference in cost of the larger transformer.

Service conductors are owned by the customer. The customer is then responsible for calculating the overall voltage dip to individual customers and determining what is an acceptable level for their facility. If the developer determines that the voltage dip is unacceptable, they must work with PSE's Project Manager to determine a solution.

I affirm that the above information is correct to the best of my knowledge. I understand that any changes I make in the above information or attached drawings will increase the time required for Puget Sound Energy to provide service to my project, and that I may be liable for additional engineering and construction costs.

DATE TEMP. SVC. DESIRED	DATE PERM SVC. DESIRED
OWNER SIGNATURE	DATE

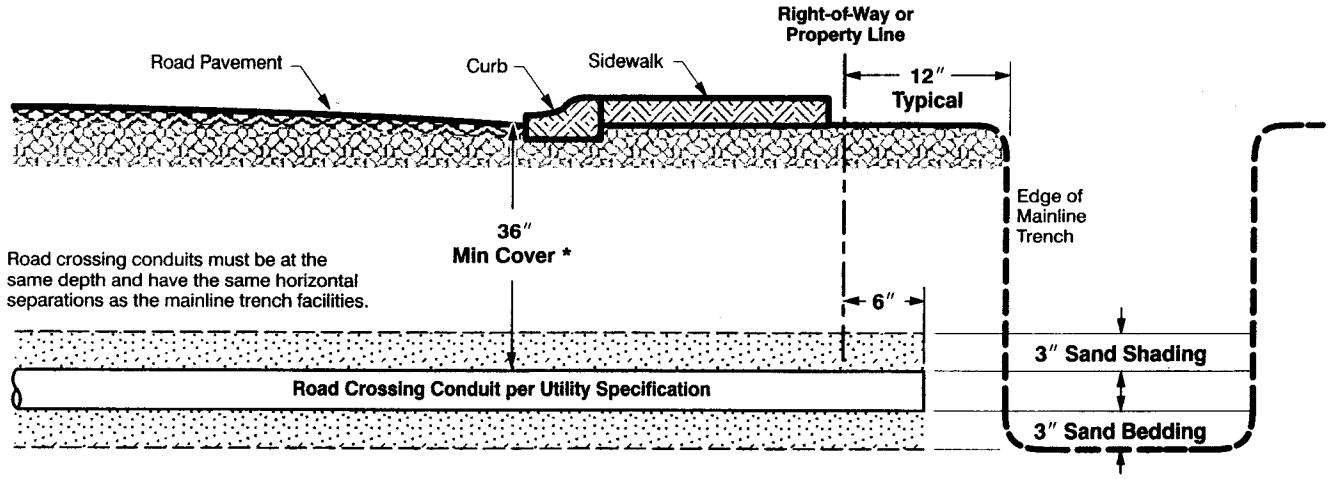
The party responsible for payment of utility construction costs is:

NAME	ADDRESS	ZIP

May 2005 Excavation Requirements for Joint Utility Mainline Trench

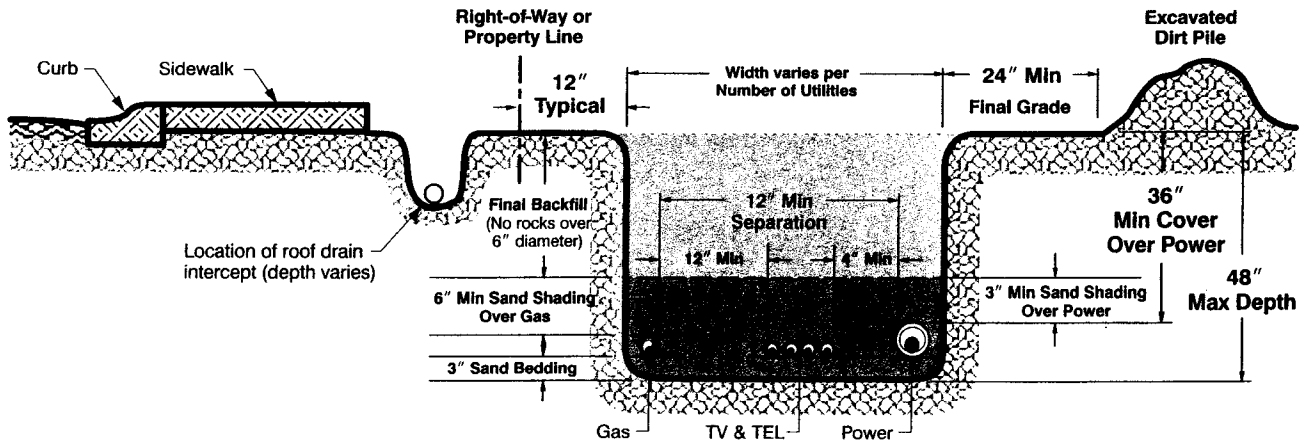
Questions? Call PSE's Customer Construction Services
1-888-321-7779

Road Crossing for Mainline Conduit



* Some jurisdictions may require a deeper installation. **Consult your PSE Project Manager for specific depth.**

Typical Mainline Joint Trench Dimensions and Facility Placement



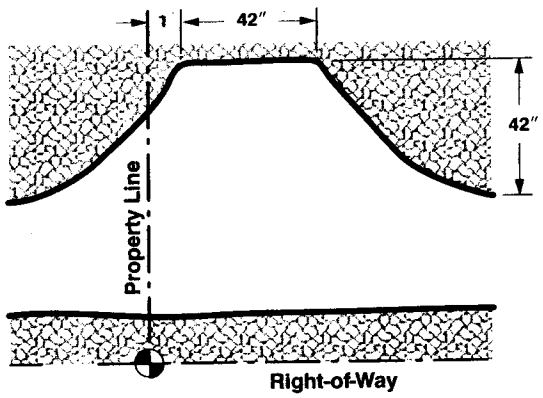
NOTE:
- If the final backfill contains rocks **greater than 6″** in diameter, install **12″ sand shading** across the full width of the trench.
- Rocks **greater than 10″** diameter are not permitted in the final backfill.

Call Two Business Days Before You Dig
1-800-424-5555

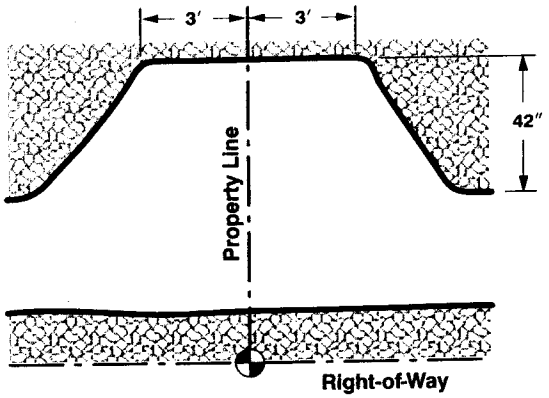
Effective on: 05/01/05
Canceling: 05/01/04

PSE PUGET SOUND ENERGY

Stubout Excavation Dimensions

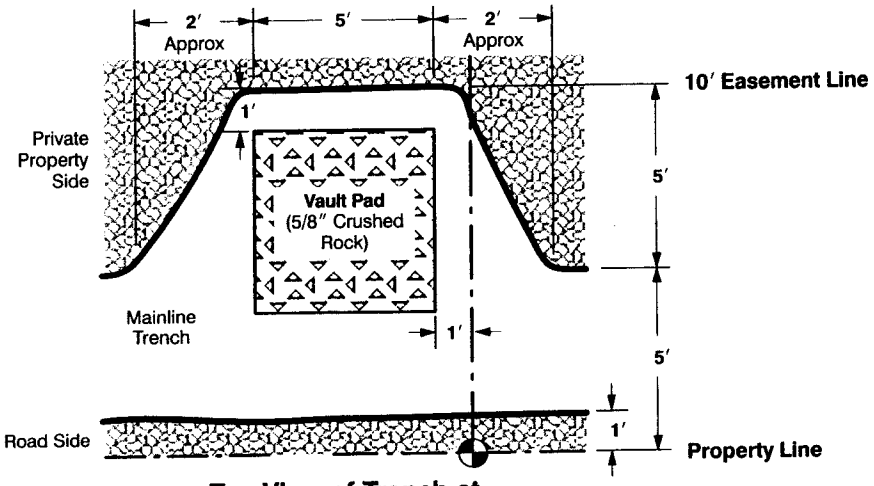


Top View of Mainline Trench for Transformer Vault Excavation – Single Stubout Location

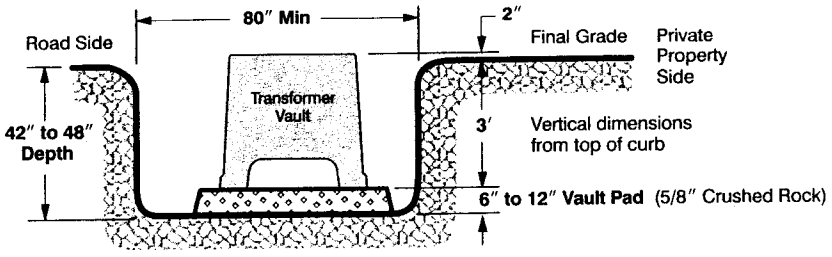


Top View of Mainline Trench for Pedestal or Double Stubout Location

Transformer Vault Excavation Details

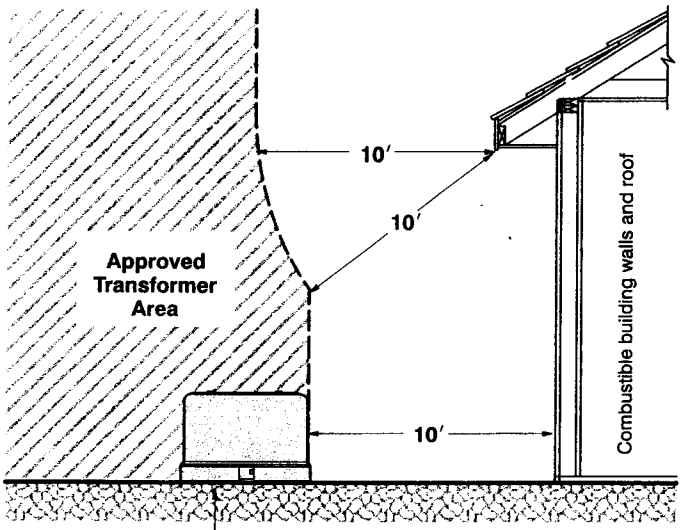


Top View of Trench at Transformer Vault Location

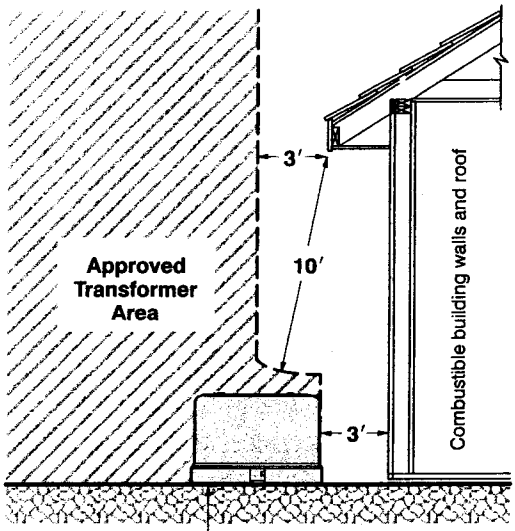


Side View of Trench at Transformer Vault Location

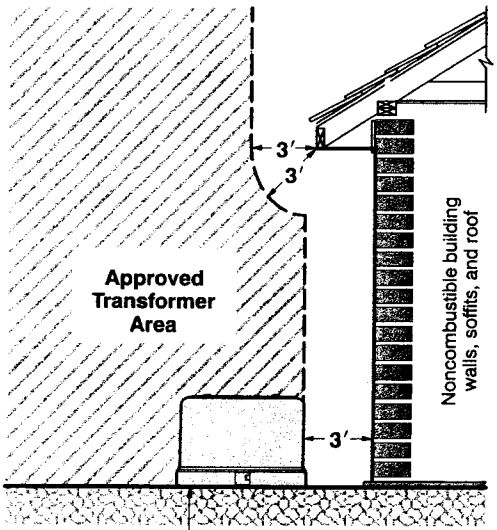
Transformer Clearances



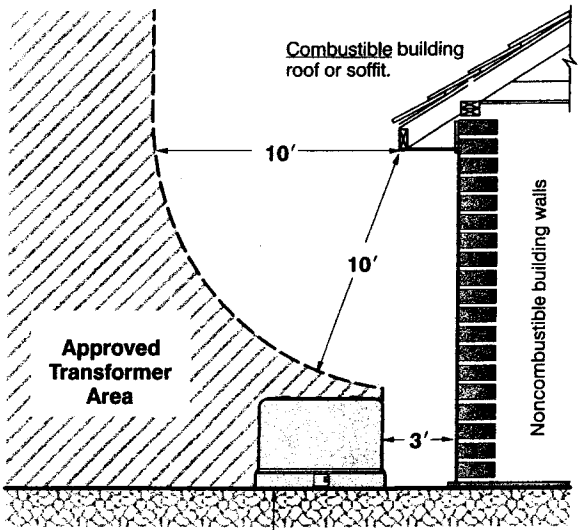
Oil-Filled Transformer Clearances from Combustible Surfaces



Reduced Flammability Transformer Clearances from Combustible Surfaces



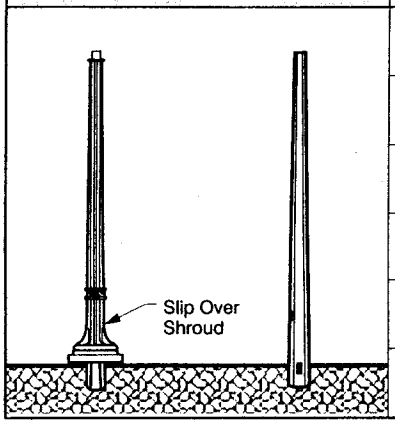
Oil-Filled Electrical Equipment Clearances from Noncombustible Surfaces

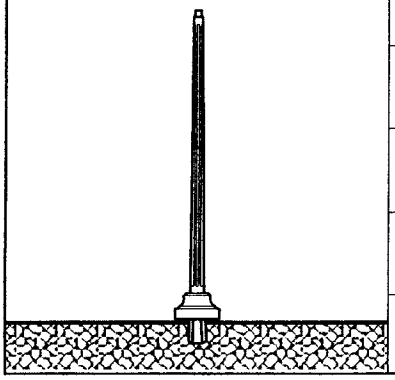


Oil-Filled Electrical Equipment Clearances from Noncombustible Walls with Combustible Roofing

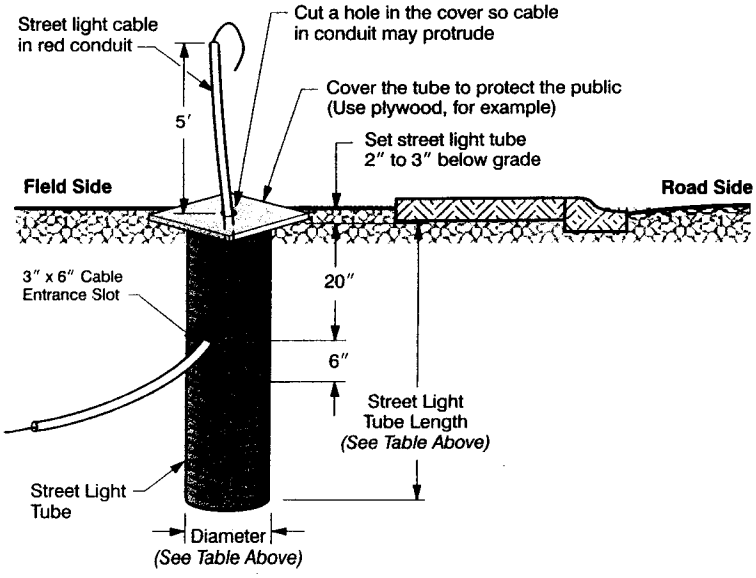
PUGET SOUND ENERGY

Street Light Tube Dimensions for Direct-Buried Poles

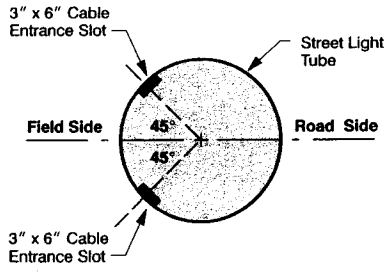
All Street Light Poles (Except Decorative Concrete)	Luminaire Mounting Height	Tube Length	Tube Diameter	
			Concrete Poles	Fiberglass Poles
	13′ or less	3′	18″	18″
	15′ - 20′	4′	18″	18″
	25′	5′	18″	18″
	30′	5′	18″	18″
	35′	6′	18″	24″
	40′	7′	24″	24″

Decorative Concrete Street Light Poles	Luminaire Mounting Height	Tube Length	Tube Diameter
	Victorian I, 15′	5′	24″
	Victorian II, 13′ & 15′	5′	24″
	Victorian IV, 15′	5′	24″
	Victorian V, 15′	4′	24″
	Washington	4′	24″

Street Light Tube Installation



TOP VIEW OF STREET LIGHT TUBE

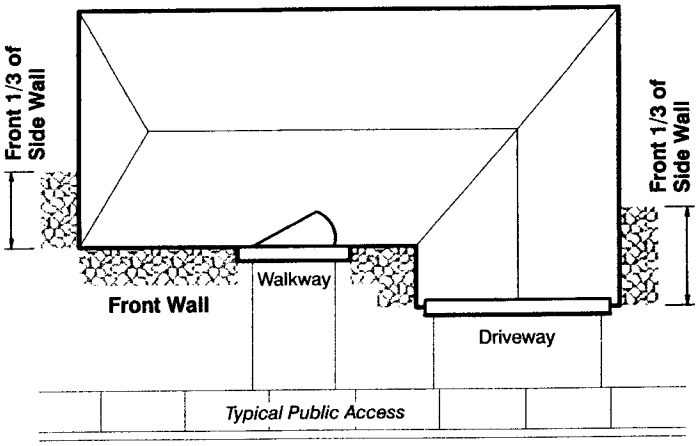


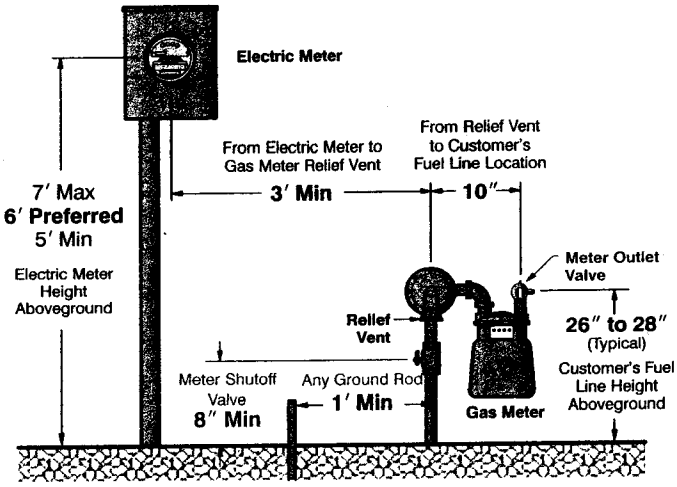
Note: Position the 3″ x 6″ cable entrance slot 45° left or right from a line perpendicular to the roadway through the center of the tube.

Meter Locations

Questions? Call PSE's Customer Construction Services
1-888-321-7779

♦ Locate electric and gas meters on the **front wall,** or **within the front 1/3 of the side wall.**





Electric and Gas Meter Clearances

Gas Meter Relief Vent Clearances

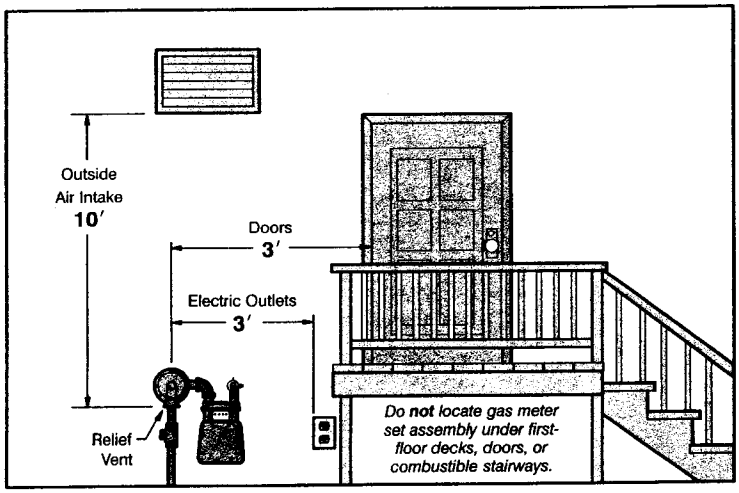


DIAGRAM A

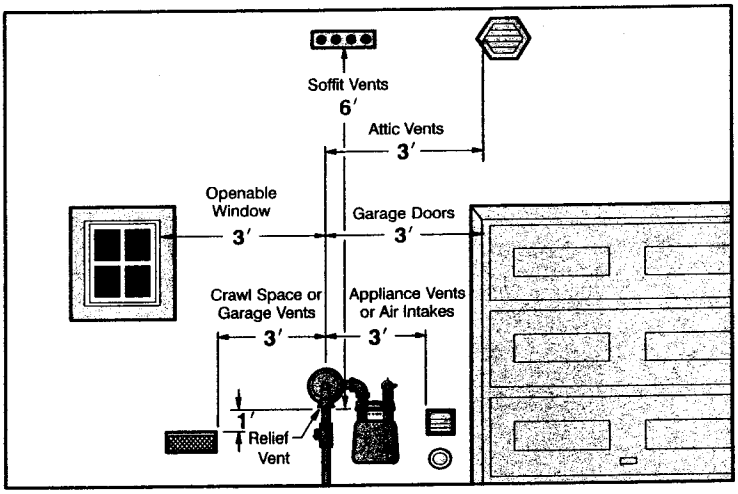


DIAGRAM B

Relief vent minimum-clearance requirements from building features

Building Feature	Horizontal		Under		Above	Diagram	
Appliance Combustion Air Intake	3 feet *	or	3 feet *	or	3 feet *	B	* 3 feet minimum or greater as specified by appliance manufacturer.
Appliance Vents	3 feet	or	3 feet	or	3 feet	B	
Attic Vents	3 feet	or	6 feet †	or	1 foot	B	† 10 feet for external relief valve vents.
Crawl Space Vents / Garage Vents	3 feet		6 feet †	or	1 foot	B	
Doors / Garage Doors	3 feet		Not Permitted	or	1 foot	A, B	
Electric Meters	3 feet		Not Permitted	or	3 feet	(See *Meter Locations* section above)	
Electric Outlets	3 feet		Not Permitted	or	3 feet	A	
Outside Air Intake	10 feet	or	10 feet	or	3 feet	A	
Soffit Vents	3 feet	or	6 feet †	or	1 foot	B	
Windows (Openable)	3 feet	or	6 feet †	or	1 foot	B	

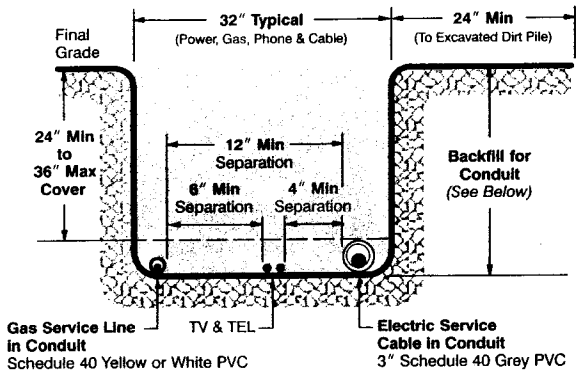
For clearances from property features such as transformers, generators, incinerators, or heat pumps, call Customer Construction Services: 1-888-321-7779.

Effective on: 05/01/05
Canceling: 07/01/04

PSE PUGET SOUND ENERGY

Conduit Installations Customer Provided

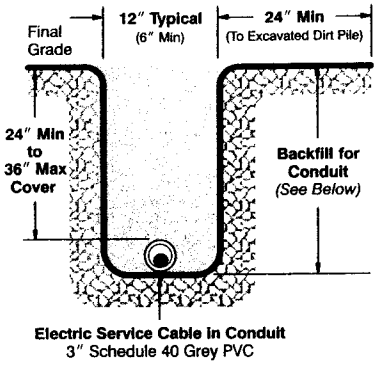
Joint Service Line Trench Conduit Installation



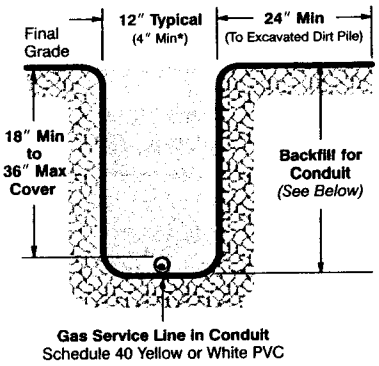
VERTICAL SEPARATION: *6" minimum vertical separation required when gas and other utilities cross.*

GAS SERVICE LINE SEPARATION: Gas service lines must be 12" minimum from electric service cables, ground rods, and ground wires.

Electric Service Cable in Conduit Installation



Gas Service Line in Conduit Installation



**** TRENCH WIDTH EXCEPTION:*** *When converting existing construction the minimum trench width acceptable is 4".*

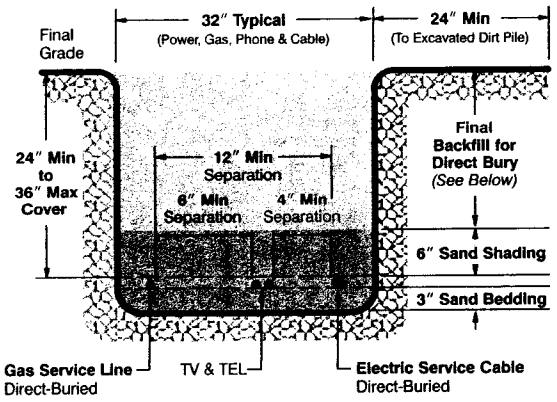
Backfill for Conduit installations:

- ***Backfill for Conduit:*** Soil that is free from construction debris, glass, sharp rocks, frozen clods, and rocks larger than **10"** in diameter.
- ***Shading:*** None required above conduit.
- ***Bedding:*** None required below conduit.

⚠ CAUTION! *Backfill Shall **Not** Damage Conduit*

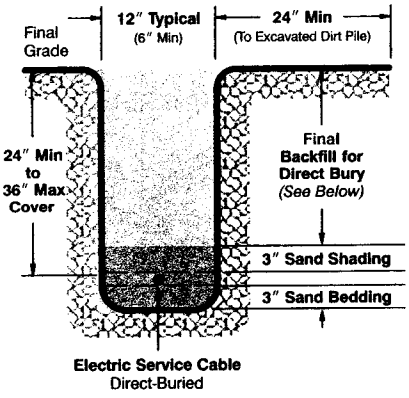
Direct-Buried Installations Customer Provided

Joint Service Line Trench Direct-Buried Installation

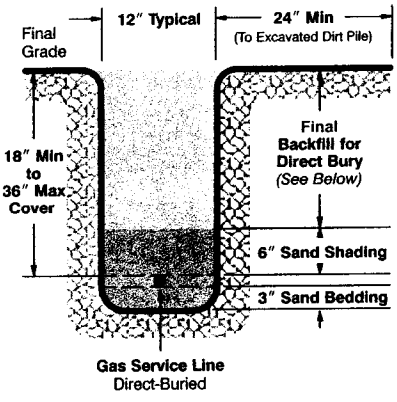


GAS SERVICE LINE SEPARATION: Gas service lines must be 12" minimum from electric service cables, ground rods, and ground wires.

Electric Service Cable Direct-Buried Installation



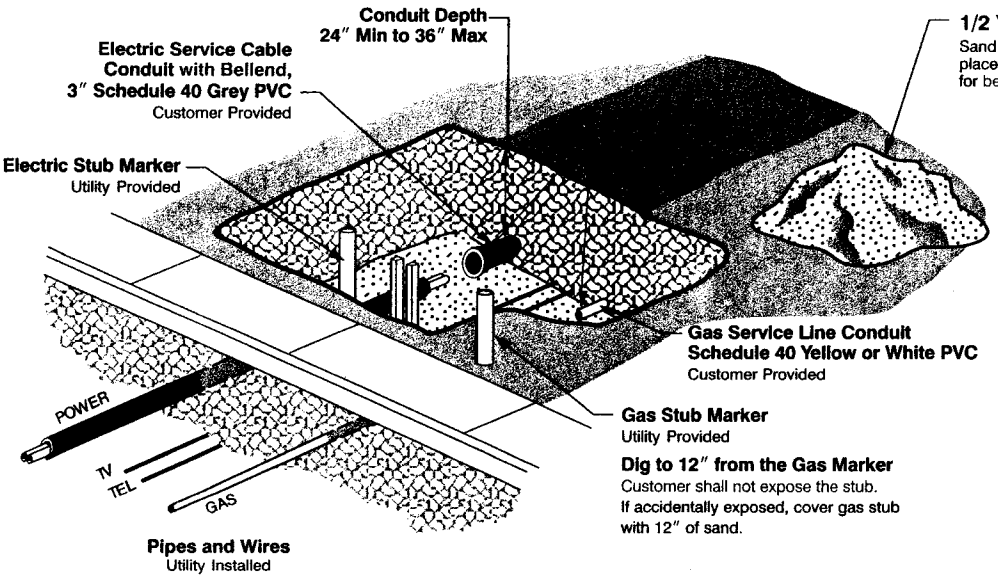
Gas Service Line Direct-Buried Installation

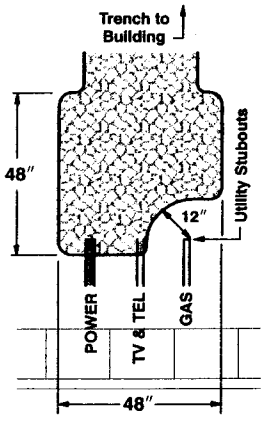


Backfill for Direct-Buried installations:

- ***Final Backfill For Direct Bury:*** The backfill layer above the sand shading shall be soil that is free from construction debris, glass, sharp rocks, frozen clods, and rocks larger than **6"** in diameter.
  - If the final layer contains rocks larger than **6"** in diameter, then **12"** of shading shall be placed over the gas service.
  - Rocks larger than **10"** in diameter are **not** permitted in the final backfill.
- ***Shading:*** Sand provided on site by the customer and readily accessible to be placed on top of direct-buried facilities in trenches and work pits.
- ***Bedding:*** Sand provided and installed by the customer to be placed on the bottom of trenches and work pits.

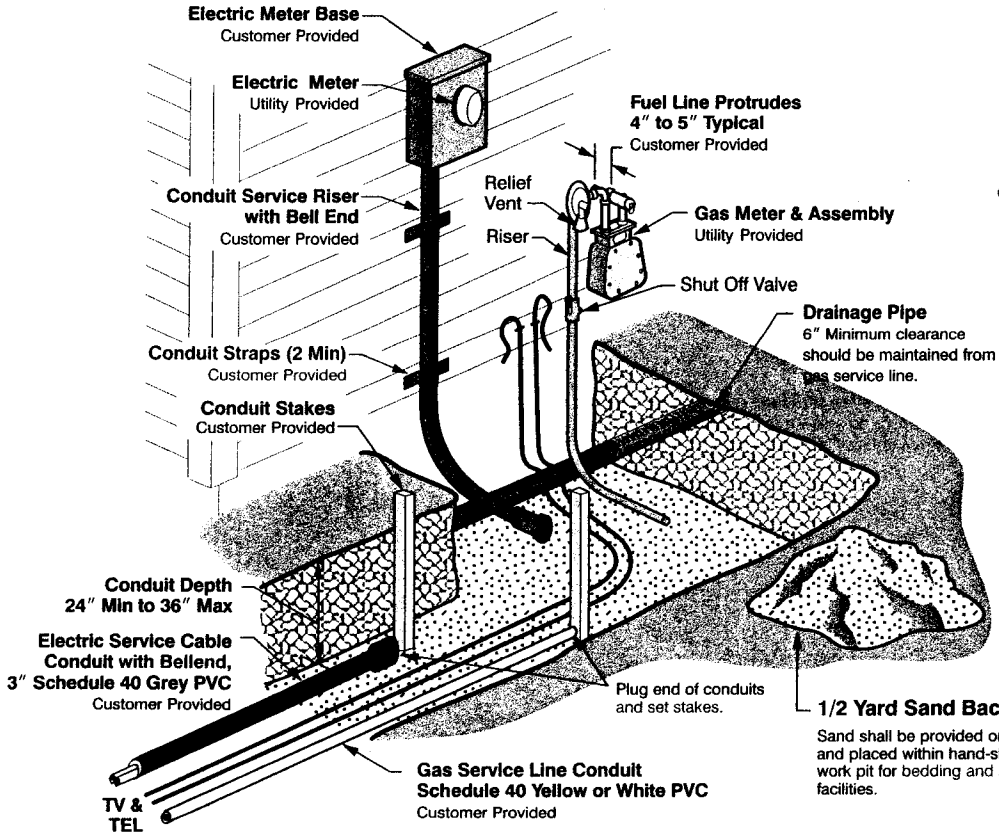
Property Line Work Pit Customer Provided

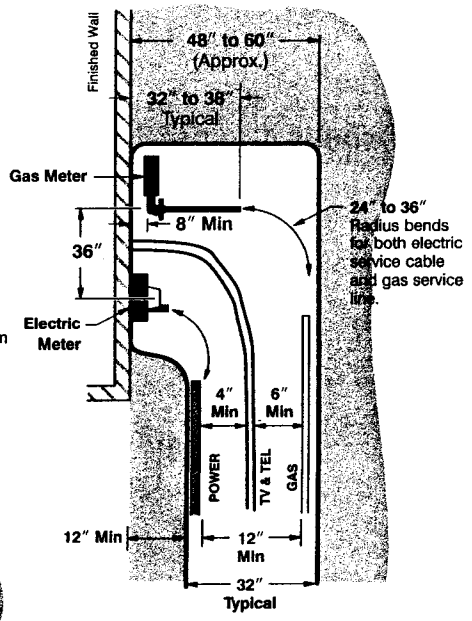




Work Pit Dimensions
Electric and Joint Utility

Service Entrance Work Pit Customer Provided

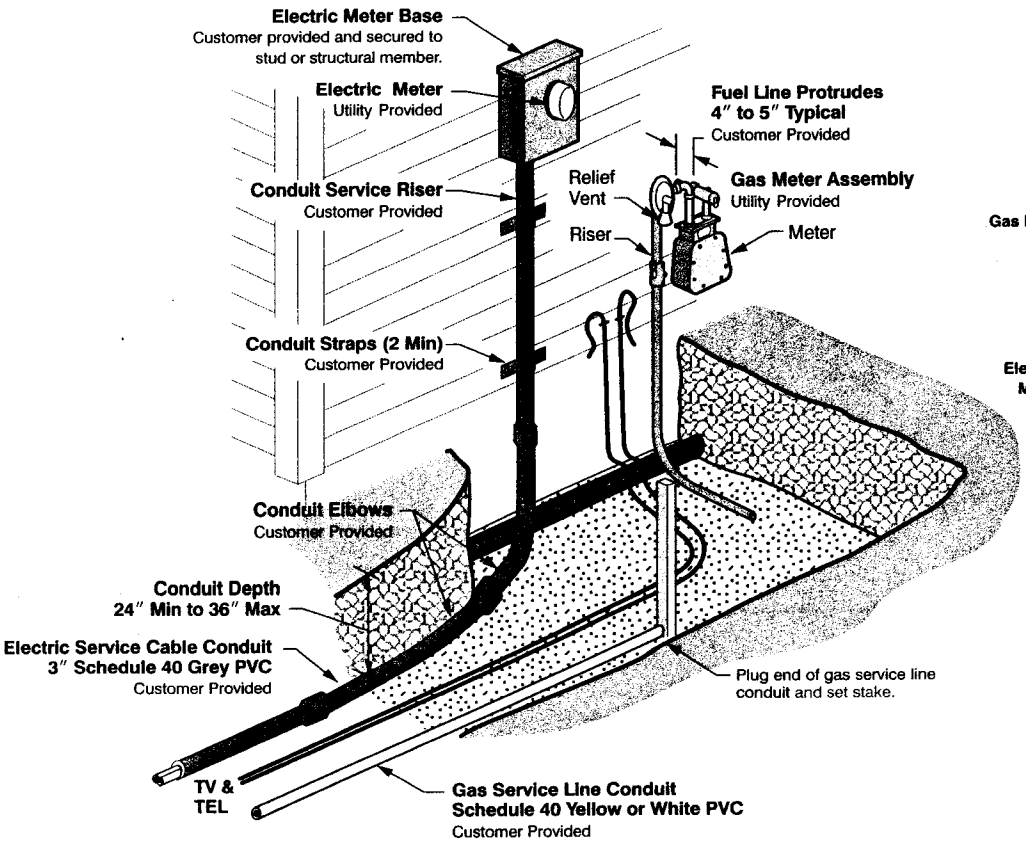


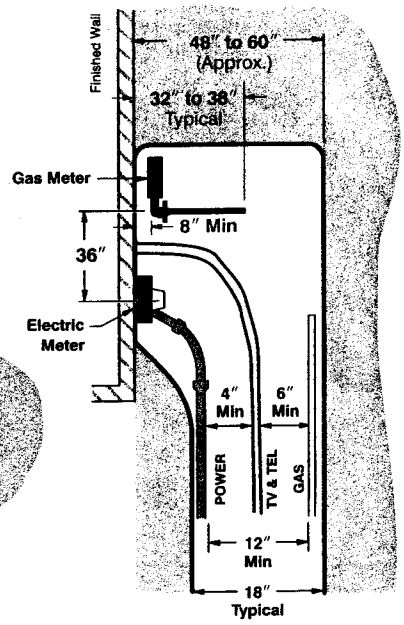


Work Pit Dimensions
Electric and Joint Utility

PUGET SOUND ENERGY

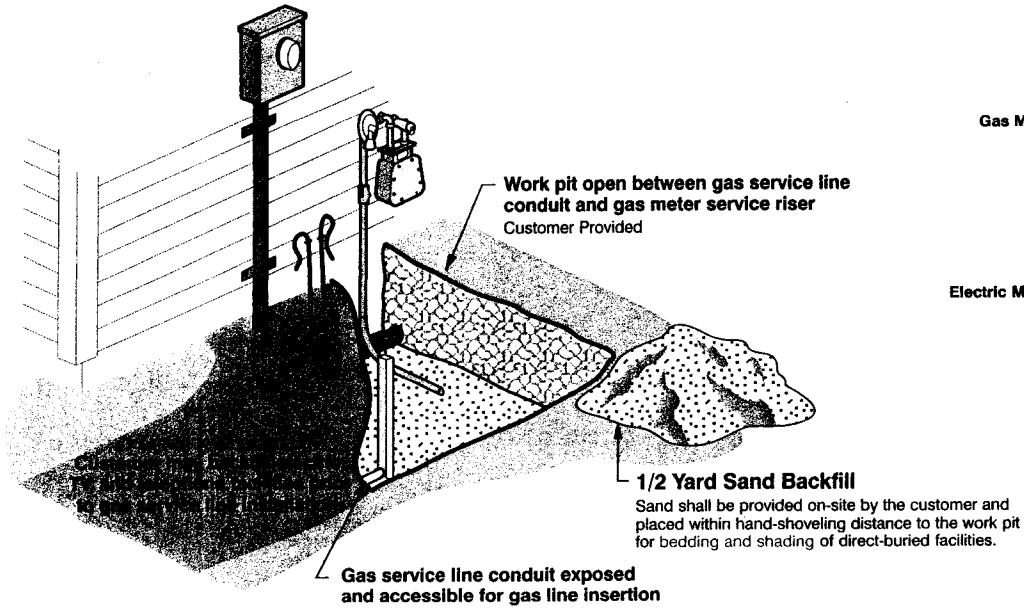
Continuous-Conduit Option for 200- and 320-Amp Services

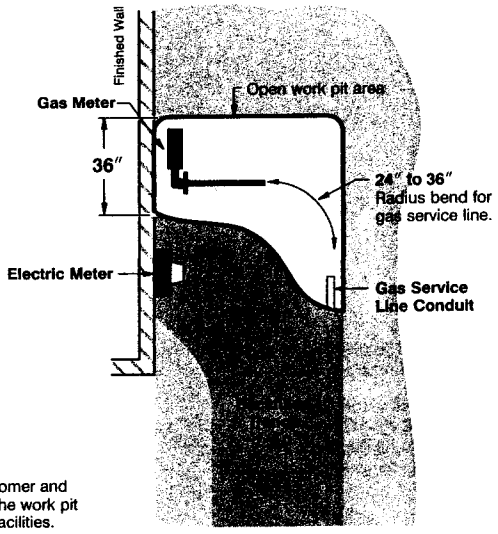




Work Pit Dimensions
Utility Placement at Service Entrance

Continuous-Conduit Service Entrance Backfill Detail





Work Pit Backfill
Backfill at Service Entrance with Accessible Gas Service Line

PUGET SOUND ENERGY

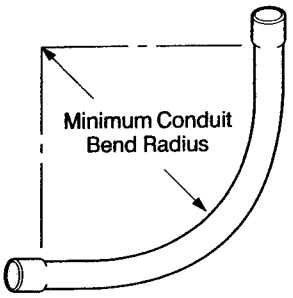
Conduit Requirements for Gas and Electric Services

- **PSE *requires* the use of conduit for electric service cables in plats with lots averaging one acre or less and with the service length 100 ft. or less.**
- **PSE also *recommends* the use of conduit for all gas and electric service installations.**

Conduit Installation Requirements:

- ❑ Electric conduit runs over 60 feet long must have a 3/8-inch minimum diameter pull rope installed.
- ❑ Conduit bends shall be one long radius, single-piece sweeps *(see table below).*
- ❑ The sum total of the degrees of bends in the conduit run cannot exceed 180°.
- ❑ Conduit shall not cross in the trench.
- ❑ Yellow or white Schedule 40 PVC conduit used for gas service lines shall not be marked "water," or any other utility.

Service Line		Conduit Size, Type, & Color	Minimum Bend Radius
ELECTRIC		3″ Schedule 40 Grey PVC	24″
GAS	5/8″	1-1/4″ (minimum) Schedule 40 Yellow or White PVC	24″
GAS	1-1/8″	2″ (minimum) Schedule 40 Yellow or White PVC	36″
GAS	Larger than 1-1/8″	Contact PSE to determine the correct conduit size and type.	Contact PSE



Electric Service in Continuous-Conduit Requirements

- **PSE will install underground electric service lines in customer-provided conduit that runs continuously from the meter riser to the property line power stub under the following conditions:**

Continuous-Conduit Conditions:

- ❑ The electric service is located in a single-family, residential plat.
- ❑ The electric service length is no longer than 70 feet.
- ❑ PSE crews must be able to successfully pull in the service wire.

Continuous-Conduit Installation Requirements:

- ❑ The electric meter base shall be secured to a stud or structural member.
- ❑ Reducer couplings shall not be used at the meter base.
- ❑ The electric service riser shall be fastened securely to a structural wall using a minimum of two conduit straps.
- ❑ The customer shall provide conduit that meets the requirements given the service size *(see table below).*
- ❑ Electric conduit bends shall not be less than a 24-inch radius.
- ❑ The sum total of the degrees of bends in the electric conduit run (including the bend required at the bottom of the meter base riser) shall not exceed 180°.
- ❑ The customer shall provide and install a 3/8-inch minimum diameter pull rope in the electric conduit run.

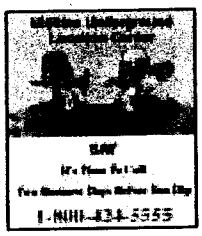
Conduit and Meter Base Requirements for Continuous-Conduit Installations:

	Service Size	Service Wire Size	Meter Base		Conduit Diameter & Type	Minimum Bend Radius
			Min Lug Size	Bottom Knockout		
ELECTRIC	200 Amp	1/0 or 4/0	4/0	2-1/2″	2-1/2″ Schedule 40 Grey PVC	24″
ELECTRIC	200 Amp	350-kcmil	350-kcmil	3″	3″ Schedule 40 Grey PVC	24″
ELECTRIC	320 Amp	4/0- or 350-kcmil	350-kcmil	3″	3″ Schedule 40 Grey PVC	24″

Builder/Developer Requirements

PSE *requires* the following conditions to be met by the builder/developer before service is installed:

- ☑ Installation of trench, work pits, sand bedding & shading, and conduit must be prepared to PSE specifications.
- ☑ Final grade of the lot must be established and in place.
- ☑ Sand must be provided by the builder or developer and placed within hand-shoveling distance to the work pit or trench for bedding & shading of any direct-buried electric service cables or gas service lines.
- ☑ Meter(s) must be located in an acceptable location within proper clearances. Acceptable locations include the front wall of the building facing typical public access, or the front 1/3 of the side wall.
- ☑ Fuel line must be in place with an approved permit and plumbed to an approved gas meter location. A valid permit must be indicated by either:
  - ♦ a permit visible from outside the structure, or
  - ♦ a green *Gas Service Approval* sticker affixed to the fuel line.
- ☑ Electrical permit must be approved and placed at the electric meter base.
- ☑ Conduit for electric service lines shall be used under all paved surfaces, decks, rockeries, bulkheads, or obstacles to access the service line.
- ☑ Questions? Call PSE's Customer Construction Services: ***1-888-321-7779***
- ☑ Call two business days before you dig, ***1-800-424-5555.***



Avoid these problems that can delay installations:

- ◆ **Construction debris or water in the trench or work pits.**
- ◆ **Trenches excavated to the incorrect depth.**
- ◆ **Failure to maintain minimum separations between utilities and drainage pipes.**
- ◆ **Backfill material is not available, inaccessible, or inadequate.**
- ◆ **Requested meter location is not acceptable or fails to meet minimum clearances.**
- ◆ **Permits are not approved.**
- ◆ **Conduit color and size are incorrect, or conduit is installed improperly.**