

CHAPTER

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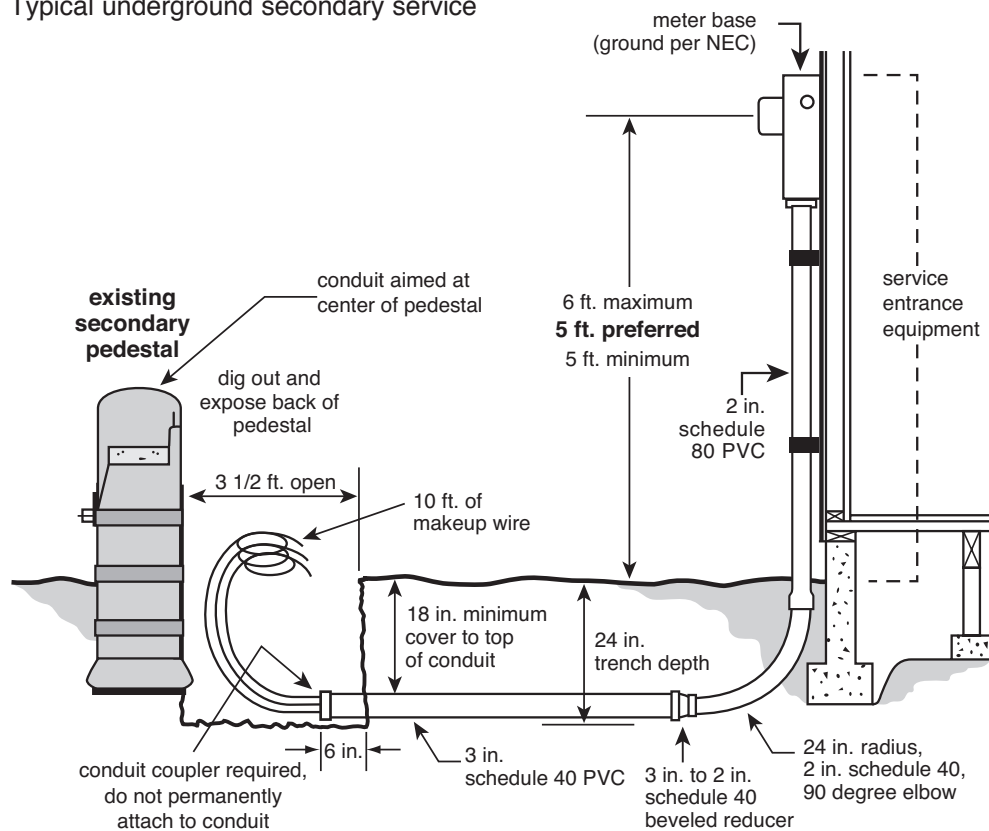
Underground Secondary Services

Preparing for the installation

Typically, an extension of secondary 120/240 volt electrical service is all that is required if less than 200 feet of **secondary voltage** wire is needed to connect the meter base to a transformer. For homes with large motor loads such as multiple heat pumps or dryers, air conditioning units, etc., this distance may be less. All single-family residences not located within 200 feet of existing primary require an underground primary line extension to place a transformer closer to the structure. See *Chapter 4, Primary Line Extensions*, for more information on this type of installation.

The following checklist will assist in preparing a project for the installation of secondary underground electric service. After these items have been completed, Clark Public Utilities will connect the service and set the meter (*Figure 4*).

Figure 4 Typical underground secondary service



To obtain new underground electric service, the financially responsible party is asked to:

- Contact Clark Public Utilities' Construction Services department at (360) 992-8558 to initiate a request for electric service.
- Provide the following information requested by Construction Services to create a job:
 - Site plan (*Figure 5*)
 - Assessor's Parcel Number (APN)
 - Existing easement information regarding utilities
 - Square footage of the home or outbuilding
 - Electrical panel size or load information
 - Heating and cooling equipment type and size
- Obtain an electrical work permit from the Washington Department of Labor and Industries (360) 896-2300 or from the City of Vancouver (360) 487-7802.
- Call the national "Call Before You Dig" locating service by dialing 811, or 1-800-424-5555 to determine the location of existing underground utilities.
- Obtain an electric service design from a Clark Public Utilities' representative.
- Pay any pre-billed utility construction charges.
- Trench to the utility's source facility as indicated by the utility provided design.
- Install a continuous conduit run from the Clark Public Utilities source to the customer-owned meter base (*Figure 4*).
- Install the underground service equipment from the service entrance to the appropriate electrical source.
- Obtain an electrical inspection of the secondary service from the appropriate inspecting body (Department of Labor and Industries or the City of Vancouver).
- After inspection and approval, backfill the trench leaving 3½ feet open at the transformer or secondary pedestal (6 inches of conduit end exposed, see *Figure 4*). **Do not** cement the conduit coupler on conduit end.

NOTE: The electrical inspector will notify Clark Public Utilities after the service has been approved.

Once Clark Public Utilities has received verification of approval, all of the above items are completed and the customer has completed backfilling the trench, the utility will:

- ▶ Energize all electrical facilities required.
- ▶ Connect underground secondary wire at the source.
- ▶ Set the electric meter at the structure.

Site plan

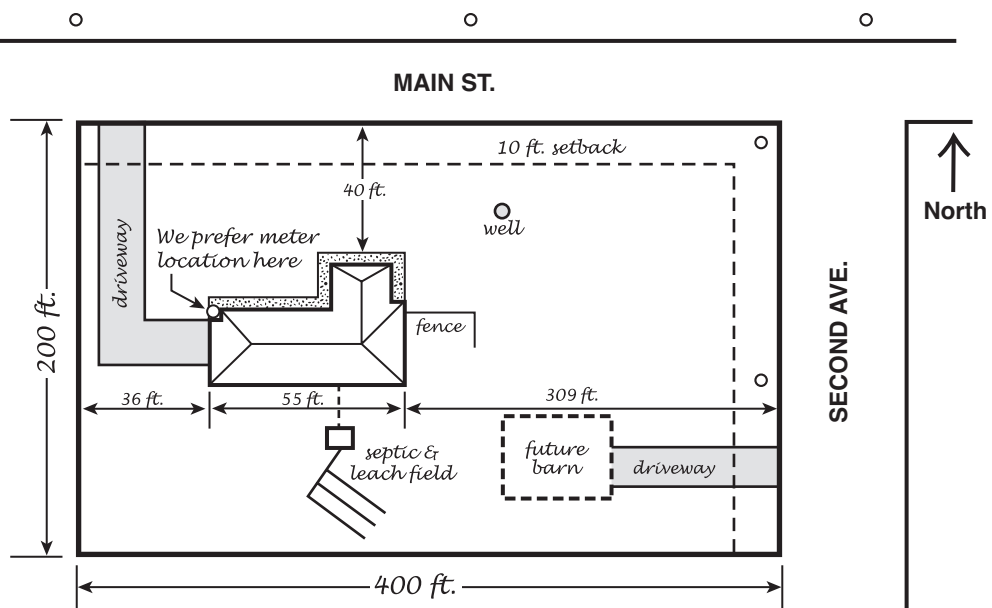
Before a utility representative visits the job site, a customer-provided site plan is required (**Figure 5**). To ensure the new electric service is located and sized to serve all future needs, the site plan should include the following helpful information:

- ▶ Customer name and contact phone number
- ▶ Site address
- ▶ Drawing of property, shape and dimensions
- ▶ Streets and intersection nearest property
- ▶ Driveway location
- ▶ Residential structure location and dimensions
- ▶ Well, septic and leach field locations
- ▶ Setbacks and existing easements
- ▶ Future buildings
- ▶ Existing poles or transformer
- ▶ Possible locations of new transformer and meter

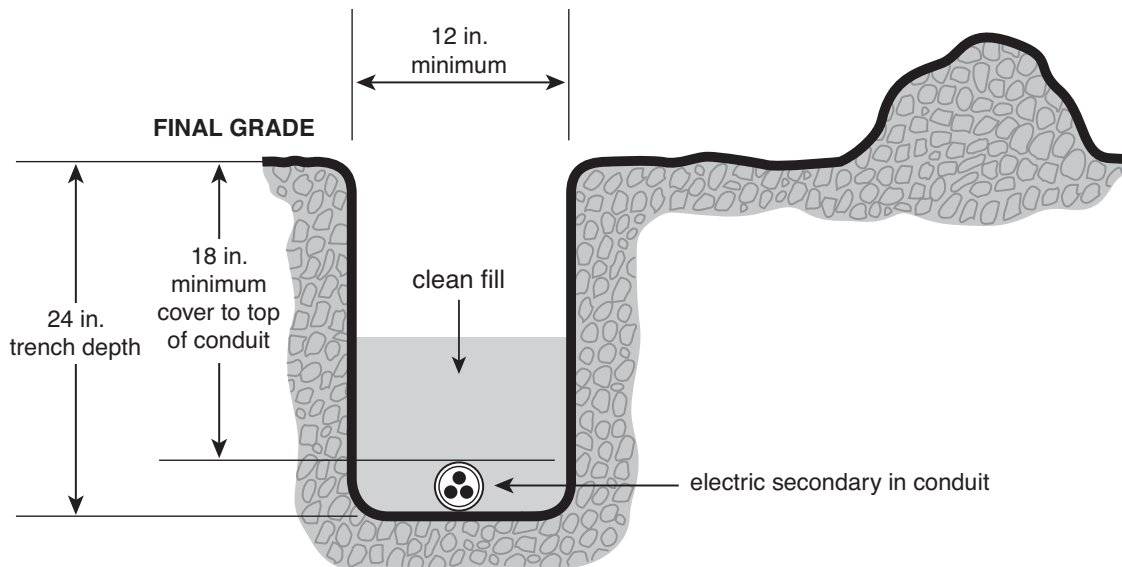
NOTE: Installation of a base rock driveway and staking of the main structure may be required prior to the site visit.

Figure 5 Typical customer-provided site plan

Name: John Q. Homeowner Address: 1234 Main Street Phone: 360-123-4567



NOTE: Customer to stake property corners, location of house or mobile home, well, septic system and future structures.

Figure 6 Secondary electric service trench detail

Secondary electric service trenches

Trench and backfill requirements for secondary electric service

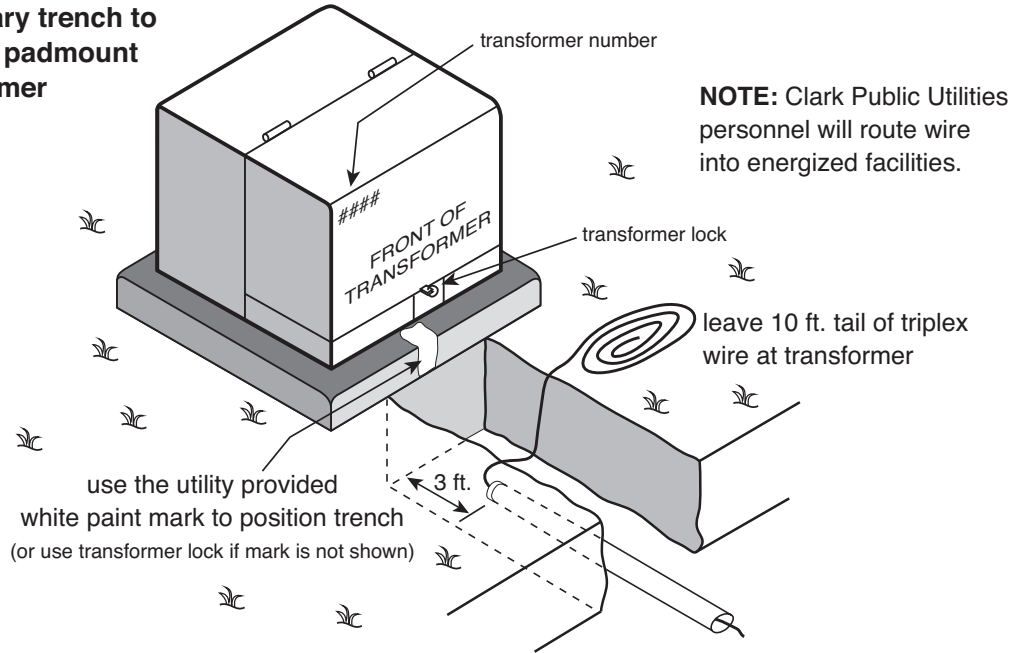
The customer is responsible for all trenching and backfill from the Clark Public Utilities electrical source to the residential service entrance. The exception is trenching that occurs within the public right-of-way or on property not owned by the customer. **Only licensed and bonded contractors hired by the customer may perform work within the public right-of-way or on neighboring property.**

The following steps are required prior to connection of service:

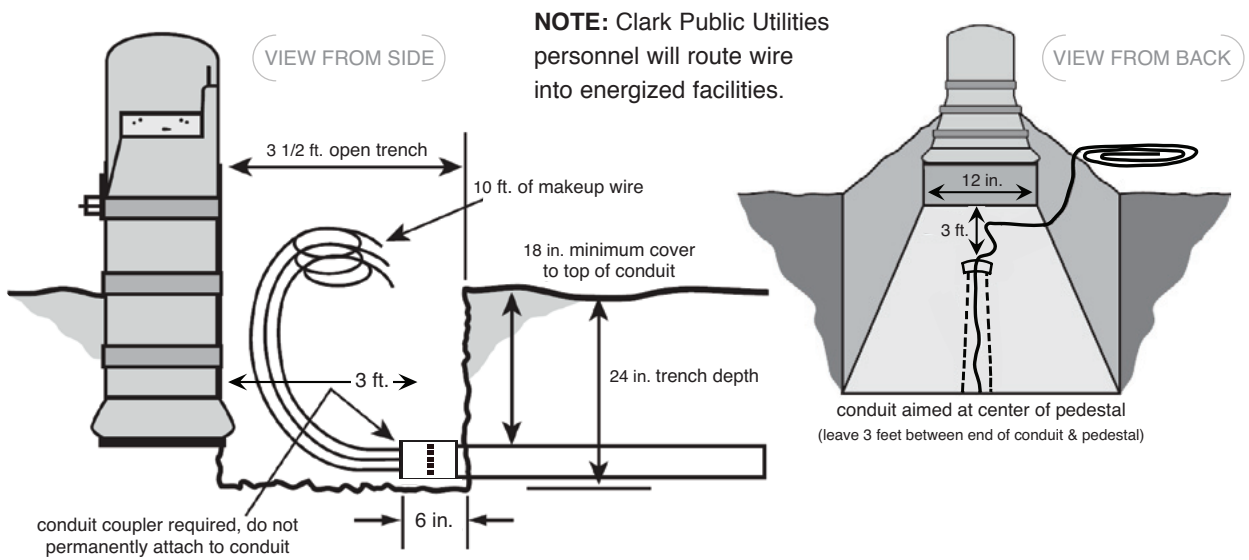
- ▶ Call for underground locates at least two business days prior to any digging or excavation by dialing 811 or 1-800-424-5555.
- ▶ Dig secondary voltage electric service trenches 24 inches deep allowing a minimum of 18 inches of cover from the top of the conduit (*Figure 6*).
- ▶ Ensure the width of the trench is a minimum of 12 inches.
- ▶ Dig trench completely up to the edge of Clark Public Utilities' source facility (*Figure 7*).
- ▶ Dig any trench within two feet of power company facilities by hand.
- ▶ Remove construction scrap material or trash of any kind from the trench.
- ▶ If soil is rocky, select **backfill** or a bed of sand may be required prior to conduit installation.
- ▶ Remove all water in electric service trenches prior to inspection by pumping or draining.
- ▶ *After* required inspections have taken place, backfill and compact the trench.

Figure 7 Typical secondary trenches to underground utility sources

secondary trench to existing padmount transformer



secondary trench to existing secondary pedestal

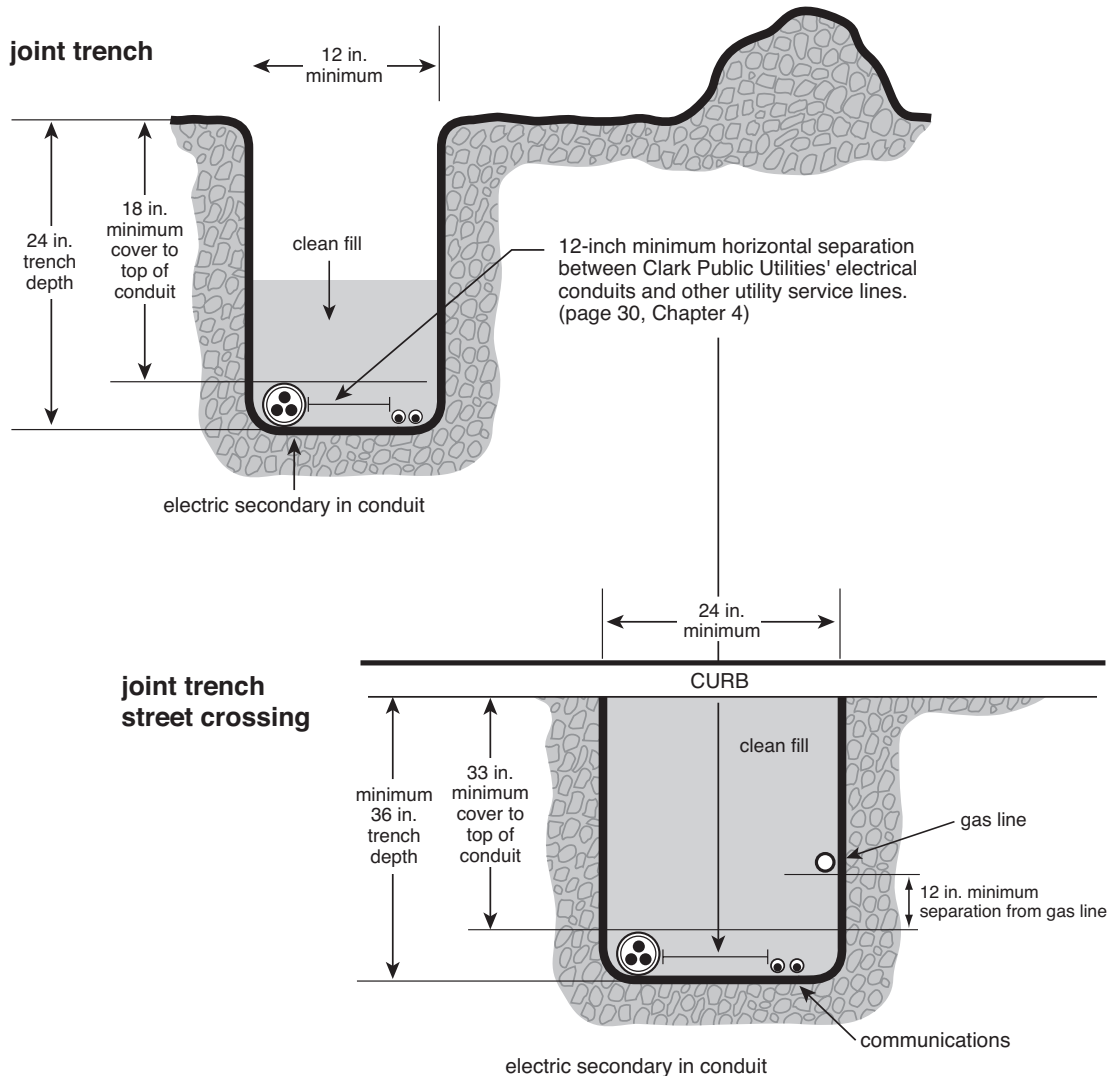


Joint trenches and crossings

Clark Public Utilities will allow a joint use secondary trench or crossing. It is the customer's responsibility to contact the appropriate phone, cable and gas utilities to coordinate the installation of their conduits and lines. The following requirements and minimum clearances from electric facilities (*Figure 8*) are necessary when utilizing a shared trench:

- ▶ All electrical service cables are in 3-inch, schedule 40, PVC, gray electrical conduit.
- ▶ Separation of utilities may be vertical or horizontal.
- ▶ Select backfill or controlled density fill (CDF) is used when deemed necessary by a utility representative.
- ▶ No construction scrap material or trash of any kind is left in any part of the trench or crossing.

Figure 8 Joint utilities secondary trench and street crossing



- ▶ A right-of-way (crossing) permit is secured from Clark County or Washington Department of Transportation (WDOT) for each crossing. Fees for these permits will be added to the customer's construction billing.
- ▶ All state and county road crossings shall meet the installation requirements outlined in the right-of-way permit issued by the authority having jurisdiction.

NOTE: Sewer lines, water mains and storm drainage systems are *not* allowed in a joint trench with Clark Public Utilities electric service lines.

Customer-installed secondary service conduit

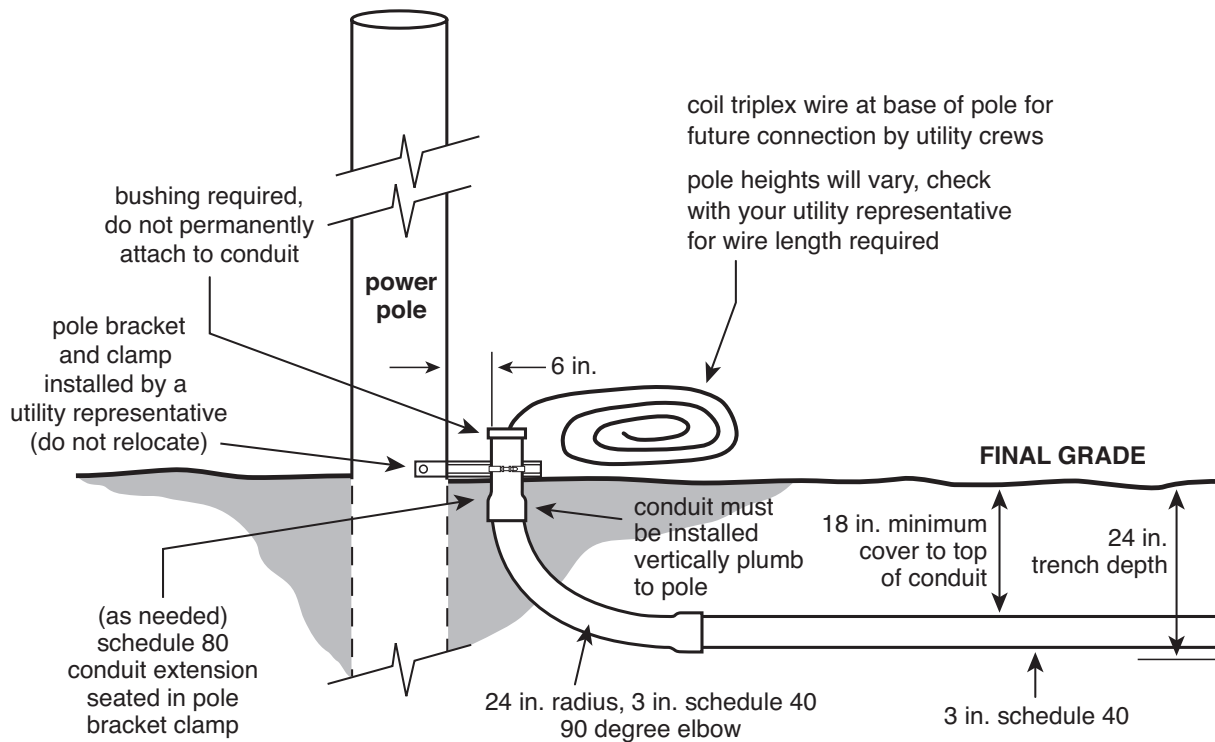
New services to residential structures require a continuous run of conduit from the meter base to the Clark Public Utilities padmounted transformer, secondary pedestal or utility pole.

The buried conduit shall be 3 inches in diameter, gray, UL listed, electrical grade, schedule 40, PVC, conduit. ***White water pipe or green 3034/black ABS sewer pipe is not acceptable.***

All customer-installed underground conduit runs require:

- ▶ No more than three, 90-degree bends (270 degrees) of which no individual bend is less than a 24-inch radius. This total includes the elbow into the source facility.
- ▶ Factory-made elbows for all bends (heat bending conduit is not acceptable).
- ▶ Smooth-walled, beveled, conduit reducers as shown in *Figure 4*.
- ▶ PVC cement applied to each joint that has been allowed to cure according to the manufacturer's recommendations prior to backfill.
- ▶ Exposed conduit from grade to the base of the customer meter base is 2 inch schedule 80, PVC.
- ▶ Parallel runs of conductor installed in separate conduits for each service line.
- ▶ Conduit runs stop 3 feet from energized underground facilities with 6 inches of conduit exposed as shown in *Figures 4 and 7*. The remaining trench, up to the side of the source facility, is to remain open and clear until a utility representative routes the conductor in and makes the final connection.
- ▶ A conduit coupler attached to the conduit end but not permanently affixed (*Figures 4 and 7*).
- ▶ Services to utility poles to be a continuous run of conduit with a 3-inch, 90-degree, 24-inch minimum radius, schedule 40, PVC elbow, seated in the standoff bracket attached at the pole base. See *Figure 9* on page 20 of this chapter.

Customer-owned electric services on the customer (load) side of the meter fall under the jurisdiction of the Washington State Department of Labor and Industries or the City of Vancouver. The local inspecting office requires conduit sleeves if these services cross under permanent structures such as a driveway, sidewalk, deck, patio or retaining wall.

Figure 9 Secondary voltage overhead to underground pole bracket installation

NOTE: Trench depths vary; review your utility-provided design for required depth.

Additional trenching and conduit installation tips

The following general tips will help to ensure that projects run as smoothly as possible and may answer additional questions about trenching and installing conduit.

- ▶ Dig trenches in straight lines to the greatest extent possible.
- ▶ Schedule the trenching so the trench is open for the shortest practical time to avoid creating a public hazard and to minimize the possibility of the trench collapsing due to other construction activity, rain, etc.
- ▶ If any conduits, wires or pipes are encountered while digging, leave them covered.
- ▶ If rock or other extremely difficult digging is involved, contact your Clark Public Utilities representative to discuss the situation.
- ▶ Prior to backfilling, the appropriate jurisdiction will inspect the trench for adequate depth, conduit and cable placement. If corrections are necessary, a second inspection is required after all corrections are completed.
- ▶ After backfill, tamp the soil, leaving a slight mound to allow for settling.

When trenching a secondary service line to an energized Clark Public Utilities source, leave the trench, conduit and conductor as follows:

Secondary Pedestal

Trench.....24 inches deep, exposing the back or side of pedestal.

Conduit.....stopped within 3 feet of the pedestal with 6 inches of conduit exposed.

Secondary

conductor.....to edge of pedestal leaving a 10-foot tail of wire for connection by utility personnel.

Transformer

Trench.....24 inches deep to white paint mark (provided by utility representative) on transformer pad.

Conduit.....stopped within 3 feet of the transformer pad with 6 inches of conduit exposed.

Secondary

conductor.....to transformer leaving a 10-foot tail of wire for connection by utility personnel.

Utility Pole

Trench.....24 inches deep to pole bracket assembly attached at pole base.

Conduit.....continuous from meter base to customer provided 3-inch, schedule 40, PVC, 24-inch minimum radius elbow, seated in pole bracket clamp at base of pole (*Figure 9*). Utility personnel will attach the pole bracket assembly at required pole location. Do not relocate the bracket assembly.

Secondary

conductor.....a wire tail to pole base, utility personnel will advise wire coil length required (varies based on pole height).

Secondary conductor and service entrance equipment

Secondary conductor specifications

Acceptable residential secondary conductor for utility-maintained services are 4/0 or 350 MCM aluminum, URD, triplex, standard or compressed stranding. The installation of COMPACT wire is *not* acceptable and will not be connected or energized by Clark Public Utilities.

Table 3 shows examples of the secondary conductor specified for typical residential installations:

Table 3 Residential underground secondary conductor

Panel Amps	Conductor Type
0 to 200 amps	4/0 aluminum, URD, triplex
201 to 400 amps	350 MCM or (2) 4/0 aluminum, URD, triplex
401 amps and larger	See utility personnel for details

Service entrance equipment

After the meter base location, service line route, and the size of the service have been determined, **service entrance equipment** can be installed. The **exposed** conduit from final grade to the bottom of the meter base is referred to by the utility as the service entrance conduit and is considered part of the customer-owned and maintained meter base.

Installation requirements

- ▶ Service entrance equipment may be installed either flush-mounted or surface-mounted. **NOTE:** Flush-mounted service entrance conduit cannot be installed inside a shear wall or within 4 feet of a structure corner (**Figure 10**).
- ▶ Install the meter base so that the center of the meter will be between 5 and 6 feet, with a preferred height of 5 feet above finished grade.
- ▶ The service entrance conduit has a maximum of one, 90-degree bend with a minimum 24-inch radius. **NOTE:** The total conduit run is restricted to no more than three, 90-degree bends (270 degrees total) of which no individual bend is less than a 24-inch radius.
- ▶ Do not install **conduit bodies** (LB joints, condulets) or other devices that allow access to the service conductor in the riser ahead of the meter.
- ▶ A **current transformer (CT)** enclosure, if required, is mounted on the outside of the structure it serves.

Service entrance conduit size

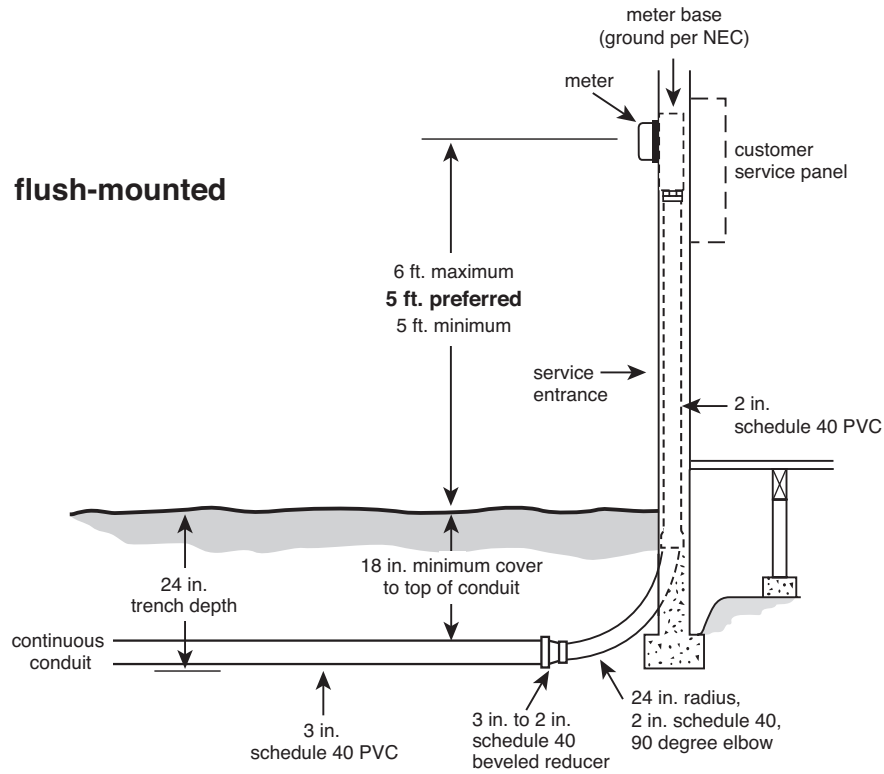
The size of service determines the size of the service entrance conduit installed. **Table 4** shows service entrance conduit sizes.

Table 4 Service entrance conduit sizes

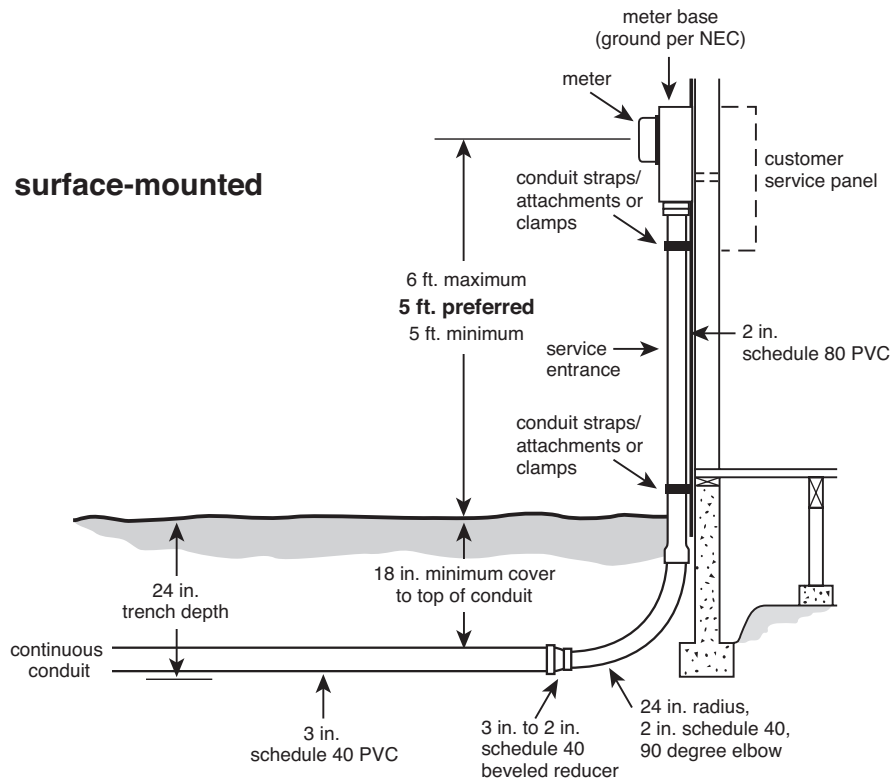
Service Size	Minimum Service Entrance Conduit Requirements
0 to 200 amps	2-inch, gray, schedule 80, PVC
201 to 400 amps (parallel 4/0 service line)	Parallel 2-inch, gray, schedule 80, PVC
201 to 400 amps (350 MCM service line)	3-inch, gray, schedule 80, PVC
Over 400 amps	3-inch, gray, schedule 80, PVC (parallel 3-inch conduits required for parallel runs of service line)

NOTE: Exposed conduit from final grade to the bottom of the meter base is referred to as the service entrance conduit.

Figure 10 Two types of meter bases for residential underground service



NOTE: Flush-mounted service entrance conduit cannot be located in a shear wall or within 4 ft. of a structure corner.



Secondary pedestals

New service installations may require a secondary pedestal set behind a transformer or at the base of a power pole. If required, utility personnel will stake the location of the secondary pedestal and install a pole bracket assembly at the pole base.

The customer is responsible for providing and installing the secondary pedestal and required tagging as shown in *Figures 11 and 12*.

All secondary pedestal installations require a(n):

- ▶ 34-inch deep trench from pole base to the staked pedestal location.
- ▶ 36-inch radius long sweep elbow seated in the pole bracket clamp (bell end down, in trench) and a 24-inch short sweep elbow stubbed up inside the center of the pedestal.
- ▶ Coil of wire at the base of the pole (length and size of conductor as called out by utility personnel).
- ▶ Wire tag zip-tied onto each conductor, (including the neutral) terminated inside the pedestal. See *Secondary conductor identification tags* on next page and *Figure 12* for additional information.
- ▶ Insulating cover installed over each termination block.

Once the new service installation has passed inspection, all pre-billed charges have been paid, and the customer has completed backfill, the utility will energize the equipment and set the meter or temporary service.

Figure 11 Secondary pedestal installation detail

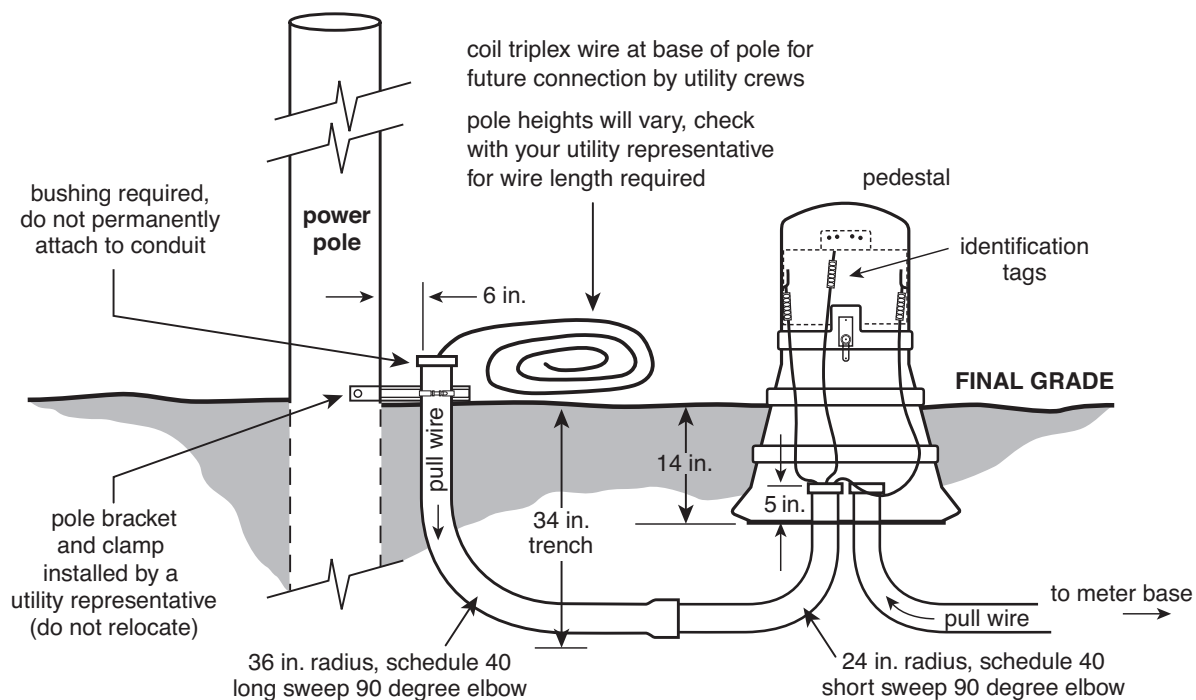
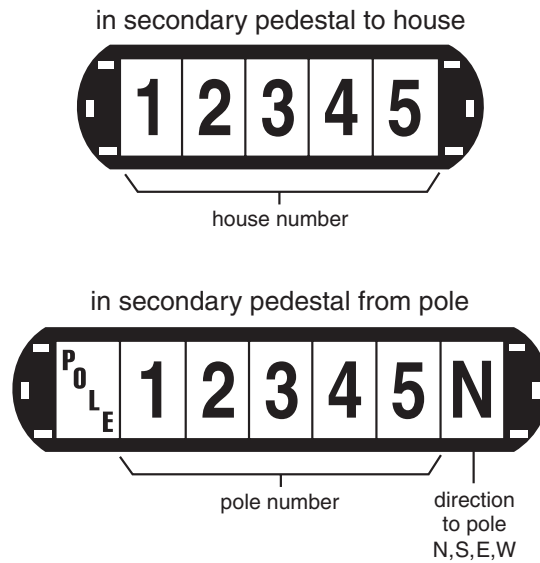


Figure 12 Secondary wire tagging

Secondary conductor identification tags

Clark Public Utilities requires the use of Tech Products brand tag holders with individual characters indicating the source equipment, its location, the equipment number and the address of the residential structure. Character holders installed inside a secondary pedestal fed from a source pole would include the following:

- ▶ From pole (or transformer): POLE character, pole number as indicated by utility personnel and direction (N, S, E, W) character.
- ▶ To house (or residential structure): House number characters.

NOTE: Wire tags are zip tied onto each conductor (including the neutral) just below the termination block.

Contact a utility representative for a current material suppliers' list and additional information on installation of a secondary pedestal and secondary conductor identification tags.

Permanent underground service for manufactured homes

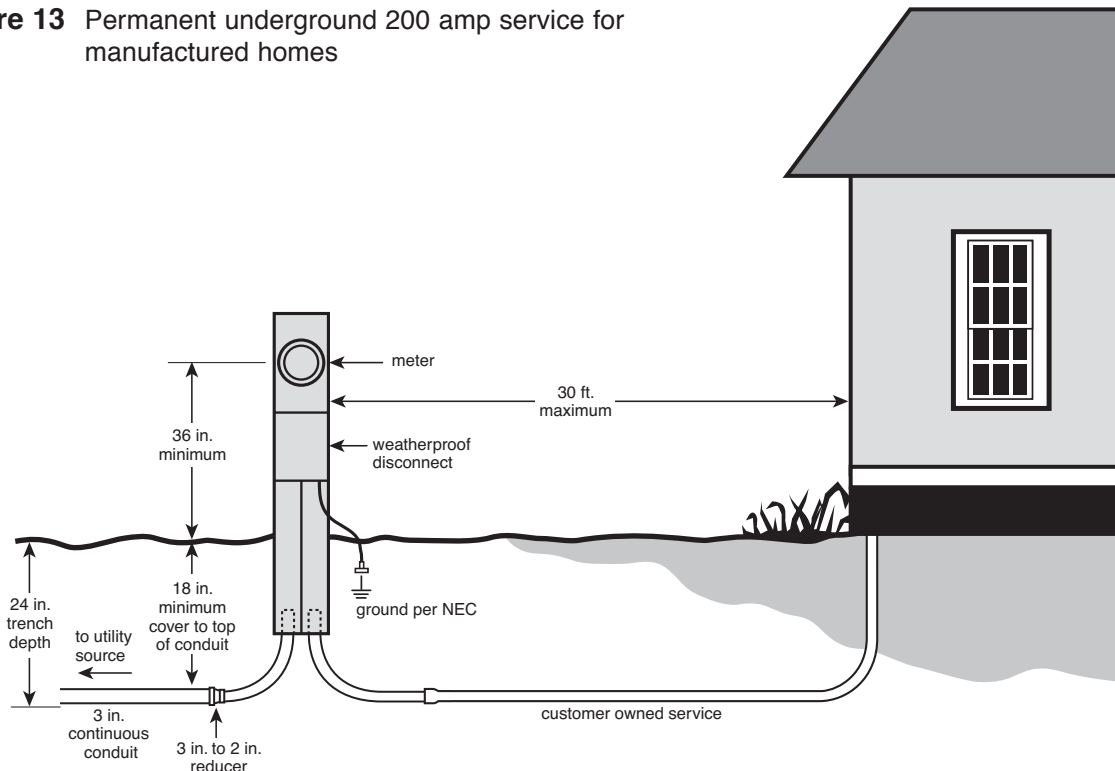
Service equipment installation

Services to manufactured homes are customer-owned and maintained from the service disconnect to the structure. When installing an underground service to a manufactured home, refer to the following general specifications *and* contact the local governing body for additional NEC requirements (*Figure 13*).

Meter pedestals installed for service to a manufactured home should:

- ▶ Have a service main with auxiliary breaker space (the most common size is 200 amps).
- ▶ Be located within 30 feet of the manufactured home but not attached to the structure (only factory-installed meter bases can be attached to manufactured homes).
- ▶ Have a 4-wire feed behind the meter pedestal (customer/load side) that supplies the manufactured home.

Figure 13 Permanent underground 200 amp service for manufactured homes



Residential leased lighting

Utility-leased area lights are installed by Clark Public Utilities and billed monthly to the customer. The monthly rate covers the capital cost of the equipment, energy used each month and maintenance of the light (re-lamping).

Leased area lights are installed on Clark Public Utilities' power poles located on private property of the requesting customer only. These lights are equipped with photoelectric controls (responding to light and dark) and cannot be manually turned on or off.

Leased lighting installation responsibilities

Customer is responsible for:

- ▶ Contacting the Construction Services department to initiate a request for leased lighting.
- ▶ Notifying the underground utilities locating service at least two business days prior to any digging or excavation.
- ▶ All trenching related to the installation.
- ▶ Installation of secondary service including conduit and conductor.
- ▶ Providing a 25-foot tail of duplex conductor coiled at the base of the pole.
- ▶ Contacting the utility to report lights that are out or not working properly.

Clark Public Utilities is responsible for:

- ▶ Providing the lighting service design.
- ▶ Installing the riser on the pole.
- ▶ Connecting the service inside the utility source (secondary pedestal or transformer).
- ▶ Installing a light tag on the pole.
- ▶ Re-lamping and maintaining the lighting service.

NOTE: Leased area lights installed at the entrance of a customer's driveway cannot be directed onto city or county roadways.

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