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## 5. Underground Requirements

### 5.1 General

The customer is responsible for providing all trenches, backfill, compaction, conduit, and equipment foundations. The customer is responsible for boring if that method is used. The customer shall meet the requirements described in this section to complete construction for underground installation of services. Consult the Power Company for conduit layout, and for equipment foundation requirements for secondary and primary extensions.

The customer shall give consideration to local ground and frost conditions such that the installation remains structurally sound.

The customer is responsible for ensuring that all conduit complies with Power Company requirements.

Before installing any conduit system, the customer shall enter into a contract with the Power Company and obtain a job sketch from a Power Company representative. The customer is responsible for ensuring that all conduit system installations comply with Power Company requirements and with the provided job sketch. Any conduit system or any part of a conduit system installed before receiving a job sketch from the Power Company may be subject to rejection or revision.

### 5.2 Conduit Requirements

All underground services shall be installed in conduit.

Following installation, the Power Company shall own and maintain the customer-installed service lateral conduit up to the sweep and riser connected to the meter socket.

The Power Company will install the underground cable from the Power Company's source to the service point.

#### Requirements:

For all conduit installations, the customer shall:

1. Ensure that Power Company conduit is located away from (and never underneath) buildings, building foundations, or other structures (including retaining walls).
2. Be responsible for recognizing potential surface and subgrade water flows and consulting the Power Company to minimize potential runoff problems.
3. Seal all raceways and conduit to prevent the infiltration of water into the electrical equipment.
4. Provide and install electrical grade PVC, HDPE, or fiberglass conduit, and long radius sweeps (elbows). See Table 10. Above-ground conduit shall be Schedule 40 PVC or better.



HDPE conduit cannot be exposed above grade. Some jurisdictions may require conduit grades better than Schedule 40; consult the local governing code.

**Table 10—Sweep Specifications**

Conduit Diameter	Long Radius Sweep
3"	36"
4"	36"
6"	48"

**Additional Requirements for Fiberglass Elbows:**

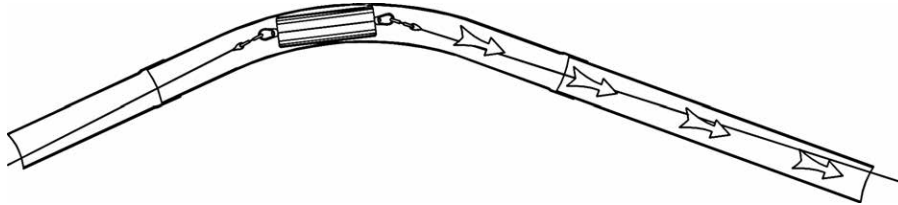
- a. Fiberglass elbows require special couplings; see company Material Specification ZG 033, *Fiberglass Conduit*, for details. ZG 033 is posted beneath this manual at [www.pacificpower.net/esr](http://www.pacificpower.net/esr) and [www.rockymountainpower.net/con/esr](http://www.rockymountainpower.net/con/esr).
- b. Elbows must be certified by a Nationally Recognized Testing Laboratory (NRTL).
5. All joints shall be compressed to the depth of the coupling system, and glued. Where straight ends and bell ends are joined, the straight end shall be beveled so as not to become an obstacle to mandrels or pulled cable.
6. The customer shall supply smooth-walled conduit reducers (swedges) when required.
7. When conduit terminates at Power Company equipment, the customer shall consult the Power Company for the exact conduit location. The customer shall not install conduit within two feet (2') of Power Company facilities, unless requested by the Power Company. Coordinate final conduit or sweep installation with the Power Company.
8. An expansion coupling shall be provided in the riser below the metering enclosure in areas where frost heaves and settling are likely to pull the surface-mounted meter socket from the wall.
9. When conduit extends vertically through a paved or concrete surface, a sleeve shall be placed around the conduit to prevent direct contact with the pavement or concrete to help prevent damage to conductors and service equipment caused by soil settling.
10. The customer shall keep the conduit free of dirt and debris during installation.
11. The customer shall provide backfill, compaction, and surface restoration that conforms to city, county, and state requirements.
12. The customer is responsible for repairing crushed conduit, including any costs for Power Company crews to return to the job site.
13. The customer shall not install customer-owned conductors in the same conduit/vault system with Power Company conductors.
14. The customer shall provide a flat pull line (preferred) or poly rope (alternative) capable of withstanding 1000 lbs. of tension, installed with 72 inches (72") of extra line capable of extending from each end of the conduit. The pull line shall be secured inside the ends of the conduit and both conduit ends shall be capped.
15. All underground raceways should be proofed with a mandrel to remove obstructions, and to confirm at least 80% of the nominal conduit diameter. When requested by the Power Company, the customer shall perform a "witnessed proofing" of conduit systems. See Table 11 and Figure 10.



**Table 11—Required Mandrel Sizes for Conduit Proofing**

Conduit Nominal Diameter	Mandrel Diameter	Minimum Mandrel Length	Maximum Mandrel Length	Proof
3"	2.5"	3.25"	8"	83%
4"	3.5"	4.25"	8"	87%
6"	5.5"	6.25"	10"	92%

**Note:** The reduced inner diameter of HDPE conduit requires a smaller mandrel diameter than listed. Use a mandrel that confirms at least 80% of the nominal inner diameter.

**Figure 10—Mandrel Proofing**

### 5.2.1 Service Conduit Requirements

The customer shall meet the following requirements when preparing a service conduit system:

1. A stronger conduit material, larger conduit size, or larger sweep radius may be required for long runs or where more than three bends are needed. The customer shall obtain prior written approval from the Power Company for exceptions.
2. The customer must meet minimum conduit size requirements. See Table 12.
3. An aerial extension (primary or secondary) to connect a new underground service is not allowed, unless one or more of the following conditions exist, and the customer obtains the Power Company's prior approval:
  - a. Physical obstacles such as large culverts or sewer lines prohibit boring or trenching
  - b. Boring is prohibited by the municipal, county, or state authority
  - c. Geological barriers such as deep canyons, water ways, solid rock, steep slopes, or unstable soil conditions prohibit trenching or boring

**Table 12—Service Conduit Sizes, Run Lengths, and Bend Limits**

Phase	Load	Maximum Conduit Length (ft.)	Conduit Size	Max. Degree of Bends
Single	100 A or less	150	one 2-inch	270
Single	101 to 400 A	150	one 3-inch	270
Single	401 A or more	100	two 4-inch	270
Three	200 A or less	150	one 3-inch	270
Three	201 to 400 A	150	one 4-inch	270
Three	401 to 600 A	100	two 4-inch	270
Three	601 to 800 A	100	three 4-inch	270
Three	801 A or more	50	Consult the Power Company	

**Note:** For sizes or quantities different than those listed in this table, consult the Power Company.

### 5.3 Trench and Backfill Requirements

The customer shall provide all trenching. All trenching work shall comply with all OSHA requirements, including shoring required when the combined height of the trench and the spoil exceeds five feet (5').

To the extent possible, trench bottoms shall be level and made of well-tamped earth or selected backfill without sharp rises and drops in elevation. Rock spurs or ridges shall not project into the trench. The customer is responsible for ensuring a clean trench prior to conduit installation.

#### 5.3.1 Call Before You Dig

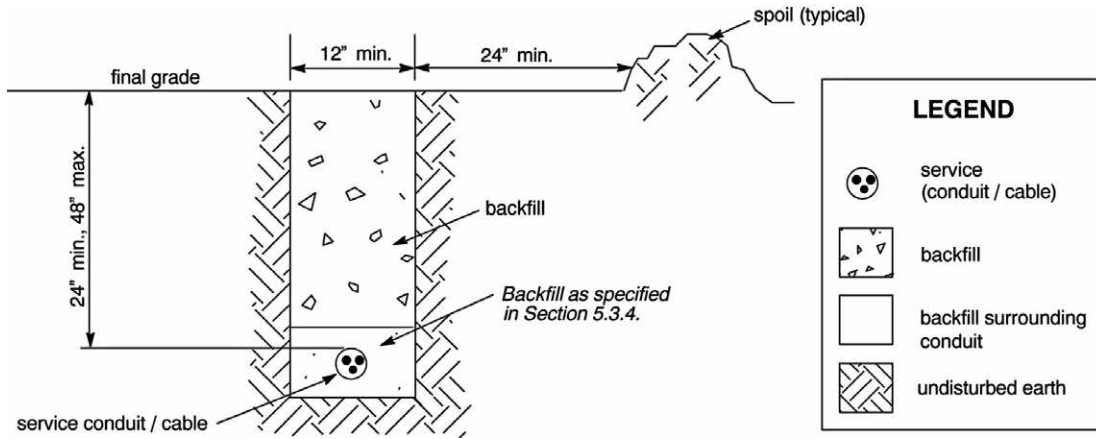
State laws require the customer or excavator call for underground utility locations. Excavation may not be started until locations have been marked or the utilities have informed the excavator that there are no facilities in the area. Notify the local underground locating services (8-1-1) before you dig.



**5.3.2 Service Trench**

When installing only service lateral conduit in the trench, follow the dimensions in Figure 11.

**Figure 11—Service Trench (Only)**



**5.3.3 Joint Use Service Trench**

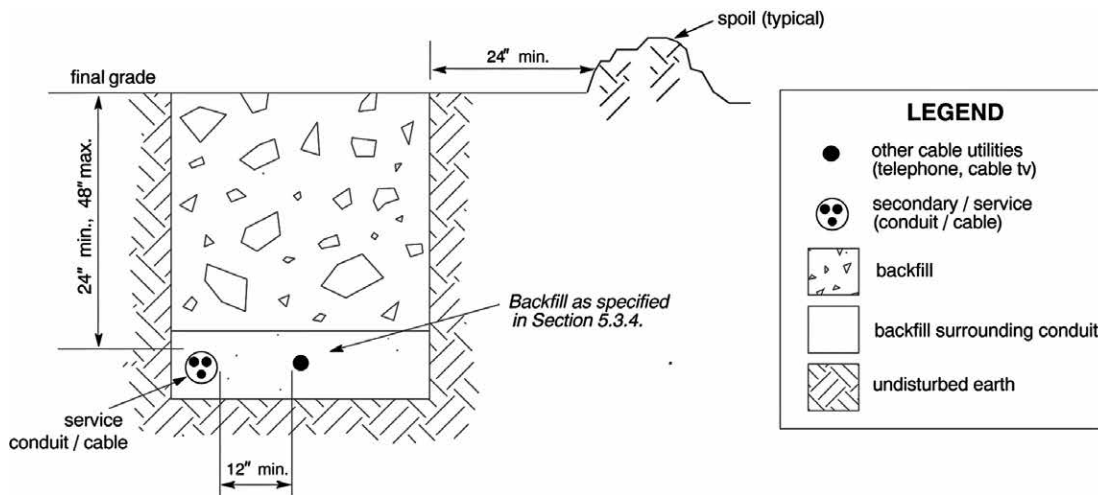
*Joint use trenching requirements may vary by area; consult the Power Company for requirements before installation.* The customer may be allowed to place communication, signal, and other electrical supply conductors in the same trench as Power Company conductors, provided that the installation meets Power Company requirements, and all concerned parties agree on the placement.

The Power Company will not install electrical conductors in a common trench with water lines, sewer lines, or other drainage lines. In general, a minimum distance of 12 inches (12") shall exist between the service lateral conduit and other utility lines, unless superseded by the requirements of other utilities involved (and/or unless local requirements differ).

For a joint use trench with gas lines, consult the Power Company for requirements. The minimum distance between the service lateral conduit and gas lines may be greater than 12 inches (12") if required by the gas utility.

When installing service lateral conduit in a joint use trench, follow the dimensions in Figure 12.

Figure 12—Joint Use Service Trench



### 5.3.4 Backfill Requirements

The following list of requirements applies to all installations requiring backfill:

1. The customer shall provide trench backfill and site restoration.
2. All backfill shall be free of materials that may damage the conduit system, such as construction waste, large rocks, sharp rocks, etc. Where natural backfill poses a hazard, alternate backfill material is required.
3. The Power Company may not energize conductors until the customer completes the backfill to Power Company satisfaction.

Extra caution should be taken when refilling trenches. The cost to repair a conduit is the responsibility of the customer.