



*ESR Supplement*

# Subdivision Construction Guide



*April 2019*

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## About This Guide

The *Subdivision Construction Guide* is intended as an aid to customers who are constructing subdivisions within Portland General Electric's service territory. The information in it supplements that available in PGE's *Electrical Service Requirements (ESR)* book.

It is strongly recommended that you consult PGE to resolve any questions concerning the requirements in this book. We will do our best to meet your needs for electric service in a safe, affordable and reliable manner.

*IMPORTANT: Individual figures or pages do not represent the complete requirements for service and should not be cited as a stand-alone. Do not use figures in this guide as construction plans by themselves. The text that accompanies a figure often contains important information that is not contained in the drawing.*

***This Guide may require different electrical equipment specifications than have been previously accepted in PGE service areas.***

Although the information in this guide is accurate as of the time of publication, PGE reserves the right to make changes without notice. While PGE may update the printed version of this *Guide* from time to time, the most up-to-date and definitive information will always be found in the PDF version. Instructions for downloading it (as well as the PDF version of the *ESR* book) are located in the "Preliminary Information" section on page v.

When referring to any code—such as the National Electrical Code (NEC), National Electrical Safety Code (NESC), or Oregon Electrical Specialty Code (OESC)—always use the most recent publication.

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





## Preliminary Information

This section includes:

- Contact information for PGE (phone numbers and emails).
- Instructions for accessing online copies of this document and the *ESR* book.

### PGE Contact Information

#### Phone Numbers

Contact	Phone Number		
	Toll-Free	Local	Fax
Service Coordination	800-542-8818	503-323-6700	503-612-3501
Customer Service	800-542-8818	503-228-6322	—
Tree Trimming	800-544-1794	503-736-5460	—
Oregon Utility Notification Center (For locating underground utility cables)	8-1-1 or 800-332-2344	503-246-6699	—
Emergencies and outages, 24 hours	800-544-1795	503-464-7777	—
Light Out (streetlights)	800-544-1795	503-464-7777	—

#### Email Addresses

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

### Accessing Online Versions of the Subdivision Construction Guide and ESR Book

To access the *Subdivision Construction Guide* and *ESR* book online:

1. Open a web browser and go to [www.portlandgeneral.com](http://www.portlandgeneral.com).
2. Scroll to the bottom of the page and click **Construction**.
3. In the box on the right side of the screen, click **Electric Service Requirements** or **Subdivision Construction Guide**.



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# 1 Scope

This *Subdivision Construction Guide* is intended to aid in the construction of subdivisions within PGE's service territory. (For maps of this territory, see the "Preliminary Information" section of the PGE *Electric Service Requirements* book.) The information in this guide applies to the design process, inspections, trenching, conduit and vault construction, and streetlight installations.

The requirements in this *Guide* are issued with the intent of complying with all applicable codes, ordinances, and tariffs. In case of conflict, however, the appropriate tariff, code, or ordinance supersedes the interpretation offered in this guide. Additionally, project-specific drawings and prior arrangements with PGE may supersede the information contained in this *Guide*.

The requirements in this *Guide* may change if governing codes, ordinances, or tariffs change. PGE does not assume responsibility for keeping this guide current and should be consulted when questions arise on the applicability of any item.





## 2 Design Process

### 2.1 Information Requirements

The Customer must provide PGE with all the information requested on the *PGE Subdivision Information Requirements* form before PGE will design the primary and secondary system. You'll find a copy of this form in Appendix A: Electronic Files and Subdivision Information Requirements.

*IMPORTANT: The design process may be delayed if the information in this form is incomplete.*

Contact PGE regarding any questions about the information that is required.

### 2.2 Customer Review and Acceptance of Design

Once PGE provides a design, the Customer reviews it to determine whether there are any possible problems and give consent for PGE to develop a cost estimate. If no problems are found, the customer accepts the design and PGE provides a line extension cost agreement (LECA).

The Customer has six months to return the signed LECA and any costs due. After six months, the LECA must be reviewed by PGE (and revised if necessary) before moving to the pre-construction stage.

*Note:* A redesign fee may apply at the time of review if changes are made after the design has been approved by the Customer and gone through PGE's approval process.



## 3 Pre-Construction

### 3.1 Basic Requirements

The Customer is responsible for trenching; backfilling; compaction; the installation of conduit and conduit markers; transformer pads or vaults; ground rods; and any other construction requirements for completion of underground service.

- For equipment (such as a transformer or vault), the Customer must provide space for that equipment within the public utility easement (PUE) or on private property with a PGE easement.
- For all trenching and transformer installations, the Customer must meet any requirements of governmental authorities—including excavation permits—as well as those of PGE.

Conduit markers, ground rods, and secondary pedestals (PF-300s) can be picked up at a PGE yard by providing a job number.

For more information, see Section 6.2, "Trenches Provided by the Customer" in PGE's *ESR* book.

All primary and secondary cables must be in conduit. To avoid damage to underground conductors and service equipment caused by soil settling, all service conduit riser elbows must be backfilled at least 4 inches deep with tamped 3/4-inch minus crushed rock.

- If a Customer's service conduit riser extends vertically through a paved or concrete surface adjacent to the service entrance, a sleeve is required around the conduit to prevent it from direct contact with the pavement.
- If a pad-mounted transformer and other equipment is exposed to motor vehicles, the Customer must install and maintain a PGE-approved barrier to protect them.

For more information, refer to Section 6.4, "Concrete Pads and Vaults for a Pad-Mounted Transformer" in PGE's *ESR* book.

In most cases PGE will install, maintain, and own the underground service tap line from the PGE distribution line or transformer in the Customer's conduit to the point of delivery. For more information, refer to Section 6.3, "Conduit" in PGE's *ESR* book.

### 3.2 Codes and Ordinances

The construction of new or remodeled installations must conform to PGE requirements and to applicable provisions of the following:

- National Electrical Code (NEC).
- National Electrical Safety Code (NESC).
- State rules and regulations.
- City and county ordinances and codes.
- Rules on file with or issued by regulators.
- Occupational Safety and Health Administration (OSHA) rules (during construction and maintenance).

### 3.3 Permits, Rights of Way, and Easements

The Customer is responsible for the cost of all permits, rights of way, and easements required to install and maintain the electrical facilities that serve the Customer. If work in the public right of way is required, then a permit from the local jurisdiction must be obtained before any work in the right of way may be performed. Contact the Service and Design Project Manager (SDPM) if a permit is needed.

*Only PGE-approved excavation contractors and contractors who have made other special agreements with PGE are allowed to work under a PGE street-operating permit. Before work begins, the contractor must notify the local jurisdiction according to the terms of the permit issued for that work. The amount of advance notification required varies from jurisdiction to jurisdiction. A copy of the permit must be on site.*

#### 3.3.1 Public Utility Easements

While PGE prefers 10 feet for front-of-lot installations, the minimum requirement is 8 feet. In addition, a private easement may be needed for PGE equipment if there is not enough room in the public utility easement (PUE). If a jurisdiction restricts the ability to attain the minimum 8-foot PUE, the Customer must contact the PGE SDPM for the job to work out an alternative design or obtain a private easement for the specific areas that have a reduced PUE.

PGE equipment (such as transformers, vaults, junction boxes, and pedestals) must be in the PUE unless PGE and the Customer agree upon another location due to space or other constraints. Since PGE line crews and vehicles need to have 24-hour access, the preferred location for equipment is front-of-lot next to a public street. Back lot locations are **not** allowed.

The Customer will have a chance to review the design during the Customer Review and Acceptance of Design stage described in Section 2.2 of this *Guide*. Contact the SDPM if there are any questions or concerns.

### 3.4 Pre-Construction Meeting

Before any construction begins, the Customer must schedule a pre-construction meeting with a PGE Field Construction Coordinator (FCC) at the construction site. The civil contractor(s) that the Customer will be using to install the vault and conduit infrastructure must be present at this meeting. During the meeting, the FCC, the Customer, and the Customer's contractor(s) will walk through the design to uncover any potential problems prior to construction.

PGE's inspection process starts with initial infrastructure inspections and continues through to the final service and metering inspections. Frequent communication between the Customer and PGE ensures a smoother project. To avoid delays or unforeseen complications, all changes in the design must be addressed with the SDPM or FCC before proceeding with construction.

A copy of the Pre-Construction Meeting Guide is available in Appendix B: Pre-Construction Meeting Guide. The guide lists common discussion points that arise in the pre-construction meeting.



## 4 Trench, Conduit, and Vault Construction Requirements

### 4.1 Trench Depth and Cover Requirements

Trenches must be a minimum of 48 inches in depth with a minimum cover of 30 inches. Do not exceed 6 feet in depth without PGE engineering or FCC approval.

*Note:* The minimum cover for trenches varies from jurisdiction to jurisdiction. For example, the City of Portland requires 36 inches of cover.

When on-site backfill contains rocks larger than 4 inches or rocks with sharp corners, select backfill must be used. Select backfill must be placed a minimum of 4 inches below and 6 inches above the centerline of the conduit. Select backfill material must be reasonably free of undesirable materials such as sharp or foreign objects. (See **Figure 1** for an illustration of these requirements.) 3/4-inch minus crushed rock might be required in certain circumstances. This will be decided by the FCC during the initial inspection.

Refer to Section 6, "Underground Requirements" in PGE's *ESR* book for more information about trench depth and cover requirements. Contact the FCC if there are any concerns or questions not answered in the *ESR* book.

### 4.2 Conduit

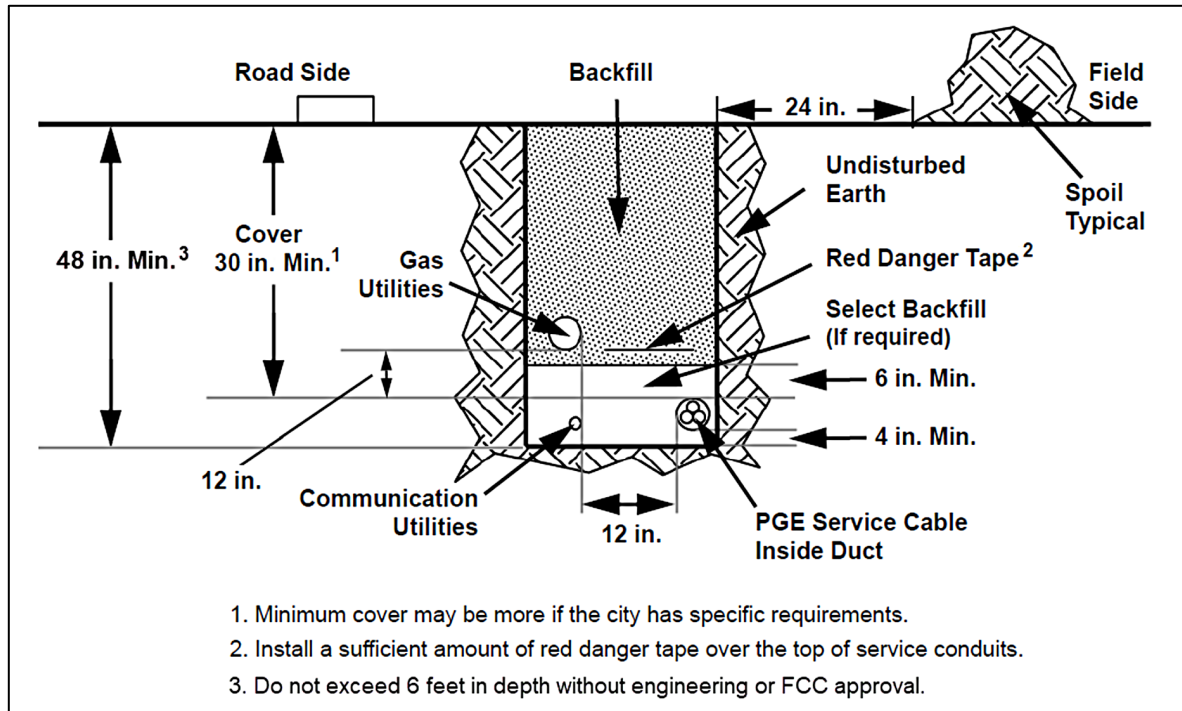
Long-sleeve PVC elbows are acceptable for conduit runs of 151 feet or less with up to 180 degrees in bends. PGE conduit runs greater than 151 feet require rigid steel or PGE-approved fiberglass sweeps. All runs that have more than 180 degrees in bends—regardless of length—require rigid steel or PGE-approved fiberglass sweeps. Fiberglass sweeps are longer and will require extra excavation at the stub-ups for proper clearance. No single conduit run may have more than 270 degrees in bends. All conduits that are stubbed at a secondary pedestal must have a minimum 5 feet of straight conduit before the bend.

HDPE duct may be used for horizontal directional boring applications. The duct must meet the requirements of PGE. Contact the FCC when using HDPE duct.

For safety reasons, all duct must be black with three equally spaced extruded red stripes. HDPE duct sections must be joined by aluminum couplings with barbed threads on both ends, and connections to PVC duct must use straight couplings with barbed threads on one end and NPT on the other end.

Communication conduits must be installed prior to inspection when applicable. No water or sewage conduits may be in the same trench as PGE conduit. See **Figure 1** for separation requirements between PGE and other facilities.

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



**Figure 1.** Service Cable Trench for Joint Use with Gas

### 4.3 Vault Grade, Location, and Clearances

All vaults must be installed and leveled to the proper grade and be located as far back on the field side of the public utility easement as possible. No other facilities (such as gas, sewer, or communications) should be located behind a vault.

Vaults installed within 24 inches of a sidewalk must be the same grade as the sidewalk; all other vault locations must be 2 inches above final grade. Vaults must not be located where swales or ditches—whether existing or planned—will impede working clearances.

When vaults and pads are installed with a sloped grade behind them or to their sides, the Customer must do one of the following:

- Install a PGE-approved retaining wall around the PGE equipment, *or*
- Slope the grade enough to prevent erosion from causing dirt or debris to enter or cover up PGE equipment.

*Note:* Contact the FCC if a retaining wall is needed.

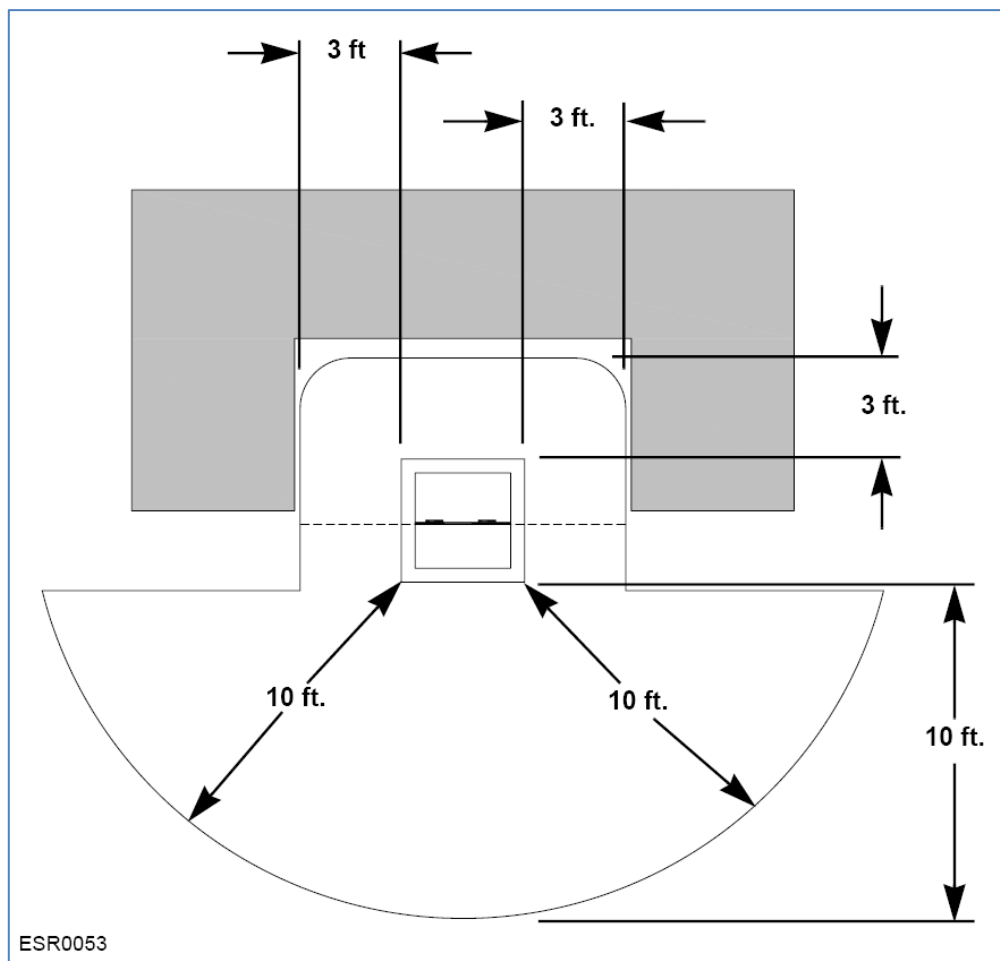
In addition to proper grade, all PGE electrical equipment requires proper working clearances. This clearance requirement also applies to shrubs and trees.

### 4.3.1 Working Clearances for Pad-Mounted Equipment

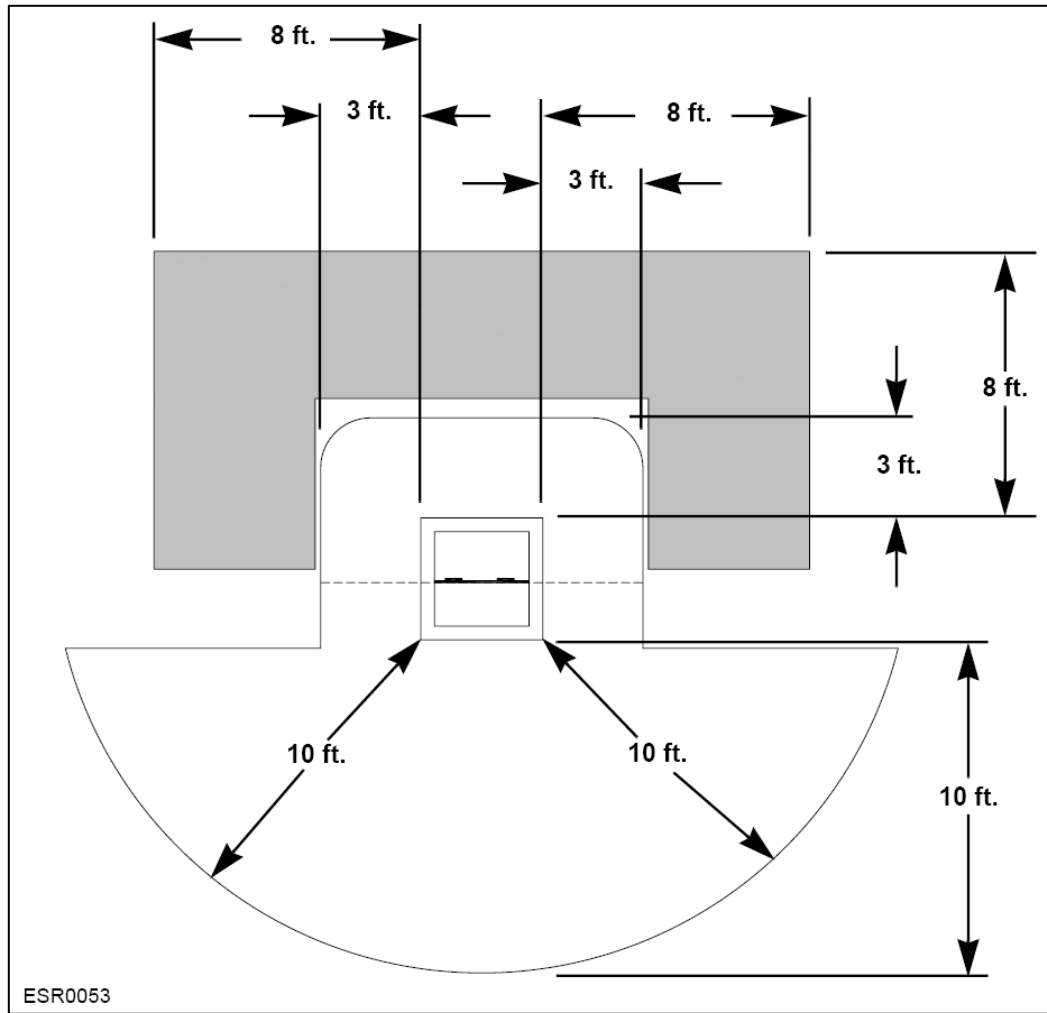
Pad-mounted equipment requires the following working clearances:

- 10 feet of horizontal separation in front of, and extending parallel to:
  - The front of the equipment enclosure *and*
  - Any side of the enclosure that has a door or access panel.
- At least 3 feet of horizontal separation on any non-opening side of the electrical equipment.
- At least 20 feet vertical clearance above the electrical equipment.

**Figure 2** and **Figure 3** show the clearances for working clearances around pad-mounted electrical equipment adjacent to a noncombustible structure and adjacent to a combustible structure.



**Figure 2.** Working Clearances Around Pad-Mounted Electrical Equipment Adjacent to a Noncombustible Structure



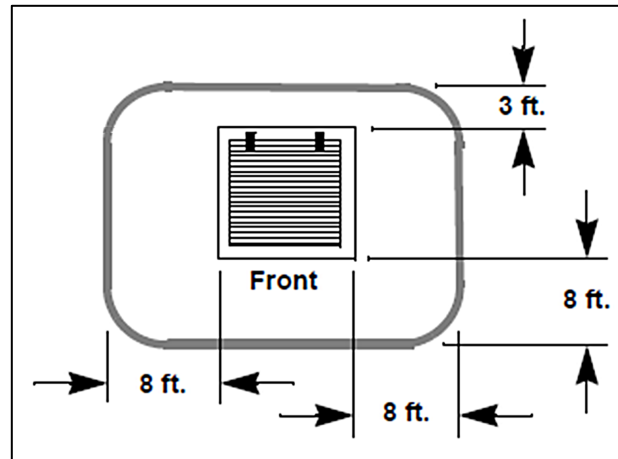
**Figure 3.** Working Clearances Around Pad-Mounted Electrical Equipment Adjacent to a Combustible Structure

#### 4.3.2 Working Clearances for Submersible Equipment

Submersible equipment requires at least 8 feet of horizontal separation in front of and on the sides of the enclosure lid. (The front of an enclosure lid is the side opposite the lid hinges.) At least 3 feet of horizontal separation is required behind the enclosure lid and 20 feet of vertical separation is required above the lid.

Refer to Section 5, "Clearances" in PGE's *ESR* book for more information about clearances. Contact the FCC if there are any questions.

**Figure 4** shows the working clearances for submersible equipment.



**Figure 4.** Working Clearances Around Submersible Electrical Equipment





## 5 Inspection

This section describes the initial inspection and the final inspection. Call Service Coordination to schedule all inspections. Contact the PGE Field Construction Coordinator (FCC) if there are any question about this process

### 5.1 Initial Inspection

Once the Customer believes that all requirements for trenches, conduits, and vault have been met, they must schedule an initial inspection with the FCC before any backfilling is done. Contact the FCC if there are questions about vault or pad placement.

During the initial inspection, the FCC verifies that all requirements have been met and works with the Customer to address any problems or potential problems.

*IMPORTANT: If required communication conduits have not been installed in the trench at the time of inspection, the FCC may refuse to inspect and approve the job.*

You'll find a checklist for the initial inspection in Appendix C: Inspection Checklists. This list contains the most common requirements and serves as a quick way for you to make sure that the requirements have been met.

For more information about clearances and location requirements, refer to Section 5, "Clearances" in PGE's *ESR* book.

### 5.2 Final Inspection

As construction nears completion, the Customer must schedule a final inspection with the FCC. A checklist for the final inspection is available in Appendix C: Inspection Checklists. The list contains the most common requirements and serves as a quick way for you to make sure that the requirements have been met.

During final inspection, the FCC will verify that all trenches, vaults, pedestals, junction boxes, and other equipment are installed according to PGE standards. This includes verifying that:

- Each conduit on the vault wall is labeled with the PGE pad or vault number that the conduit is routed to.
- Pull strings are tied to the vault lids of switch vaults and transformer vaults.
- Vaults are free of mud, dirt, and debris.
- Any PGE vault that is open must be covered with 3/4-inch marine grade plywood. Pallets and other covers are **not** acceptable.

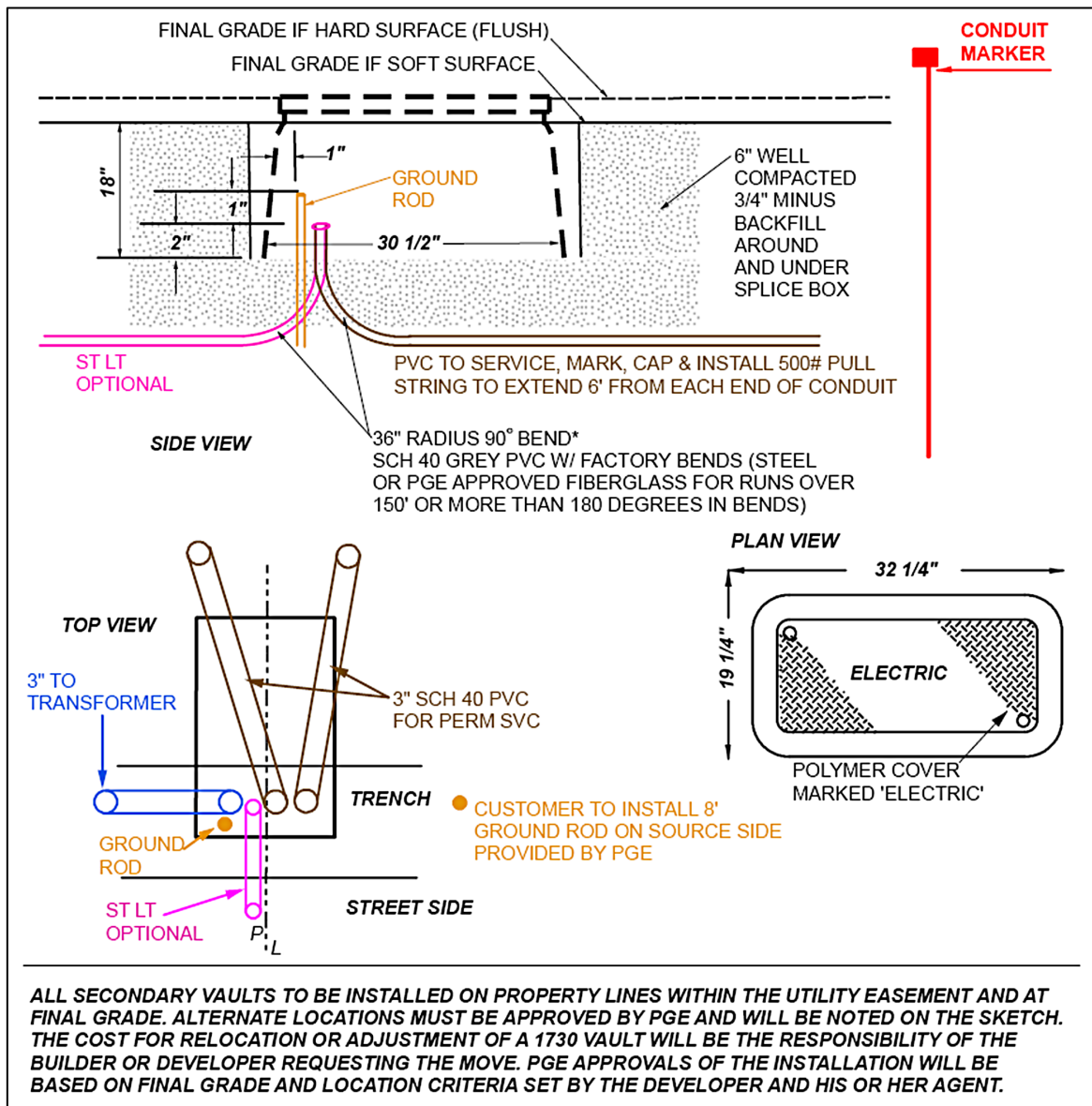
The requirements for each of these can be found in Section 6.4, "Concrete Pads and Vaults for a Pad-Mounted Transformer" in PGE's *ESR* book. Requirements for pedestals and junction boxes are in Section 7.2, "Single-Family Service."

*IMPORTANT: Permanent property pins should be in place in the front and back of the lots at the time of the final inspection. If this is not possible, temporary property stakes may be used instead provided that the Customer signs a waiver absolving PGE of any liability for improperly installed property markers. Contact the SDPM for more information about temporary property stakes.*

**Figure 5, Figure 6, and Figure 7** show some (but not all) of PGE's requirements for secondary junction boxes and pedestals. All Tier 15 junction boxes must have flared sides and all junction boxes must have a cover that is marked with the word *ELECTRIC*. The cover must be attached to the box with two penta-head, stainless steel 3/8-inch bolts. **Table 1** lists the PGE-approved manufacturers for 1730 junction boxes.

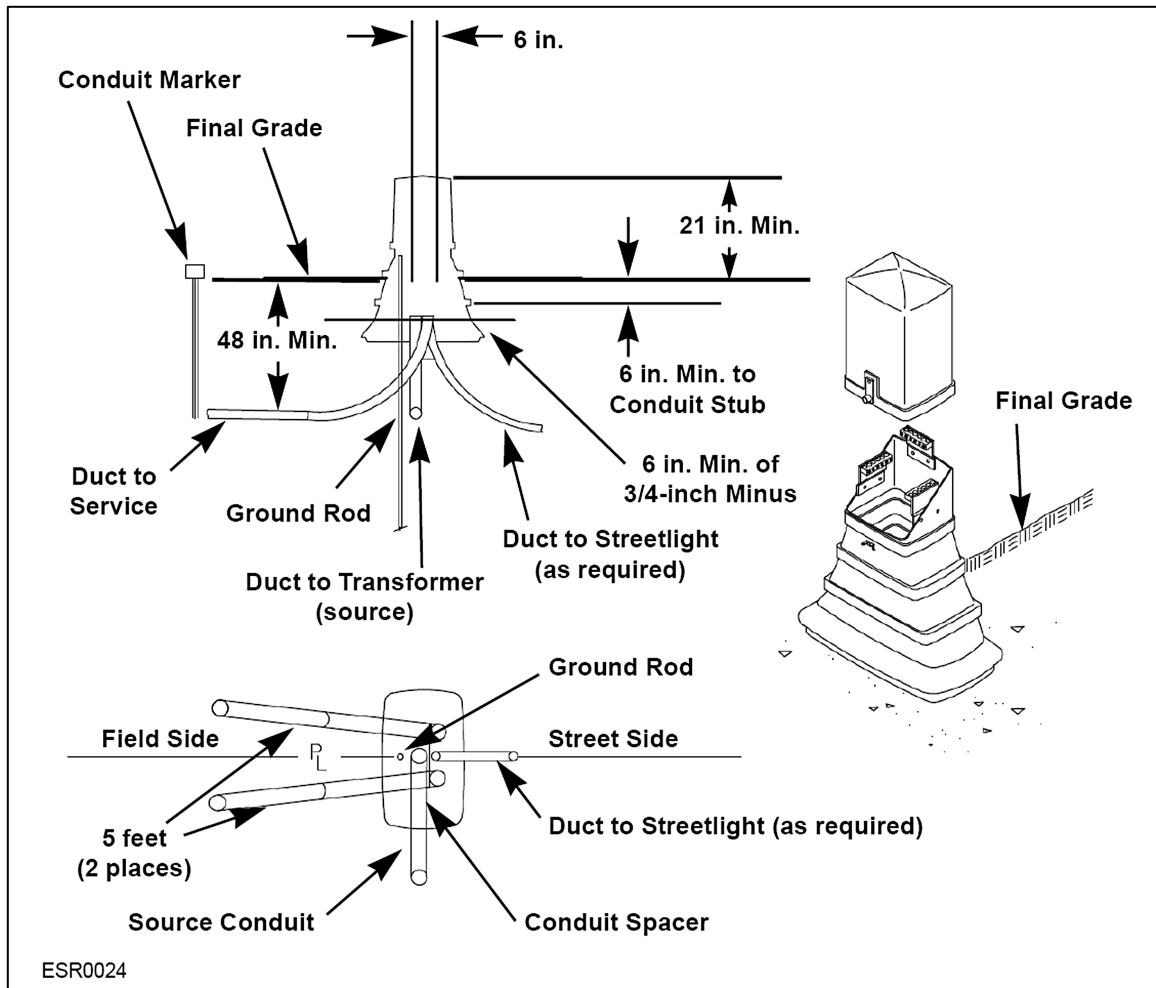
Refer to the appropriate *ESR* sections for the full PGE requirements. In this *Guide*, you will find additional information about clearances in Appendix F: Transformer Clearances.

**IMPORTANT:** Do not cut factory-formed sweeps unless approved by the FCC. Ducts should decline in grade gradually to achieve appropriate height in vaults. Contact the FCC if there are any questions. The project **will not** be scheduled until final inspection is complete.

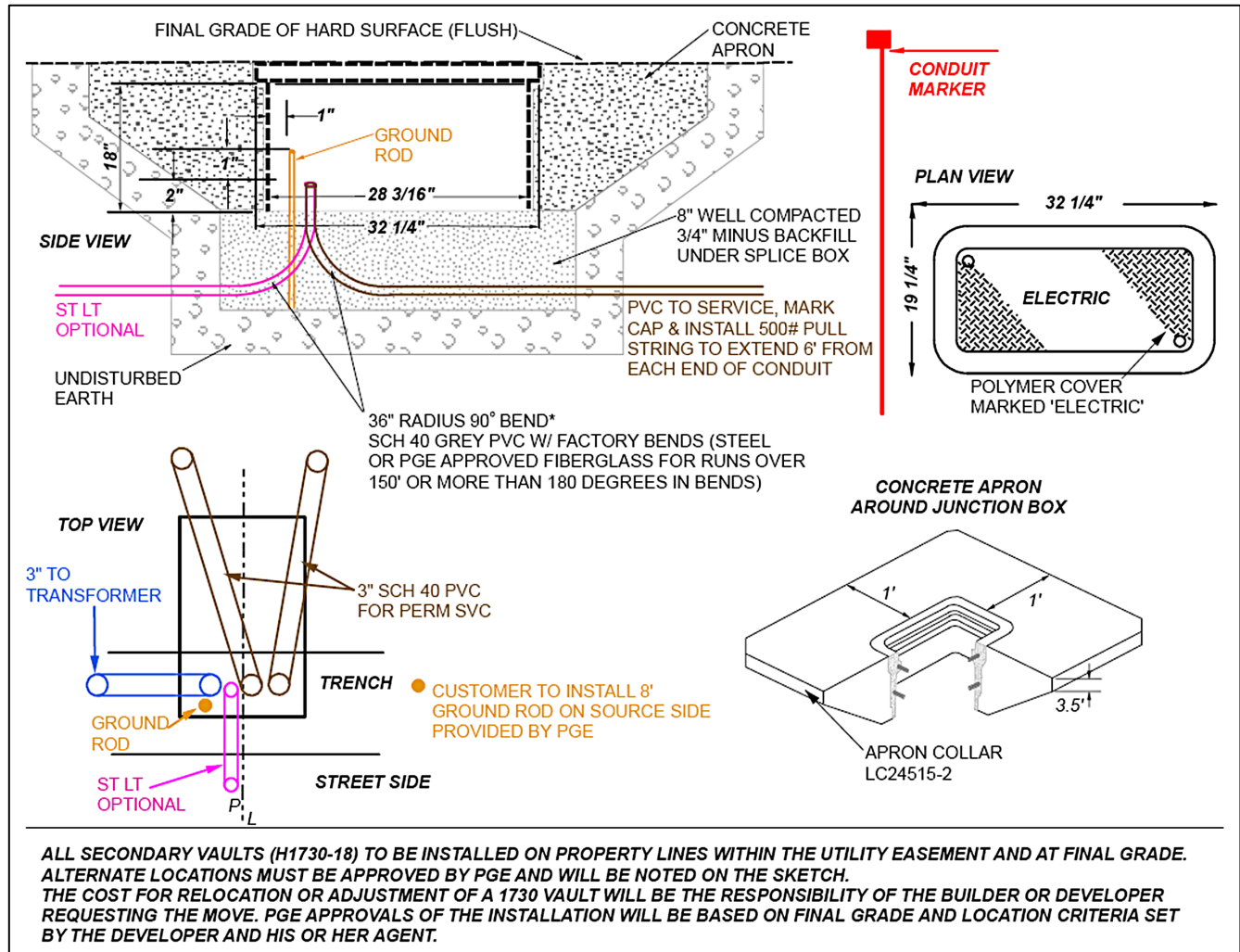


**Figure 5.** Secondary Junction Box (PGE 18)

**Note:** Tier 15 junction boxes are commonly used for secondary handholes. PGE requires Tier 22 junction boxes if it's expected that the box will be exposed to vehicle traffic (see **Figure 7**). Contact the FCC for more information about Tier 22 junction boxes.



**Figure 6.** PF-300 Secondary Splice Pedestal



**Figure 7.** Tier 22 Secondary Junction Box

**Table 1.** PGE-Approved Manufacturers for 1730 Junction Boxes

Manufacturer	Manufacturer's Part #
Armorcast Products	A6001640TAX18
Highline Products	CHA173018HE1
NewBasis	FCA173018T-90026
Oldcastle Infrastructure	17301726
Quazite (Hubbell Power Systems)	A42173018A017



## 6 Streetlight Installation

This section discusses the basic requirements for streetlight installations, as well as the specific requirements for ducts, elbows and sweeps, and junction boxes.

### 6.1 Basic Requirements

Streetlighting Project Managers are available to answer questions regarding streetlight designs. Streetlight designs are one of the following:

- Option A: PGE owns and maintains.
- Option B: Customer owns, PGE maintains.
- Option C: Customer owns and maintains.

The Customer/developer must provide the PGE Streetlighting Project Manager with a streetlight design layout that has been stamped *Approved* by the municipality or county in whose jurisdiction it falls. The layout must include complete streetlight design details (pole and fixture specifications).

- For Option A and Option B, all streetlight materials maintained by PGE must be specified according to PGE's approved streetlighting equipment list.
- For Option C, the locations of demarcation points must be determined in consultation with the Streetlighting Project Manager.

PGE requires the Customer to install the bottom piece of streetlight poles and/or concrete footings for streetlights while their trench is open. All aluminum streetlight poles must be grounded in compliance with NESC 215C1. PGE will provide the materials for Option A streetlight bases and request the Customer to install them.

**Note:** If an aluminum streetlight pole is being installed, PGE will provide the Customer with ground rods to install. Refer to the job sketch for installation information

Facilities (including conduit, junction boxes, and streetlight poles) may not be located in bioswales or rain gardens because PGE does not have the resources to construct a bioswale or rain garden back to the original design if a facility must be repaired.

In-depth information on the three streetlight options can be found in Appendix D: Option A and Option B Streetlight Installation Requirements and in Appendix E: Option C Streetlight Installation Requirements. Contact the Streetlighting Project Manager for additional information when needed.

### 6.2 Duct Requirements

Streetlight ducts must be installed at a minimum depth of 36 inches if there are no other PGE facilities present. If PGE facilities (such as secondary or primary conduit) are present, the minimum depth is 48 inches.

The approved streetlight duct sizes are 1-inch, 2-inch, and 3-inch.

- Use 1-inch duct from the junction box to the streetlight pole.

- The Streetlighting Project Manager will determine whether a 2-inch and/or 3-inch duct is needed between the transformer and the junction box at the time of design.
- All Option C streetlight designs require 3-inch duct from PGE's source to a demarcation location.

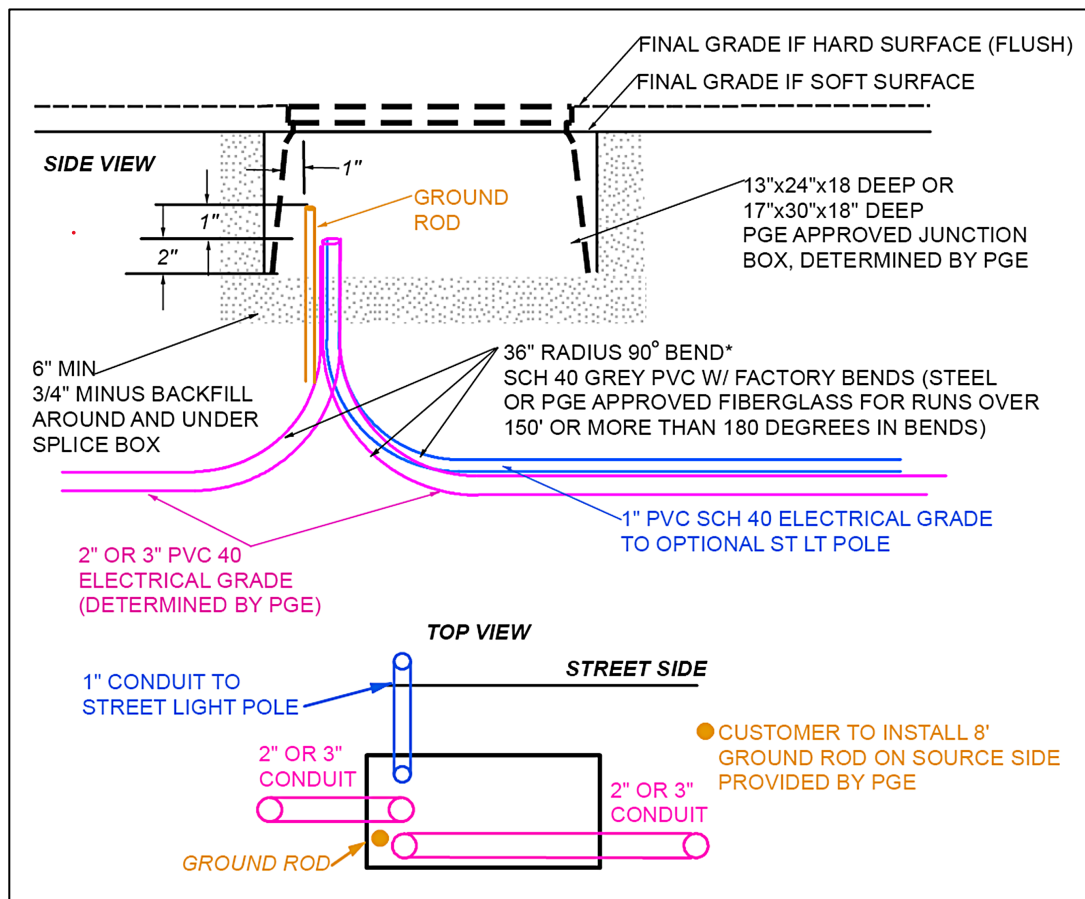
All ducts—except for the 1-inch duct between the junction box and the pole—must contain 500-pound pull line.

### 6.3 Elbow and Sweep Requirements

Long-sweep PVC elbows are acceptable for ducts up to 151 feet long with less than 180 degrees in bends. If a duct is more than 151 feet long or a conduit run contains more than 180 degrees in bends, elbows must be made of rigid steel or PGE-approved fiberglass. No single conduit run may have more than 270 degrees in bends. A 36-inch radius elbow is required for all duct lengths greater than 6 feet, except when the duct is 1-inch conduit. 2-inch and 3-inch conduit elbows must be separated by a 5-foot straight section.

### 6.4 Junction Box Requirements

Junction boxes must be installed at final grade level, and all duct elbows must be clustered at one end of the junction box. **Figure 8** shows hard and soft surface installation.



**Figure 8:** 1730 and 1324 Junction Box Layout

Two junction box sizes are available for use:

- The smaller junction box—commonly called a *1324 box*—measures 13 x 24 x 18 inches. This box is used for streetlight circuits that have one or two 2-inch conduits or one 3-inch conduit.
- The larger junction box—commonly called a *1730 box*—measures 17 x 30 x 18 inches. This box is used for streetlight circuits that have three or four 2-inch conduits or two 3-inch conduits.

A list of PGE-approved junction boxes for use in terminating and fusing streetlight conductors is available upon request from the Streetlighting Project Manager.



## 7 Services

This section is a quick reference guide to topics in PGE's *Electric Service Requirements (ESR)* book that contain information and requirements for residential and commercial services.

- Section 5, "Clearances"
- Section 6, "Underground Requirements"
- Section 7, "Single-Family Service"
- Section 8, "Multiple-Family Service"
- Section 9, "Manufactured and Mobile Home Services"

*Note:* Many other topics are covered in the *ESR* book. Refer to its table of contents for a complete listing.



## Appendix A: Electronic Files and Subdivision Information Requirements

### REQUIREMENTS FOR ELECTRONIC FILES

This letter states the requirements for providing electronic files of site plan and profile for new services construction and road construction projects in the Portland General Electric (PGE) service territory. Its purpose is to clarify electronic file formats and methods for delivering files to your Service Design Project Manager (SDPM) in PGE.

**NOTE: YOU MUST STILL SUBMIT A REQUEST FOR SERVICE FORM TO PGE, IN ADDITION TO PROVIDING ELECTRONIC FILES.**

1. Provide CAD files with civil engineered drawings of site plan and profile to PGE. Our CAD software will accept MicroStation Version 7 and 8, AutoCAD version 2010 and older. We will work with your files in the original survey coordinate system or datum. Updates to these files are requested at significant milestones in the project.
2. Include the same layers in the CAD files as shown on the Site Plan and profile hardcopy. The minimum layers need to include: Survey control points, existing and future street right of way, property/lot lines, lot numbers, street names, building footprints, curb, sidewalk, centerline, stationing, and existing electrical facility locations.
  - a) *If survey control points are not available in CAD format, our software will also accept these points in text or Excel file formats*
  - b) *If you utilize non-standard file and level naming conventions, please provide your guidelines for our reference.*
  - c) *If your data contains attachments, such as aerial imagery, please provide the attachments, or delete the files from your reference before submittal.*
  - d) *If you send a 90% completed file and then a 93% completed file (for example), it is critical that you let us know what has changed. Please itemize in the email or in the actual CAD drawing, anything that has been revised. E.g. ROW, curbs, planter strips, sidewalk, centerline, etc.*
  - e) *If sending multiple files, provide a description of what is included in individual files.*

#### For Road Construction Projects:

3. Please specify the datum of the file sent. PGE utilizes North Oregon State Plane (NAD83, international ft). Also, if there is a Local Datum Plane (LDP), please provide the conversion factor.
4. You may also make files available on your FTP site, or by email, **Zipped** files are acceptable (**Do not send executable files**). If electronic means of transfer is not an option, we will also accept the information on DVD/CD.
5. Your PGE SDPM will provide you with an e-mail address if that is preferred. The format for any PGE e-mail address is [john.doe@pgn.com](mailto:john.doe@pgn.com).
6. Send a paper copy of the site plan along with a cover sheet to your PGE SDPM at one of the following Line Crew Centers:

Gresham	1705 East Burnside St, Gresham, OR 97030
Portland	3700 SE 17 <sup>th</sup> , Portland, OR 97202
Salem	4245 Kale St NE, Salem, OR 97305
Beaverton	2213 SW 153 <sup>rd</sup> Drive, Beaverton, OR 97006

## PGE SUBDIVISION INFORMATION REQUIREMENTS

### Design Information

1. A CAD file to set up land base onto our mapping system (guidelines attached). Either emailed or send a disk.
2. **Full sized** set of civil engineering plans to include the following:
  - **Site Layout** with Lot Numbers
  - **Demo Plan** as applicable or plan showing remaining home to be fed from new subdivision
  - **Landscaping Plan** as applicable showing any trees or foliage to be saved
  - **Street Improvements** showing existing pole/anchor locations as applicable and any need for relocations
  - **Composite Utility Plan** (showing wet utilities, hydrant locations, PUEs, street cross sections)
  - **Street Lighting Plan**
3. Driveway curb cuts. (If unknown, attempting to provide me some information can help to avoid long service runs to meters or costly secondary pedestal or junction box relocations.)
4. Developer's preference for PF300 PGE-supplied/customer installed secondary pedestals or customer purchased and installed 1730 Vaults.
5. For common wall buildings or row homes, we request you consult your electrician and determine the following:
  - a. If meters are to be banked in multiples
  - b. Location of the meter banks
  - c. Total number of meters at each bank
  - d. Individual amperage rating per meter
  - e. Total maximum rated amperage of the meter bank
6. Please note that PGE's point of termination on row homes/townhomes/condos with banked meters is at the main termination lugs in those banks. These types of terminations are only appropriate when the building structure is commonly owned (usually apartments/condos). It is NOT appropriate for townhome/row home situations where each unit is an individually platted and owned by an individual property owner. In those situations, individual meters must be set on each unit.
7. General Contractor Requirements for Construction Trailer Power
8. Requirements and timing for the removal/relocation of any existing PGE facilities on public right of way or private property.
9. Please note that the Builder's temporary construction service can be accessed the following ways:
  - a. **Pedestal Gold Temp** -used on PF300 pedestals
  - b. **Standard Gold Temp at Stub** - Gold temp on metal standpipe inserted into 2" conduit and stubbed up at elbow provided within 20' from any secondary junction box or transformer
  - c. **Handhole or 1730 Gold Temp** – Gold temp built right onto lid of a 1730 Vault. Permanent lid is replaced with this temporarily during construction and then the reinstalled when temps are removed.
  - d. **Standard Gold Temp at 1730 Vault** – Gold temp on metal standpipe inserted into 2" stubbed up elbow right next to vault (if handhole/1730 Gold Temp is not appropriate or desired).

### Other information

Please provide the submittal status and tentative construction schedule.







## Appendix C: Inspection Checklists

### Trench and Conduit Checklist Guide to Calling In for T&C Inspections

**Initial trench inspection checklist: Items to consider before calling in for first T&C inspection.**

- ☐ Trench depth is minimum 48 inches for subdivisions and horizontal construction apartments.  
**MAXIMUM TRENCH DEPTH IS 6 FEET.** Deeper depths must have PGE's approval.
- ☐ No more than 270 degrees in sweeps in any one conduit run. **NO HEAT BENDS**
- ☐ Conduit runs over 151 feet require fiberglass sweeps. All runs over 180 degrees regardless of length require fiberglass sweeps.
- ☐ Conduit is installed, glued with proper glue for the application (PVC-to-PVC, PVC-to-ABS etc.) and has the proper sweeps. 36-inch radius sweeps on 4-inch and under conduit; 60-inch radius on 5-inch and over conduit.
- ☐ Vaults are installed on the proper compacted 3/4 minus rock pad with a compaction rate of at least 95% within 5 feet of pad or vault (444, 504, 644, 660, 5106, 233, 1730, 1324, etc.). Vaults installed within 12 inches of sidewalk must be same grade and all other vault locations must be 2 inches above grade.
- ☐ All conduit risers for PF-300 secondary splice pedestals and 1730 junction boxes are splitting lot lines and are in easement/PUE or as designed.
- ☐ Pad vaults are installed splitting lot lines or as designed.
- ☐ Minimum of 5 feet straight conduit in and out of vaults before attaching any conduit sweeps or HDPE bore pipes.

**Transformer pad vaults require primary conduit installed on field side of vault on designed end.**

- ☐ Minimum of 3 feet straight conduit between conduit sweeps.
- ☐ Transformer pad vaults have secondary conduit installed on road side of vault on designed end. Refer to design or contact the Field Construction Coordinator (FCC) if minimum conduit depth cannot be met or if all the road side Term-a-Ducts are full.
- ☐ Conduit must be installed in the short side of switch vaults, starting with the lower right set of Term-a-Ducts when looking at the vault end. PGE does not allow conduit ducts to enter the front or back (long side) of a vault, except for 504 vaults. See the PGE job sketch for vault detail.
- ☐ All transformer vaults, switch vaults, and pads must be from 5 feet to 15 feet from a drivable surface. When installed, all vaults and pads must face drivable surface. Barrier posts are required when transformers are less than 5 feet from drivable surface. All transformers vaults and pads must be at least 30 feet from switch vaults. For more information, refer to Section 5.6.2, Location of a Transformer Next to a Building and Section 6.4.6, Barrier Post in PGE's ESR book.
- ☐ All conduit risers must come out of the ground 90 degrees to grade (straight) at the pole, into a secondary vault, and at the meter base.

**Final Trench Inspection: Things to consider before calling in for final inspection.**

- ❑ All trenches are backfilled 100%, and vaults are backfilled to final grade.
- ❑ All primary vaults, pads, secondary vaults, and PF-300 secondary splice pedestals have proper clearances around them. For more information, refer to Section 5, Clearances in PGE's *ESR* book, or contact your Service & Design Project Manager (SDPM) or Field Construction Coordinator (FCC).
- ❑ All pull strings have been installed with minimum 500 lb. strength using the proper size rigid mouse to ensure that the conduit is clear of obstructions. No baggies or parachutes allowed for installing pull string.
- ❑ When blowing string into or penetrating energized vaults, a PGE standby crew **MUST** be used.
- ❑ All primary vaults, secondary vaults, and pads are free of mud, dirt, and debris. 3/4-inch marine grade plywood is installed and secured over any openings in PGE vaults. Pallets or other covers are **NOT** acceptable.
- ❑ PF-300s, 1730s, and 1324s are all installed to proper grade and backfilled with 3/4 minus rock.
- ❑ All conduit risers must be backfilled with 3/4 minus.
- ❑ PF 300s, 1730s, and 1324s are plumbed to exact PGE standards. (See Appendix F: Details for Vaults, Junction Boxes, Trenches, and Clearances for detailed drawings.)
- ❑ Ground rods are all installed in proper location. In rocky areas, contact your SDPM or FCC for alternate location of ground rods.
- ❑ Barrier posts are installed where transformer are less than 5 feet from a drivable surface. All transformer vaults and pads are at least 30 feet from switch vaults. For more information, refer to Section 5.6.2, Location of a Transformer Next to a Building and Section 6.4.6, Barrier Post in PGE's *ESR* book.
- ❑ Be prepared to run a mandrel and brush through any section of conduit installed for PGE. Contact your FCC to determine whether they must be on site while proofing.
- ❑ Conduit risers are attached to standoff bracket in proper location on the pole.
- ❑ All PF 300s, 1730s, 1324s, pads, and vaults have been installed in easement/PUE, splitting lot lines unless designed otherwise, and are clean of mud, rock, and debris.
- ❑ All conduits are capped and free of debris.
- ❑ Six feet of string is required at each end of conduit runs for the crew to have an ample amount to connect to. **All pull string MUST be tied to vault lid to pass final inspection.**
- ❑ Concrete street light bases are clean from all debris on the surface, and all nuts and washers are present.
- ❑ Permanent property pins have been installed in the front and back of lot lines. A waiver be obtained from your project manager if permanent pins cannot be installed and temporary stakes need to be used.

Revised 4/12/2018

## Appendix D: Option A and Option B Streetlight Installation Requirements

Portland General Electric

### STATEMENT OF STREETLIGHT INSTALLATION RESPONSIBILITIES

JUNE 20, 2018

This letter states the installation service requirements for Option A and B streetlights in the Portland General Electric (PGE) service territory. Its purpose is to clarify streetlight design and installation procedures. This update supersedes all previous publications.

#### Ownership Options under Streetlight Tariff Schedules 91 and 95.

- ◆ Option A is for luminaires owned, maintained and supplied with electric energy by PGE.
- ◆ Option B is for maintenance and energy supplied to equipment owned by the customer. This option is applicable only to Schedule 91. **NOTE:** If customer (municipality) has begun converting their Option B lights to LED (Schedule 95 C), then any new lights cannot be installed under Schedule 91 B.

#### DESIGN RESPONSIBILITIES

##### 1. Design Layout for Option B Streetlights (Owned by Municipality)

For Option B streetlights (owned by the municipality), the developer/project is responsible to provide the PGE Lighting Design Project Manager with the streetlight design layout stamped approved by the municipality under whose jurisdiction it falls, which includes complete streetlight design details (pole and fixture specifications). This approved layout is to be submitted simultaneously with any projects needing power plans, to avoid delays with the PGE electrical plans. Option B street lighting materials need to be specified from PGE's approved street lighting equipment list.

##### 2. Design Layout for Option A Streetlights (Owned by PGE)

For Option A streetlights, materials need to be specified from PGE's approved street lighting equipment list. PGE Lighting Design Project Managers are available to assist with pole and fixture information needed on the project, this information will be based on municipality direction. The lighting design layout will need to meet the recommended maintained illuminance values in the current revision of *ANSI/IES RP-8 American National Standard Practice for Roadway Lighting*, or the appropriate standard adopted by the municipality with jurisdiction over the project. A municipality has the option to accept & authorize streetlight designs that do not meet ANSI/IES RP-8 guidelines, PGE will put a notation on the letter of authorization that is signed by the City as well as the sketch.

##### 3. Bioswale / Rain Gardens & Trees

PGE does not allow any facilities (conduit, junction box, streetlight pole, etc) in bioswale / rain gardens. PGE does not have the resources to construct the bioswale / rain garden back to original design if a streetlight infrastructure needed replaced. The bioswale / rain garden infrastructure may not adequately support the installation of a

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streetlight pole. (Exceptions may be granted. The engineer for the project must provide PGE with a design for the proposed streetlight pole location. All exceptions need to be approved by the Lighting Project Manager prior to PGE finalizing design.)

Suggestions for exceptions:

- ◆ Need a 4' section of the bioswale/rain garden dedicated to the streetlight pole location. This area would need to be separated by a concrete wall and compacted with ¾ minus rock for the streetlight pole foundation. This section cannot be considered part of the bioswale/rain garden.

There are no exceptions for the infrastructure (junction box/conduits).

A streetlight pole cannot occupy the same space with a tree in a tree well. PGE recommends streetlights to be a minimum of 15' from any tree location.

#### 4. Design Alterations

In order to meet customer needs in a timely manner PGE must have adequate notice of design changes. If PGE is not given adequate notification of design changes PGE reserves the right to bill the developer, the municipality, or the designated contractor, responsible for the installation, for any costs to PGE associated with the changes. This billing may include, but is not limited to, the cost of additional trips, corrective trenching, conduit work, and alterations to PGE design sketches.

#### 5. Approved Materials

Street lighting designs can only use materials that are listed on PGE's approved streetlight equipment list. A list of approved streetlight luminaires, lamps, photo controls, poles, pole bases, mast arms, wire, and junction boxes is available upon request. **No substitutions are allowed.** Materials installed must also meet the standards of the local municipality in whose jurisdiction the development exists.

### TRENCH AND INSTALLATION REQUIREMENTS

#### 1. Trench Excavation

- ▮ **Only PGE-approved excavation contractors and contractors who have made special arrangements with PGE will be allowed to work under a PGE street right-of-way permit. The contractor must notify the local jurisdiction 48 hours before the work is to begin. A copy of the permit must be on site.**
- ▮ The developer/contractor is responsible for all trench excavation and backfilling, compaction, road crossings, conduits, elbows, vaults, junction boxes, landscape restoration, associated permits and any other requirements to complete the construction for streetlight service.
- ▮ Trenches are to be 48 inches deep when shared with other utilities, and otherwise at least 36 inches in depth.
- ◆ An on-site preconstruction meeting is required for all projects with the PGE's Field Construction Inspector.
- ▮ Finished grade must be established prior to trench excavation to ensure that minimum cover requirements for cables and conduits are attained. Minimum cover requirements for cables are measured from the trench surface to the top of the cable or conduit.

#### 2. Conduits and Elbows

- ▮ All conduit routes must be approved by PGE prior to installation by the Customer, customer-installed conduit must be inspected by PGE before backfill.

- ▮ All conductors are to be installed in conduit. Conduits are to be sized for the required conductor, as determined by PGE.
  - Three-inch and/or two-inch diameter conduit is required for all runs over 100 feet and for all runs serving more than one light.
  - One-inch diameter conduits may be used for runs not exceeding 100 feet in length and serving only one light.
- ▮ HDPE duct may be used for horizontal directional boring applications. The duct must meet the requirements of PGE specification L22501 (available upon request of your PGE project manager).
  - For safety reasons, the duct must be black with three equally spaced extruded red stripes, which is a specification requirement. Aluminum couplings with barbed threads on both ends must be used to join HDPE duct sections, and straight couplings with barbed threads on one end and NPT on the other end must be used for connecting to PVC duct.
- ▮ All conduits must be gray electrical grade schedule 40 PVC, flex conduit is not allowed.
- ▮ All conduits are to contain a 500-pound test non-conductive pull string with 6 feet of pull string extending beyond each end of the conduit.
- ◆ Bends are to be rigid steel or PGE approved fiberglass as noted in PGE's Electrical Service Requirements book: For conduit runs longer than 151 feet, or for any length run with more than 180 degrees in bends. No more than 3-90 degree elbows or a total of 270 degrees of bends in any conduit run;
- ▮ 36-inch radius elbows are required for all conduit runs longer than 6 feet. 24-inch radius elbows are allowed for 1-inch Sch 40, PVC conduit runs of 6 feet or less, while still maintaining a 36-in minimum depth with prior PGE approval.
- ▮ For three-inch and two-inch conduit, sweeps must be separated by a minimum 5-foot straight section. There must be a 3-foot minimum straight section from a vault.
- ▮ All elbow bends must be factory made and all conduit and elbow ends shall be smooth and free of burrs and rough edges.
- ▮ If the power source is at a utility pole, the terminal elbow is to be installed eight inches from the pole, and attached to a PGE installed standoff bracket, at the quadrant specified by PGE.
- ▮ When a new conduit and/or pull line will be entering an existing PGE secondary vault or transformer, the installer is required to contact PGE prior to installation. A PGE crew will be scheduled to meet the installer at the site to assist with the installation. **To schedule a PGE stand-by crew, please call PGE Service Coordinators at (503) 323-6700 or toll-free (800) 542-8818.**
- ▮ **Oregon Utility Notification Center at, (800) 332-2344, 811, or online at [www.callbeforeyoudig.org](http://www.callbeforeyoudig.org), must be called to locate any underground facilities at least two business days (48 business hours) prior to any digging.**
- ▮ The Customer is responsible for duct proofing all ducts installed for PGE jobs before the job is completed and before the installation of PGE conductors.

### 3. **Junction Boxes:**

- ▮ All junction boxes are to be PGE-approved (available upon request of your PGE project manager), the lid must be secured with five sided Penta-head bolts.
- ▮ Minimum 6 inches of 3/4-inch minus well-compacted backfill under and around the outside of the junction box
- ▮ Customer to install a PGE-provided ground rod inside the junction box, a maximum of 3 inches of ground rod must be showing inside the junction box.
- ▮ Junction box must be set 2 inches above final grade or on the highside of the slope. Junction boxes set on a sidewalk must be set to grade.

- Junction boxes are required at each streetlight location where:
  - conduit runs serve more than one light, or
  - conduit runs exceed 100 feet in length, or
  - conduit sizes are greater than one-inch diameter.
- A minimum of twelve inches working space is to be provided between the top of elbows and the junction box lid to allow bending wire without damage to the wire.
- The elbows are to be clustered at one end of the junction box.
- Where multiple lights are served from a run of wire, three-inch or two-inch conduit and junction boxes are always required.

#### 4. **Light and Pole Placements**

- Where there is a planter strip, streetlights are to be placed a minimum of 2 foot Face of Pole, Face of Curb.
- ◆ Where sidewalk is directly behind curb, streetlight placement is 6" behind walk.
- Conduit and junction boxes are to be placed in the Public Utility Easement (PUE).
- All other locations must be approved by a PGE Lighting Project Manager.
- ◆ All metal poles must be grounded per NESC 215.C and NESC Section 9, using a 5/8" x 8' galvanized rod, connected to the grounding lug inside the pole using solid #6 Cu BSD wire (stranded wire is not acceptable). PGE will provide the ground rod and copper wire for grounding the metal streetlight pole. Ground rods will be installed a minimum of 6 inches behind the concrete footing and a minimum of 2 inches below grade. The copper wire is to be coiled at both ends for PGE, copper wire will be pulled through one of the flutes in the concrete footing during the footing installation and the other end placed adjacent to the groundrod.

#### 5. **Light and Pole Installation by Contractor (Option B):**

- Where junction boxes are installed, the contractor shall run continuous #10 Cu 3-conductor streetlight wire from the luminaire to the junction box.
- Where junction boxes are not installed, the contractor shall run continuous #10 Cu 3-conductor streetlight wire from the luminaire to the hand hole of the pole. PGE will run conductor from the source to the pole hand hole.
- In both cases, 18" of extra conductor shall be provided for PGE to make the connection.
- All direct burial type streetlight poles are to be set to the depth specified in PGE standards:
  - five feet for 30 and 35 foot poles,
  - four feet for all shorter poles.
- **Where anchor-base type poles are installed using precast concrete footings, PGE specifies:**
  - Utility Vault #20R-LB-4-PGE: 20" diameter/4' long round footing with 11" bolt circle for all 14' or 16' decorative aluminum or composite poles.
  - Utility Vault #4-LB-PGE: 18" square/4' long footing with 8" bolt circle for all 16' regular aluminum poles.
  - Utility Vault #5CL-LB-PGE: 14" square/5' long footing with 11" bolt circle for all 25' to 35' regular-arm aluminum, davit-arm aluminum and composite poles.
  - Utility Vault #7LB: 18" top to 24" bottom tapered square/7' long footing with 11" bolt circle for all 40' davit-arm aluminum poles and composite poles.
  - All Concrete Footings are to be installed with top of concrete base flush to curb/sidewalk.
- ◆ Minimum 8 inch tamped 3/4-inch minus crushed rock backfill is required around all poles and footings regardless of soil condition to maintain proper pole alignment.



- ◆ All metal poles must be grounded per NESC 215.C and NESC Section 9, using a 5/8" x 8' galvanized rod, connected to the grounding lug inside the pole using solid #6 Cu BSD wire (stranded wire is not acceptable). The ground rod is to be driven into undisturbed soil near the pole.
- ▮ All streetlights are to be connected 240 volts to the black and red hot legs of the conductor, unless other voltage is approved by PGE lighting project manager. The green wire is to be connected to ground.
- ▮ Wire nuts are not allowed by PGE. The contractor may only connect approved wire directly to the terminal block in the luminaire itself. PGE will make all other connections using compression clamps.
- ▮ PGE will make the final connection in the junction box or hand hole to energize the streetlight.

**NOTE: The contractor is responsible for the correct operation of the street light system for the first year after being energized by PGE. The contractor is also responsible for any poles which go out of plumb within this first year. During this acceptance period any repairs or pole straightening performed on the installed system by PGE will be billed to the developer.**

## BILLING AND AUTHORIZATION

### 1. Line Extension Charge:

There will be a cost to install circuitry for all streetlight projects. The line extension cost is the total material and labor cost for PGE to install as necessary the conductors, transformers, pole conduits, anchors and guying, conductor support poles, and related hardware. The line extension charge is the line extension cost less the allowance based on anticipated revenue to PGE, as approved by the Oregon Public Utility Commission in the PGE tariff.

**The line extension charge is to be paid in full prior to any streetlight installations.** A signed Streetlight Job Cost Agreement needs returned with payment to **PGE, Attn: Line Extensions, PO Box 3340, Portland, OR 97208** with PGE's job number on the check.

### 2. Authorization to Energize and Initiate Billing:

PGE will request authorization from the municipality to install or energize the streetlights as installed, and to begin billing for them under provisions of the appropriate streetlight option.

**This letter is effective as of June 20, 2018.** If you have any questions or if we can be of any assistance please call your local Outdoor Lighting Project Manager.



## Appendix E: Option C Streetlight Installation Requirements

### OPTION C STREETLIGHT INSTALLATION RESPONSIBILITIES

REVISED JULY 18, 2018

This letter states the installation service requirements for Tariff Schedules 91 and 95 Option C streetlights in the Portland General Electric (PGE) service territory. Its purpose is to clarify streetlight design and installation procedures. Option C is for energy only for equipment owned and maintained by the customer. This update supersedes all previous publications.

#### Design Responsibilities

##### 1. Design Layout

The customer is responsible for the lighting design which shall be approved by the municipality. PGE will determine the power source, calculate fault current as needed, and approve the conduit design from the source to the designated point of connection. PGE requires a minimum 60 day lead time as stated in the PGE Electric Service Requirements book.

##### 2. Termination / Demarcation Point

The developer needs to work with the municipality as to what type of termination is required. There are a few different types available it is up to the municipality to make that determination. PGE needs a place to terminate their cable which can be in a non-metered pedestal (if it has a separate lockable side for PGE connections and one for customer connections) or a PGE approved junction box. Anything beyond this point is 100% municipal owned – PGE stops at the customer's pedestal or in the j-box. Contact local municipality for additional details.

**Note:** Customer to provide and install a non-metered disconnect near PGE junction box with conduit and circuitry plumbed into PGE junction box. PGE to make electrical connections in PGE junction box; **please specify voltage to connect.** Contact local municipality for information regarding disconnect, conduit and circuit beyond PGE connection. **Note: Panel must be inspected and approved by municipality prior to PGE energizing it.**

##### 3. Bioswale / Rain Gardens & Trees

PGE does not allow any facilities (conduit, junction box, streetlight pole, etc) in bioswale / rain gardens. PGE does not have the resources to construct the bioswale / rain garden back to original design if a streetlight infrastructure needed replaced.

##### 4. Design Alterations

In order to meet customer needs in a timely manner PGE must have adequate notice of design changes. When the developer, contractor, or the municipality alters the agreed upon connection point or the quantity or wattage of luminaires, it is their responsibility to notify the PGE Lighting Services Specialist in writing prior to installation. If PGE

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is not given adequate notification of design changes PGE reserves the right to bill the developer, the municipality, or the designated contractor, responsible for the installation, for any costs to PGE associated with the changes. This billing may include, but is not limited to, the cost of additional trips, corrective trenching, conduit work, and alterations to PGE design sketches.

## **5. Approved Materials**

Street lighting junction boxes must be on PGE's approved streetlight equipment list.

## **TRENCH AND INSTALLATION REQUIREMENTS FROM POWER SOURCE TO CONNECTION POINT**

### **1. Trench Excavation**

- **Only PGE-approved excavation contractors and contractors who have made special arrangements with PGE will be allowed to work under a PGE street right-of-way permit. The contractor must notify the local jurisdiction 48 hours before the work is to begin. A copy of the permit must be on site.**
- The developer is responsible from the PGE power source to the designated point of connection for all trench excavation, road crossings, conduits, elbows, vaults, junction boxes, and associated permits.
- Trenches are to be 48 inches deep when shared with other utilities, and **otherwise at least 36 inches in depth.**
- An on-site preconstruction meeting is required for all projects. All conduit routes must be approved by PGE prior to installation and conduit must be inspected by PGE before backfill.
- Call PGE Service Coordinators at (503) 323-6700 to schedule a pre-construction meeting or an inspection. The developer is also responsible for all trench backfill and landscape restoration.

### **2. Conduits and Elbows**

- All conduit routes must be approved by PGE prior to installation by the Customer, customer-installed conduit must be inspected by PGE before backfill.
- All PGE conductors are to be installed in conduit. Three-inch diameter conduit is the minimum required size for all runs, unless otherwise specified by PGE.
- HDPE duct may be used for horizontal directional boring applications. The duct must meet the requirements of PGE specification L22501 (available upon request of your PGE project manager).
  - For safety reasons, the duct must be black with three equally spaced extruded red stripes, which is a specification requirement. Aluminum couplings with barbed threads on both ends must be used to join HDPE duct sections, and straight couplings with barbed threads on one end and NPT on the other end must be used for connecting to PVC duct.
- All conduits must be gray electrical grade schedule 40 PVC, flex conduit is NOT allowed.
- All conduits are to contain a 500-pound test non-conductive pull string with 6 feet of pull string extending beyond each end of the conduit.
- Bends are to be rigid steel or PGE approved fiberglass as noted in PGE's Electrical Service Requirements book: For conduit runs longer than 151 feet, or for any length run with more than 180 degrees in bends. No more than 3-90 degree elbows or a total of 270 degrees of bends in any conduit run;
- 36-inch radius elbows are required for all conduit runs longer than 6 feet.
- Sweeps must be separated by a minimum 5-foot straight section. There must be a 3-foot minimum straight section from a vault.
- All elbow bends must be factory made and all conduit and elbow ends shall be smooth and free of burrs and rough edges.

- If the power source is at a utility pole, the terminal elbow is to be installed eight inches from the pole, and attached to a PGE installed standoff bracket, at the quadrant specified by PGE.
- When a new conduit and/or pull line will be entering an existing PGE secondary vault or transformer, the installer is required to contact PGE prior to installation. A PGE crew will be scheduled to meet the installer at the site to assist with the installation. **To schedule a PGE stand-by crew, please call PGE Service Coordinators at (503) 323-6700 or toll-free (800) 542-8818.**
- **Oregon Utility Notification Center at, (800) 332-2344, 811, or online at [www.callbeforeyoudig.org](http://www.callbeforeyoudig.org), must be called to locate any underground facilities at least two business days (48 business hours) prior to any digging.**
- The Customer is responsible for duct proofing all ducts installed for PGE jobs before the job is completed and before the installation of PGE conductors.

### 3. Junction Boxes

- All PGE junction boxes are to be 17" x 30" x 18" (available upon request of your PGE project manager), the lid must be secured with five sided Penta-head bolts.
- Minimum 6 inches of 3/4-inch minus well-compacted backfill under and around the outside of the junction box
- Customer to install a PGE-provided ground rod inside the junction box, a maximum of 3 inches of ground rod must be showing inside the junction box.
- Junction box must be set 2 inches above final grade or on the highside of the slope. Junction boxes set on a sidewalk must be set to grade.
- A minimum of twelve inches working space is to be provided between the top of elbows and the junction box lid to allow bending wire without damage to the wire.
- The elbows are to be clustered at one end of the junction box.

## BILLING AND AUTHORIZATION

### 1. Line Extension Charge

PGE will provide and install the line extension necessary to serve the streetlights. The line extension cost is the total material and labor cost for PGE to install as necessary, the conductors, transformers, pole conduits, anchors and guying, conductor support poles, and related hardware. The line extension charge is the line extension cost less the allowance based on anticipated revenue to PGE, as approved by the Oregon Public Utility Commission in the PGE tariff. **The line extension charge is to be paid in full prior to installation unless prior arrangements have been made.** A signed Streetlight Job Cost Agreement needs returned with payment to **PGE, Attn: Line Extensions, PO Box 3340, Portland, OR 97208** with PGE's job number on the check.

### 2. Authorization to Energize and Initiate Billing

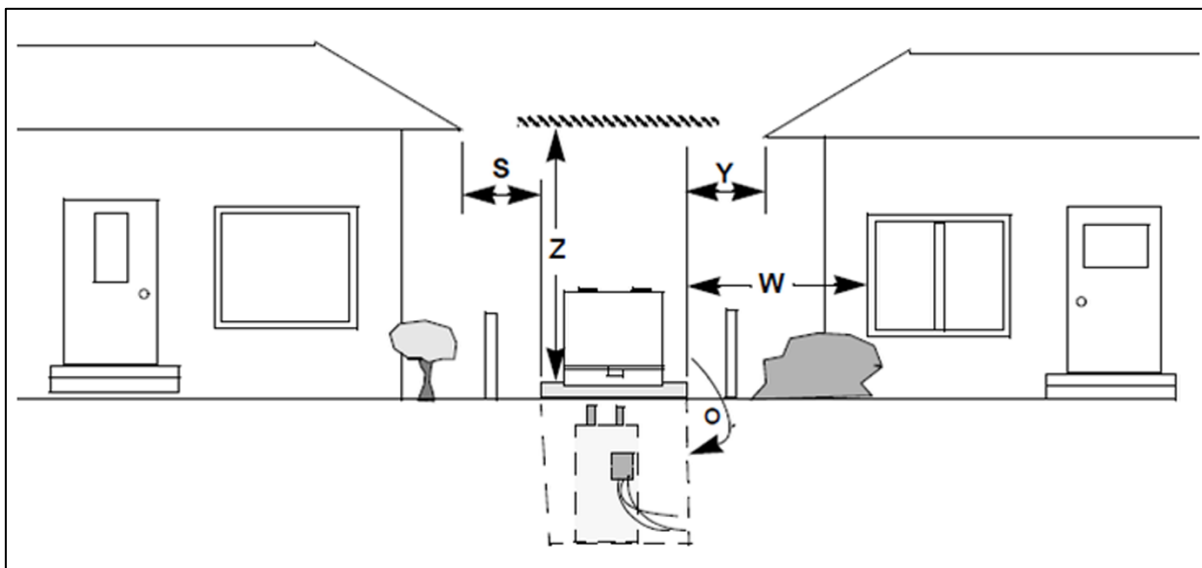
PGE will request Authorization (LOA) from the local municipality to energize the streetlights and begin billing for them upon installation.

If you have any questions or if we can be of any assistance please call your local Outdoor Lighting Project Manager.





## Appendix F: Transformer Clearances



**Figure F-1.** Minimum Separation of Non-Reduced Clearance Transformer

**Table F-1.** Minimum Separation of Non-Reduced Clearance Transformer from a Building

Oil Capacity (gallons)	Minimum Separation (feet)			
	Noncombustible Structure (S) *	Combustible Structure (Y) **	To Any Opening in a Structure (W) †	Vertical Distance (Z) ††
0–499	3	8	8	25
500–5000	25	50	50	50
5001 or more	50	100	100	100

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

\*\* Separation to the nearest component (wall or overhang) if the structure is combustible.

† A window that is not designed to be opened is not considered an opening.

†† Separation measured from the top of the pad to any barrier that is not a living space or workspace.

