



**CITY OF FOREST GROVE  
LIGHT & POWER DEPARTMENT**

**2019**

**ELECTRIC SERVICE HANDBOOK**

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**TABLE OF CONTENTS**

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**GENERAL INFORMATION**

1.01	Purpose .....	1
1.02	Codes, Ordinances & Approvals .....	1
1.03	Application for Service.....	1
1.04	Customer's Responsibility for Safety .....	2
1.05	Types of Service Available.....	3
1.06	Disconnection and Reconnection of Service .....	3
1.07	Seals .....	3
1.08	Temporary Service.....	4
1.09	Clearances from Utility Equipment .....	5

**SERVICE ENTRANCE AND METERING REQUIREMENTS**

2.01	General .....	6
2.02	Responsibilities.....	6
2.03	Customer Equipment on Utility Poles .....	6
2.04	Metering Equipment Locations .....	6
	Ganged Meter Bases.....	7
2.05	Meter Identification .....	7
2.06	Metering Equipment Clearances.....	8
2.07	Grounding.....	9
2.08	Sealing of Cabinets and Gutters .....	9
2.09	Metering Equipment Specifications.....	9
2.10	Responsibilities for Equipment.....	12
	Current and Potential Transformer Enclosures.....	12
2.11	Large Services (Over 800a).....	13

**OVERHEAD SERVICE**

3.01	General Requirements .....	14
3.02	Service Line Location.....	14
3.03	Service Installation .....	14
3.04	Clearance Requirements .....	15
3.05	Meter Pole .....	17

# TABLE OF CONTENTS

---

## ***UNDERGROUND SERVICE***

4.01	General Requirements.....	18
4.02	Service Line Location .....	19
4.03	Trenching Requirements .....	19
4.04	Underground Service Installation.....	20
	Conduit Sizing .....	20
4.05	Meter Pedestal.....	22

## ***CUSTOMER EQUIPMENT, DEVICES AND CHARACTER OF SERVICE***

5.01	General.....	23
5.02	Single-Phase Service .....	23
5.03	Three-Phase Service.....	23
5.04	Motor Protection and Starting .....	24
5.05	Interfering Loads.....	24
5.06	Power Factor .....	25
5.07	Available Fault Current.....	25
5.08	Emergency and Standby Generators .....	25
5.09	Parallel Generation and Cogeneration.....	25

<b><i>GLOSSARY</i></b> .....	26
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<b><i>SOURCES</i></b> .....	28
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## **DIRECTORY**

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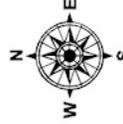
<b><u>OFFICE</u></b>	<b><u>LOCATION</u></b>	<b><u>TELEPHONE</u></b>
<b>City Hall</b> .....	1924 Council Street ..... Forest Grove, OR 97116	(503) 992-3200
<b>Light &amp; Power Department</b> .....	1818 "B" Street ..... P.O. Box 326	(503) 992-3250
General Information, Outages & Service Requests.....		(503) 992-3250
Energy Conservation .....		(503) 992-3250
Operations .....		(503) 992-3252
Engineering .....		(503) 992-3296
Outages after 5:00 p.m. ....		(503) 992-3250
<b>Billing Office</b> .....	1924 Council Street .....	(503) 992-3221
Billing Information.....		(503) 992-3221
Move-In & Move-Out .....		(503) 992-3221
Credit & Delinquent Bills .....		(503) 992-3221
<b>Utilities Notification Center</b>		
Request for Location of Underground Equipment.....		1(800) 332-2344
<b>Washington County,</b> <b>Building Services Division</b> .....	155 N 1st Avenue, Suite 350 ..... Hillsboro, OR 97124	(503) 846-3470
Electrical Inspections & Permits .....		(503) 846-3699

# City of Forest Grove Light & Power Service Area

## MAP LEGEND

	Light & Power Service Area
	Urban Growth Boundary
	City Limits
	Major Roads
	Roads and Streets
	Streams

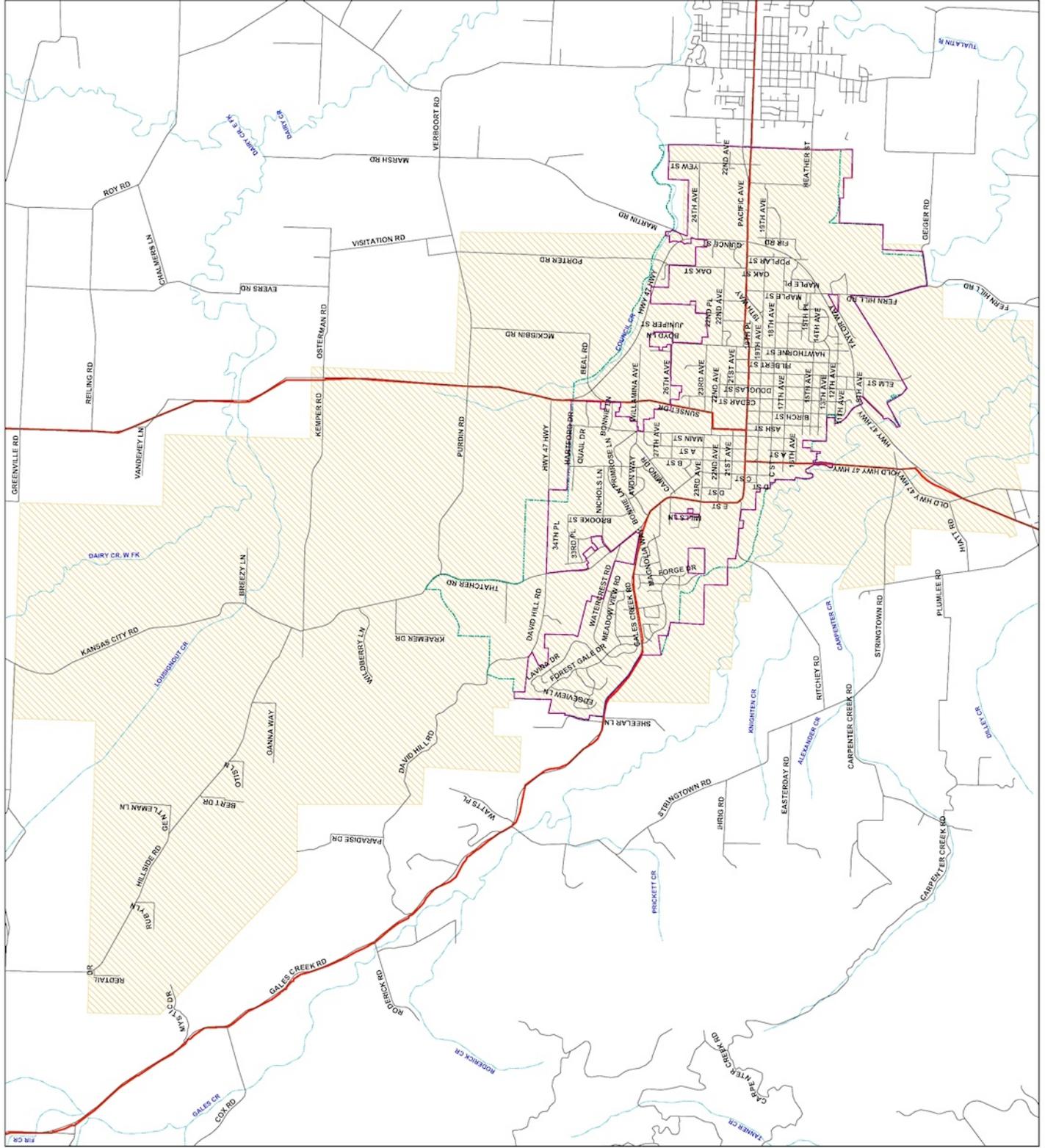
Map produced for The City of Forest Grove use. Information displayed is subject to frequent change and The City of Forest Grove makes no warranties as to the accuracy of this map.



## City of Forest Grove Light & Power Service Area

City of Forest Grove - Engineering Department  
Features shown may not reflect all The City of Forest Grove  
Power and Light Service Area

Map current as of: May 2006 - Product 06-02



## 1 GENERAL INFORMATION

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### 1.01 PURPOSE

This booklet was prepared to aid you in establishing electric service for new and remodeled structures. The information in this handbook can assist you with many of the guidelines and general requirements that must be met before Forest Grove Light & Power can connect your electric service. It covers general information such as the location of your service entrance equipment, the height of service masts, and the depth of trenches. We recognize that you may require personal assistance from our staff and we encourage you to contact us to discuss your electric service requirements. It is the desire of Forest Grove Light & Power and the local electrical code enforcing authority to provide you with high-quality safe electric service.

In order to avoid unnecessary repetition, the letters "FGL&P" or the word "Utility" as used in the following pages shall mean the City of Forest Grove Light & Power Department.

### 1.02 CODES, ORDINANCES, AND APPROVALS

The construction of new or remodeled installations needs to conform to the latest revisions of the applicable provisions of the National Electrical Safety Code (NESC), the National Electrical Code (NEC), the State of Oregon rules and regulations, the County of Washington codes, and the City of Forest Grove ordinances and codes. For applicable wiring code requirements, contact Washington County Building Services Division or an electrical contractor. These requirements are subject to change in the event that the governing codes, ordinances, or rate schedules are changed. FGL&P does not assume responsibility for keeping this book current.

Before Forest Grove Light & Power will install and connect the service cable and meter, an electrical work permit must be obtained from and the installation inspected and approved by Washington County Building Services Division or a "Request to Energize an Electrical Installation" form must be completed by the supervising electrician. When the service passes the inspection, the Washington County Inspector will apply an approval sticker directly to your service entrance equipment, which is typically the meter base.

### 1.03 APPLICATION FOR SERVICE

It is important that Forest Grove Light & Power be provided as early as possible with accurate load information and the date when you will require service. Requests for service which require an extension of primary electrical facilities, such as residential subdivisions, mobile home parks, apartment complexes, and commercial or industrial loads, should include a plot plan showing structures, lot lines, curbs, and street centerlines in digital format; either MicroStation (DGN) or AutoCAD (DWG).

Requests for service for commercial and industrial loads should also include a single-line diagram of the electrical layout and a completed electrical application form. The request must show load information, including lighting, receptacle, water heating, cooking, electric heat, air conditioning, and motor load. Sufficient information on equipment operations will also be required so that the kilowatt demand of the load can be estimated. If conditions are encountered during construction that require changes to the service, FGL&P must be consulted so mutually satisfactory alternative arrangements can be made.

## FGL&P ELECTRIC SERVICE HANDBOOK 2019

Engineering, scheduling, and construction of the work will vary, depending upon the complexity of the job. Typically, a service can be installed and connected within ten business days of FGL&P receiving the request for service. Installations that involve one of the following may require special attention:

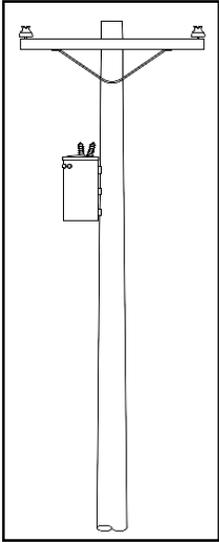


Figure 1: Overhead Transformer

- Size of the service will be larger than 200 amps.
- Service will be three phase.
- There is no transformer on the nearest pole (See Figure 1).
- Overhead service is over 100 feet from the nearest pole.
- Underground service is over 125 feet from the nearest pole.
- Underground service is over 150 feet from a padmount transformer (See Figure 2).
- Lot has no pedestal or transformer.
- Service trench will be opened before wiring is scheduled for County inspection.
- Service route will cross another piece of property.
- Service route will cross a railroad, road, wetland, stream, or foreign utility facilities.
- Request that Forest Grove Light & Power facilities be extended or otherwise altered.

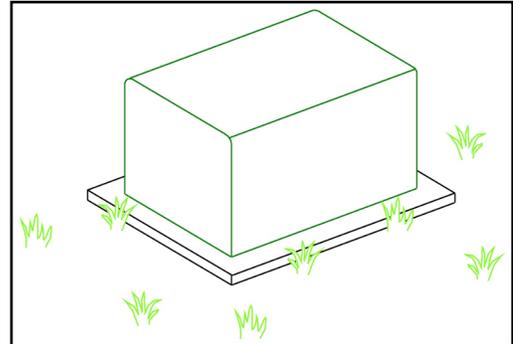


Figure 2: Padmount Transformer

If any of these situations apply or if you have any questions, please contact Forest Grove Light & Power engineering at (503) 992-3296. We can provide additional information which may be useful in planning your electric service. We can also answer questions about the availability of temporary power during construction.

### 1.04 CUSTOMER'S RESPONSIBILITY FOR SAFETY

The Customer shall comply with all federal, state, and local laws and regulations, as well as all applicable laws of negligence concerning all activities in the vicinity of the Utility's electrical wire and equipment. The Customer shall comply with laws and regulations to protect himself, his family, his employees, the Utility, and all third parties from injury, loss, or damage. If the Utility serves the Customer by means of primary voltage or transmission voltage circuits on the Customer's premises, the Utility may require the Customer to obtain and retain insurance coverage which the Utility deems adequate to satisfy the duty of indemnification.

## 1.05 TYPES OF SERVICE AVAILABLE

The available electric service is 60 hertz, alternating current, single- or three-phase. Normally, only one voltage will be provided for each service location. The nominal secondary voltages available from overhead and underground distribution lines are given below:

### Overhead Service

Single-phase, 120/240 volt, three-wire, grounded

Three-phase, 120/208 volt, four-wire, grounded, wye

Three-phase, 120/240 volt, four-wire, grounded, delta (1-PH 120/240 load may not exceed 100 amps)

Three-phase, 277/480 volt, four-wire, grounded, wye

*Under certain conditions and at the option of the Utility, the following voltages may be provided: single-phase, 120 volt, two-wire, grounded; single-phase, 120/208 volt, three-wire, grounded.*

### Underground Service

Single-phase, 240/120 volt, three-wire, grounded

Three-phase, 208/120 volt, four-wire, grounded, wye

Three-phase, 480/277 volt, four-wire, grounded, wye

*Under certain conditions and at the option of the Utility, the following voltages may be provided: single-phase, 120 volt, two-wire, grounded; single-phase 120/208 volt, three-wire, grounded.*

## 1.06 DISCONNECTION AND RECONNECTION OF SERVICE

Normally, only authorized Forest Grove Light & Power employees shall connect or disconnect the Utility's electric service to a building or structure. Under certain circumstances, electrical contractors, with prior approval by the Utility, may disconnect and/or temporarily reconnect single-phase services no larger than 200 amperes that are 120/240V or less. The Utility must be notified as soon as possible of the work that has been performed.

At the Customer's request, the Utility will disconnect a service prior to it being modified in order to maintain safe working conditions. There will be no charge for these disconnections during regular working hours. The service will be reconnected without charge if it can be completed during regular working hours and at the Utility's convenience; otherwise, the Customer will be billed a reconnection charge in accordance with the fee schedule in effect.

All new or modified services must be inspected by the Washington County Electrical Inspector (the County) prior to power being supplied. Services which have been disconnected for longer than six months for any reason must be brought into compliance with current Forest Grove Light & Power standards and inspected by the County. Services which are found to be unsafe or pose a risk of injury shall be immediately disconnected by the Utility.

## 1.07 SEALS

The purpose of seals placed by the Utility on meters and associated service equipment is to prevent injury and/or tampering. In normal circumstances, these seals are to be removed by only authorized Utility employees. If an emergency should require seal removal without prior notification, Forest Grove Light & Power must be notified as soon as possible, so the installation can be inspected and the seal replaced.

## 1.08 TEMPORARY SERVICE

### Single Family Residence

Forest Grove Light & Power will install a temporary service at a residential construction site as a service to construction contractors. The features of the service and the fee for the service are further described below. The temporary service is to be used for construction power only. **If other loads, such as area lighting, job shacks (including motorhomes), heating or air-conditioning units, or a furnace blower, are connected, the temporary service will be disconnected and removed. In addition, if the temporary pedestal is tampered with, the service will be disconnected and removed and the Contractor will be billed for any and all damages to the equipment.** The Customer or Contractor will then need to apply for a new temporary service.

Location of temporary services for construction work must be selected so that the equipment can be used throughout the construction period. Should relocation of a temporary service become necessary, the relocation cost will be borne by the Customer or Contractor, in accordance with the fee schedule in effect.

#### Features\*

- Utility-supplied temporary service equipment.
- Either underground or overhead, depending on local availability.
- No temporary service electrical permit and inspection needed.
- (2) 20 amp, 120 volt circuits;  
(1) 20 amp, 240 volt circuit.

#### Fee\*\*

- Prepaid fee allows up to four months of use.\*\*\*
- Up to one 4-month extension.\*\*\*
- Fee is to be prepaid at the Light and Power Department office.

\* Each temporary service is assigned to an individual construction site and will be removed when the permanent service is connected.

\*\* Applicable where temporary service will be placed adjacent to existing Utility equipment.

\*\*\* Check current fee schedule for rate.

### Other than Single Family Residence

In general, temporary service at construction sites other than single family residences (e.g. commercial, apartments, etc.), will be metered. The Customer or Contractor is responsible for installing a temporary meter pole and obtaining the necessary inspections. Please contact Forest Grove Light & Power for additional information.

## 1.09 CLEARANCES FROM UTILITY EQUIPMENT

This section covers clearances which must be maintained around Utility equipment. For equipment which is located in areas subject to vehicular traffic, the Customer shall provide and install steel traffic bollards, painted yellow, and set in concrete. If you have a special situation or question, please contact Forest Grove Light & Power at (503) 992-3250.

### Poles

In order to ensure the safety of Utility personnel, a clearance of 10 feet from all Utility poles to any structures or equipment must be maintained. Any obstructions found in this clear zone will be removed by the Utility. In addition, nothing may be attached to Utility poles. This includes, but is not limited to, all signs and placards. Attachments will be removed and the violators may be responsible for the cost of removal.

### Padmount Equipment

In general, a minimum clearance of three feet is required around the sides and back of padmounted electrical equipment. A separation of eight feet shall be maintained between transformers and building openings. In no event shall any portion of a combustible structure encroach into the clearance zone 8' in any direction from a transformer at ground level. The clearance zone includes all space below and above the 8' ground level clearance zone. For all equipment, the minimum clearance in front is eight feet. No obstructions, including fences, retaining walls, poles, mail boxes, shrubs, trees, or landscaping, may be placed within this area. Refer to Figure 3 for details.

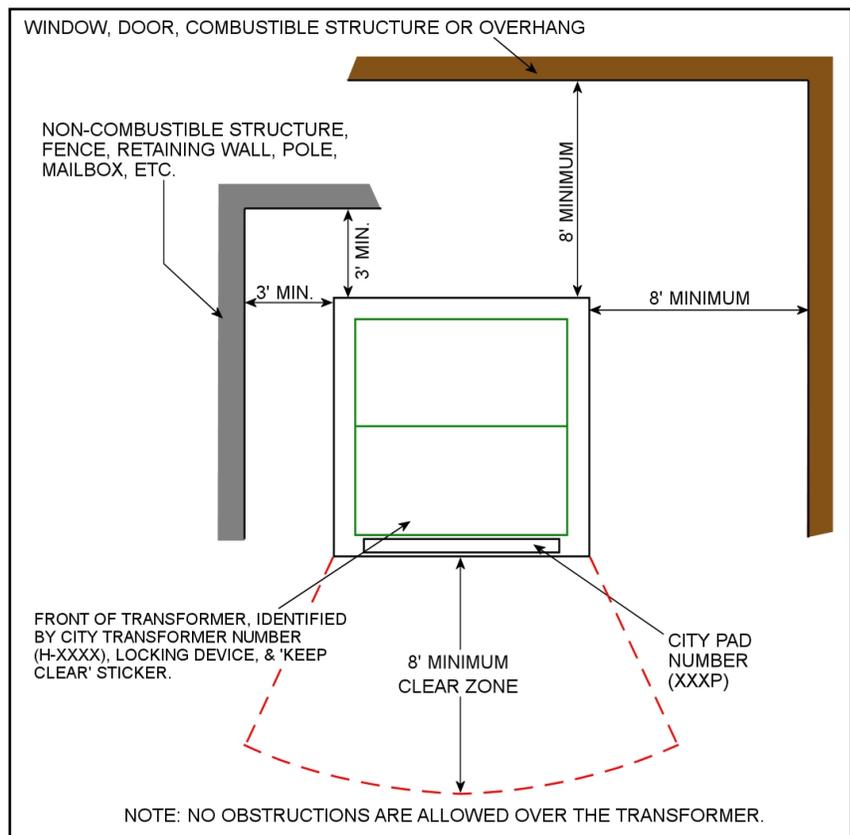


Figure 3: Clearances to Pad Mount Transformers (Plan View)

## 2 SERVICE ENTRANCE & METERING REQUIREMENTS

### 2.01 GENERAL

This section covers requirements for customer metering and service entrance installations for secondary voltages less than 600 volts. If you have a special situation or question, please contact Forest Grove Light & Power at 992-3296.

### 2.02 RESPONSIBILITIES

Forest Grove Light & Power will provide, install, and maintain transformers, meters, and service drops or service laterals (see Article 100 of the National Electrical Code). The customer will provide, install, and maintain all service equipment, including instrument transformer enclosures (if applicable), the meter socket, and either conduit, if the service is underground, or the weatherhead and service entrance conductors, if the service is overhead. In addition, the customer will be responsible for providing rights-of-way and access for the installation and maintenance of the Utility's facilities.

### 2.03 CUSTOMER EQUIPMENT ON UTILITY POLES

Customer-owned equipment, including metering, switching devices, conduits, conductors, luminaires, etc., is not permitted on Forest Grove Light & Power poles. In some situations, the Utility may elect to provide meter poles (e.g. overhead service to mobile homes or farmyard service), as shown in Section 3.05.

### 2.04 METERING EQUIPMENT LOCATIONS

In general, meters are to be located on the exterior of the structure being served and are limited to the front wall or on a side wall within three feet of the front, unless approved by the utility. The front of the structure is the portion facing normal public access. Locations that could have access restricted, such as carports, breezeways, or fenced yards, will **not** be approved. The meter shall not be installed over window wells, steps in stairways, or in other unsafe or inconvenient locations. Residential meter location shall be approved by the Utility prior to installation of service equipment.

**All building plans are reviewed by the Forest Grove Light & Power and the location of the meter base and the route of the service drop and/or conduit are indicated on site plan.**

If, in the opinion of the Utility, a meter is made inaccessible, such as by the installation of a fence or enclosure, the Customer shall, at his expense, move the meter base to an accessible location.

Meter socket height may be no more than 6 feet and no less than 5 feet above finished grade or floor (Figure 4). With prior approval from Forest Grove Light & Power, a meter pedestal with a minimum height of 3 feet 6 inches above finished grade may be installed for mobile homes. Refer to Section 4.05 for details. In all cases, the center of the meter socket is the point of reference.

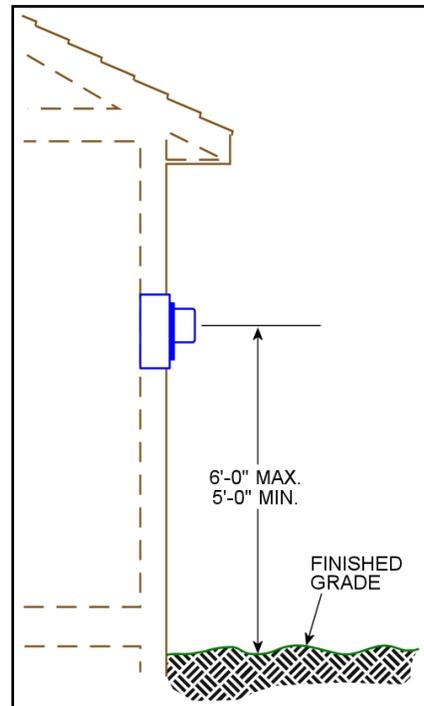


Figure 4: Meter Height

**Ganged Meter Bases**

For ganged meter bases, such as those used for duplexes and apartments, the meters are to be located on the exterior of the structure being served and are limited to the front. The front of the structure is the portion facing normal public access. With prior approval from the Utility, the meter base may be mounted on the side of the structure, provided the edge of the meter base is no more than three feet from the front of the structure, as shown in Figure 5. Refer to Section 2.05 for details on marking the meter bases.

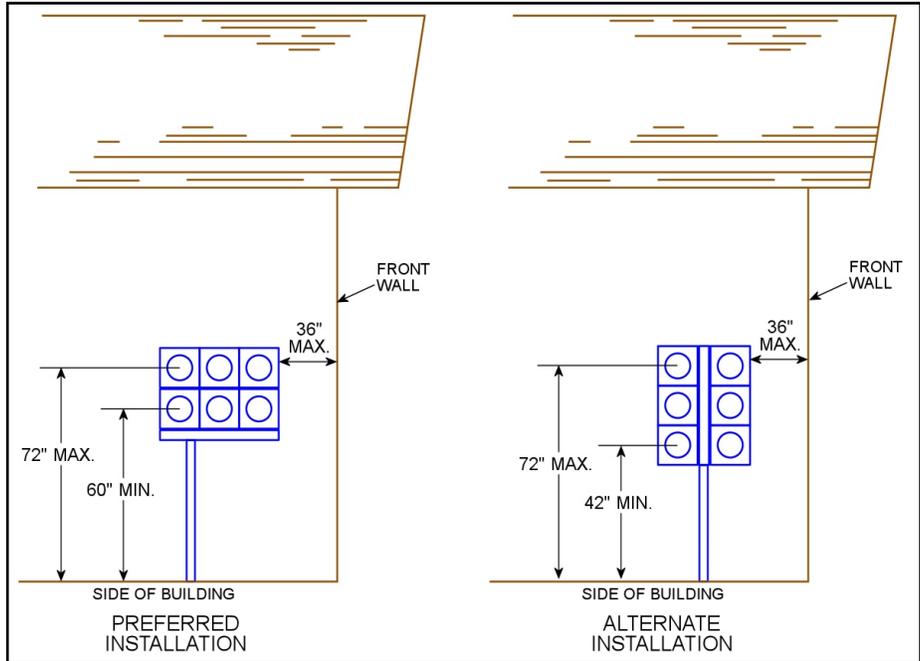


Figure 5: Ganged Meter Bases

**2.05 METER IDENTIFICATION**

Where two or more meters are grouped, the Customer is responsible for clearly and permanently marking each meter position with a label glued to its front to indicate the particular location supplied by it. The labels must be printed and weatherproof. Minimum height of 1" is required for all characters.

**Service will not be connected until the marking is completed.** Refer to Figure 6 for details.

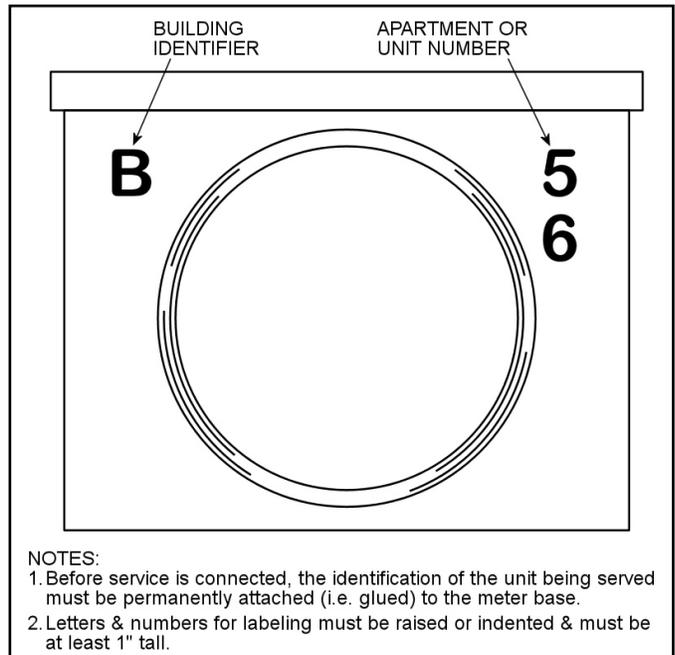


Figure 6: Meter Identification

2.06 METERING EQUIPMENT CLEARANCES

All meters, metering equipment, and enclosures must be readily accessible by Forest Grove Light & Power personnel at all times for meter reading, maintenance, testing, installation, or removal. They must be at a location free from obstructions, vibration, corrosive atmosphere, and abnormal temperatures. Working space in front of meters or metering equipment (including instrument transformer enclosures) must be at least 36 inches measured from the front of the meter glass or enclosure. Working space behind freestanding switchboards must be at least 36 inches from the panel to any obstruction, with provisions for safe exit. Refer to Figure 7 for details. To maintain safe working conditions, no exceptions will be allowed (NEC). A minimum clearance of 36 inches must be maintained between the electric meter enclosure and gas meter.

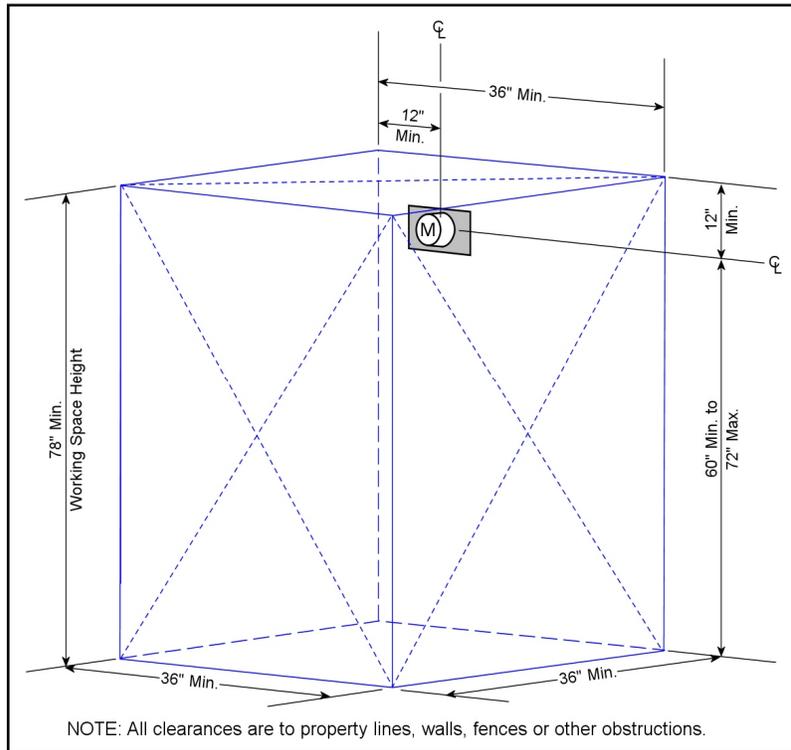


Figure 7: Clearances to Meters

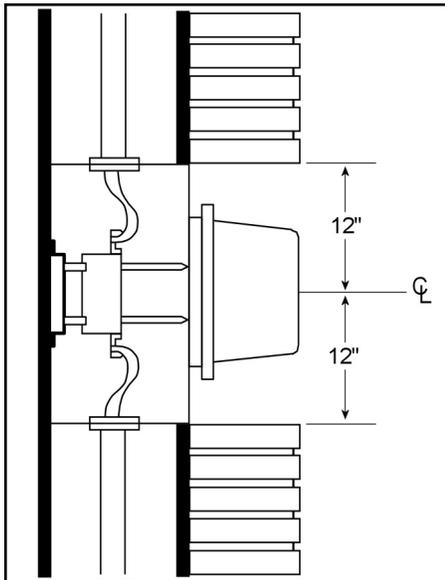


Figure 8: Flush-Mount Meter

The center of all meter socket enclosures must be a minimum of 12 inches from walls, ceilings, service equipment, or other obstructions. Building siding may not cover or overlap any portion of the meter socket. Refer to Figure 8.

## 2.07 GROUNDING

All meter sockets, enclosures, and conduit must be bonded and grounded in accordance with Articles 230 and 250 of the latest edition of the NEC. Where self-contained meter sockets are used, the neutral conductor must be connected to the ground terminal in the socket.

## 2.08 SEALING OF CABINETS AND GUTTERS

All cabinets and gutters containing unmetred conductors, other than mainline switches required by applicable electrical codes, must be arranged for sealing with the Utility's seal. Removable conduit fittings may be installed between the service outlet and the meter when approved by the Utility. These fittings must be visible from the meter location or from an exterior ground position and must be arranged for sealing.

## 2.09 METERING EQUIPMENT SPECIFICATIONS

### Meter socket

Meter sockets and troughs must be of a type acceptable to Forest Grove Light & Power and must be UL listed and approved for the intended use. Each unit must be equipped with the required number of terminals and meter jaws, and a sealing ring or gasket. Terminals must be marked with the conductor range for aluminum or copper conductors. When aluminum conductors are used, the socket must be listed or approved and clearly marked by the manufacturer for that use.

- Any meter socket that does not have a meter must have a cover plate and be sealed.
- Meter sockets are not to be jumpered to provide power when a meter is not installed.
- All meter equipment exposed to weather must be rain-tight according to NEMA-3R.
- Before a meter is installed, all unused openings of the meter socket enclosure are to be closed with plugs that are locked tightly in place from inside the enclosure.
- Meter bases shall be securely fastened to a stud behind the outside wall with minimum 2" fasteners. All exceptions must be presented to the Operations Superintendent prior to installation.

For self-contained meter sockets, the meter must be located ahead of the disconnect switch. Under special conditions, permission may be granted to modify this sequence in group installations of more than six individual occupancies, provided all equipment ahead of the meter can be sealed by Forest Grove Light & Power. Meter and circuit breaker combinations are acceptable for 0-400 amperes single-phase and 0-200 amperes three-phase services, provided the meter socket section meets dimensional requirements.

**Meter socket requirements**

Refer to Figures 9 and 10 and notes below:

<i>Voltage Rating</i>	<i>Applic.*</i>	<i>Amp Rating</i>	<i>No. of Phases</i>	<i>No. of Terminals</i>	<i>Socket Type</i>	<i>Refer to Note(s)</i>	<i>Typical Meter Base or Equivalent</i>
120/240	res	up to 200	1	4	Fig 9, A	1	Square D #UTRS213B
120/240	res	201-400	1	4	Fig 9, A		Square D #UTH4300T
120/208	comm	up to 200	1	5	Fig 9, B	1, 2	Square D #EM52NRB
120/240	comm	up to 200	1	4	Fig 9, A	1, 2	Square D #UTH4213T
120/240	comm	201-400	1	4	Fig 9, A	2	Square D #UTH4330T
120/240	comm	401-600	1	6	Fig 9, C	3	Circle AW #12146
208/120	comm	up to 200	3	7	Fig 9, D	2	Square D #EM72NRB
208/120	comm	over 200	3	13	Figs 9 E; 10	3, 4	Circle AW #121413
480/277	comm	up to 200	3	7	Fig 9, D	2	Square D #EM72NRB
480/277	comm	over 200	3	13	Figs 9 E; 10	3-5	Circle AW #121413

\* *Applic.* refers to the typical usage or application: “res” represents residential and “comm” represents commercial.

**Notes**

- Services 0-200 amperes must use a self-contained meter socket enclosure 4-1/4 inches deep, 11 inches wide and 14 inches high, minimum.
- All self-contained meter sockets for non-residential service require a manual circuit-closing block. Automatic circuit closers are **NOT** acceptable.
- All CT meter bases must have test switch perches.
- All three-phase services that have a main bus rating greater than 200 amperes must have current transformers and a 13-terminal meter socket.

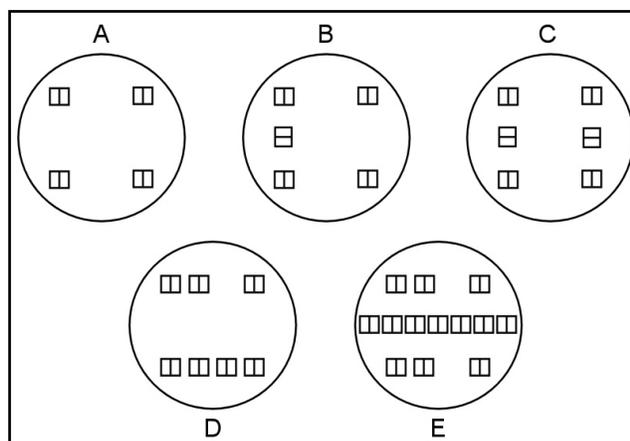


Figure 9: Standard Meter Bases

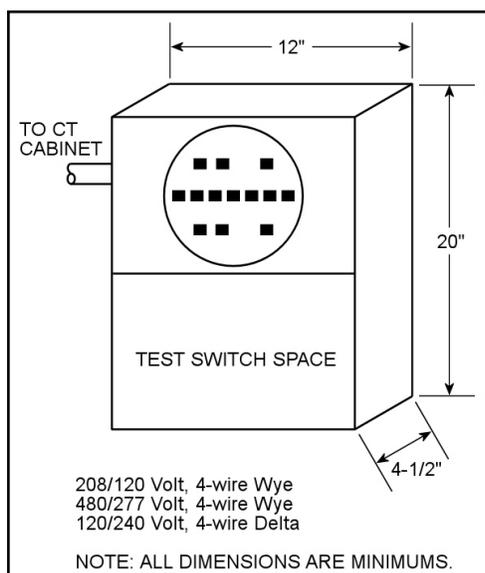


Figure 10: 13-Terminal Meter Base

- For voltages over 240 volts line-to-line, a potential transformer compartment must be installed. (Hoffman A24R248HCR or equal)

**For services with a main bus rating greater than 400 amperes single-phase or 200 amperes three-phase**, provisions must be made for current transformers. In addition, provisions for potential transformers must be made when the voltage of the service exceeds 240 volts, line-to-line.

**Instrument Transformer Enclosure Requirements**

All potential and current transformers must be installed on the supply side of the main disconnect. All load monitoring equipment or current-limiting fuses must be located on the load side of the Utility’s metering. Instrument transformer enclosures must contain only main service conductors; no customer equipment is allowed inside the meter or instrument transformer enclosures. Three sets of main service conductors may be served off the load side of the current transformer. The bottom of the enclosure must be no less than two feet and the top must be no more than eight feet above the floor or working platform. Refer to Figures 11 for details. All exceptions must be obtained in advance from the Utility’s Meter Department. All meters and enclosures are to be located in accordance with Section 2.04.

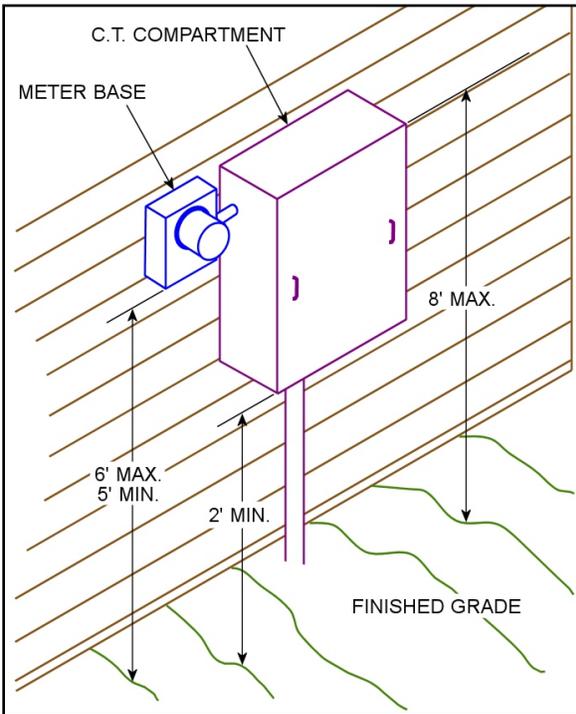


Figure 11: Preferred Installation

**2.10 RESPONSIBILITIES FOR EQUIPMENT**

**Customer responsibilities:**

- Provide and install all service conductors and equipment, including breakers or fuses, on the customer’s side of the point of delivery.
- Provide and install the weatherhead and service entrance conductors if the service is overhead.
- If applicable, provide and install the conduit to the pedestal if the service is underground.
- If applicable, provide and install the conductor to the metered pedestal if the service is underground.
- Provide the minimum clearances for all meter bases and instrument transformer enclosures. Refer to Section 2.06.
- Provide and install the meter base, which
- If more than one meter, clearly and permanently identify each meter base in accordance with Section 2.05.
- If applicable, provide and install a sealable instrument transformer enclosure(s) in accordance with the following Utility requirements (dimensions are minimum):

<b><i>Current Transformer (CT) Compartment: (refer to Figures 11 &amp; 12)</i></b>						
Size of Service	No. of Phases	No. of CTs or PTs	Width	Height	Depth	Height above Final Grade
401-600A	1	2	30"	36"	11"	30"
201-400A	3	3	30"	36"	11"	30"
*401-800A	3	3	30"	48"	11"	24"
*over 800A	3	3	Consult with Utility Engineer			
<b><i>Potential Transformer (PT) Compartment: (refer to Figures 13 and 17)</i></b> <b>Hoffman A24R248HCR (or equal)</b>						
*over-240V	3	3	24"	24"	8"	36"

*\*Enclosure with hinged door is required*

- If applicable, provide and install metering circuit conduit (1 ¼” min. diameter) between the meter base and instrument transformer enclosure(s), making it as short as possible. Do not use flex conduit in meter circuits. The conduit run must not exceed 50 feet in length unless specifically approved by Forest Grove Light & Power’s Meter Department. Conduit must not contain condulets or junction boxes.

**Forest Grove Light & Power's responsibilities:**

- Provide and install service drops or laterals on the Utility’s side of the point of delivery.
- Provide and install meters.
- If applicable, provide and install current instrument transformers.
- If applicable, provide and install potential transformers.

2.11 LARGE SERVICES (OVER 800 AMPERES)

**Remote Meter Pedestal Service**

Forest Grove Light & Power Engineering must be consulted regarding all services with a rating of 800 amps or more. Typically, they will be served from a dedicated, pad-mounted type of transformer. Some situations may require that the CTs be installed in the secondary compartment of the transformer. FGLP metering personnel will install the CTs and/or PTs and run wires to customer provided and installed meter socket (if service over 240 volts) via customer provided and installed 1 ¼" (min.) metallic or PVC conduit.



Figure 12: Freestanding CT Meter Base

The supporting members are to be 2" steel or equivalent and are to be set in a minimum of 24" of concrete. The center of the meter is to be between 3'-6" and 5' above final grade. Refer to Figures 12 to 14 for details. There must be a minimum of 24" of clearance between the transformer and the meter base installation. Refer to Figure 16.

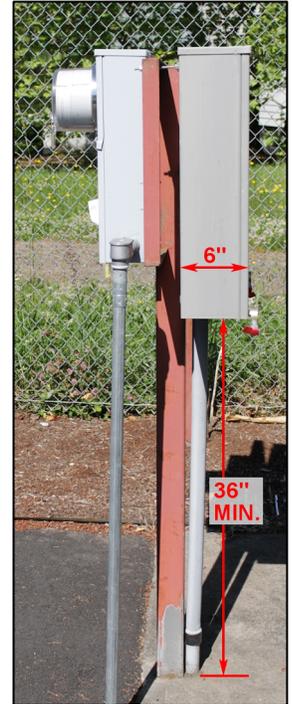


Figure 13: Freestanding CT Meter Base



Figure 14: Clearance Between Transformer & Freestanding Meter Base

## 3 OVERHEAD SERVICES

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### 3.01 GENERAL REQUIREMENTS

The process of installing a new overhead service to your home is a joint project between you and Forest Grove Light & Power. We request that several items be completed prior to connecting your service. Once these items are complete, Forest Grove Light & Power will install your service wire and new meter.

The items to be completed are:

- Contact Forest Grove Light & Power and request a new permanent service. Our telephone number is 992-3250. If temporary service is needed, it may be requested at the same time.
- Obtain an electrical work permit from the Washington County Building Services Division.
- Install the new meter base. Refer to Section 2.04 for the location.
- Install the service mast and service entrance conductor through the mast.
- Provide a clear path from the weatherhead to the Forest Grove Light & Power contact point.
- Obtain the appropriate electrical inspection.
- After the above items have been completed, call the Operations Superintendent at 992-3252 and inform him that the meter base has been inspected and you are ready for service.

If clarification is needed on any of the items, please call Forest Grove Light & Power and someone will assist you.

**NOTE: In general, new electric services within the city limits of Forest Grove must be installed underground.**

### 3.02 SERVICE LINE LOCATION

The location of the overhead service line has been marked on the building plans by the FGL&P Project Engineer. The service route must be accessible not only during initial installation, but also throughout its service life. Trees must remain clear of the line through regular pruning or tree removal by the homeowner.

### 3.03 SERVICE INSTALLATION

The location of the meter base has been marked on the building plans by the FGL&P Project Engineer. In general, it should be on the front wall or on a side wall within three feet of the front of the structure. The front is the portion facing normal public access. Locations that could have access restricted, such as carports, breezeways, or fenced yards, are not acceptable. The service mast shall be located so that only one attachment of the service conductors to the building is required. Exceptions must be approved by Forest Grove Light & Power and the County Inspector before any equipment is purchased to avoid delays in connecting your service.

The mast must be a minimum of 2-inch rigid galvanized steel conduit and attached to the building securely enough to support the weight of the service conductors. The height of the mast should be determined according to applicable service conductor clearances (refer to Section 3.04). Normally, a guy is not required on service masts 26 inches or less above the roof. If the service mast is more than 100 feet from the source or over 26" tall or if the service is larger than 200 amps, guying is required (Figure 17). Stiff leg guying (not shown) is an acceptable alternative.

The service conductors should not be terminated on chimneys, vent pipes, gutters, or other nonstructural portions of the building. Suitable service attachment devices should be provided and installed during construction. Service entrance conductors are to be installed by the customer and should extend a minimum of 18 inches from the end of the weatherhead to permit the attachment of the service conductor by Forest Grove Light & Power.

Any questions regarding service entrance equipment, including the size of the service entrance conductors, should be referred to the Washington County Building Services Division or the County Inspector by calling (503) 846-3470.

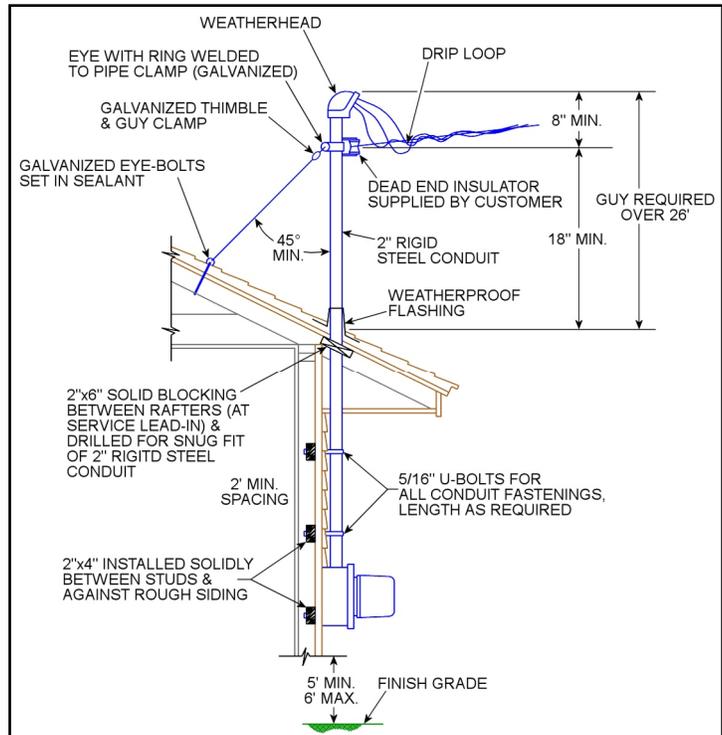


Figure 15: Overhead Service Entrance (Less Than 200A)

### 3.04 CLEARANCE REQUIREMENTS

Service conductors should be attached a minimum of 12 feet and a maximum of 25 feet above final grade. The bottom of the drip loop must be a minimum of 10'-6" above final grade (Figure 18). (NESC Table 232-1)

#### Horizontal clearances from buildings

Service drop conductors must have a minimum horizontal clearance of 3 feet to walls and windows and 5 feet to readily accessible locations, such as balconies, porches, and fire escapes. (NESC Table 234-1)

#### Vertical clearances over roofs

Service conductors must have a vertical clearance of at least eight feet above the roof. Where the roof is not readily accessible, a clearance of 3 feet is permitted.

Where the roof is not readily accessible and the weatherhead is no more than 4 feet from the edge of the roof, a clearance of 18" is permitted for a horizontal distance of 6 feet, beyond which a minimum clearance of 3 feet is required. (NESC 234.C.3.d.(1))

#### Vertical clearances over porches & decks

A minimum clearance of 11 feet is required over porches and decks. (NESC Table 234-1)

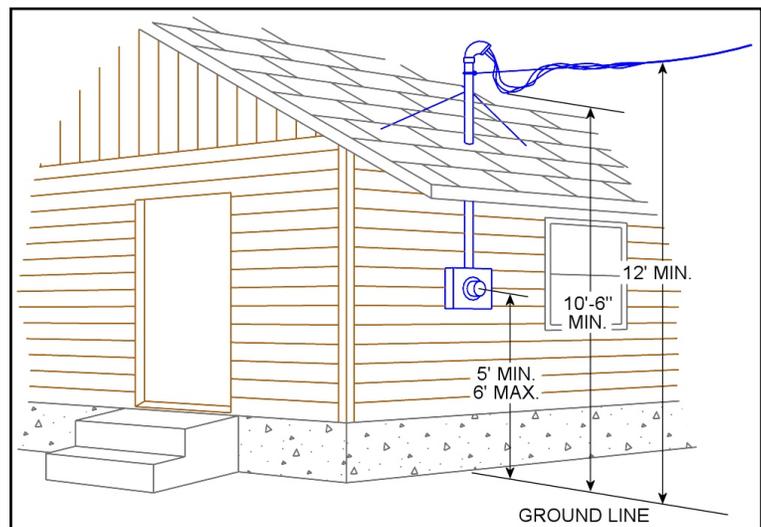


Figure 16: Service Conductor Clearances

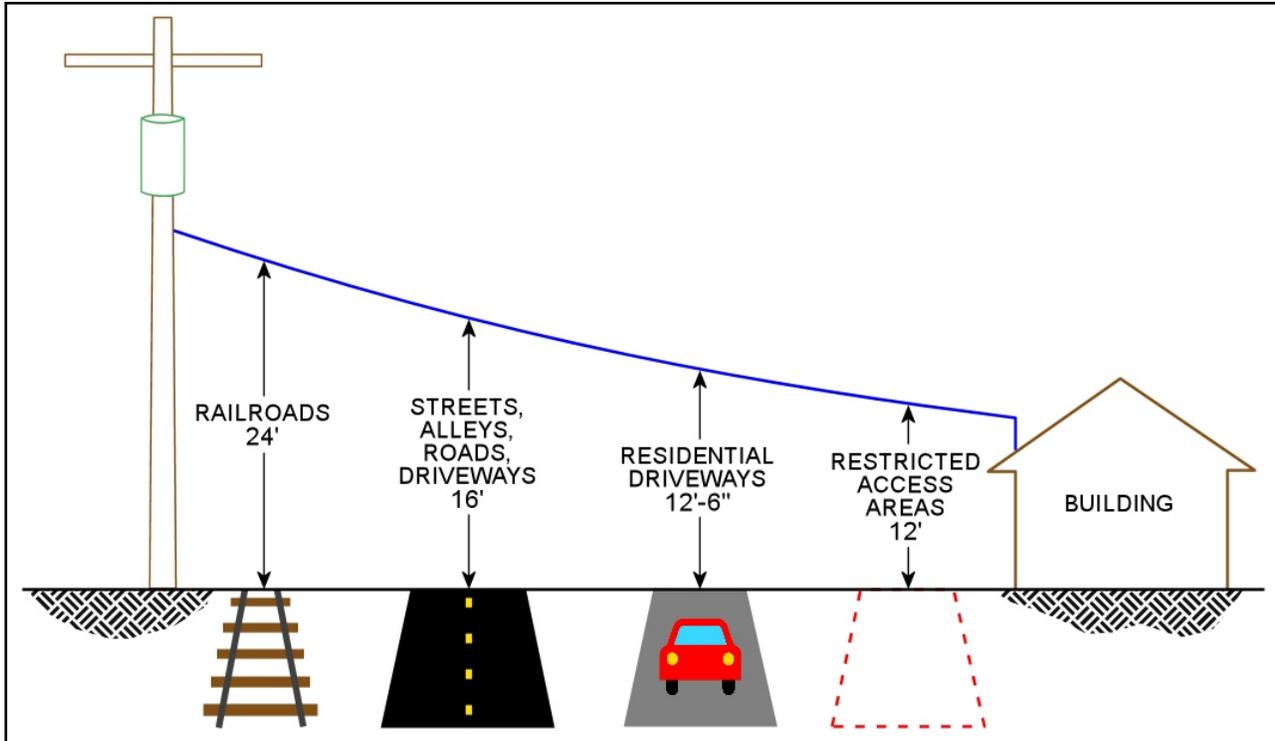


Figure 17: Conductor Clearances Above Grade

**Vertical clearances from ground**

Service drop conductors 600 volts and under shall have the following minimum clearance from final grade (Figure 19): (NESC Table 232-1)

- 10'-6"**: At the electric service entrance or at the drip loop of the building electrical entrance, measured from final grade or other accessible surface.
- 12'-0"**: Spaces and ways subject to pedestrians or restricted vehicle traffic only.
- 12'-6"**: Over residential driveways.
- 16'-0"**: Over roads, streets, driveways, parking lots, alleys, and other areas subject to truck traffic, including cultivated fields, grazing lands, forests, and orchards.
- 24'-0"**: Over track rails of railroads.

**3.05 METER POLE**

If the meter is not installed on a permanent building or structure, Forest Grove Light & Power requires that a meter pole be set. It is the customer's responsibility to coordinate with Engineering or Operations to find an acceptable location for the pole.

The customer is responsible for owning and maintaining the meter pole. Contact the Operations Superintendent for the purchase and installation of the meter pole. Refer to Figures 18 and 19 for details. Fees may apply in the event that a meter pole is required.

**Guying**

A guy may be required on meter poles where the service conductor is over 50 feet between points of attachment or if the main bus rating of the service is larger than 200 amps.

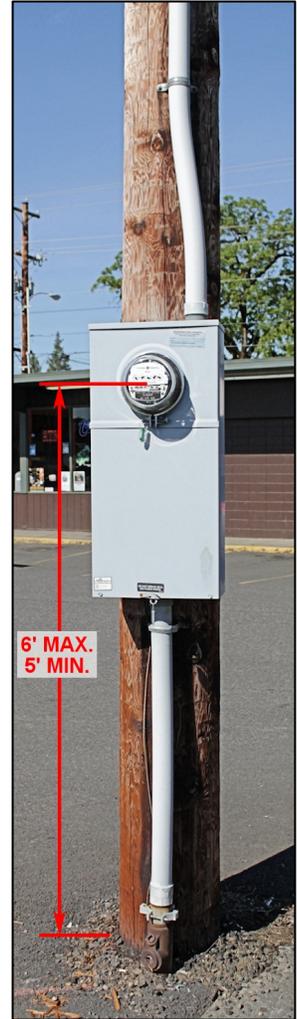


Figure 18: Meter Pole Equipment

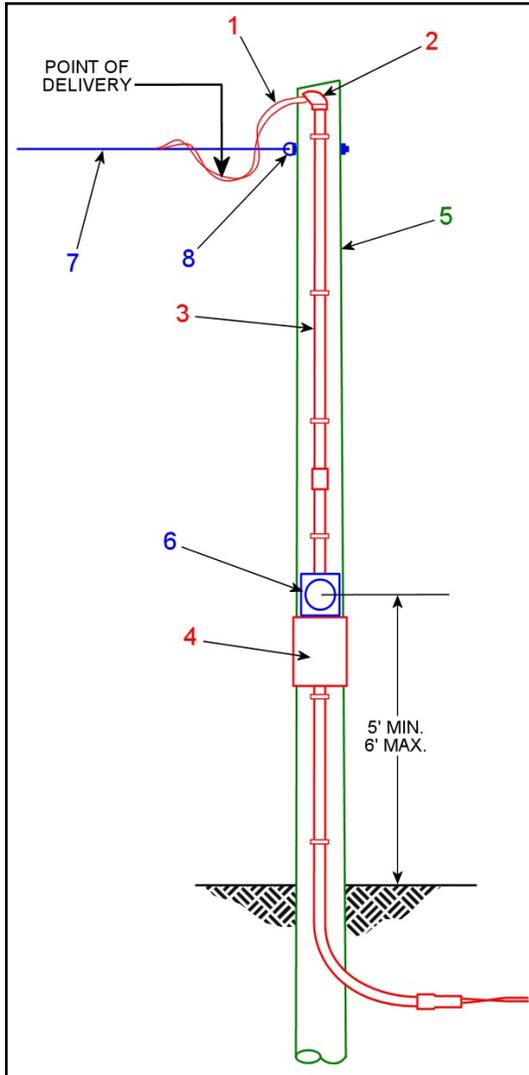


Figure 19: Meter Pole

**Items Owned & Installed by Customer**

1. Service entrance conductors - 18inches (min.) out of weatherhead
2. Weatherhead
3. Conduit and straps
4. Meter socket, disconnect switch, and service equipment, including grounds.

**Items Owned by Customer & Installed by FGL&P**

5. Meter pole

**Items Owned & Installed by FGL&P**

6. Meter
7. Service conductors
8. Insulated clevis

## 4 UNDERGROUND SERVICES

### 4.01 GENERAL REQUIREMENTS

The process of installing a new underground service to your home is a joint project between you and Forest Grove Light & Power. We request that several items be completed prior to connecting your service. Once these items are complete, Forest Grove Light & Power will install your service wire and new meter.

The items to be completed are:

- Contact Forest Grove Light & Power and request a new permanent service. Our telephone number is (503) 992-3250. If temporary service is needed, it may be requested at the same time.
- Obtain an electrical work permit from the Washington County Building Services Division.
- Install the new meter base. Refer to Section 2.04 for the location.
- Obtain underground locates and provide a trench to the Forest Grove Light & Power contact point. Install the service conduit in the trench. Contact FGLP (503) 992-3250 to arrange for inspection of trench and conduit prior to back filling trench.
- Install the service conduit on the building.
- If applicable, install the service conductor.
- Obtain the appropriate electrical inspection.

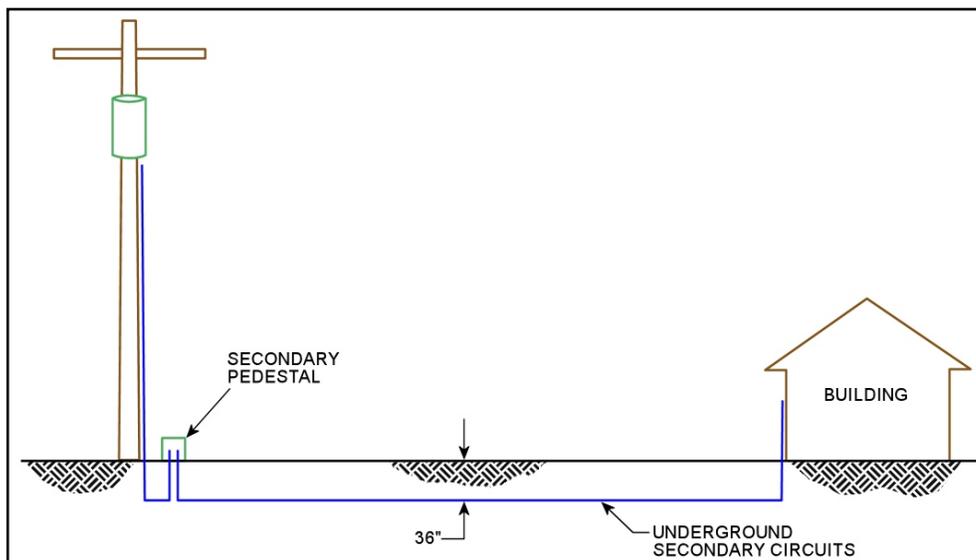


Figure 20: Typical Underground Service

After the above items have been completed, call the FGLP at (503) 992-3250 and inform him that the meter base has been inspected and you are ready for service. If clarification is needed on any of the items, please call Forest Grove Light & Power and someone will assist you.

*NOTE: Please consult with Forest Grove Light & Power Engineering to determine the "A.I.C." rating that will be required for your equipment. Failure to do so may result in you having to replace your equipment at your cost and may cause delays in connecting the service.*

#### 4.02 SERVICE LINE LOCATION

Forest Grove Light & Power requires that for an underground service, the cable route be through an area that will be accessible to excavation equipment in the future. In the event that the cable ever fails, this will enable the Utility to either replace or repair it more quickly. The area where the cable and conduit are run may need to be dug up if the conduit should collapse. Forest Grove Light & Power requires that all services be installed in electrical (grey) Schedule 40 PVC or better conduit. Also, a minimum clearance of 5 feet must be maintained from any sewer drain field, regardless of the type of construction used in the sewer system.

#### 4.03 TRENCHING REQUIREMENTS

##### Survey Monuments

The State of Oregon administers state laws pertaining to removal or destruction of survey monuments. If you plan on doing *ANY* digging within one foot (1') of a survey monument or property corner, you are required to comply with all relevant codes and rules. This includes monuments and property pins you can see as well as monuments and property pins which are expected. You will need to contact a licensed land surveyor to meet this requirement.

##### Locates

Before digging, it is necessary to obtain locates for underground utilities in the area. Locates can be obtained by calling the Utility Notification Center at (503) 246-6699. The Center must be contacted 48 hours prior to performing any excavating. They will have representatives from the utilities visit the site to locate their facilities.

The locaters will drive stakes or spray paint directly over each utility, signifying its location. Each type of utility has a color assigned to its facilities. The color codes are red for electric, orange for communication, yellow for gas and oil, green for sewer, and blue for water.

Please note that some private water, irrigation, and similar utilities do not participate with the Utility Notification Center. These utilities will need to be notified directly by the excavator. Once all of the utilities have been located, any digging within two feet of the location mark must be done by hand.

##### General Requirements

The excavated trench must be free of sharp objects or obstructions that could damage the conduit. After the conduit is installed, the first 6 inches of cover should be earth which is free of large rocks, sharp objects, or scrap building materials. **The trench and conduit MUST be inspected by Forest Grove Light & Power prior to backfilling. A Utility personnel will apply a bright green sticker to the conduit after it has passed inspection.** The service will not be energized until adequate clearances have been provided and the trench has been backfilled and compacted. Mark the end of the conduit to allow the crews to find the conduit and connect to it. To schedule an inspection of the installed conduit and open trench, call FGLP at (503) 992-3250. Refer to Figure 21 for additional trenching details.

**Service conductors (600 volts or less)**

All trenches for underground service conductors and conduits must be between 36" and 40" deep. If other utilities share the trench with power, the trench should have a minimum width of 18 inches.

**Primary Cables (15,000 volts)**

All trenches for underground primary conductors and conduits must be between 48" and 52" deep. Trench width varies depending upon which utilities will share the trench. When power conduits cross over or under gas lines, a vertical separation of 12 inches is required.

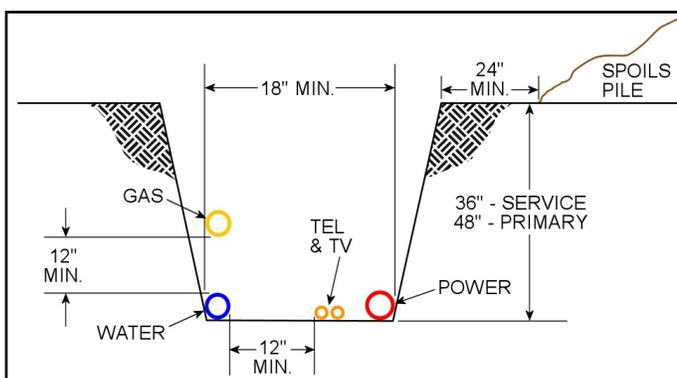


Figure 21: Trenching Details

**4.04 UNDERGROUND SERVICE INSTALLATION**

The location of the meter base has been marked on the building plans by the FGL&P Project Engineer. In general, it should be on the front wall or on a side wall within three feet of the front of the structure. The front is the portion facing normal public access. Locations that could have access restricted, such as carports, breezeways, or fenced yards, are not acceptable.

The maximum distance from the meter base to the serving transformer is 150 feet. If the meter base is further than this distance, please contact Forest Grove Light & Power. It may be necessary to modify the Department’s facilities in order to provide power for the new service.

All service cables must be installed in conduit. The size and number of conduits installed depends on the size of the service:

Size of Service	No. of Phases	Nominal Diameter	No. of Conduits
0-200A	1 or 3	3"	1
201-400A	1 or 3	4"	1
401-600A	1 or 3	*4"	2
601-800A	3	4"	2
over 800A	3	4"	Consult Utility

\*For 201-400A service a 3” conduit may be acceptable upon utility approval

**In addition to the sweep at the pedestal (supplied by the Customer) and the sweep at the bottom of the meter base (supplied by the Customer), the service conduit run may contain NO MORE than one 90-degree bend or the equivalent.** The sweeps must have a minimum radius of 36" unless approved by the utility.

Service conductors within a building or structure must be installed in rigid steel galvanized conduit or Schedule 80 PVC conduit. The total length of the raceway within the building to the customer's overcurrent protection shall be as short as possible. On an outside wall, service conductors may be installed in Schedule 40 PVC conduit, or equivalent. For locations where damage (such as from vehicles) may occur, Schedule 80 PVC or rigid steel conduit is required. Consult utility for clarification.

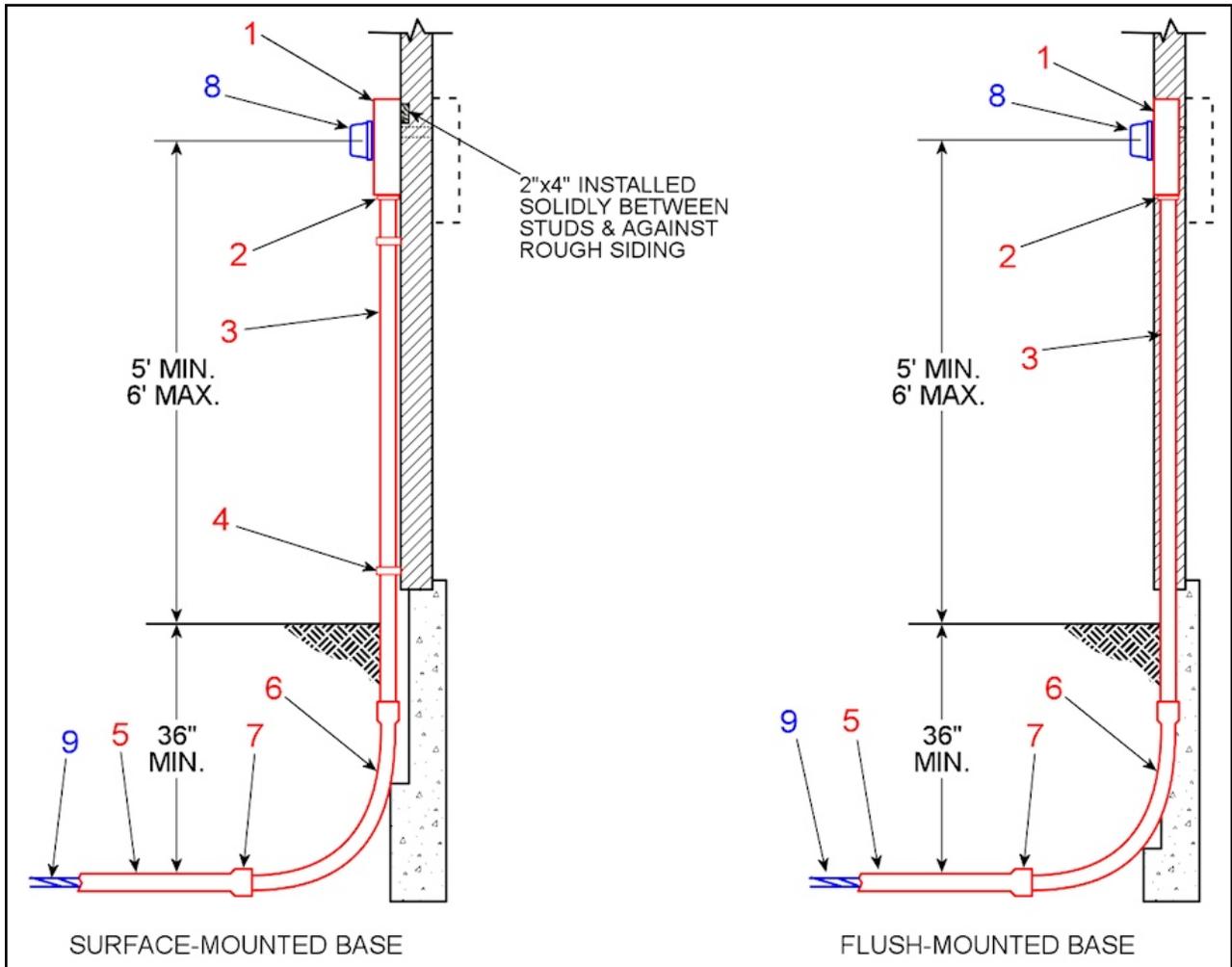


Figure 22: Underground Service Meter Installation

**Items Installed by Customer**

1. Meter base – 200 amp continuous rated
2. Lock nut & insulating bushing
3. Service conduit
4. Conduit strap
5. Service conduit in trench – Sch. 40 PVC, minimum\*
6. Sweep, 90°, 36" minimum radius
7. Bell end of conduit

**Items Installed by FGL&P**

8. Meter
9. Service lateral conductor

\* Conduit will be maintained by FGLP

#### 4.05 METER PEDESTAL

##### Service, 0-200 amperes

Meter pedestals are to be constructed of metal which has been treated to protect it from deterioration; wood pedestals are **not** allowed. The pedestal must be set in concrete and plumb to the finished grade and the concrete must be rigid prior to the City connecting the service. It is to be situated near the front of the structure and located such that a meter reader is not required to enter an enclosed area. Please contact Forest Grove Light & Power for assistance in choosing your meter base location.

##### Factory-Built Meter Pedestal

###### **Items Installed by Customer**

1. Factory-built meter pedestal
2. Service conduit, 3" sch. 40 PVC min.\*
3. Sweep, 3" sch. 40 PVC min., 24-inch min radius
4. Ground wire (in accordance with NEC)
5. Ground rods (two required)
6. 18"x18"x24" deep concrete stabilizer
7. Service conductor (from meter base to customer's load; size as needed per NEC)

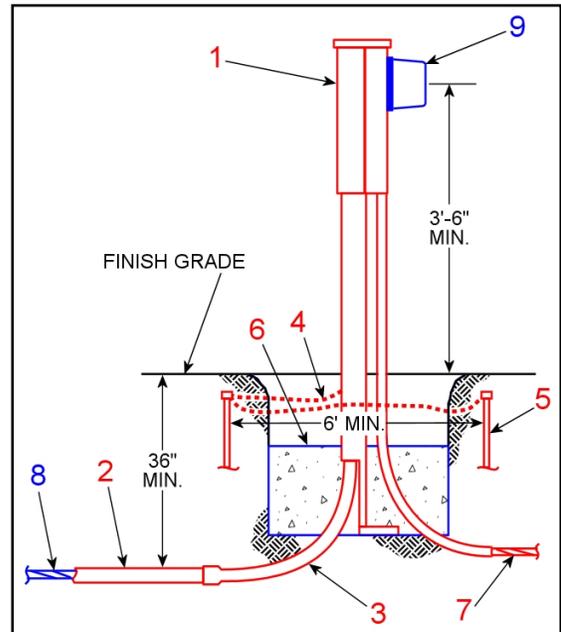


Figure 23: Factory-Built Meter Pedestal

###### **Items Installed by FGL&P**

8. Service conductor to the utility pedestal\*\*
9. Meter

*NOTE: Factory-built pedestals must have two separate raceways to isolate the Utility's service conductor from the customer's service conductor (NEC).*

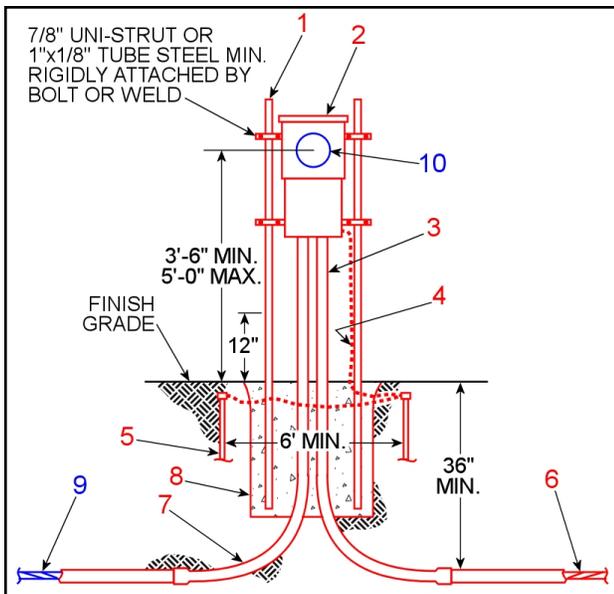


Figure 24: Site-Built Meter Pedestal

##### Site-Built Meter Pedestal

###### **Items Installed by Customer**

1. 1 5/8" Unistrut or 2" galvanized steel pipe, min.
2. Meter base, service entrance equipment
3. Service conduit, 3" Sch. 40 PVC min.
4. Ground wire (in accordance with NEC)
5. Ground rods (two required)
6. Service conductor (from meter base to customer's load; size as needed per NEC)
7. Sweep, 3" Sch. 40 PVC min., 36-inch min. radius
8. 18"x18"x24" deep concrete stabilizer

###### **Items installed by FGL&P**

9. Service conductor to the utility pedestal
10. Meter

\* Conduit will be maintained by FGL&P.

\*\* Customer may be required to provide and install the service conductors.

## 5 CUSTOMER EQUIPMENT, DEVICES & CHARACTER OF SERVICE

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### 5.01 GENERAL

Forest Grove Light & Power makes reasonable effort to prevent abnormal voltages and frequencies and loss of phase on its distribution system. However, such operating conditions can occur due to circumstances beyond the Utility's control. As such, the customer's equipment should be designed to afford protection against operating anomalies such as fault currents, under- and over-voltages, and, for three phase services, loss of phase.

Electric service supplied by Forest Grove Light & Power may be subjected to voltage disturbances which will not normally affect the performance of lighting, appliances, heating, motors, or other typical electrical equipment, but may result in the improper operation of voltage-sensitive equipment, such as computers or microprocessors. It is the customer's responsibility to provide those power conditioning devices that may be required to ensure the quality of power necessary for proper performance of voltage-sensitive equipment.

### 5.02 SINGLE-PHASE SERVICE

Single-phase service, if available, will be provided to customers upon request, except where the size of the service is more than 600 amperes. Three-phase service may be required where, in the Utility's judgment, the customer's connected load would be more efficiently supplied by three-phase. (e.g.-If there are large motors, heat pumps, or air conditioners.) All appropriate line extension charges will be born by the customer.

If the total load of a single phase service exceeds 4 kilowatts or if the rating of any single piece of equipment exceeds 2 kilowatts, the service may **not** be two wire 120V. The single phase service shall be three wire and the load shall be balanced on the ungrounded conductors as closely as practical.

Single phase motors larger than 5 horsepower and air conditioners or heat pumps larger than 3.5 tons may NOT be connected without prior approval from the Utility. Please note that single-phase motors larger than 3 horsepower may cause unavoidable voltage dips (light flicker). Any residential space heating or water-heating appliance having a total capacity greater than 11.5 kilowatts shall be designed and controlled so that not more than 11.5 kilowatts will be switched on or off at any one time.

### 5.03 THREE-PHASE SERVICE

Three-phase service, if available, will be provided to customers upon request, except where the total load is less than 10 kilowatts or the largest motor is less than 3 horsepower. All appropriate line extension charges will be born by the customer.

In areas with overhead distribution lines, either wye or delta connected three-phase service **may** be available. In areas with underground distribution lines, **only** wye connected three-phase service is available. The selection of the voltage to be supplied is at the option of the Utility and will depend upon the characteristics of the Utility's distribution system in the area and the customer's electrical needs.

The manner in which the single-phase loads of a three-phase service are connected is critical. For wye connected services, all single-phase loads should be split evenly among the three phases. For four wire delta connected services, only three-phase load shall be connected to the power leg. With prior permission, single phase 240 volt resistance heating equipment may be balanced across all three phases. Connections made otherwise may result in an overload or single-phase condition with the possibility of damage to the customer's three-phase equipment.

Normally, three-phase, 480-volt service will not be supplied where the total load to be served is less than 50 kilowatts, except where the load consists of a single motor, such as irrigation pumping, with a nameplate rating of at least 30 horsepower.

The Utility, at its option, may limit the maximum load served through a single point of delivery to the capacity of the Utility's largest standard transformer(s). Customers requiring three-phase service should contact Forest Grove Light & Power in a sufficient amount of time to allow equipment to be ordered, received, and installed.

#### **5.04 MOTOR PROTECTION AND STARTING**

To assure adequate safety to personnel and equipment, the customer shall provide and maintain code-approved protective devices to protect all motors against overloading, short circuits, ground faults, and low voltage, and to protect all three-phase motors against loss of phase(s).

Reduced-voltage starters are usually required on motors rated in excess of 50 horsepower and motors that are rated in excess of 10 horsepower that are frequently started to minimize interference with service to other customers. The Utility will furnish information regarding allowable starting currents. The maximum starting current permitted will depend upon the frequency of start of the motor and the size and character of the customer's load.

If voltage fluctuations are caused on a service by the starting of motors on that service, the customer will be responsible for installing approved reduced-voltage starters. If these measures do not correct the problem, the Utility may install additional facilities at the customer's expense.

#### **5.05 INTERFERING LOADS**

The customer's electrical equipment and devices are to have characteristics that efficiently utilize the Utility distribution system and do not adversely affect any of the Utility's facilities. This includes maintaining an average total harmonic distortion (THD) level of the load current that is consistent with the IEEE 519 standard for distribution system customers. In addition, the customer's equipment may not cause interference with the electric service to other customers.

In the event that a customer's equipment causes problems, the customer shall modify their equipment to eliminate the interference. Where corrective measures taken by the customer do not correct the problem, the Utility, at its option, may install additional facilities, such as separate service entrances, separate transformers, capacitor banks, or separate primary distribution lines, at the customer's expense.

The Utility reserves the right to inspect and test any equipment connected to its lines and to require any information necessary to determine the operating characteristics of the equipment. Prior to purchase, the customer shall submit information to the Utility regarding all equipment which might cause interference with service to other customers or require additional facilities for its satisfactory operation. Typical examples of this type of equipment include large motors (over 30hp), variable speed drives, large UPS systems, induction heating equipment, X-ray machines, large inductive loads, and any equipment which generates significant amounts of harmonics.

#### 5.06 POWER FACTOR

The Utility's current rate schedules specify a charge for excessive reactive demand, which may cause inferior performance of the customer's electrical system. It is recommended that the customer install corrective devices, such as capacitors, to make the most effective use of the electrical system and minimize or eliminate the reactive demand charge.

#### 5.07 AVAILABLE FAULT CURRENT

Upon request, the Utility will supply the information on available fault current at the customer's service entrance. It is the customer's responsibility to install equipment which will withstand that fault current.

#### 5.08 EMERGENCY AND STANDBY GENERATORS

Emergency or standby generators are to be connected to the customer's wiring system by a permanently installed transfer switch intended for that purpose. The transfer switch is to be designed and installed so that connection of the generator to the Utility system is prevented for **all** modes of operation. Compliance with these provisions is necessary to prevent serious or possible fatal accidents. **Portable generators shall not be connected to a permanent wiring system at any time.**

All transfer switches and/or transfer operating schemes must be inspected by the Utility Electrical Engineer, as well as the appropriate governmental inspector(s).

#### 5.09 PARALLEL GENERATION AND COGENERATION

Parallel generation is the production of electric energy where sources of generation other than the Utility's are connected for parallel operation with the Utility's system. Such sources, when customer-owned, may provide all or part of their output to the Utility and may include, but are not limited to, wind turbines, waterwheels, steam turbines, solar conversion, and geothermal devices.

Cogeneration is the joint production of electric energy and useful thermal energy in a combined process. These sources may include, but are not limited to, gas turbines, diesel-driven generators with waste heat recovery, and steam or back-pressure turbines.

Each proposal for either parallel generation or cogeneration will be handled on an individual basis and will require a special contract between the customer and the Utility.

The operation of the parallel generation or cogeneration system must be approved by the Utility. The metering location, type of metering, and the method of interconnecting the customer's and the Utility's systems will be designated by the Utility.

## GLOSSARY

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**AIC** - Available Interruptible Current

**Amps** - The unit of measure for current.

**ANSI** - American National Standard Institute

**Approved** - Acceptable to the authority having jurisdiction.

**Clearance** - A set distance between two objects.

**Common Ground Point** - The conductor used to connect the grounding electrode to the equipment grounding conductor and/or to the grounded conductor of the circuit at the service.

**Conduit** - A listed or approved wireway with a smooth interior surface to permit easy drawing-in of the electrical conductors. A conduit may be metallic or non-metallic, depending on its usage, in accordance with codes and Forest Grove Light & Power standards. Note: non-metallic conduit must be **gray** in color.

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

**County Inspector** - The qualified representative of the County of Washington Building Services Division who has been authorized by governmental agencies to inspect electrical service installations on their behalf.

**Current** - The flow of electricity between two conductors or a conductor and ground due to a voltage. It is measured in "amps".

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

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

**Drip Loop** - A loop formed in overhead secondary conductors at the weatherhead to prevent water from entering the service entrance conduit and equipment.

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

**Face of the Pole** - The side of the pole with the date stamp embedded in the pole.

**Ganged Meter Base** - A single enclosure which houses more than one revenue electric meter.

**Group Installation** - More than one electrical device, such as panels, meters, motors, etc., connected together by a common electric circuit.

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

**Instrument Transformer** - Current and/or potential transformers used with metering equipment to monitor high current and/or voltage.

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

**Meter Base** (also meter socket) - The mounting device consisting of meter jaws, connectors, and enclosure for accommodating socket-type meters.

**Meter Equipment** - Any equipment associated with measuring electric energy.

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

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

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

**NEC** - National Electrical Code

**NESC** - National Electrical Safety Code

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

## FGL&P ELECTRIC SERVICE HANDBOOK 2019

**Operations Superintendent** - The designated representative of Forest Grove Light & Power responsible for scheduling all work and construction activities. The Operations Superintendent inspects work performed by customers, including trenching, conduit, and vaults.

**OAR** - Oregon Administrative Rule

**Point of Delivery** - The point at which Forest Grove Light & Power's circuit and the customer's system are interconnected. The customer is responsible for the purchase, installation, and maintenance of all equipment on the load side of this point.

**Power** - The measure of the amount of energy transferred over a period of time. It is typically measured in "kilowatts".

**Power Factor** - The measure of the non-useful work required by electrical equipment, such as motors, transformers, and fluorescent lights.

**Power Leg** (also wild, delta, or high leg) - The phase leg of a delta service that has only three phase load connected to it (ie-no single phase loads). This leg shall be identified in red.

**Project Engineer** - The designated representative of Forest Grove Light & Power who is responsible for the design and/or coordination of new and modified services for Forest Grove Light & Power customers. The Project Engineer responds to inquiries on policies, standards, practices, rates, and energy utilization.

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

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

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

**Select Backfill** - Native soil or soil brought in from another area, free from sharp objects, rocks, scrap building material, and corrosive material.

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

**Service Drop** - The overhead conductors from Forest Grove Light & Power's system to the customer's point of attachment.

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

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

**Service Mast** - The conduit above the meter used to provide mechanical protection for the overhead service conductors and to support the service drop from Forest Grove Light & Power's system.

**Standards** - Authorized design principles applied to engineering, construction, and operation of Forest Grove Light & Power's electrical facilities.

**Temporary Service** - An electrical service installed by Forest Grove Light & Power to provide power to a customer on a temporary basis. Temporary service may be provided for up to four months.

**Transformer** - A device used to change the voltage to a level which can be utilized by the customer.

**UL** (Underwriters' Laboratories) - A nationally-recognized test laboratory which lists materials it has tested and accepted.

**Voltage** - A difference in electric potential between two conductors or a conductor and ground. It is measured in "volts".

**Watt** - The unit of measure for power.

## SOURCES

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*The following national standards were used to compile the information in this booklet:*

ANSI	05.1	American National Standards Institute
AWPA	C4	American Wood Products Association
EUSERC		Electric Utility Service Equipment Requirements Committee
NEC	200-6	Identifying Grounded Conductors
NEC	225-18	Clearance from Ground
NEC	225-19	Clearances from Buildings for Conductors of Not Over 600 Volts, Nominal
NEC	230	Services
NEC	250	Grounding
NEC	300-5	Wiring Methods, Underground Installations
NEC	310-12	Conductor Identification
NEC	310-14	Aluminum Conductors
NEC	550-32	Mobile Home Service Equipment
NESC	150	Current Transformers
NESC	232	Vertical Clearances of Wires and Conductors above Ground and Roads
NESC	234	Clearances of Wires and Conductors from Buildings