

## **6. SECONDARY SERVICES (under 600 volts)**

### **6.1 AVAILABILITY**

For the electrical characteristics of available secondary services see Section 3.4.

### **6.2 OVERHEAD SERVICES**

Wiring of any premises for connection to overhead lines must be brought outside the building wall to a location designated or acceptable to the Company. From that point the Customer's service conductors shall extend at least 3 feet to simplify attachment to the company's service supply lines. The Customer's service entrance conductors should be carried about one foot above the service bracket or rear bus conductors to a service head or formed into drip loops. The bare neutral conductor should be taped where exposed to the atmosphere. See Section 4.4.1.1 for private property construction where buildings are more than 100 feet from the property line.

#### **6.2.1 Service Head**

An acceptable rain-tight service head is required when the service conductors are in conduit or electrical metallic tubing. A service head is also recommended for service entrance cable. Where a service head is not used with service entrance cable, the cable shall be formed into a goose neck loop not less than 6 inches in diameter and turned downward for connection to the supply conductors. The cable shall be properly supported at the point where it leaves the wall to form the gooseneck. The end of the cable braid or jacket shall be adequately taped.

#### **6.2.2 Parallel Service Conductors**

Where parallel service entrance conductors are required, they shall be combined at the service heads so that not more than two connections are required per polarity to the Company's service drop or rear bus conductors.

#### **6.2.3 Clearance Above Ground**

Overhead services that cross over public streets, roads, or highways shall not be attached to any structure at a height less than 14 feet from the ground line. A higher attachment may be required to provide a minimum clearance of 18 feet above public streets, roads, or highways. If necessary, the customer must erect a suitable metal mast of adequate strength to safely withstand the strain imposed by the service drop to provide this minimum clearance. Overhead services that do not cross over public streets, roads, or highways, may have less than 14 feet, but not less than 12 feet, clearance above ground to the lowest service conductor. See Figure 12.02.

### 6.2.4 **Service Masts**

Service masts of galvanized steel conduit or other metal masts of equivalent strength may be used. See Figure 12.03. The minimums acceptable for unguyed service masts are:

<u>Maximum Height (H) Above Support</u>		
<u>Galvanized Steel Conduit Diameter (D)</u>	<u>100 Amp Service</u>	<u>200 Amp Service</u>
2"	3'	2'
2-1/2"	5'	4'
3"	8'	6'

### 6.3 **UNDERGROUND SECONDARY SERVICES**

Wiring of any premises for connection to the underground supply facilities of the Company must be brought to within 18 inches of the Customer's side of the property line at a location designated or acceptable to the Company. From this point the Customer's service conductors shall extend at least 2 feet for attachment to the Company's service conductors. Where a building sets back from the property line, the Company's service lateral terminates and the Customer's service conductors begin at a point 18 inches inside the property line whether the conductors are spliced at that point or are continuous into the building. Exceptions to the above are specified in Electric Service Tariff, Rule 7.3 and the PECO "**Developer Trenching**" Procedure, See Figure 12.01.

When the building is not set back from the property line, the Company service conductors will terminate in an end box installed by the Customer on the inside wall of the building at a location designated or acceptable to the Company.

#### 6.3.1 **End Boxes**

When the Company's service lateral enters a building below grade, the contractor shall furnish and install an acceptable sealable end box over the point where the lateral enters. The contractor shall also furnish and install a suitable service entrance extension, as short as possible, between this box and the meter or service equipment. Rigid conduit, electrical metallic tubing, or a sealable trough shall be used for this purpose. Acceptable end boxes are listed below in chapter 6.3.1.1. If constructed of ferrous material they shall be protected inside and outside against corrosion by enameling, painting, galvanizing, plating or an acceptable equivalent. For single residential applications, service conductors may be run directly into the metering equipment.

##### 6.3.1.1 **End Box Sizes**

The minimum size end box for a service lateral entering from underground shall be 12" x 12" x 5". Two feet of slack cable is required in the end box for connection to the Company service lateral. Conditions may be encountered where, because of the size and numbers of conductors, oversized splice boxes or separate troughs will be required. The Contractor should consult the local PECO Company office to determine detailed requirements before starting construction.

The following table may be used as a guide to determine the minimum size end box required for given types of services and sizes of conductors. If the Customer's service conductors differ in size or number from the Company's service lateral, the minimum size end box shall be the largest required by either of the installations.

### MINIMUM SIZES OF END BOXES FOR SERVICE CONDUCTORS

Minimum Box Size (Inches)	<u>Maximum Conductor Size (AWG or MCM)</u>			
	<u>Single Phase</u>		<u>Three Phase</u>	
	1 Service	2 Services or 1 Service with Parallel Conductors	1 Service	2 Services or 1 Service with Parallel Conductors
12 x 12 x 5	250	1/0	1/0	2
16 x 16 x 6	350	2/0	4/0	1/0
20 x 20 x 8	500	3/0	350	2/0
24 x 24 x 10	750	250	500	3/0
36 x 36 x 18	1000	350	1000	4/0
42 x 42 x 24	----	1000	----	1000

**Note: End boxes required for conductor sizes not listed above shall be sized according to the requirements as specified by the National Electrical Code.**

#### **6.3.2 Service Extensions**

Not more than two service extensions shall be made from one underground service end box without consent of the Company. Where more than two service extensions are required, an auxiliary sealable trough or junction box of adequate size shall be provided adjacent to the incoming underground service end box. All additional service extensions shall be made from this auxiliary trough or box. There will be no limit to the number of service extensions permitted unless limited by the load capacity of the incoming service and extension conductors.

#### **6.3.3 Electric Services Installed With Other Services**

Underground electric service entrance conductors may occupy a common trench with gas or communication services. Minimum Twelve (12) inches of separation is acceptable between electric and all other utility facilities.

Electric and communication services shall be installed with a minimum of 12 inches separation from the gas service.

A detailed drawing of a gas and electric meter installed at the same location is Figure 8.05 in section 8. Trench design is detailed in the PECO "Developer Trenching" Procedure.

## **6.4 COMPANY OWNED TRANSFORMERS ON CUSTOMER'S PROPERTY**

### **6.4.1 Outdoors on Precast Transformer Foundations**

Depending upon capacity or voltage requirements, it may be necessary to locate Company owned distribution transformers on the Customer's premises. Normally these transformers will be padmount type installed on a precast concrete transformer foundation outside the building being served. The Customer will provide the precast concrete transformer foundation with a concrete cover at a location approved by the Company in accordance with Figure 12.11 or 12.12.

Single line diagrams for overhead and underground services are shown in Figure 12.05. Typical transformer connection configurations are shown in Figures 12.13 and 12.14. See Section 3.4.1 for maximum transformer sizes.

### **6.4.2 Indoors in Transformer Vaults**

When there is not enough space outside the building for a padmount transformer, a bank of Company owned transformers may be installed inside the building in a vault provided by the Customer at a location approved by the Company. This vault must be on the ground floor or one story below grade and meet the National Electrical Code requirements. The Company will not install indoor transformation in areas supplied by, or designated to be supplied by, 33,000 volts or higher. See Section 3.4.1 for maximum transformer sizes. Contact the local PECO Company office for specific details.

## **6.5 SERVICE CONDUCTORS**

The customer shall install service entrance conductors of an approved type. The proper number and size of conductors installed shall be adequate for the load to be supplied in accordance with the National Electrical Code.

### **6.5.1 Service Entrance Cable**

Only service entrance cables of an approved type are acceptable. Service entrance cable shall be securely fastened to the surface of the building wall throughout the length of the run by approved cable straps of the proper size and shape for the cable. Straps and clamps shall be spaced not more than 30 inches apart and within one foot of every service head, gooseneck, connection to a raceway, or enclosure. The cable shall be securely fastened at the top by a substantial means that can support the entire weight of the cable in a vertical run. Unarmored cable shall be properly protected in cases where it may be subjected to physical damage. Where a metallic sleeve is used for protection of service entrance cable, the sleeve opening exposed to weather shall be adequately caulked.

### **6.5.2 Underground Service Entrances**

Aluminum or copper conductors recognized by the National Electrical Code for underground use are acceptable to the company for underground service entrances for either direct burial or in metallic or nonmetallic conduit. The use of bare aluminum or copper clad-aluminum grounded conductors is unacceptable.

### **6.5.3 Raceway Service Entrances**

Where rigid conduit or electrical metallic tubing is used to enclose the service entrance conductors, it shall be equipped with a service head at the top and shall be fastened securely to the face of the building wall with approved straps or clamps located as specified in the National Electrical Code. The conduit or tubing shall be connected securely to the metering and service equipment with approved fittings.

#### **6.5.3.1 Concealed Service Entrance Conductors**

Service entrance conductors for single-phase residential services may be concealed within the hollow spaces of building walls under the following conditions:

- Conduit shall be rigid and is acceptable in straight or swiped vertical runs within outside walls only.
- Conduit shall not contain pull boxes or junction boxes.
- Conduit shall be grounded by approved method when required.

See Figure 8.04

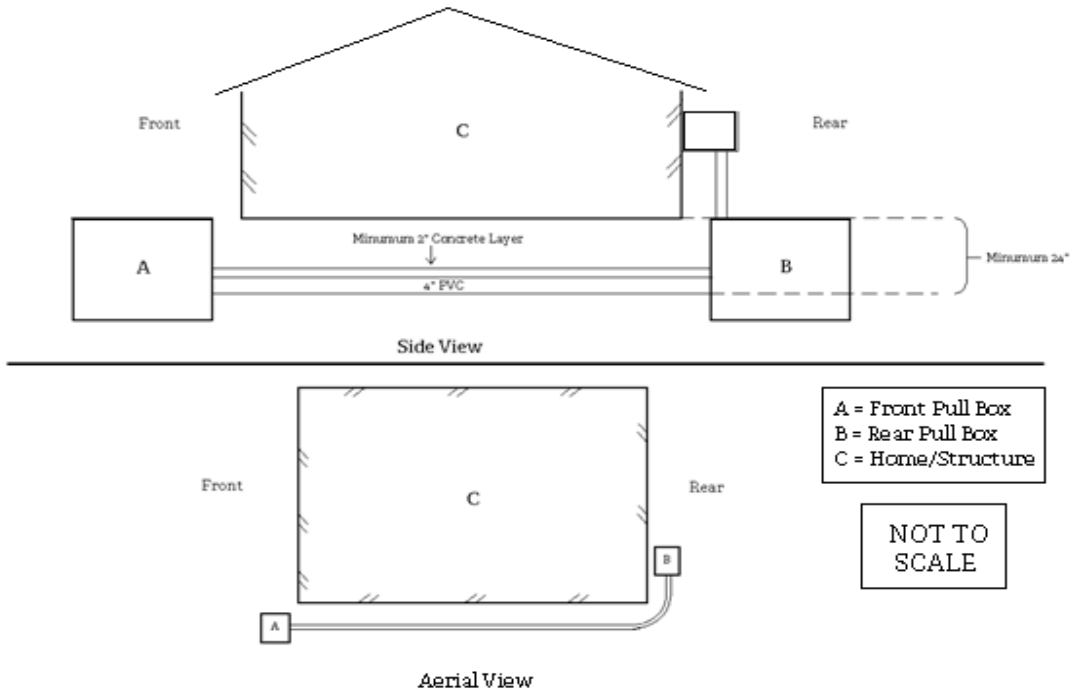
### **6.5.4 Separation of Metered and Unmetered Conductors**

Metered and unmetered conductors shall not be run within the same raceway. Exception may be made for factory wired multiple meters mounting equipment that has been accepted by the Company and listed in Table 8.05.

### **6.5.5 Non-Standard Rear Property Meter Requirements**

Where conditions make it necessary and upon PECO approval, meters shall be located on the backside of a structure with the following additional requirements (see PECO standard S-5551-A for more detailed description and Illustration):

1. Customer must provide and install PECO approved pull box at front of structure for transition from direct bury to conduit.
2. Customer must provide and install PECO approved 17"x30"x18" high density polyethylene pull box at rear of structure for transition from 4" PVC to 3" meter riser (see section 10, Accepted Equipment).
3. Customer must provide and install 4" PVC (type EB) conduit at a minimum depth of 24" with a minimum 2" layer of concrete on top from front to rear pull box.
4. Duct and /or cable must not be installed under or within the foundation of the building.
5. Secondary service cable shall be 2-1x500 MCM AL and 1-1x4/0 AL(Neutral).
6. An easement must be granted to PECO.
7. Rear property meter must remain accessible without fencing, etc. which could limit access.
8. Customer responsible to provide PECO with As-Built drawings prior to energization.



**NON-STANDARD REAR PROPERTY METERING**

**6.6 SERVICE CABLE RESTRICTIONS**

Unprotected service cable is not acceptable for unmetered connections between meter sockets or for unmetered connections between service raceways and meter sockets. Unmetered connections for Rate R meters or additions to existing services shall be made through rigid metallic conduit, electrical metallic tubing, flexible metal conduit or approved sealable metal raceway. Service cable is acceptable for unmetered use only where the service cable is continuous from the service bracket or service head to the meter socket, a service raceway, or service equipment ahead of metering.

## **6.7 MINIMUM SIZE OF SERVICE ENTRANCE CONDUCTORS**

The sizes of Customer's service entrance conductors shall meet the requirements of the load as specified by the National Electrical Code. The minimum conductor sizes acceptable to the Company are as follows:

### **6.7.1 Single Residential Customer installation:**

	Rated Service Amperes	Minimum Conductor Size (AWG) <u>75°C Type Insulation</u>		
		<u>Ungrounded</u>	<u>Neutral</u>	<u>Grounding (Note 2)</u>
Copper	60 (Note 1)	6	8	8
	100	4	6	8
	200	2/0	1	4
Aluminum	60 (Note 1)	4	6	6
	100	2	4	6
	200	4/0	2/0	2

**Note 1: Limited to replacement of existing services where service equipment is adequate for the load.**

**Note 2: When a grounding conductor is connected solely to a "made" ground, the conductor need not be larger than No. 6 AWG copper or its equivalent in current carrying capacity.**

### **6.7.2 Multiple Residential Customer Installations**

The minimum conductor sizes recommended for multiple residential installations are as follows:

<u>No. of Meters</u>	Minimum Conductor Size (AWG) <u>75°C Type Insulation</u>	
	<u>Copper</u>	<u>Aluminum</u>
2	1	1/0
3	1/0	2/0
4	2/0	3/0
5	3/0	4/0
6	4/0	300 MCM

## **6.8 GROUNDING**

Grounding of all electric services shall meet the requirements of the National Electric Code and all applicable local codes.

### **6.8.1 Grounding Conductor Connection**

The grounding conductor from the grounding electrode system required by the National Electrical Code, shall always be run to and connected in the Customer's service equipment. It shall not be connected in the meter mounting equipment or current transformer enclosure.

### **6.8.2 Grounded Service Conductor**

A grounded service conductor will be extended by the Company to the point of delivery of all secondary services for new installations. This grounded conductor shall be extended to and connect with the meter mounting equipment neutral terminal and continue to termination on the Customer's service equipment grounding terminal. This connection will then tie the Customer's grounding conductor with the Company's system ground.

#### **6.8.2.1 Existing Three Phase, 3-Wire Installations**

In existing three phase, 3-wire installations, any alteration that establishes the requirement for an electrical re-inspection of service equipment should provide for running and terminating the grounded service conductor where none exists. The Company will provide meters to register the Customers load based on the use of a grounded service conductor even when the Customer runs no actual neutral conductor.

## **6.9 SERVICE EQUIPMENT**

The maximum reliability and the most satisfactory use of electric service results when the electrical equipment provided by both the Customer and the Company are adequately designed and properly applied to each installation. Acceptable service equipment shall meet these requirements.

### **6.9.1 Company Acceptance**

The service equipment may be of any make that meets the following requirements except that, for equipment that incorporates a meter socket, only the catalog items listed in section 8 Tables 8.04,8.05, and 8.11 are acceptable.

### **6.9.2 Ampacity**

Service Equipment shall be adequate for the load to be served. The minimum size for new and replacement installations shall be 3 wire, 120/240 volt, 100 ampere capacity, except for installations with no more than two 15 ampere branch circuits that may be serviced through single phase 2 wire, 120 volt, 30 ampere nominal capacity equipment. Replacement of existing service conductors may be made with 3 wire 120/240-volt conductors of 60-ampere capacity provided they are adequate for the load to be served.



### **6.9.3 Disconnecting Means**

Service disconnecting means shall be of a type approved for service equipment and for the prevailing conditions. The disconnecting means shall be so arranged that, at full capacity of the cabinet, total disconnection of the service can be effected by not more than 6 operations of the hand in order to comply with the National Electric Code.

### **6.9.4 Non-Interlock Feature**

In order to permit inspection of the interior of the service switch or circuit breaker enclosures without interrupting the service, the service switch or breaker handle shall NOT be interlocked with the enclosure door or cover. However, it is required that covers be sealable whenever the device is used on the line side of the Company's meter.

### **6.9.5 Polyphase Equipment**

For 3 phase, 4 wire, delta services to combined lighting and power loads, separate independently fused service switches or circuit breakers shall be installed for the lighting load and for the power load. If a main disconnecting device is desired or necessary, it should not be fused; a common trip circuit breaker is acceptable. Each leg of the single-phase load should be balanced as close as practicable.

### **6.10 KNOCKOUTS**

Nested knockouts, concentric or eccentric, are acceptable in the compartments of any meter mounting equipment that contain unmetered service conductors. Construction specifications for acceptable meter sockets or connection equipment are available upon request from the Company.

## **6.11 LOCAL FIRE ALARM AND FIRE PUMP SYSTEMS**

### **6.11.1 General**

The electrical supply to a local fire alarm or fire pump system shall always be metered. No connections shall be made within any sealed section of the meter socket. The supply shall be connected on the load side of the meter but ahead of all switches, fuses, circuit breakers, or other circuit interrupting devices found on the load side of the meter.

**Note: PECO will not supply a separate service for a fire pump or other “emergency” service. The reason is that although PECO never guarantees continuous service under any circumstances; experience has shown that structure fires commonly cause an interruption to the building service, and sometimes interrupt the power lines in the vicinity of the fire.**

**Continuous operation of a fire pump during a fire is the responsibility of the customer. PECO strongly recommends that the customer consult an Independent Fire Expert for the design of the fire pump system.**

### **6.11.2 National Electrical Code Requirements**

The electrical supply to a local fire alarm or fire pump system shall be fused and otherwise installed to comply with the wiring requirements of the National Electrical Code and any pertinent local ordinance.

## **6.12 CUSTOMER INSTALLED LIGHTNING ARRESTERS**

### **6.12.1 General**

Although lightning arresters for services at secondary voltages are not required, where the Customer wants to install lightning arresters the following rules shall apply:

### **6.12.2 Approved Type**

It shall be a type approved by Underwriter's Laboratories.

### **6.12.3 Location**

It shall be attached and connected to the Customer's service equipment on the load side of the main fuses.

### **6.12.4 Unacceptable Location**

It shall not be attached or connected to the Company meter installation.

### **6.12.5 Safe Installation**

It is recommended that qualified persons, because of the hazards involved in connecting to energized equipment, install lightning arresters.

## **6.13 MOBILE HOME PARKS**

### **6.13.1 Service**

The Company will construct, own and maintain distribution facilities within a mobile home park for separately supplying and metering each home's use of electrical energy as prescribed in Electric Service Tariff Rule 7.3. Transient trailers, known as travel trailers, are restricted to service through a single Company meter and privately owned facilities of the trailer park.

### **6.13.2 Service Equipment**

Adequate facilities for mounting the service equipment, and for supporting the service drop and service entrance conductors where service is aerial shall be furnished and set at a reasonable distance from the mobile home. Service equipment shall be weatherproof with a minimum rating of 100 amperes, 3 wires, 120/240 volts. An adequate ground or grounding system shall be provided for each mobile home.

#### **6.14 TEMPORARY SERVICE**

When the Company and Customer have agreed to terms for the installation of a temporary secondary service, the Customer, for the extension of Company facilities, must provide an adequate support. See section 12 Figure 12.08 and 12.09.

#### **6.15 COMMERCIAL SERVICES**

##### **6.15.1 General**

PECO must receive a properly completed Application for Electric Service & Meter (S&M) for each individual meter location. This S&M must be filed at the time of the pre-construction meeting in order to avoid delays in obtaining service.

PECO will **not** energize customer service cables unless an approved meter socket or metering transformer cabinet, as listed in PECO's "Electric Service Requirements" manual, has been installed and the electrician has completed all work in the metering equipment.

A meter will **not** be energized unless a customer's name, address, etc. have been received, the installation has been inspected by the appropriate underwriting agency, and the underwriter's inspection card has been received by PECO.

On multiple meter installations, each meter socket and service-disconnecting device shall be legibly and permanently marked to indicate the customer it serves.

##### **6.15.2 Distribution to a Single Commercial Customer**

When only one customer is involved, PECO will extend an aerial service to the service termination point, nominally 100'.

If capacity or voltage requirements preclude an aerial service, a PECO owned transformer will be installed on the customer's property on a precast concrete transformer foundation with concrete lid, provided by the customer. In addition, the customer must provide conduit and cables as outlined in the Illustration section of this manual and make transformer connections (See table 6.01).

Section 12, "Illustrations", of this manual illustrates service design options that are available to supply electric service to commercial customers.

### **6.15.3 Distribution to Multiple Commercial Customers**

PECO will maintain aerial distribution facilities on private property, which are common to more than one customer. At the request of the customer, these facilities may be installed underground at additional expense to the customer.

Contact Regional New Business for specific details for your project.

See table 6.01 for installation / ownership responsibility.

Section 12, "Illustrations", of this manual illustrates service design options that are available to supply electric service to commercial customers.

### **6.15.4 Multiple Meter Installations**

When multiple meter installations are to be indoors, as in an office condominium, or outdoors, as in shopping centers, PECO facilities will terminate at a mutually agreed upon location in a developer- provided end box, splice box, etc. as discussed below:

1. In an end box immediately inside wall of the building (NOTE: The developer is responsible for continuing conduit through the building wall into the end box.)
2. In a splice box mounted on the exterior wall of the building
3. In a manhole outside of the building
4. In a pad-mounted or pedestal type splicing enclosure outside the building
5. In an approved switchgear compartment.
6. When the service cable(s) supplying a single customer are extended from the secondary compartment of a PECO padmounted transformer which is supplying multiple customers the building owner will maintain ownership and responsibility for the cable(s) serving the single customer.
7. Please refer to section 8.8 for specific meter location requirement

**NOTE: PECO will not extend cables: under a building or to the terminals of the customer's service receiving equipment, or further into a building than an end box immediately inside the exterior wall. Any construction, which occurs over existing PECO conductors, will result in relocation of these conductors at the customer's expense.**

**Table 6.01  
Customer / PECO Responsibility for Padmounted and Underground  
Facilities Located on Private Property  
Quick Reference**

	<b>Single Commercial</b>	<b>Multi-Customer Commercial</b>
<b>Padmount Transformer Base</b> (Precast concrete transformer foundation with lid for 3 PH., Fiberglass for 1 PH)	Customer provides and installs (owns)	Customer provides and installs (owns)
<b>Duct on Private Property</b> Primary and Secondary	Customer provides and installs (owns)	Customer provides and installs (owns) - one spare conduit required for each secondary conduit run
<b>Primary Cable</b>	Customer provides and installs (owns)	Customer provides and installs - PECO assumes ownership upon being energized, and maintains cable common to 2 or more customers
<b>Secondary Cable</b>	<b>N. A.</b>	Customer provides and installs based on PECO Design. PECO assumes ownership upon being energized, and maintains cable common to 2 or more customers to point of delivery (manhole, splice box, etc.)
<b>Service Cable</b>	Customer provides and installs (owns)	Customer provides and installs (owns) to secondary splice enclosure (manhole, splice box, etc.) or rear buss
<b>Fiberglass Switch Module Bases</b>	Customer provides and installs (owns)	Customer provides and installs (owns)
<b>Secondary Splice Enclosure</b> (manhole, pedestal, wall mounted splice box, end box)	Customer provides and installs (owns)	Customer provides and installs (owns)
<b>Transformer</b>	PECO owns and provides for secondary service	PECO owns and provides for secondary service
<b>Transformer Connections</b>	Customer connects transformer for new secondary services. In addition, customer must provide adequate support for cable(s) weight.	Customer connects both primary and secondary side. In addition, customer must provide adequate support for cable(s) weight (PECO will take ownership of)
<b>Terminal Pole Molding</b>	Customer provides and installs (PECO will take ownership of)	Customer provides and installs (PECO will take ownership of)
<b>Brackets for Rear Buss</b>	<b>N. A.</b>	PECO supplies, Customer installs, PECO maintains
<b>Secondary Connections at Point of Delivery</b> (Secondary Enclosure)	Customer owns, provides, and installs	Customer provides and installs (PECO will take ownership of)