

## 7. SERVICES OVER 600 VOLTS

### 7.1 GENERAL

The Company shall always be consulted to obtain required design criteria where service is contemplated. Preliminary plans of the Customer shall be submitted for review before purchase of equipment or start of construction. Drawings submitted for review shall include (1) Plot Plan showing desired delivery point, (2) Service details (underground or aerial), (3) Service entrance equipment or structures, (4) Arrangement of service substation equipment, (5) Single Line Diagram, and (6) Load Information.

All facilities beyond the delivery point (except metering equipment) shall be furnished, installed, maintained and operated at the Customer's expense and shall be owned or leased by the customer. This includes necessary structures, foundations, enclosures, ground busses, and cautionary and designation markings. The National Electrical Code requires an enclosure for all electrical installations (Article 110 Part III), unless acceptable tamper resistant equipment is used. Customers should provide regulating equipment if the voltage band for satisfactory operation of their load equipment does not fall within the voltage band of the Company service.

### 7.2 ACCEPTABLE HIGH VOLTAGE SERVICE EQUIPMENT

#### 7.2.1 Ratings

All customer-owned service equipment shall be rated for the service voltage being supplied, and have adequate fault close and fault current interrupting ratings. Please refer to Table 7.01.

**Table 7.01  
Service Equipment Ratings**

Service (kV) # Phase, # Wires	Equipment Voltage Class (kV)	Minimum (BIL) (kV)	Max Fault Current Amps Sym	Recommended Transformer Primary Voltage & Winding Configuration
4.16, 3 Ph, 4 wire	5	60	6,300	4,160 Delta
13.2, 3 Ph, 3 or 4 wire	15	95	6,300	13,200 Delta
33, 3 Ph, 3 Wire *	34.5	200	**	33,000 Delta
33, 3 Ph, 4Wire *	34.5	150	**	33,000Y/19,050 * ***
69, 3 Ph, 4 Wire	72.5	350	**	69,000
138, 3 Ph, 4 Wire	145	750	**	138,000
230, 3 Ph, 4 Wire	242	900	**	230,000

\* See Figures 12.06 & 12.07      \*\* Consult ~~New Business~~ Customer Engineering

\*\*\* Transformers connected to 33,000 V, 3 Phase, 4 Wire circuits shall have grounded-wye primary and grounded-wye secondary winding configurations

## **7.2.2 Service Cable, Terminations and Splices**

Company requirements for service cable, terminations, and splices are provided in Section 11.

## **7.2.3 Location of Disconnects**

The service disconnect shall consist of one of the following: a removable circuit breaker, a circuit interrupter with visible 3 phase gang operated isolation switch, or a three phase, gang operated, load break switch and fuse assembly. The service disconnect may be located at any convenient location on the customer's property either indoor or outdoor. The location shall meet the requirements of the National Electrical Code. Open wire services over 500 feet long, or less where conditions warrant, require a service switch near the property line. Indoor type service control assemblies shall be installed in clean, dry locations and shall not be located in vaults with oil insulated transformers. Service equipment should not be installed in locations that are susceptible to flooding or where water supply or sewer piping failures may flood the room. An emergency exit shall be located near the service switch. Personnel shall be able to exit from the service switch without passing transformers.

### **7.2.3.1 Working Space**

Front aisle space for metalclad switchgear shall not be less than the manufacturer's recommendations or the National Electrical Code, whichever is greater. For all new construction, aisle space, where the service cable and PECO metering compartment doors open, shall permit inspection of live parts while energized. Working space shall meet the dimensions specified in Table 110-34(a) of the National Electrical Code to accommodate this requirement. Front and rear aisles shall allow full opening of compartment doors, and shall not be less than 36 inches. For assemblies that do not require rear access, rear aisle space is not required. When in the open position, compartment doors shall allow occupants a safe and unobstructed exit from the electrical room or substation enclosure. Aisle space for replacement of damaged equipment shall be permitted to maintain pre-existing aisle clearances, subject to acceptance by the company and a listed electrical inspection agency.

### **7.2.3.2 Indoor Service Disconnect**

The Customer's indoor service control units shall be of metalclad or metal enclosed switchgear construction. This equipment shall have drip proof indoor enclosures.

### **7.2.3.3 Outdoor Service Disconnect**

Service equipment installed outdoors may be of weatherproof metal clad or metal enclosed switchgear or of pole type construction. Typical equipment configurations applicable to single service installations are shown in Figs. 12.06 12.07, and may also be applied in required combinations for dual service installations if acceptable facilities are incorporated to ensure that the two services cannot be in parallel and that the fuses will be accessible only when they are completely isolated.

## **7.2.4 Overcurrent Protection**

PECO High-Voltage customers shall install, own, operate and maintain overcurrent protection systems meeting National Electrical Code requirements. The overcurrent protection system shall assure that the devices coordinate with PECO's distribution / transmission system protection, and meet PECO requirements for reliability and periodic testing.

### **7.2.4.1 Fuses**

Fuses selected as service overcurrent protection shall be of a manufacturer, type, and size compatible with the Company's distribution system protection. A list of acceptable fuses and recommended maximum connected transformer capacities is found in Tables 10.20C, 10.21C & 10.22C. The fuse selected shall be rated for the Company's operating voltage and able to interrupt the maximum fault current available from the Company's system. The Customer shall select a fuse type and size that will properly protect the system, and does not exceed the maximum fuse sizes listed by the Company. A set of spare fuses shall be provided and stored in or near each service control assembly.

### **7.2.4.2 Circuit Breakers and Circuit Interrupters**

Circuit breakers shall be installed as service disconnects where the load or connected transformer capacity exceeds the limit specified for switch and fuse application, or for other reasons where the requirements are unusual. Fixed circuit breakers shall have isolating switches to provide a lockable, visible break device for PECO or customer system maintenance and repair. Circuit interrupters may be installed for services rated 4,160 through 33,000 Volts if a visible break device is provided for isolation. Circuit breakers shall be installed as service disconnects and overcurrent devices for all installations above 33,000 Volts. Refer to Tables 10.20A, 10.21A, and 10.22A for acceptable circuit breakers.

#### **7.2.4.2.1 Overcurrent Relays**

PECO High-Voltage customers with circuit breaker or circuit interrupter service control, shall install, own, operate and maintain overcurrent relay systems that coordinate with PECO's distribution / transmission system protection and meet PECO requirements for reliability and periodic testing.

#### **7.2.4.2.2 Overcurrent Protection Scheme**

Each service shall have four-element protection that senses overcurrent in each phase and the neutral of the relay CT circuit. Relays shall be of draw-out construction with internal current shorting contacts or have separate test switches, permitting removal of one relay without affecting the operation of the remaining relay(s).

The protection scheme shall be designed such that failure of any one protective device, shall still sense overcurrent in three of the four elements being protected. This is to guarantee that any type of fault can be detected when one protective device has failed. The protective devices shall be connected to a test switch that provides access to each phase and neutral current, voltage (when applicable), control power, and completely isolate tripping contacts for testing. Meter Devices, Superior, and GECO PK test plugs manufacture acceptable test switches. Relays equipped with internal GECO test plugs or ABB flexi-test switches are exempt from the external test switch requirement (i.e., GECO IAC, IFC, DIAC, MDP; ABB CO; and Basler 50/51B).

Discrete, individual phase and ground overcurrent relays are acceptable, without need for back-up overcurrent protection.

Microprocessor based overcurrent relays shall provide the following features:

1. A self-diagnostic failure feature, which provides an alarm contact to be used by the customer to enunciate the condition.
2. A power source that is not dependent on the primary service voltage during the time the relay is sensing a fault.
3. Multi-Function, digital and microprocessor based relays with 3 phase and neutral overcurrent protection in one enclosure are considered one protective device. A redundant relay with the same overcurrent protective characteristics shall be installed to meet PECO reliability requirements. Service control devices protected by only one microprocessor relay shall be limited to applications where PECO can fuse the service connection according to its current service fusing standards.
4. Where the protective device provides additional functions beyond the overcurrent protection required by PECO, the customer shall be responsible to program and or set all useable and desired functions of the relay. A copy of the relay's electronic setting file shall be submitted to Customer Engineering for record purposes.

#### **7.2.4.2.3 Service Relay Settings**

The customer shall be responsible to determine the overcurrent protection settings of the relays used to protect the service entrance equipment. The customer's designer shall assure that the setting coordinates with PECO's distribution system protection. The setting shall meet requirements of the National Electric Code and any other standards concerning protection of the customer's service cable, switchgear, bus, or transformation. Typically, customer relay settings with 360 Amp primary pick-up with 15 cycles delay at 400% of pick-up will coordinate with PECO's distribution system protection. PECO Customer Engineering, will review the CT ratio, relay type, model number, and the proposed setting submitted, for acceptance, and proper coordination to PECO distribution system protection.

#### **7.2.4.2.4 PROTECTIVE RELAY CURRENT TRANSFORMERS (CTs)**

CT ratios shall be sized for the load not the substation capacity. Typical limit is 600/5, unless the facility's expected ½ hour electrical demand produces currents is above this rating. Service relay CTs may be used to supply current information to customer instrumentation that is permanently mounted on the service switchgear.

The service protection scheme submitted for approval shall include the following relay information:

1. AC schematic (3 line)
2. Control schematic
3. Single Line Diagram
4. CT ratio
5. Relay manufacturer
6. Relay model numbers
7. Type of curves available (Inverse, Very Inverse, Extremely Inverse, etc)
8. Time element tap range
9. Instantaneous element tap range

The relay setting information for 3 phase and neutral overcurrent protection shall include:

1. Type of curve selected (Inverse, Very Inverse, Extremely Inverse, etc)
2. Time delay primary pick up current in amperes, CT ratio and pick up tap value
3. Time delay expressed as cycles at 400% of the relay pick up current. or time dial equivalent
4. Instantaneous element primary pick up current in amperes, CT ratio and tap selected.

5. This information shall be submitted on the PECO Relay Setting Form, available through Customer Engineering.

**7.2.4.2.5 Relay System Commissioning** Upon PECO's acceptance of the proposed service relay settings, the customer shall retain a qualified testing agency to perform the following:

- Calibrate the relays with the approved settings
- Record pick up and tripping time for 100% and 400% secondary current values
- Verify the CT ratios by primary current injection
- Verify a single safety ground on the CT network
- Trip test the circuit breaker by injecting secondary current into the over current relays mounted in their cases
- Submit a certified test report to PECO.

**7.2.4.2.6 Relay System Maintenance** The customer shall be responsible to maintain the service overcurrent protection system, with testing periods recommended by the manufacturer. Protective relay systems should be tested every two years, including relay calibration, tripping power supply check, and a breaker trip test, per NFPA 70B - *Recommended Practice for Electrical Equipment Maintenance*, Section 11.12. Customers may perform their own service relay calibration checks and breaker trip tests, provided that qualified technicians are contracted and the testing company submits a certified test report to PECO for review. The customer may not change the service relay settings without review and acceptance by PECO.

PECO reserves the right to disconnect the service or to test customer service relays if the condition of the installation could jeopardize the reliability of PECO's transmission or distribution system.

## **7.2.5 Transformers**

All customers with services over 600 volts are responsible to install, own, and operate all transformers. The transformer nominal voltage rating and primary winding configuration should meet the recommendations of Table 7.01. Transformers with reduced BIL ratings should have additional surge protection coordinated to the BIL selected and service voltage characteristics. Customer owned transformers should have 2 – 2 ½ % primary no load taps above and below the nominal voltage rating. Transformers supplied by 4,160 or 13,200 Volt services may be specified with delta primary windings. Transformers supplied by 33 KV services, with a PECO system neutral, should be specified with grounded-wye primary and grounded-wye secondary windings, to minimize the risk of a ferro-resonant condition. Customer Engineering shall be consulted before specifying 33 KV transformers.

Transformers with grounded-wye primary and delta secondary windings are not recommended for connection to PECO distribution services. This transformer-winding configuration provides ground fault current to PECO's system and can

result in nuisance tripping of customer overcurrent protection or transformer failure. This configuration is recommended for customers planning to operate generators in parallel with PECO's system, and requires special overcurrent protection systems.

### **7.2.6 Grounding**

Grounding of all electric services shall be according to the requirements of the National Electrical Code and current IEEE substation grounding standards. For services of 33 KV or less, grounding resistance shall be 25 ohms or less.

## **7.3 SERVICE REQUIREMENTS, 13 AND 33 KV**

(For Services over 33 kV, consult Customer Engineering.)

### **7.3.1 Single Service**

The load controlled by all of the assemblies referred to below will be metered as a single load.

#### **7.3.1.1 13kV Service**

A maximum of one service control assembly consisting of a 3-phase gang operated switch and fuses, or a circuit breaker shall be permitted, per service. (See Tables 10.23P, 10.23S and 10.24).

**Exception** – Connections shall be permitted on the line side of the service disconnect to supply PECO accepted service assemblies for a fire pump supply. This fire pump connection shall meet the requirements of Section 7.4.

#### **7.3.1.2 33kV Service**

One main service control assembly consisting of a 3-phase gang operated switch and fuses is preferred. If the line exposure on the Customer's property is acceptable, the Company may permit the installation of not more than six individual switch / fuse feeders before requiring a main circuit breaker. A main service switch shall be required for three or more switch / fuse feeders, or where 33 KV primary metering is installed. (See Tables 10.29 A and 10.30\_).

**Exception** – Connections shall be permitted on the line side of the service disconnect to supply PECO accepted service assemblies for a fire pump supply. This fire pump connection shall meet the requirements\_of Section 7.4.

### **7.3.2 Dual Service**

Dual service consists of two circuits , each of which is connected to a separate bus with approximately one half total load normally supplied by each service. Each service shall have separate, acceptable service disconnect and overcurrent devices. Primary transfer facilities may be omitted if transformers and secondary transfer facilities are provided which can supply the entire load from either service. The maximum facility load supplied by either circuit depends upon the rating of the PECO circuits , and is typically 4 MVA per 13.2 kV circuit, and 11 MVA per 33 kV circuit . The transfer bus shall be on the *load side* of the service overcurrent devices. Only one service control assembly will be permitted for each 13.2 KV Service. (See Tables 10.25A, 10.25B, and 10.26).

**Exception** – Connections shall be permitted on the line side of each service disconnect to supply PECO accepted service assemblies for a fire pump supply. This fire pump connection shall meet the requirements of Section 7.4.

### **7.3.2.1 DUAL SERVICE AUTOMATIC TRANSFER REQUIREMENTS**

#### **7.3.2.1.1 Normal Operating Configuration**

Normal configuration of the service equipment requires each service breaker to be closed and the tie breaker to be open. Both lines carry a portion of the total facility load (split as close to 50 - 50% as possible). Regular / reserve operation (one service breaker and tie breaker closed) may be permitted with PECO's approval.

#### **7.3.2.1.2 Required Features For Dual Service Circuit Breaker Assemblies**

- a. The main and tie circuit breakers must be connected to a control power source that is available when all breakers are open, permitting operation of close coils, trip coils, and charging mechanisms. Acceptable systems include a station control battery or an AC source derived from either VTs or CVTs connected on the line side of the service breaker with a transfer switch (Dev 83) to select power from either source. Control Voltage Transformers (CVT) not exceeding 2 kVA are acceptable for use on the line side. Control Power Transformers (CPT) exceeding 2 kVA are not permitted to be connected on the line side of PECO's metering transformers.
- b. Service overcurrent relays shall operate a lockout device, which shall trip the associated service breaker, and lockout (prevents closing) both main breakers and the tie breaker.
- c. The tie breaker shall not be tripped from the line overcurrent relays or their associated lockout relays. If tripping the tie breaker is a desired feature, a covered test switch must be provided on the tie breaker compartment to block tripping from each service overcurrent or lockout device. This is necessary to allow testing of each services' overcurrent relays with the tie closed and carrying load.
- d. An AUTO / MANUAL (Dev 43) selector switch shall be available to enable and disable the automatic transfer scheme.
- e. In MANUAL position
  - Automatic transfer is blocked
  - Breakers may be tripped and closed at will from their control switches, including paralleling of the main - tie - main breakers and closing on a de-energized line.
  - The customer may elect to install a permissive switch (Dev 69) to prohibit manual paralleling and closing on a de-energized line. This switch must have two positions NORMAL / PARALLEL and must **NOT** be key operated.



- f. In AUTO position
- The transfer scheme will be operative
  - Paralleling of the mains and tie are prohibited. If the main-tie-main breakers are paralleled when Dev 43 is switched to the AUTO position, the tie breaker shall trip.
  - Main and tie breakers may be tripped from their control switch.
  - Tripping a main breaker from its control switch, with 43 in AUTO, will disable the auto transfer scheme. The breaker's associated lockout relay may be upset to accomplish this requirement.
  - Main and tie breakers may not be closed from their control switch
  - All loss of source transfers shall be OPEN transition (break before make).
  - Upon loss of voltage to either service, with a recommended 2 second time delay, the scheme shall:
    - Verify loss of voltage to the affected service
    - Verify acceptable voltage is available on the alternate service
    - Verify all lockout relays are reset
    - Trip the service breaker on the affected service and close the tie breaker
  - Upon return of acceptable voltage to the affected service, restoration to split load shall require a MANUAL operation.
  - Automatic "GOOD LINE SEEKING" is permitted after a transfer to one line (transferring the total load from one available line to another as needed to maintain service until normal operating configuration can be established). After a recommended 2-second time delay, the service breaker on the affected line shall trip and the service breaker of the available line shall close, provided all lockout relays are reset. The tie breaker may remain closed during good line seeking operations.
- g. A means shall be provided to test the automatic transfer scheme by simulating loss of voltage.
- h. Slip contacts (remain closed after trip or close) in the main and tie breaker control switches shall **NOT** be used in the breaker control scheme.

#### **7.3.2.1.3 Required Features For Dual Service**

##### **Motor Operated Switch / Fuse Assemblies**

- a. Switch assemblies for dual service shall include a manually operated main load break switch on the line side of the service fuse, and the motor operated switch on the load side of the fuse. The tie shall include a motor operated load break switch and a manually operated load break isolation switch for maintenance of primary devices.
- b. The motor operated switches shall be connected to a control power source that is available when all switches are open, permitting operation of close and open circuitry, and charging mechanisms. Acceptable systems include a

station control battery or an AC source derived from either VTs or CVTs connected on the line side of the service breaker with a transfer switch (Dev 83) to select power from either source . Control Voltage Transformers (CVT) not exceeding 2 kVA are acceptable for use on the line side. Control Power Transformers (CPT) exceeding 2 kVA are not permitted to be connected on the line side of PECO's metering transformers

- c. The motor operated switches shall be electrically and mechanically interlocked to prevent paralleling of the services
- d. An AUTO / MANUAL (Dev 43) selector switch shall be available to enable and disable the automatic transfer scheme.
  - In **MANUAL** position
    - Automatic transfer is blocked
    - Switches may be opened and closed at will from their control switches.
  - In **AUTO** position
    - The transfer scheme shall be operable
    - Motor operated service and tie switches may be tripped from their control switches.
    - Tripping a main switch from its control switch, with 43 in AUTO, shall disable the auto transfer scheme. A lockout relay may be upset to accomplish this requirement.
    - Motor operated main and tie switches shall not be able to be closed from their control switches
    - All transfers shall be OPEN transition (break before make).
    - Upon loss of voltage to either service, with a recommended 2 second time delay, the scheme shall:
      - Verify loss of voltage to the affected service
      - Verify acceptable voltage is available on the alternate service
      - Verify all lockout relays are reset
      - Open the service switch on the affected service and close the tie switch
    - Upon return of acceptable voltage to the affected service, restoration to split load shall require a MANUAL operation.
    - Automatic "GOOD LINE SEEKING" is permitted after a transfer to one line (transferring the total load from one available line to another as needed to maintain service until normal operating configuration can be established). After a recommended 2 second time delay, the motor operated service switch on the affected line shall open and the motor operated service switch of the available line shall close, provided all lockout relays are reset. The tie switches may remain closed during good line seeking operations.

- e. A means shall be provided to test the automatic transfer scheme by simulating loss of voltage for each service
- f. Slip contacts (remain closed after trip or close) in the motor operated main and tie switch control switches shall **NOT** be used in the control scheme.

**7.3.2.1.4 Required Features For Dual Service – Secondary Selective Transfer Schemes with Circuit Breakers.**

- a. Normal configuration of the service equipment requires each main breaker to be closed and the tie breaker to be open. Both lines carry a portion of the total facility load (split as close to 50 - 50% as possible). Regular / reserve operation (one service breaker and tie breaker closed) may be permitted with PECO's approval.
- b. The main and tie circuit breakers must be connected to a control power source that is available when all breakers are open, permitting operation of close coils, trip coils, and charging mechanisms. Acceptable systems include a station control battery or an AC source derived from the line VTs with a transfer switch (Dev 83) to select power from either line VT. Control Power Transformers (CPT) are not permitted to be connected on the line side of PECO's metering transformers.
- c. Main breaker trippings for overcurrent shall disable the automatic transfer scheme, preventing any further main or tie breaker automatic operations for loss of voltage.
- d. An AUTO / MANUAL (Dev 43) selector switch shall be available to enable and disable the automatic transfer scheme.
- e. In MANUAL position
  - Automatic transfer is blocked
  - Breakers may be tripped and closed at will from their control switches.
  - The main - tie - main breakers shall electrically interlocked to prevent paralleling the services.
- f. In AUTO position
  - The transfer scheme will be operative
  - Paralleling of the mains and tie are prohibited.
  - Main and tie breakers may be tripped from their control switch.
  - Tripping a main breaker from its control switch, with 43 in AUTO, will disable the auto transfer scheme.
  - Main and tie breakers may not be closed from their control switch
  - All loss of source transfers shall be OPEN transition (break before make).

- Upon loss of voltage to either service, with a recommended 2 second time delay, the scheme shall:
  - Verify loss of voltage to the affected service
  - Verify acceptable voltage is available on the alternate service
  - Verify that an overcurrent tripping has NOT occurred.
  - Trip the service breaker on the affected service and close the tie breaker
  - Upon return of acceptable voltage to the affected service, restoration to split load shall require a MANUAL operation.
  
- Automatic "GOOD LINE SEEKING" is permitted after a transfer to one line (automatically transferring the total load from one available line to another as needed to maintain service until normal operating configuration can be established). After a recommended 2-second time delay, the service breaker on the affected line shall trip and the service breaker of the available line shall close, provided a fault condition is not present. The tie breaker may remain closed during good line seeking operations.
  
- g. A means shall be provided to test the automatic transfer scheme by simulating loss of voltage
  
- h. Slip contacts (remain closed after trip or close) in the main and tie breaker control switches shall **NOT** be used in the breaker control scheme.

### **7.3.3 Regular-Reserve Service**

Regular-Reserve service consists of two PECO circuits connected directly to a common bus. Each circuit shall have separate, acceptable service disconnect and overcurrent devices. The bus will be supplied normally from only one circuit. The other circuit will be used as a reserve in the event the normal circuit is interrupted or disconnected. The "NORMAL" line shall be designated by PECO, and may change with notice to the customer. The maximum facility load for a regular/reserve service shall not exceed 4 MVA at 13.2 kV, and 11 MVA at 33 kV. The transfer bus shall be on the load side of the service overcurrent devices. (See Tables 10.27 and 10.28).

Only one service control assembly shall be permitted for each service.

**Exception** – Connections shall be permitted on the line side of each service disconnect to supply PECO accepted service assemblies for a fire pump supply. This fire pump connection shall meet the requirements of Section 7.4.

#### **7.3.3.1.1 Required Features For Regular/Reserve Circuit Breaker Assemblies**

- a. The main breakers must be connected to a control power source that is available when all breakers are open, permitting operation of close coils, trip coils, and charging mechanisms. Acceptable systems include a station control battery or an AC source derived from either VTs or CVTs connected

on the line side of the service breaker with a transfer switch (Dev 83) to select power from either source . Control Voltage Transformers (CVT) not exceeding 2 kVA are acceptable for use on the line side. Control Power Transformers (CPT) exceeding 2 kVA are not permitted to be connected on the line side of PECO's metering transformers.

- b. Service overcurrent relays shall operate a LOCKOUT (Dev 86) relay for the associated service. This device shall trip the associated service breaker and lockout (prevent closing) both service breakers.
- c. An AUTO / MANUAL (Dev 43) selector switch shall be available to enable and disable an automatic transfer scheme.
  - In **MANUAL** position
    - Automatic transfer shall be disabled.
    - Breakers shall be permitted to be tripped and closed at will, including paralleling of the main breakers and closing on a de-energized line.
    - The customer may elect to prohibit manually paralleling and closing on a de-energized line, however this feature must be defeatable through a permissive switch (Dev 69). This switch must have two positions NORMAL / PARALLEL and must NOT be key operated.
  - In **AUTO** position
    - The transfer scheme shall be operable
    - Service breakers may not be closed from their control switches
    - Paralleling of the mains is prohibited. If the main breakers are paralleled when Dev 43 is switched to the auto position, one of the service breakers shall trip.
    - Main breakers may be tripped from their control switch, which must also disable the auto transfer scheme. The breaker's associated lockout relay may be upset to accomplish this requirement. Slip contacts in the control switch may not be used to disable the auto scheme.
    - The control scheme shall NOT determine which service is to be considered the normal supply.
    - Upon loss of voltage to the connected service, and voltage is available on the alternate source, the associated breaker shall trip, after a pre-set time delay (2 seconds recommended). The alternate breaker shall close after verifying that the service voltage on the connected line has been lost, the connected service breaker has opened, and voltage on the alternate line is available.
    - Upon restoration of voltage to the previously connected service, no further breaker operations shall occur.
    - Reconnecting to the previously connected service shall be a manual operation.
    - The scheme shall automatically "seek a good line", as needed, to maintain service to the facility.

- d. Slip contacts (remain closed after trip or close) in the main breaker control switches shall **NOT** be used in the breaker control scheme.
- e. A means shall be provided to test the automatic transfer scheme by simulating loss of voltage for each service

#### **7.3.3.1.2 Required Features For Regular/Reserve Motor Operated Switch / Fuse Assemblies**

- a. Switch assemblies for Regular/Reserve service shall include a manually operated main load break switch on the line side of the service fuse, and the motor operated switch on the load side of the fuse.
- b. The motor operated switches shall be connected to a control power source that is available when all switches are open, permitting operation of close and open circuitry, and charging mechanisms. Acceptable systems include a station control battery or an AC source derived from either VTs or CVTs connected on the line side of the service breaker with a transfer switch (Dev 83) to select power from either source . Control Voltage Transformers (CVT) not exceeding 2 kVA are acceptable for use on the line side. Control Power Transformers (CPT) exceeding 2 kVA are not permitted to be connected on the line side of PECO's metering transformers
- c. The motor operated switches shall be electrically and mechanically interlocked to prevent paralleling of the services
- d. An AUTO / MANUAL (Dev 43) selector switch shall be available to enable and disable an automatic transfer scheme.
  - In **MANUAL** position
    - Automatic transfer is blocked
    - Switches may be opened and closed at will from their control switches.
  - In **AUTO** position
    - The transfer scheme shall be operable
    - Motor operated service switches may be tripped from their control switches.
    - Tripping a main switch from its control switch, with 43 in AUTO, shall disable the auto transfer scheme. A lockout relay may be upset to accomplish this requirement.
    - Motor operated switches shall not be able to be closed from their control switches
    - All transfers shall be OPEN transition (break before make).
    - The control scheme shall not determine which service is to be considered the normal supply.

- Upon loss of voltage to the connected service, and voltage is available on the alternate source, the associated service motor operated switch shall open, after a pre-set time delay (2 seconds recommended). The alternate service motor operated switch shall close after verifying that the service voltage on the connected line has been lost, the connected service switch has opened, and voltage on the alternate line is available.
  - Upon restoration of voltage to the previously connected service, no further switch operations shall occur.
  - Reconnecting to the previously connected service shall be a manual operation.
  - The scheme shall automatically "seek a good line", as needed, to maintain service to the facility.
- e. Slip contacts (remain closed after trip or close) in the main breaker control switches shall **NOT** be used in the breaker control scheme.
- f. A means shall be provided to test the automatic transfer scheme by simulating loss of voltage

#### **7.3.4 Parallel Operation of Services**

Paralleling of services is not permitted except as listed in 7.3.4.1, 7.3.4.2, and 7.3.4.3 All fused services, 13 kV and higher, shall have interlock facilities that prevent paralleling All circuit breaker services 13 kV and above shall not have interlocks that prevent paralleling in the MANUAL operating mode.

**7.3.4.1 Momentary Paralleling** Momentary paralleling of primary services with circuit breakers rated 13 kV and above is permitted only upon notification to the Company and if transfer facilities accepted for the purpose have been provided by the Customer.

#### **7.3.4.2 Automatic Closed Transition Transfers for Dual and Regular/Reserve Services**

Customers with circuit breaker primary service control assemblies may specify incorporation of automatic closed transition, (make before break) transfers for scheduled switching, to restore to normal configuration or to transfer load from one line to another as needed for PECO or customer equipment maintenance. These schemes must have the following features:

- Device 43 must be in the MANUAL position
- Must include a permissive device (69) which has an OFF position, and positions to pre-select which breaker shall trip when the parallel is completed
- Verify normal 3-phase voltage is available on both services.
- Verify all service lockout Relays are reset

- Notify PECO Operation Control Center prior to initiation
- Must be manually initiated and fully automated to completion.
- Initiation shall be either by closing the open breaker by its control switch, or through a spring return or push button switch that initiates the sequence, and seals in until complete.

#### **7.3.4.3 Continuous Paralleling**

Continuous paralleling of services, 13 kV and above, with circuit breakers, may be accepted in rare cases, where the customer's operating requirements are unusual, and with special permission by the Company. The Company's distribution infrastructure and the customer's service facilities shall be designed for continuous parallel operation, including installation of circuit breakers and relays, designed for continuous parallel operation. Note: The restriction on paralleling also applies at utilization voltage levels derived from high voltage services unless special permission is granted by the Company.



## **Fire Pump Connections**

### **7.4.1 2,400 2 Phase, 4,160, 13,200 and 33,000 Volt 3 Phase Single Services**

PECO shall permit fire pumps to be connected to services over 600 Volts on the line side of the service disconnects, in compliance with National Fire Protection Association life safety and National Electrical Code requirements. The installation shall also meet local building and fire code requirements. The fire pump connection shall have its own acceptable service assembly and transformer meeting the service ratings in table 7.01. The service cable may terminate in the fire pump service assembly, and be extended to the main service assembly or tapped in an acceptable splice box. Accepted modular "T" splices may be used to make the service tap.

### **7.4.2 2,400 2 Phase, 4,160, 13,200 and 33,000 Volt 3 Phase Dual and Regular/Reserve Services**

Fire pumps supplied by dual or regular reserve services shall have the capabilities of transferring to either circuit, or have a back-up supply acceptable to the NEC Authority Having Jurisdiction. PECO may interrupt either service for extended periods to repair, maintain, or connect other customers to its distribution system. Switch and fuse fire pump service assemblies shall assure isolation of either supply for maintenance of PECO's supplies and or the customer's service fuses.

### **7.4.3 Fire Pump Metering Requirements**

All fire pumps and their associated equipment loads shall be metered. Primary or compensated secondary metering shall be permitted. PECO shall provide the necessary metering voltage and current transformers for the customer to install in an acceptable enclosure. The customer shall make all primary connections and provide secondary conduit per Section 8 in this manual, between the meter transformer enclosure and the meter instrument panel. PECO shall make the secondary connections and install the meter on the mounting equipment installed by the customer.

## **7.5 Customer Substation Maintenance, and Operating Responsibilities**

Customers with services over 600 Volts shall maintain their service equipment and substations to assure safe and reliable operation. The customer shall provide trained operating personnel to operate service equipment as requested by PECO system operators. Substations shall be secured to prevent unqualified personnel from entry into energized compartments, and maintained to assure safe egress of personnel for inspection and operation. Services may be terminated if customer substations jeopardize PECO system reliability or present a safety hazard to operators or the general public.

## **7.6 Customer Substation Access**

In the event of an emergency or for normal access a 24 hour-7 day a week contact phone number and the name of the responsible person shall be provided to PECO. If in an emergency contact cannot be made with the responsible person of record at the designated contact phone number, PECO reserves the right to break and enter the property to gain access to the high voltage equipment in order to secure the emergency and facilitate repairs. PECO will

secure the property and have local law enforcement agency on site during the break and entry process. PECO will make every attempt to notify the customer after a break entry has occurred.