



**Pad-Mounted and  
Submersible Transformers  
Customer Reference Specification  
6-17-122**

0000-000-ST-6017  
Custom ID: DCS 6-17  
Revision: 03  
Effective Date: 3/27/2017  
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**6-17-122 – Customer Reference Specification**

**Customer Installed  
Three-Phase Pad-mounted  
Precast Transformer Foundation**

THIS CUSTOMER REFERENCE SPECIFICATION (CRS) IS PART OF THE  
RULES FOR ELECTRIC METER AND SERVICE INSTALLATION (REMSI) WEBSITE.



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This specification defines the customer's responsibilities and PPL EU's requirements for underground service from a three-phase pad-mounted distribution transformer as defined in Rule 9 and Sketch #40 of the REMSI website.

All details of this specification and those listed below must be strictly followed. Any deviation must be approved by the PPL EU engineer. Unapproved deviations are usually costly for the customer to correct and can result in delays or possible refusal to connect service.

**Other Associated Specifications**

- CRS 6-14-125 ----- Customer Installed Screening of Pad-mounted Devices
- CRS 6-15-160 ----- Customer Installed Pre-Cast Manhole
- CRS 6-15-180 ----- Customer Installed Duct Systems
- CRS 6-18-115 ----- Installation Instructions for Customer Installed Conduit Systems on PPL EU Terminal Poles
- CRS 6-19-100 ----- Customer Low-Voltage Switchboards, Arrangements, and Clearances

**General Instructions for Typical Installation:**

**1. Plot Plan**

The customer must provide PPL EU with a detailed plot plan showing location of building and property lines, switchgear, metering, and service entrance.

**2. Construction Plan**

A PPL EU engineer will provide the customer with a construction plan showing the proposed location of overhead and/or underground electrical facilities including cable and conduit routes, precast transformer foundation and service conduit locations. The transformer must always be located in an area where there is free access for PPL EU mobile crane and maintenance vehicles.

**3. Right-of-Way**

When the customer and PPL EU reach final agreement on location of electric facilities and capacity of service, the customer signs associated agreements and grants the necessary right-of-way. Construction by PPL EU will not proceed until these documents are authorized by the customer or his representative.



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**Notes:** (cont'd.)

**4. Precast Transformer Foundation (PTF)**

The customer's contractor is responsible for purchasing the precast transformer foundation. A list of PPL EU approved suppliers is contained at the end of 6-17-122. The customer's contractor must coordinate site preparations with the desired delivery date. If site preparations are complete, the supplier will set foundation in final position. The customer's contractor must provide a clear and firm approach to the point of service.

**5. Excavation for Transformer Foundation**

The customer's contractor is responsible for the excavation to install transformer foundation and for backfill afterwards. The excavation should be at least 9 ft. by 9 ft. by 5 ft. deep.

**Note:** Actual excavation depth may vary from site to site depending upon difference between existing and finished grade at time of delivery.

Spread a six-inch layer of #2B crushed stone to level the bottom of the excavation and to act as a French drain. The bottom must be well tamped and level or transformer will lean and failure may occur.

**6. Finished Grade**

Finished grade around the transformer must be approximately 3 to 6 inches below top surface of the foundation. Never grade the area surrounding foundation in such a way that it forms a swale where ground water will collect.

**7. Ground Ring**

The customer's contractor digs a trench around the foundation (4 ft. off sides and 2 ft. deep) for installation of a ground rod and ground ring by PPL EU. The customer's contractor notifies PPL EU when the trench is open. After PPL EU installs the grounding, the customer's contractor backfills the trench.

**8. Conduit Systems**

The customer's contractor installs primary and service conduit systems in accordance with PPL EU's construction plan. All conduits must enter transformer foundation through knockout areas in sides. Never penetrate the floor or corners. A PPL EU engineer will specify the minimum number of conduits required. The quantity specified may be more than the minimum shown on Figure 4 due to the nature of the building load.

**Notes:** (cont'd.)

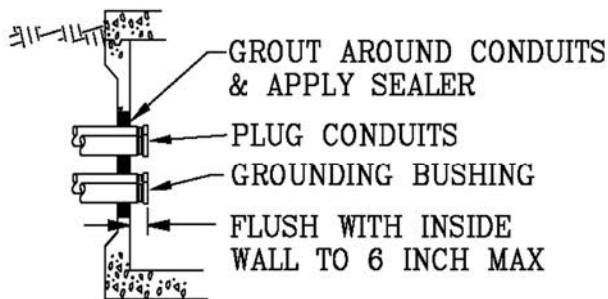
The customer's contractor must install conduits by one of these methods:

- A. Use 4-inch, hot-dipped, galvanized steel conduit (rigid or intermediate grade) directly buried in earth. All threaded couplings must be tightly joined using plumbers Teflon tape or similar joint compound designed to stop water leaks. All sweeps must be at least 36-inch radius. All steel conduits must have grounding bushings at the switchgear and transformer foundations.
- B. Use 4-inch type EB or DB PVC conduit encased in a concrete envelope as specified in CRS 6-15-180. All joints must be tightly sealed using the appropriate contact cement or joint compound. All 90° sweeps must be 4-inch, hot-dipped galvanized steel (rigid or intermediate grade) with at least a 36-inch radius. Concrete must also encase steel sweeps to prevent breakage at steel to plastic adaptors resulting from cable pulling tensions. All PVC conduit must have bell ends at the transformer foundation.

After installation, the customer's contractor must clean debris from the ducts by pulling a stiff bristled brush and some clean rags through each conduit. A pulling line must be provided in each conduit; the only approved pulling line is a flat polyester, woven, pre-lubed tape, ½ inch width, with a minimum breaking strength of 1200 pounds.

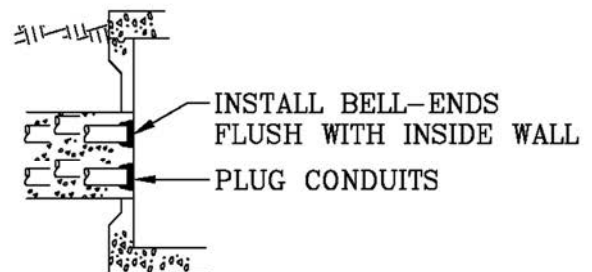
When installing the pulling line in the PVC conduit, be sure the conduit adhesive is dry before installing the pulling line to avoid gluing the pulling line to the joints. If joining two pulling lines, review the knot in CRS 6-19-133 or CRS 6-19-134. All conduit ends must be temporarily plugged to keep them clean and dry.

Regardless of which conduit installation method is used, the customer's contractor must seal and waterproof the knock-out area around the conduit penetration.



6-17-122-A

**Steel Conduits**



6-17-122-B

**PVC Encased**

**Figure 1**



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**9. Switchgear**

The customer's switchgear and metering cabinet design must be approved by the PPL EU engineer before units are built. The customer must provide minimum working clearances as shown in CRS 6-19-100.

**10. Service Connectors**

The customer's contractor must provide connectors at the customer's switchgear for the size and number of aluminum cables. (See CRS 6-19-100).

**11. Cable Limiters**

PPL EU will provide and install cable limiters (a type of current-limiting device) on certain WYE 277/480V services. The need for these cable limiters will be determined by a PPL EU engineer.

**12. Notification to PPL EU of Delivery Time**

It is the customer's responsibility to ensure that the PTF precaster notifies PPL EU 24 hours prior to delivery to job site. At PPL EU discretion, a PPL EU representative may be at job site during precaster's permanent placement of the PTF. All approved precasters have names and phone numbers of appropriate PPL EU personnel to be notified of PTF delivery date and time.

**13. Protective Barriers**

It is the customer's responsibility to install protective barriers. They are required when the transformer is located in an area exposed to vehicular traffic – for example, parking lots, loading docks, and driveways. Barriers must be located and installed in accordance with this specification (see Fig. 6-17-122-F), or as shown on the PPL EU construction plan. All protective barriers must be removable bollards (constructed as or equivalent to 6-17-122-G).

**CAUTION!** If barrier locations shown in this specification or on the PPL EU construction plan are directly over primary conduits, service conduits, or the ground ring, adjust the barrier locations as required. Barriers must be installed before service can be energized.



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**14. Regulations and Clearances**

The minimum clearances shown in this specification were set by PPL EU for maintenance and operating purposes. It is the customer's responsibility to comply with the National Electrical Code (NEC) and local municipal or fire insurance regulations regarding the location of an oil-filled transformer. Some fire codes may require transformer to be located 25 feet away from any building openings. Whenever fire resistant barriers, enclosures, or other safeguards are required by any authority, they are installed and maintained by customer.

**15. Cover and Concealment**

The customer must keep the area above the transformer clear of obstructions. This includes overhanging tree limbs which may block crane access to transformer.

All construction and maintenance work must be performed by the customer. Walls or fences which totally surround transformer must have access gates in front of transformer. Refer to CRS 6-14-125 for more details.

Minimum clearances to transformer are shown in Figure 3 (Fig. 6-17-122-D) and Figure 4 (Fig. 6-17-122-E). The customer must secure PPL EU approval before installing any of the above-mentioned concealments.

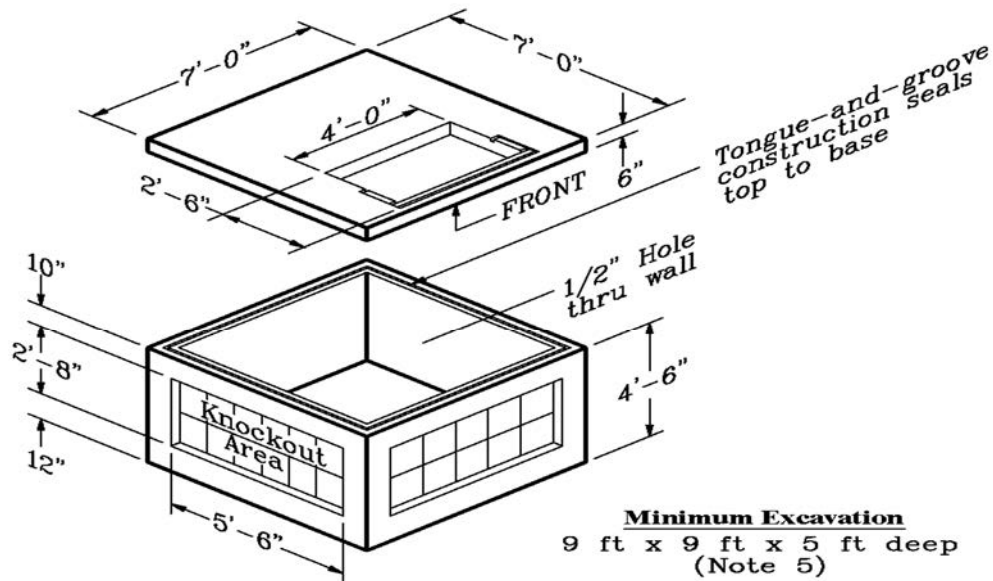
**16. Sump Knockout**

**DO NOT** open the sump knockout. Most installations do not use a sump hde and pump. An oil sensor device must be installed on any equipment that automatically pumps water from the unattended vault. Transformer oil shall **not** be drained or pumped into surrounding ground (earth).

**17. Applicable Industry Standards**

The customer shall comply with all applicable industry standards. PPL EU does not assume responsibility for customer's equipment and/or facilities, nor does PPL EU's installation of its equipment infer that customer's equipment and/or facilities comply with applicable industry standards.

**Figure 2  
Customer Installed Precast Transformer Foundation**



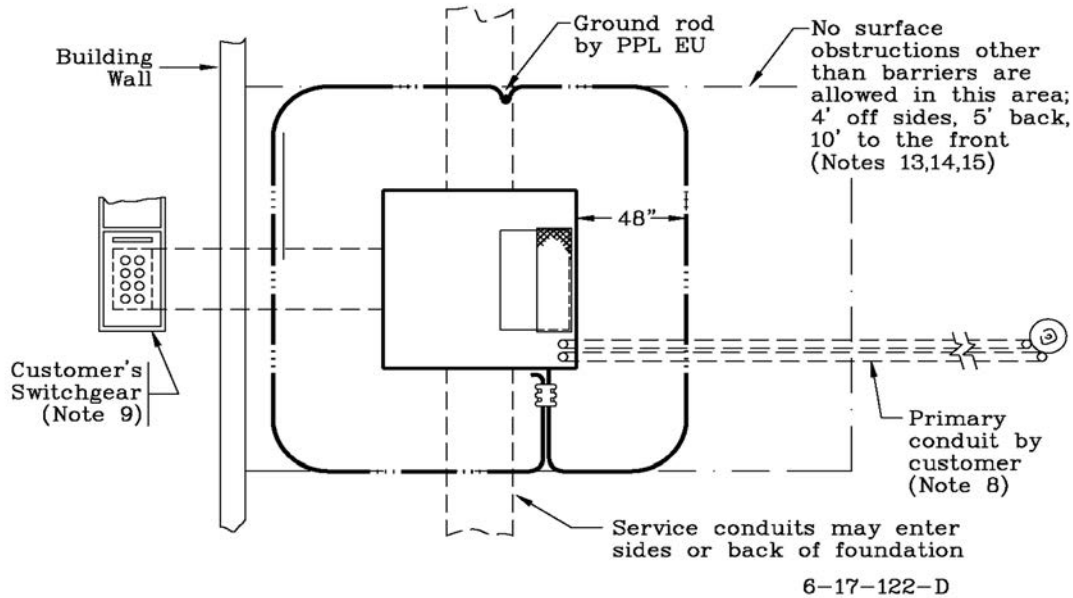
6-17-122-C

Order from these suppliers **only**:

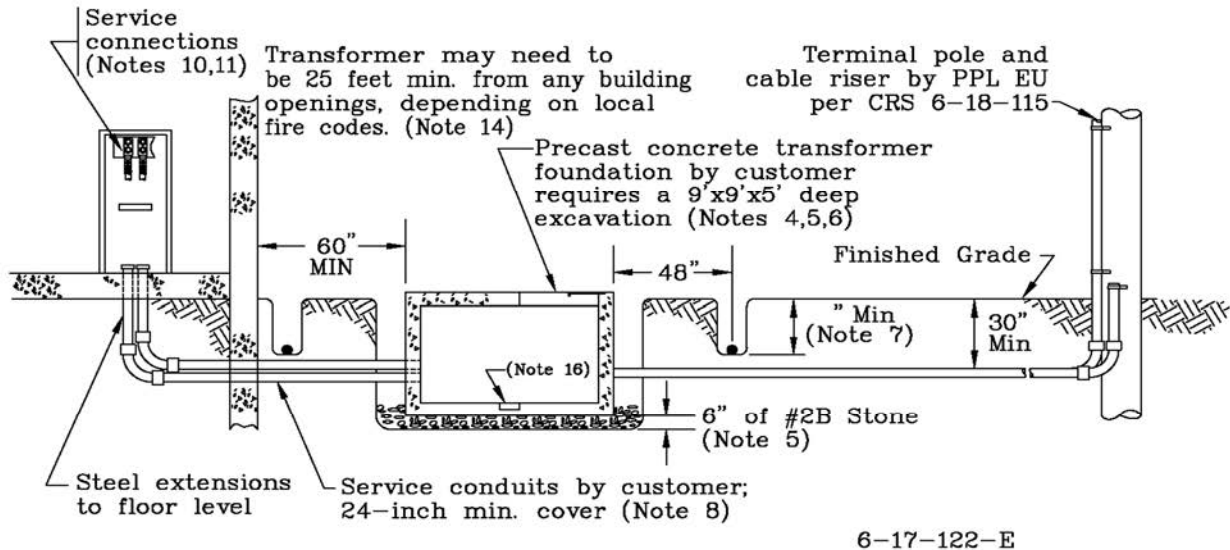
**Approved Suppliers:** Please allow approximately 3 days to coordinate delivery.

- |  |  |  |
|--|--|--|
| 1. Oldcastle Precast<br>200 Keystone Drive<br>Telford, PA 18969<br>(215) 257-8081                                      | 5. Binghamton Precast & Supply<br>18 Phelps Street<br>Binghamton, NY 13901<br>(607) 722-0334                             |  |
| 2. A.C. Miller Concrete Products, Inc.<br>31 E. Bridge Street<br>Spring City, PA 19475<br>(610) 948-4600, 800-229-2922 | 6. By-Crete<br>517 King Street<br>Lebanon, PA 17042<br>(717) 866-7690  |  |
| 3. Monarch Products Co., Inc.<br>385 Snipe Road<br>York Haven, PA 17370-9705<br>(717) 938-8303                         | 7. Modern Precast Concrete Products<br>& Construction Supplies<br>3900 Glover Road<br>Easton, PA 18040<br>(610) 997-3119 |  |
| 4. Monarch Precast Concrete Corp<br>425 North Dauphin Street<br>Allentown, PA 18109-2199<br>(610) 435-6746             | 8. Scranton Craftsmen, Inc.<br>930 Dunmore Street<br>Throop, PA 18512<br>(800) 775-1479                                  | <u>Mailing Address</u><br>P.O. Box 97<br>Dunmore, PA 18512 |

**Figure 3  
Typical Installation: Plan View**



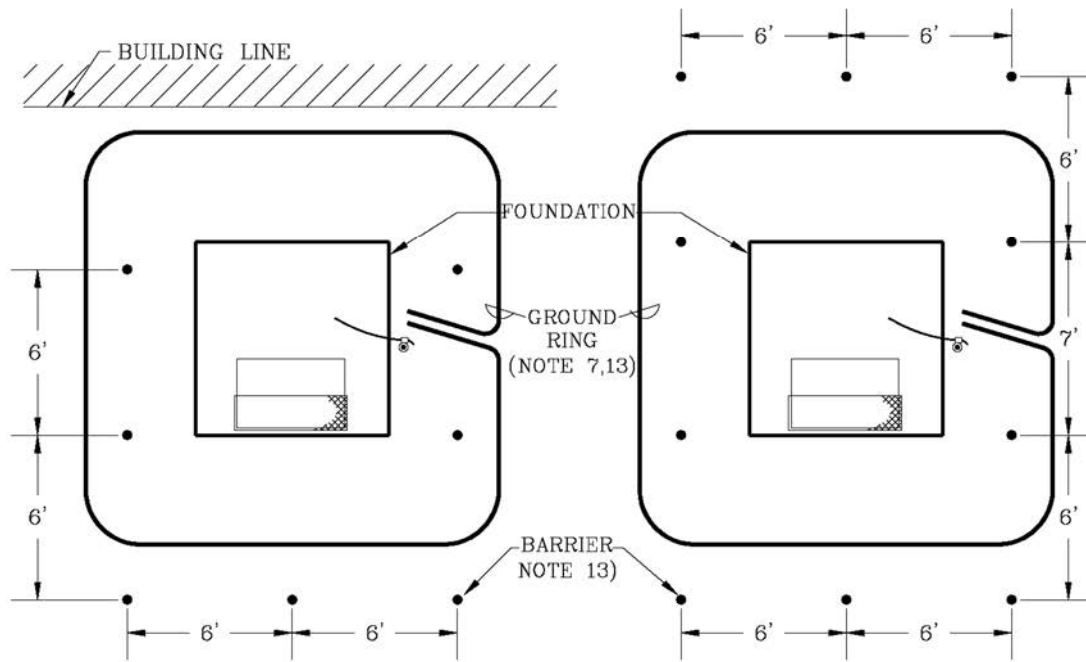
**Figure 4  
Typical Installation: Elevation View**



KVA	75	150	300	500	750	1000	1500	2000	2500
WYE 120/208	2	2	4	8	10	12	--	--	--
WYE 277/480	--	2	2	3	4	8	10	12	14



**Figure 5**  
**Customer Installed Protective Barriers**  
Barriers are required when a transformer is located in an area exposed to traffic.

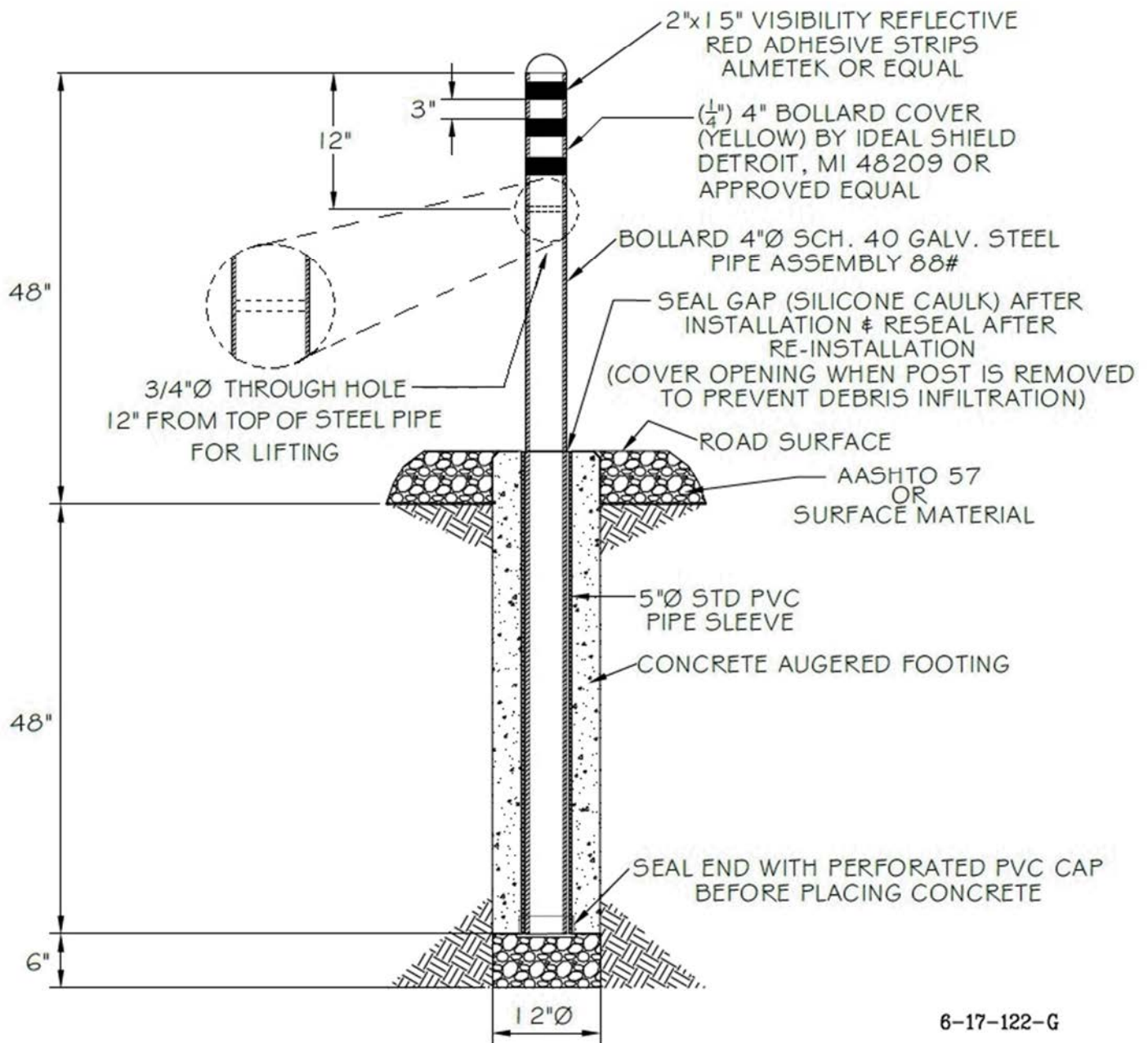


6-17-122-F

**Example A**  
**Transformer located in parking  
lot adjacent to building**

**Example B**  
**Transformer located in open  
area of parking lot**

## REMOVABLE BOLLARD



6-17-122-G

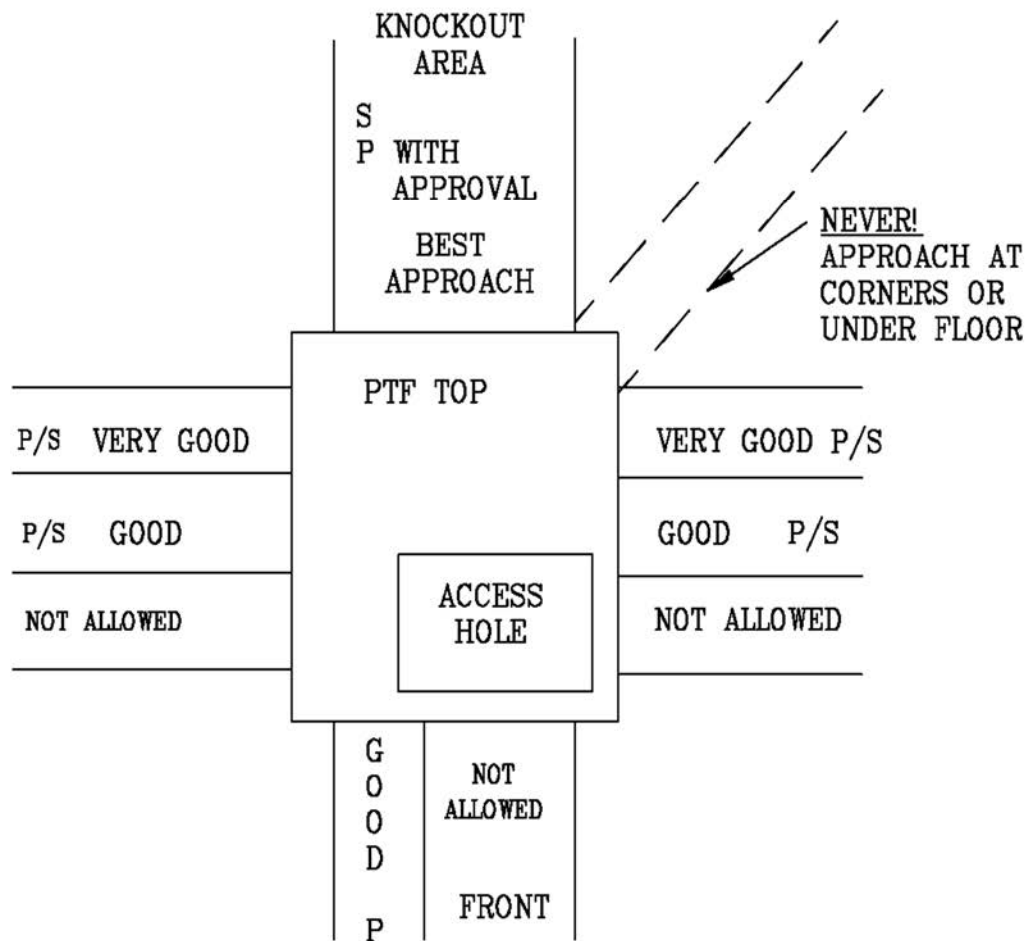


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Not To Scale

Conduits Entering PTF – It is very important to consider the transformer orientation (with respect to front) when designing the conduit system. Always face front of transformer so that conduit entrances will not obstruct the access hole.



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**6-17-163 – Customer Reference Specification**

**Customer Installed Transformer Vault;  
Vault Arrangement and Grounding Details  
30 KVA to 2500 KVA Capacity**

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This specification defines the customer’s responsibilities and PPL’s requirements for underground service from a transformer vault located within the customer’s building or a walk-in enclosure as described in Rule 9 and Sheet 38 of the “Rules For Electric Meter and Service Installations” book.

All details of this specification and those listed below shall be strictly followed. **Any** deviations **must** be approved by a PPL engineer. Unapproved deviations are usually costly for the customer to correct and can result in delays or possible refusal to connect service.

This specification was prepared for new construction only. Based on operating, maintenance, and safety criteria, a PPL engineer will make the determination to accept or reject an existing installation that does not conform to this specification.

The customer shall comply with all applicable industry standards. By installing its equipment, PPL does not assume responsibility for customer’s equipment and/or facilities, nor does PPL’s installation of its equipment infer that customer’s equipment and/or facilities comply with applicable industry standards.

**Other Associated Specifications:**

A-168735 .....Customer-Installed Duct Systems

6-18-115 .....Installation Instructions for Customer-Installed Conduit Systems on PPL Terminal Poles

A-190556 .....Customer Low-Voltage Switchboards, Arrangements, and Clearances

**Introduction**

PPL expects the customer to construct its vault in accordance with “National Electrical Code” requirements enacted by the authority having jurisdiction. The customer must have the vault inspected by an electrical inspection agency, whose cut-in cards are accepted by PPL before PPL will connect the electric service. PPL does not “approve” the vault construction, but will accept or reject the completed vault based on the electrical inspection agency report and the customer’s compliance with the applicable PPL specifications.



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**General Instructions:**

**1. Location Plan**

Prior to the start of vault construction, the customer must provide PPL with a detailed floor plan or plot plan showing the location of the proposed vault or walk-in enclosure, switchgear room, metering location, and conduit entrance location. The vault entrance must be located where it is readily accessible for inspection and maintenance by PPL without involving a second party.

**2. Door Opening**

The door must lead directly to an outside area and be large enough to remove or replace the largest transformer installed. The vault door must be equipped with a hasp suitable for a PPL padlock with 3/8 inch shackle and a panic release arranged so that the door can be readily and quickly opened from the inside. The customer must place safety signs on the outside of the door in a conspicuous location warning unqualified persons not to enter:

For example:

“DANGER”  
HAZARDOUS VOLTAGE INSIDE  
QUALIFIED PERSONNEL ONLY  
FOR YOUR SAFETY  
-----KEEP OUT-----  
CALL PPL UTILITIES IF DOOR NOT LOCKED

These safety signs must be chosen and located in accordance with ANSI Z535.

**3. Vault Lighting**

The customer is responsible for all lighting equipment in the vault. A minimum of two light fixtures are required; normally ceiling mounted above the transformers. Locate the light switch adjacent to the entrance door.

**4. Ventilation**

The vault ventilation system must be adequate to dispose of the transformer full load heat losses without creating a temperature rise which is in excess of the transformer rating. A vault ventilated by natural circulation of air must have roughly half the total required vent area located in the wall near to the floor and the remaining half located near the roof—or all the required vent area can be located in or near the roof.

The clear vent area must be at least 3 square inches net per kVA transformer capacity. Net clear area is defined as space not occupied by screens, grating bars, louvers, etc.

For example: Up to 750 kVA requires 15.6 sq. ft.<sup>2</sup>

Up to 1000 kVA requires 31.3 sq. ft.

Up to 2500 kVA requires 52.1 sq. ft.

<sup>2</sup>Value is based on name plate rating only; overloaded transformers will require additional ventilation.



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Ventilation openings must be designed or located such that sticks, wires, rods, etc., cannot be inserted and come in contact with live parts. Provisions for additional ventilation should be made if transformer capacity will be increased at a future time.

#### **5. Door Sill**

To conform with the “National Electrical Code”, the customer must install a door sill or curb of sufficient height to confine within the vault, the oil from the largest transformer. The sill or curb must be at least 4 inches high.

#### **6. Drainage**

The customer is responsible to provide drainage if the vault is located in an outside area or where water seepage is a potential problem. An oil sensor device must be installed on any equipment that automatically pumps water from the unattended vault.

#### **7. Vault Size**

The vault must be sufficiently large to provide safe access and working space for operating and maintaining all electrical equipment. The vault should be sized to provide for possible load growth.

- A. 9 ft x 15 ft x 10 ft high for up to 750 kVA
- B. 14 ft x 19 ft x 10 ft high for up to 1500 kVA
- C. 20 ft x 30 ft x 11 ft high for up to 2500 kVA

#### **8. Safety Barrier**

The customer is required to provide a removable safety barrier to alert qualified personnel before they enter within reaching distance of live parts.

#### **9. Grounding**

The customer must provide and install the following grounding devices and connections:

- A. One 8-foot ground rod located in the vault floor (see sketch),
- B. #2 copper connection to the outside case of the service bus duct or cable tray.
- C. #4/0 copper connection from the ground rod to the ground and neutral bus (see sketch).

#### **10. Service Bus**

The customer must install the service bus duct and provide the proper type and number of connectors as shown in Table 1. The height and spacing of the bus bars must be approved by a PPL engineer.

If a cable tray is used, the customer’s cables must be terminated on copper bus bars suspended from the ceiling above the transformers. The customer must provide connectors per Table 1.

If an increase in load is anticipated, additional bus connectors or larger connectors may be required.



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**Table 1 Required Quantity and Size Secondary Connectors**

Transformer Size Total kVA Of Three Units	240/120 Volt 4W Delta Service		480 Volt 3W Delta Service		208/120 Volt 4W Wye Service		480/277 Volt 4W Wye Service	
	Phase	Neutral	Phase	Neutral	Phase	Neutral	Phase	Neutral
30	6-1/0	1-1/0	--	--	3-1/0	3-1/0	--	--
45	6-1/0	1-1/0	--	--	3-1/0	3-1/0	--	--
75	6-1/0	1-1/0	6-1/0	--	3-4/0	3-4/0	--	--
150	6-4/0	1-4/0	6-1/0	--	3-350	3-350	3-4/0	3-4/0
300	6-500	1-350	6-4/0	--	6-500	6-500	3-350	3-350
500	12-350	1-350	6-350	--	9-500	9-500	3-750	3-750
750	12-750	1-750	6-750	--	12-750	12-750	6-500	6-500
1000	18-500	2-350	12-350	--	15-750	15-750	6-750	6-750
1500	24-750	2-750	12-750	--	15-1000 Copper	15-1000 Copper	9-750	9-750
2500	--	--	18-750	--	--	--	--	--

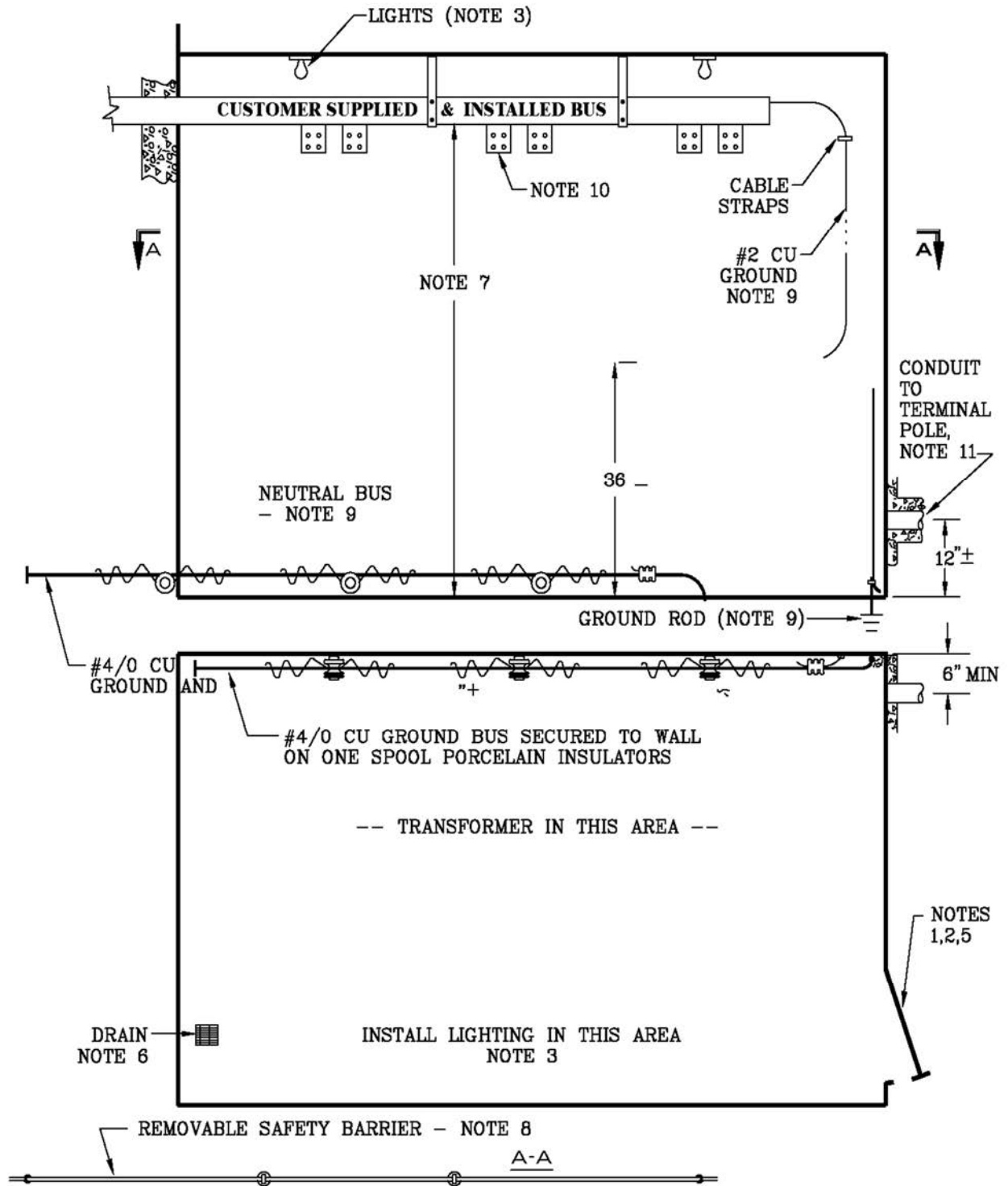
**11. Conduit**

The customer furnished and installs the primary cable entrance conduit (or conduits if a spare is desired) in accordance with PPL specifications A-168735 and 6-18-115. If steel conduit is used, grounding bushings are required. All PVC conduits must have bell-ends installed where the conduit enters the vault or manhole.

**12. Fire Protection System**

To conform with the “National Electrical Code”, the vault must be constructed of materials which have a minimum fire resistance of 3 hours—typically 6-inch thick reinforced concrete. Fire protection systems utilizing automatic sprinklers, water spray, carbon dioxide, or halon are **NOT** permitted.





6-17-163-A