

## 11 Commercial, Industrial, and Large Residential Services, 801 Amps or Higher

This section provides the PGE requirements for commercial, industrial, and large residential services higher than 800 amps and lower than 600 volts. Consult PGE Meter Services for requirements and equipment for services higher than 600 volts.

### 11.1 Basic Requirements

All commercial, industrial, and large residential Customers must coordinate their service requirements with PGE before purchase and installation of equipment.

Large residential services are single-residential services over 320 amp continuous and all three-phase residential services. Residential meters must meet the meter clearances and location criteria covered in Section 5.2, *Meter Clearances and Location Criteria*.

### 11.2 Switchgear Metering

An Electric Utility Service Equipment Requirement Committee (EUSERC)-approved switchgear metering section is required when the service entrance rating is greater than 800 amperes. The switchgear metering section may be used for three-phase services over 200 amperes and single-phase service over 320 amperes.

The metering current transformer will be located in the current transformer (CT) compartment. The meter and test switch may be mounted on the cover of the hinged compartment or located remotely. The area below the barrier in this compartment may be used as a main switch (or breaker) compartment, a load distribution compartment, or a bottom-fed terminating pull section. The metering compartment shall be on the supply side of the main switch.

The mounting pad for all switchgear metering enclosures will be a concrete pad that is at least 4 inches thick for the width of the switchgear.

Follow these requirements when installing indoor or outdoor switchgear metering.

- Meter panels must not be hinged to a filler panel.
- The neutral terminal must be permanently identified in clearly visible block lettering with *neutral* or *N*.
- For 240/120 volt, three-phase, four-wire services, the high-leg (wild) terminal must be located on the right side, and permanently marked in orange by the manufacturer.
- Cable entry through the back of the cabinet generally does not meet PGE requirements due to minimum cable bend radius.

### 11.2.1 Indoor Switchgear Metering

Follow these additional requirements when indoor switchgear metering (EUSERC 325 and 326), such as that shown in **Figure 11-1**.

- Prior approval must be obtained from PGE if the metering switchgear is to be installed indoors. Indoor switchgear must be accessible for maintenance and meter reading. For more information, see Section 5.2, *Meter Clearances and Location Criteria*.
- The load section of an indoor switchgear may be used by PGE as the terminating section for underground service (EUSERC 327). See **Figure 11-2**.

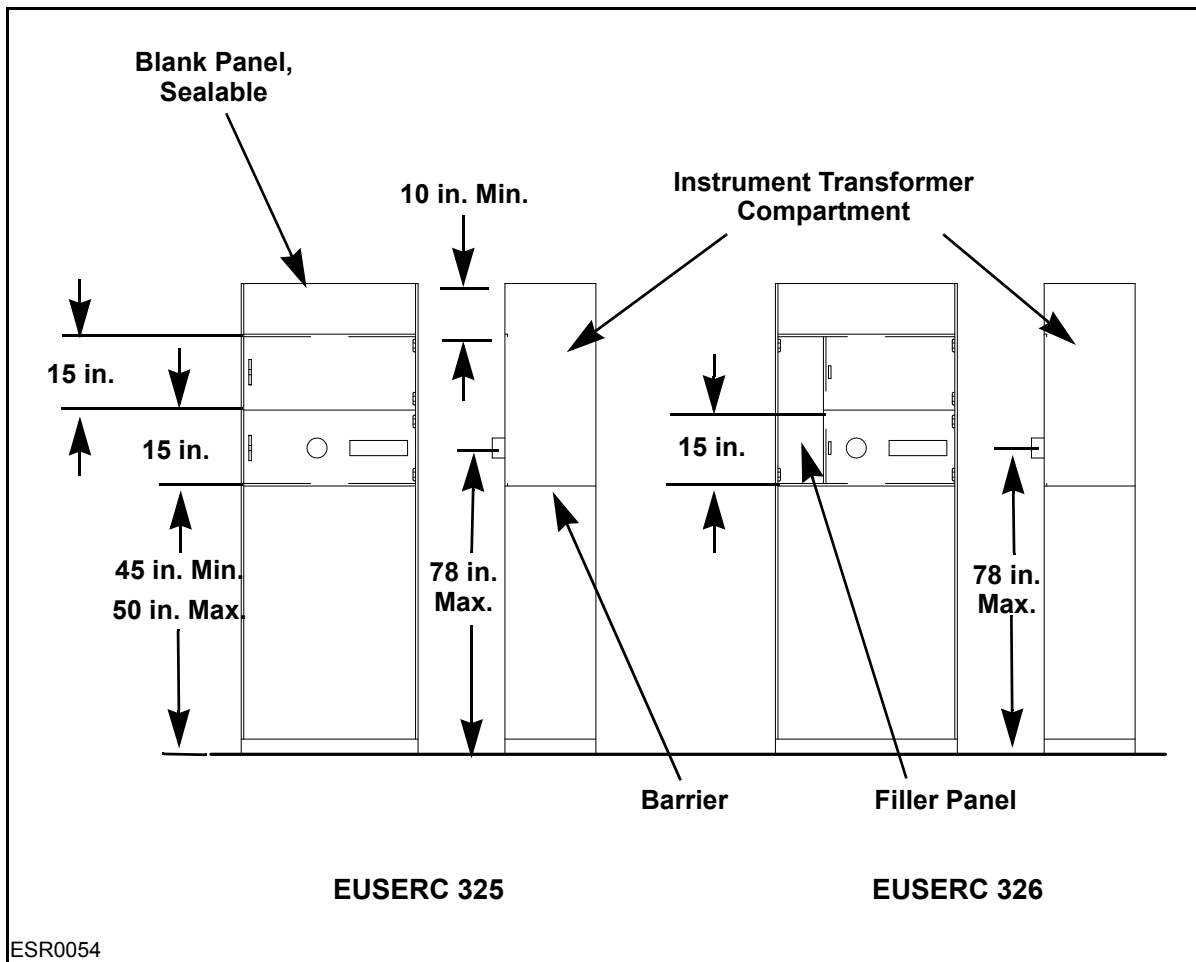


Figure 11-1: Indoor Switchgear Metering (EUSERC 325 and 326)

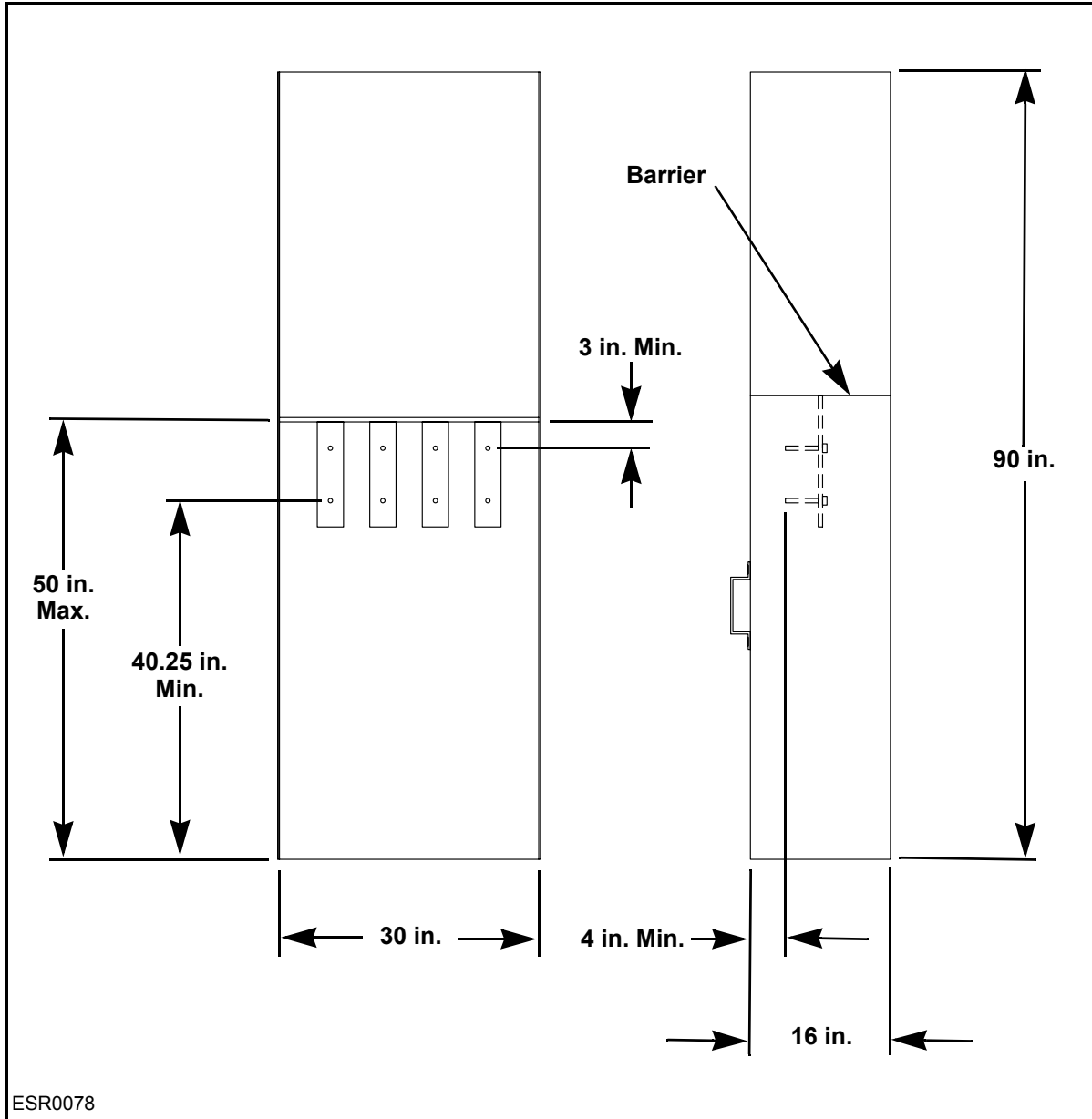


Figure 11-2: Load Section of an Indoor Switchgear (EUSERC 327)

### 11.2.2 Outdoor Switchgear Metering

Follow these additional requirements when installing outdoor switchgear metering (EUSERC 354), such as that shown in **Figure 11-3**.

- Exterior doors on outdoor switchgear must be sealable and must hold securely at a minimum of 90 degrees when open.
- PGE will only approve the outdoor switchgear with a single enclosure door that is constructed with a 4-inch spacer as shown in EUSERC 354.
- When installing outdoor switchgear metering, the Customer must install a concrete pad with 48 inches of concrete in front of any cabinet that contains PGE equipment. Drainage must slope away from the cabinet. See **Figure 11-4**.
- Barrier posts are required if the switchgear is exposed to vehicular traffic. For more information, see Section 6.4.6, *Barrier Post*.

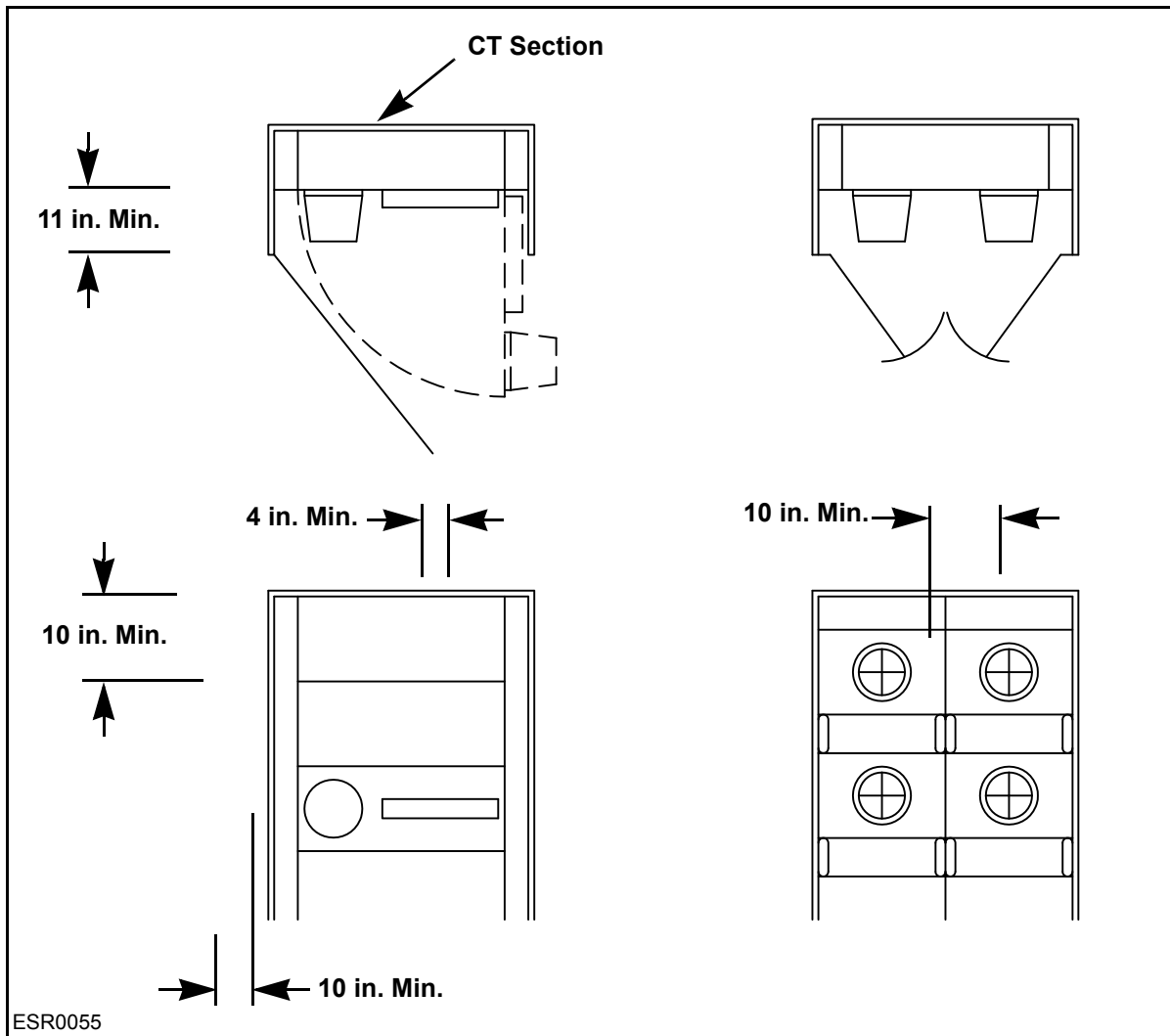


Figure 11-3: Outdoor Switchgear Metering (EUSERC 354)

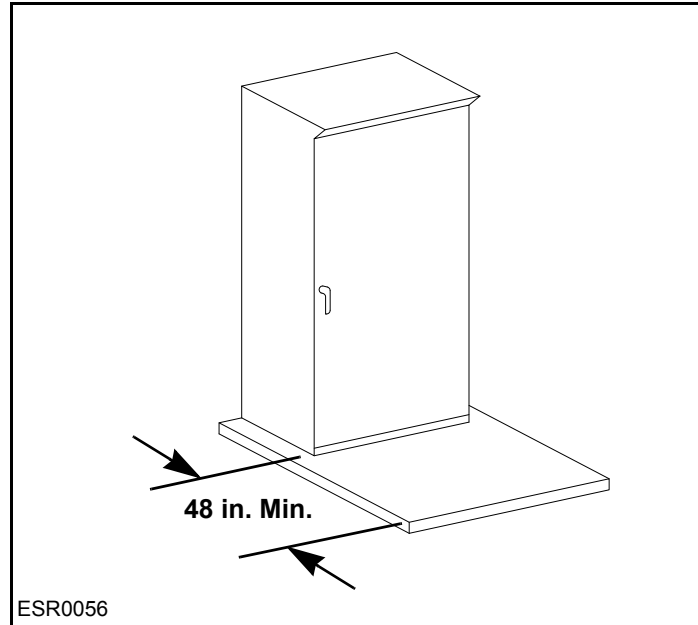


Figure 11-4: Concrete Pad in Front of Cabinet

### 11.2.3 Switchgear Service Termination

Follow these basic requirements for switchgear service termination.

- The Customer will provide the switchgear service section, instrument transformer mounting base, panels, meter socket, and provisions for a test switch.
- The meter and test switch are to be owned, provided, and installed by PGE in the Customer-owned metering compartment. Window or doughnut-type current transformers for switchgear are provided by PGE and installed and secured by the Customer.
- For four-wire delta services, the high-leg (wild) terminal must be located on the right side and identified by an orange mark. This identification must be consistent on the equipment for all metering and PGE termination points.
- For underground service, PGE will terminate the line-side service conductors using PGE-provided connectors on lug landings in the pull section.
- The locking method used by the Customer on the metering enclosure must provide for independent access by PGE.
- Customer-owned conductors and devices, such as limiters and fuses, are not permitted in PGE sealed pull sections or metering compartments.

### 11.2.4 EUSERC Requirements

These EUSERC requirements apply to switchgear service termination.

- Terminating bolts must be secured in place and must be provided with nuts, flat washer, and a spring washer; all parts must be plated to prevent corrosion. Bus bars are required from the pull section into the service section.
- PGE requires a clear workspace in front of a switchgear of 78 inches high, a minimum of 48 inches wide, and 48 inches deep.
- Bonding must meet Oregon Electrical Specialty Code (OESC) requirements. Lugs for terminating the Customer's bonding wire (or other bonding conductors) must be located outside the sealable section and must be designed to readily permit the Customer's neutral system to be isolated from the PGE neutral when necessary.
- All removable panels and covers to the compartments used for terminating or routing conductors must have sealing provisions.
- All pull and termination sections must have full-front access. Cover panels must be removable, sealable, provided with two lifting handles, and limited to a maximum size of 9 square feet in area.
- When self-contained meter sockets are installed in switchgear, they are to be wired by the switchgear manufacturer.

11.2.5 Pull Box With Terminating Facilities 0 to 600 Volts, 0 to 1200 Amps

Figure 11-5 shows a pull box with terminating facilities 0 to 600 volts, 0 to 1200 amps (EUSERC 343A and 347). See Figure 5-3 for meter clearances for multiple-meter installations.

See Table 11-1 for minimum dimensions for pull boxes with terminating facilities (EUSERC 343A).

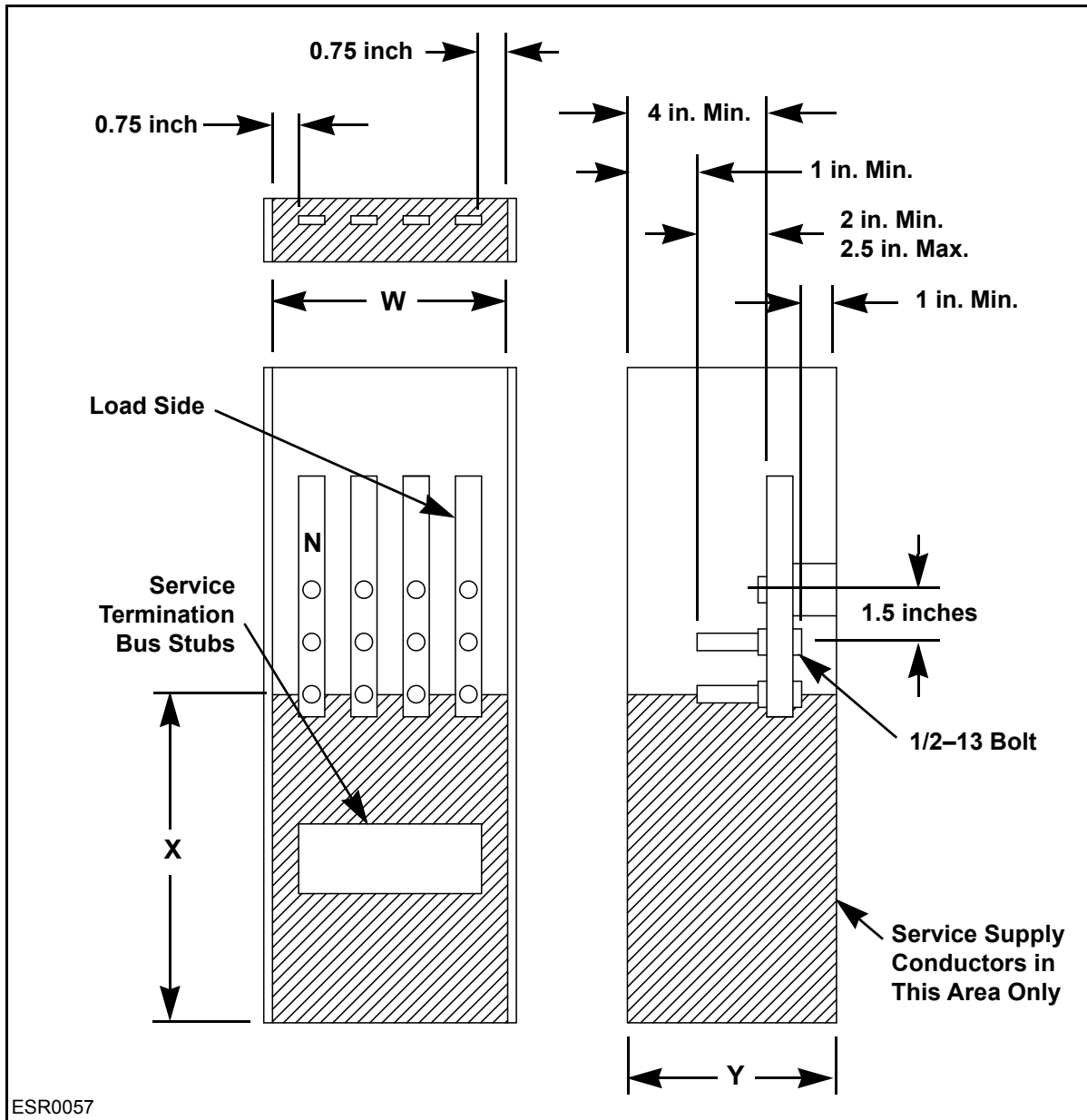


Figure 11-5: Pull Box With Terminating Facilities 0 to 600 Volts, 0 to 1200 Amps (EUSERC 343A and 347)

Table 11-1: Minimum Dimensions for Pull Boxes with Terminating Facilities (EUSERC 343A)

Total Service (amps)	W (inches)		X (inches)	Y (inches)
	3-Wire	4-Wire	Lug Height	Depth
0 to 200	10.5	14	11	6
201 to 400	10.5	14	22	6
401 to 800	16.5	22	26	11
801 to 1200	22.5	30	25	11

### 11.2.6 Commercial Multiple Metering, Direct-Connect, Floor-Mounted Switchgear, 1201 Amps and Higher

Follow these requirements when installing commercial multiple metering, direct-connect, floor mounted switchgear, 1201 amps and higher (EUSERC 306 and 345), such as that shown in **Figure 11-6**.

- All removable panels and covers to compartments used for metering must be sealable.
- Metering conductors must not pass through adjacent metering compartments except in enclosed wireways.
- For four-wire delta services, the high-leg (wild) terminal must be located on the right side and identified by an orange mark. This identification must be consistent on the equipment for all metering and PGE termination points.
- Test blocks with rigid insulating barriers must be furnished, installed, and wired or bused to the meter sockets. Test block cover panels must be sealable and fitted with a lifting handle.
- Meter panels must be removable, but must be nonremovable when the meter is in place.
- Each metered service must have a permanently engraved metal or hard plastic label with letters at least 3/8-inch high to identify the customer's service address before power is connected. See **Figure 10-1**, *Meter Label With Service Address*.
- Single-phase, 480 volt service must be permanently and visibly labeled as such. PGE requires a red label with white lettering that reads: SINGLE-PHASE 480V. Place the label in an easy-to-see location for safety. Consult PGE for further label requirements.

NOTE: Each meter socket and associated disconnect must be correctly labeled as to the unit, suite, or space number.

- For pull section details when used on underground services, see **Figure 11-7** or EUSERC 345, and **Table 11-2**.



- The Customer must provide an acceptable concrete pad for all switchgear metering service sections and pull boxes.
- If a freestanding unit can be expanded beyond six meter sockets (due to load growth), then a main disconnect will be required in the initial installation.

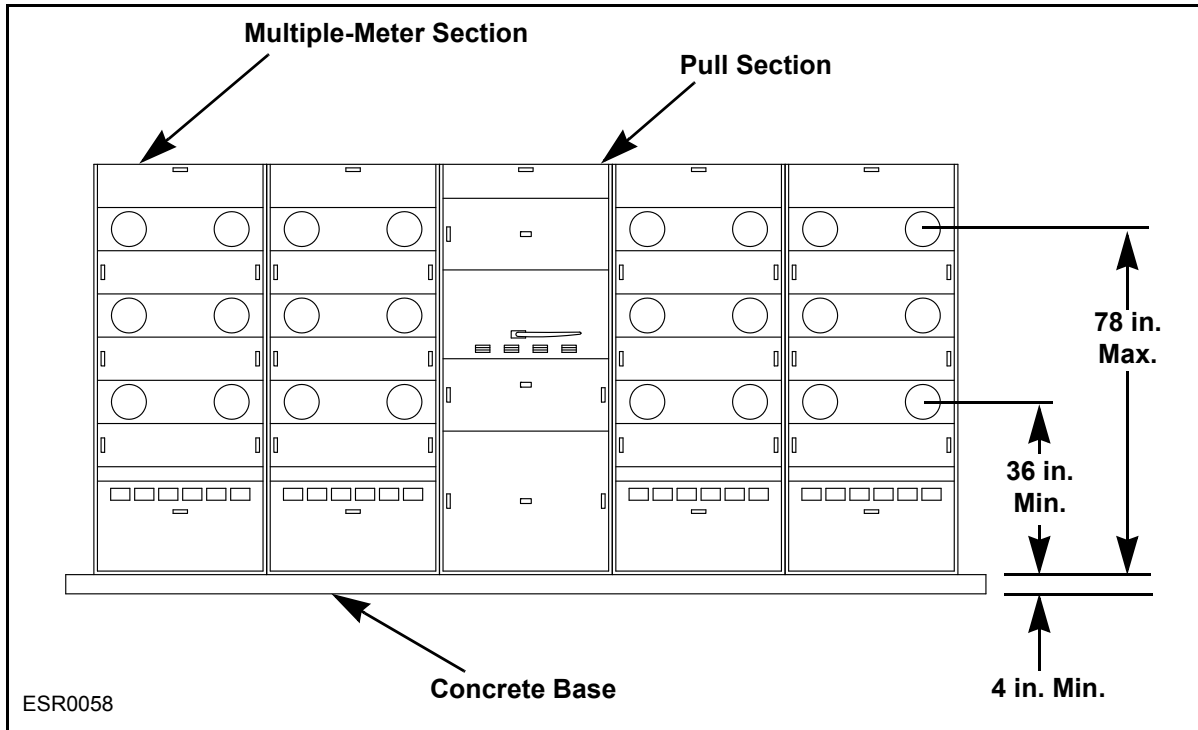
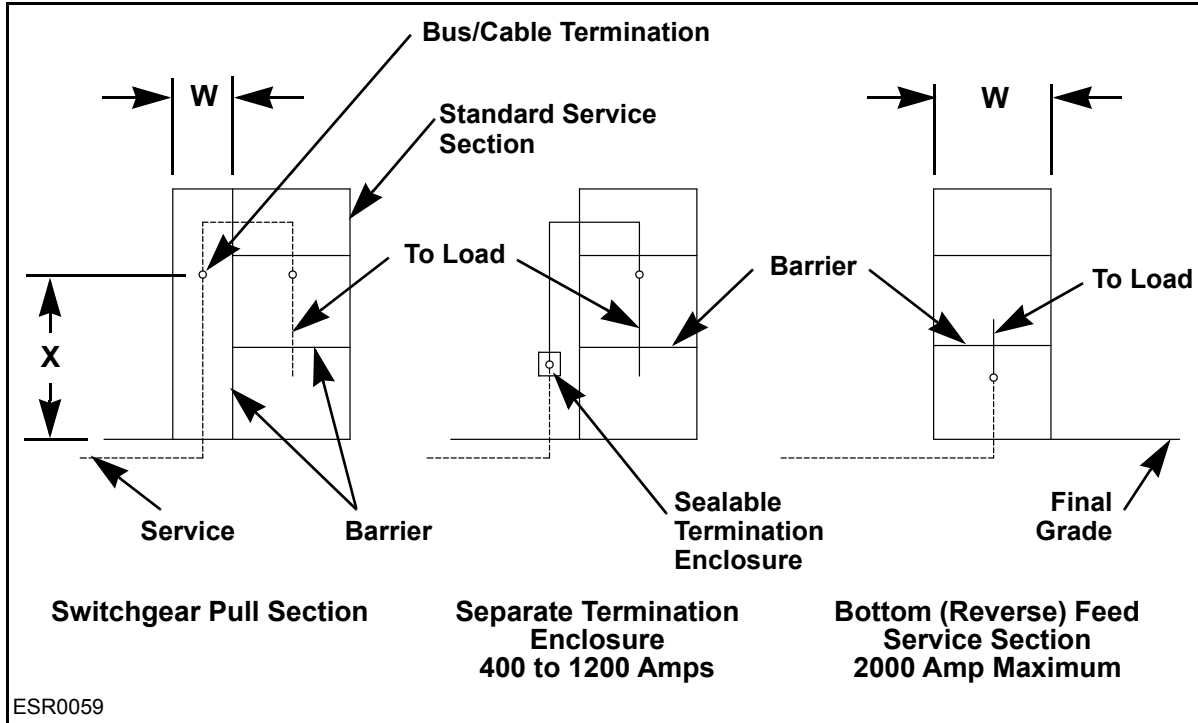


Figure 11-6: Commercial Multiple Metering, Direct-Connect, Floor-Mounted Switchgear, 1201 Amps and Higher (EUSERC 306 and 345)



**Figure 11-7: Underground Service Termination Switchgear Service Section, 400 to 3000 Amps, 0 to 600 Volts (EUSERC 345)**

**Table 11-2: Minimum Pull Section Dimensions (Applies to Figure 11-7 Only)**

Switchgear Rating (amps)	Minimum Width W (inches)		X Minimum Dimension (inches)
	3-Wire	4-Wire	
200 to 800	24	24	42
801 to 1200	24	30	
1201 to 2000	30	35	
2001 to 3000 <sup>1</sup>	—	42	60

1. Consult PGE for services higher than 2000 amps.

### 11.2.7 Underground Service Termination Switchgear Service Section, 400 to 3000 Amps, 0 to 600 Volts

Follow these requirements when installing an underground service termination switchgear service section, 400 to 3000 amps and 0 to 600 volts (EUSERC 345), such as that shown in **Figure 11-7**.

- A switchgear pull section, a separate termination enclosure, or a bottom-feed service section must be provided for all switchgear underground services.
- Bus bars—with provisions for termination lugs per EUSERC 347—are required from the pull section into the service section when the main switch is rated higher than 800 amperes, or when multiple metering is to be supplied.
- The minimum dimensions in **Figure 11-7** are for vertical entry at the top or bottom only. Side or rear entry of the service cable into the pull section may require a greater dimension than that shown in **Table 11-2**.
- The Customer must provide a drawing with dimensions of proposed service equipment.
- Consult PGE for services higher than 2000 amps.
- Refer to EUSERC 347 for bus/cable termination.
- Refer to EUSERC 343 for sealable termination enclosure.

### 11.2.8 Underground Service Termination in a Pull Section Below the Ground Level

**Figure 11-8** and **Figure 11-9** show underground service termination in a pull section below the ground level, 400 to 3000 amps, 0 to 600 volts based on EUSERC 345 note 6.

- **Figure 11-8** shows a pull section with back-entry conduits at the top or bottom.
- **Figure 11-9** shows a pull section with side-entry conduits at the lower end of the section.

See **Table 11-3** for the variable dimensions shown in the two figures.

Follow these requirements when installing an underground service termination in a pull section below the ground level:

- The cover panels on the pull and wireway sections must be a two-piece design of equal size with two lifting handles. The cover panels shall be removable and sealable.
- The minimum access dimensions—W1 and W2—are measured between the inside edges of the left- and right-side return flanges.
- The pull section and termination section shown in **Figure 11-8** and **Figure 11-9** are reserved for PGE supply conductors. No conduits or Customer wiring shall be installed in, or routed through, this area.
- The minimum clearance from any energized part to a removable cover panel must be 4 inches.
- The Customer shall provide a Unistrut® cable support bracket. Consult PGE.
- A minimum 10-foot clear workspace is required in front of the pull section and in the opposite direction from the entry direction of the cable.
- Potential water intrusion into service conduits, the pull section, and termination section can occur when the source side of PGE facilities, (such as a transformer vault) are at a higher elevation than the pull and termination sections. When the intrusion of water can reasonably be expected, the following actions are required.
  - The Customer is responsible for providing a means to prevent the accumulation of water in the pull and termination sections. This can be accomplished by providing a water collection system—a concrete well, for example—under the pull and termination sections with a gravity drain or sump pump to remove any standing water.
  - PGE must review and approve of any water accumulation and drainage systems prior to installation. See **Figure 11-10** for a pad drain for freestanding switchgear.

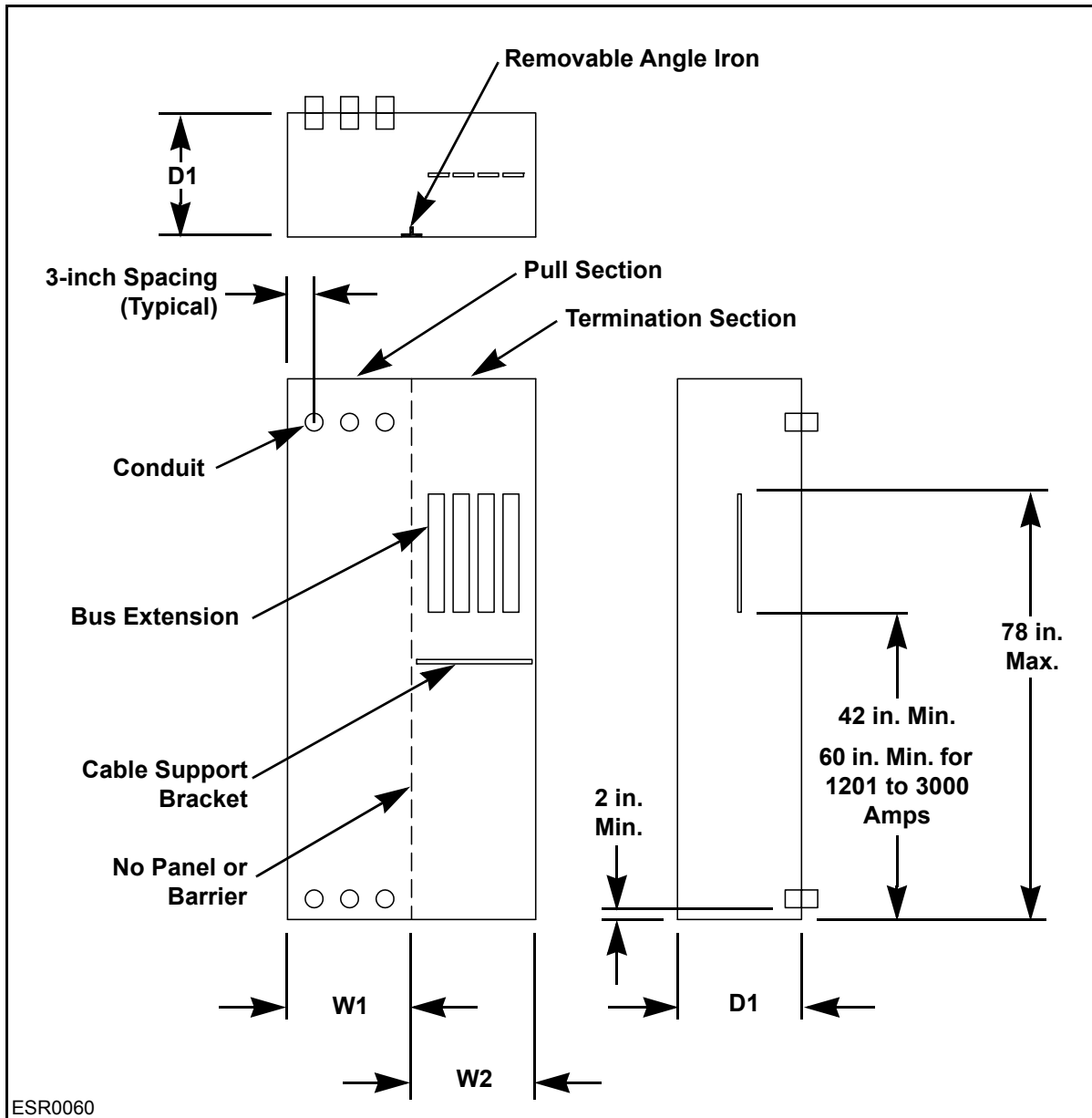


Figure 11-8: Underground Service Termination in a Pull Section Below the Ground Level, Showing Pull Section With Back-Entry Conduits at the Top or Bottom

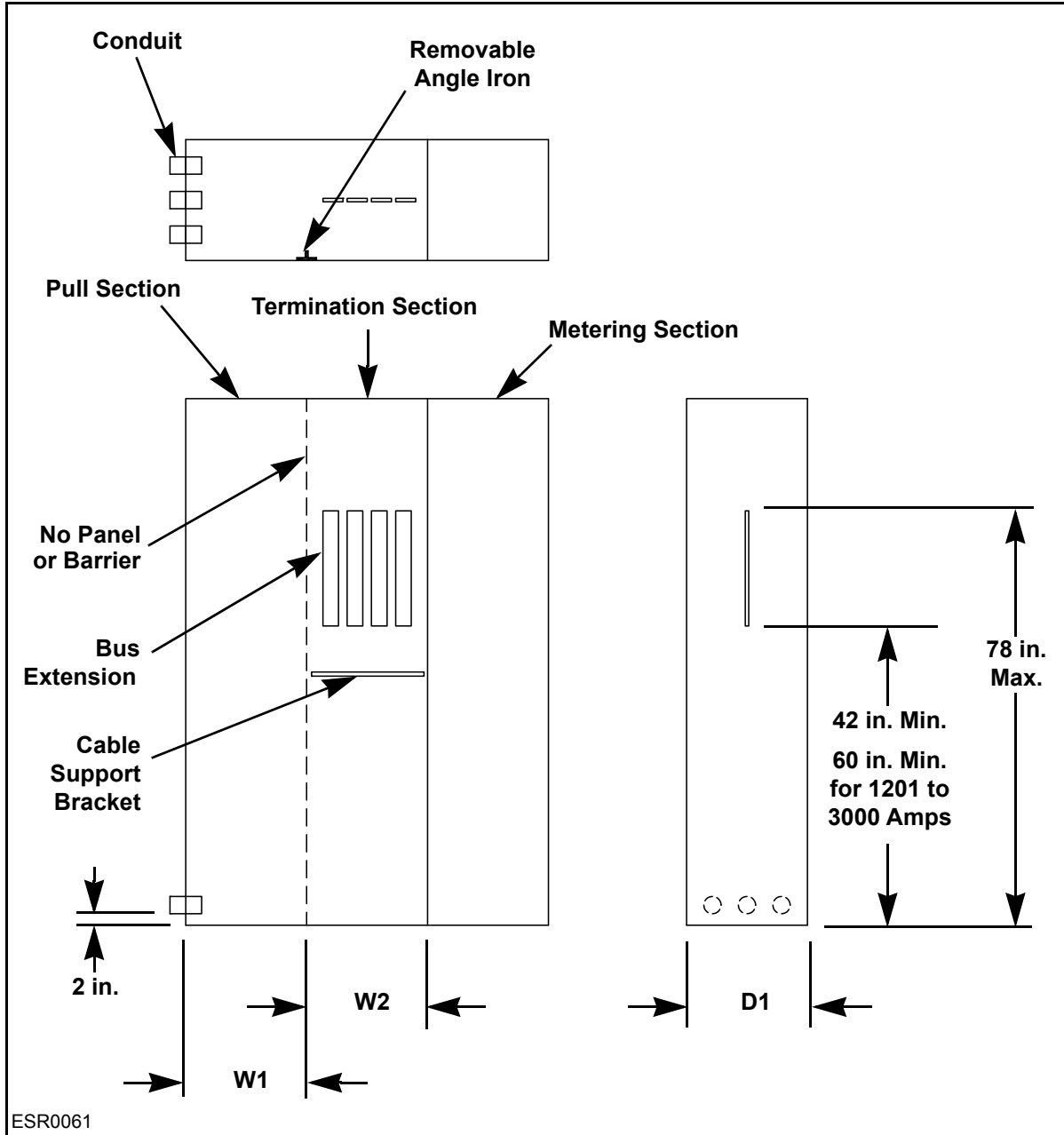


Figure 11-9: Underground Service Termination in a Pull Section Below the Ground Level, Showing Pull Section With Side-Entry Conduits at the Bottom

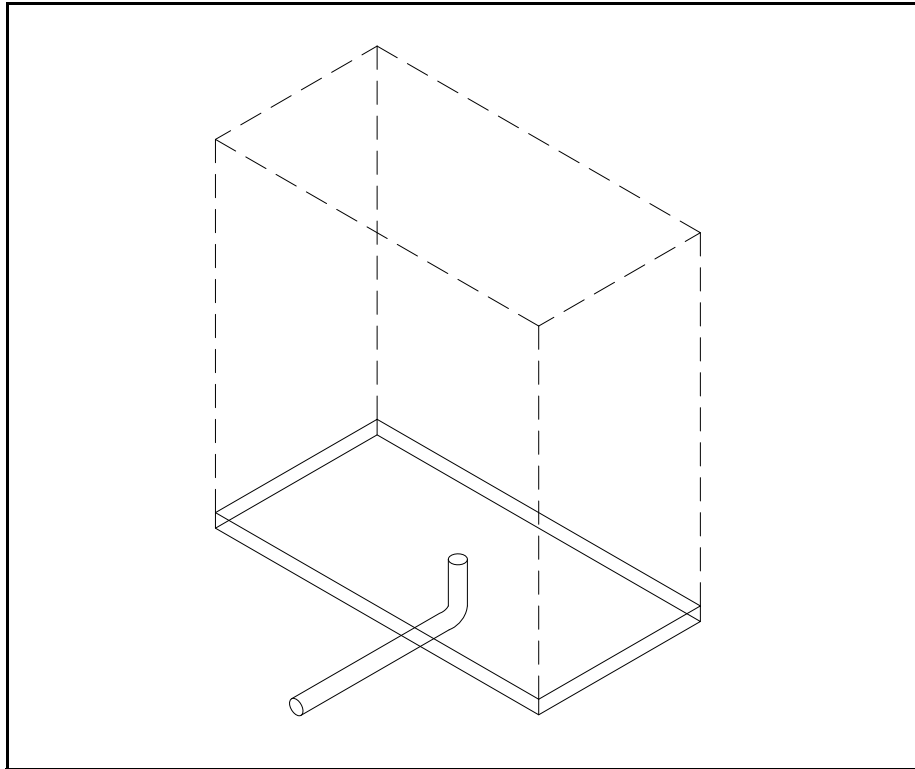


Figure 11-10: Pad Drain for Freestanding Switchgear

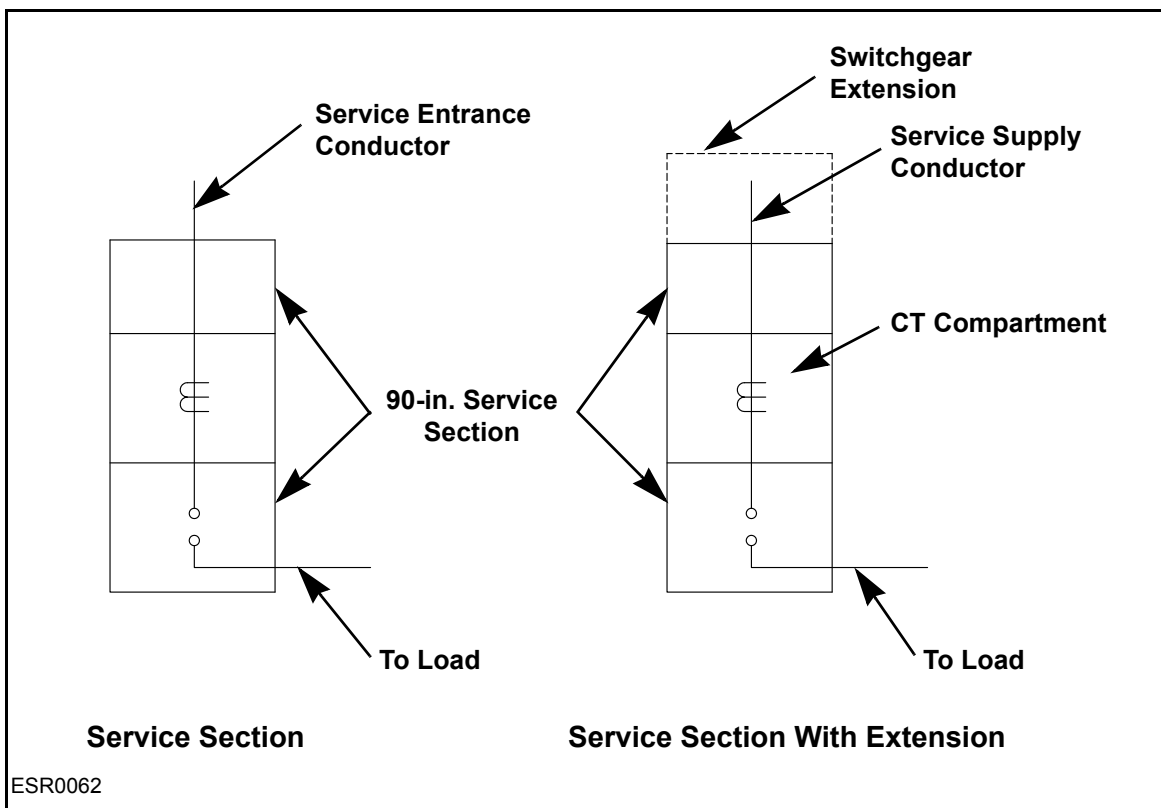
Table 11-3: Minimum Pull Section Dimensions

Switchgear Rating (amps)	Pull Section Width W1 (inches)		Wireway Width W2 (inches)	Wireway Depth D1 (inches)
	Single-Phase, Three-Wire	Three-Phase, Four-Wire		
401 to 800	24	24	24	24 (single-phase only) 30
801 to 1200	—	30	30	30
1201 to 3000	—	42	42	48

### 11.2.9 Overhead Service Termination Switchgear Service Section

Follow these requirements when installing an overhead service termination switchgear service section, 0 to 600 volts (EUSERC 348), such as that shown in **Figure 11-11**.

- The service entrance conductors, cable, or bus bar are furnished and installed by the Customer as follows:
  - When the switchgear is served with bus or bar conductors, the conductors shall enter through the top, or at the side or back in the upper 10-inch section.
  - When the switchgear is served with cable conductors, the conductors shall only enter the top of the switchgear.
- An extension may be required when conduits enter from the side or rear.
- The direction of feed is from the top to bottom in the switchgear service section. Load conductors shall exit below the metering compartment and may not be routed back through the current transformer compartment in order to exit the service section.
- Refer to EUSERC 325 and 326 for the requirements for the 90-inch service section.



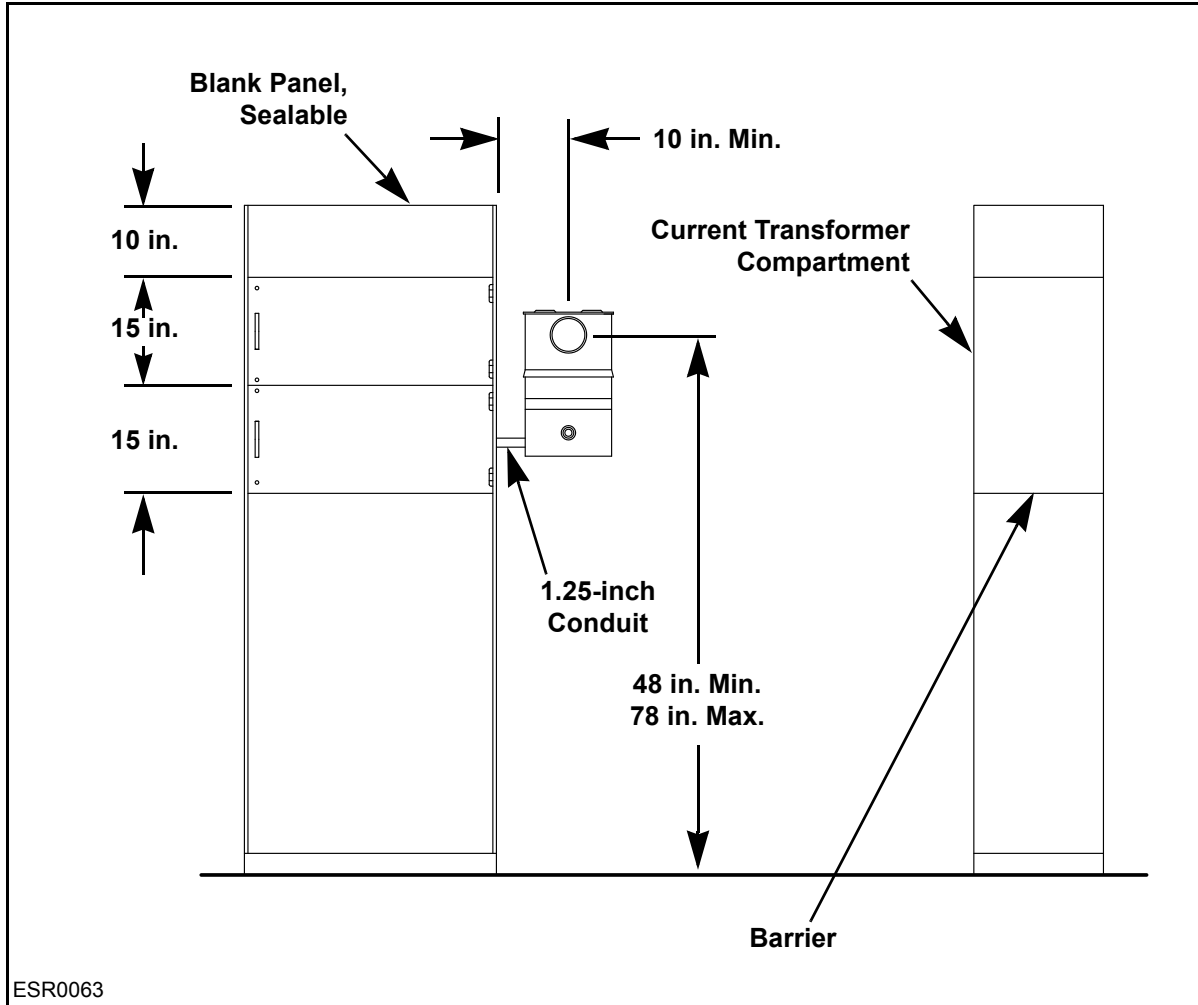
**Figure 11-11: Overhead Service Termination Switchgear Service Section, 0 to 600 Volts (EUSERC 348)**



### 11.2.10 Remote Switchgear Metering Enclosure

Follow these requirements when installing a remote switchgear metering enclosure (EUSERC 325 and 339), such as that shown in **Figure 11-12**.

- The service termination and metering equipment should be located outside, near the transformer. If PGE allows the service termination to be located inside the building, the metering enclosure must be located outside the building.
- The conduit in the switchgear section must be nonmetallic tubing and must be terminated in the current transformer compartment in front of the current transformers. Ninety-degree sweeps (LBs or similar devices) are not permitted inside the enclosure.
- The neutral terminal must be permanently identified in clearly visible block lettering with *neutral* or *N*.
- For 240/120 volt, three-phase, four-wire service the high-leg (wild) terminal must be located on the right side, and permanently marked in orange by the manufacturer.
- If—in the opinion of PGE—the switchgear service section is inaccessible for meter testing and maintenance, the Customer must provide direct access between the remote meter and the current transformer.
- The Customer must provide and install the remote meter socket enclosure, the metering switchgear section, and 1.25-inch conduit for the metering secondary conductors. For more information, see Section 10.7.4, *Current Transformer Metering Conduit*.



**Figure 11-12: Remote Switchgear Metering Enclosure  
(EUSERC 325 and 339)**

### **11.3 Current Transformer Compartment for Switchgear**

Follow these basic requirements when installing a current transformer (CT) compartment for switchgear.

- Set the direction of feed from the top or bottom. No other conductors shall pass through this compartment.
- The dimensions are measured to the inside edge of the compartment access opening.

#### **11.3.1 Current Transformer Compartment for Switchgear 0 to 1000 Amps, 0 to 600 Volts**

Follow these additional requirements when installing a CT compartment for switchgear 0 to 1000 amps, 0 to 600 volts, three-phase, four-wire service (EUSERC 320), such as that shown in **Figure 11-13**.

- Bus arrangements and supports shall be provided as shown in **Figure 11-13**. The neutral bus may be located at either side.
- A clear, unobstructed workspace shall be provided around the CT bus units from the barrier to the upper support bar.
- The barrier shall be constructed of rigid insulating material that is resistant to electrical arc tracking.

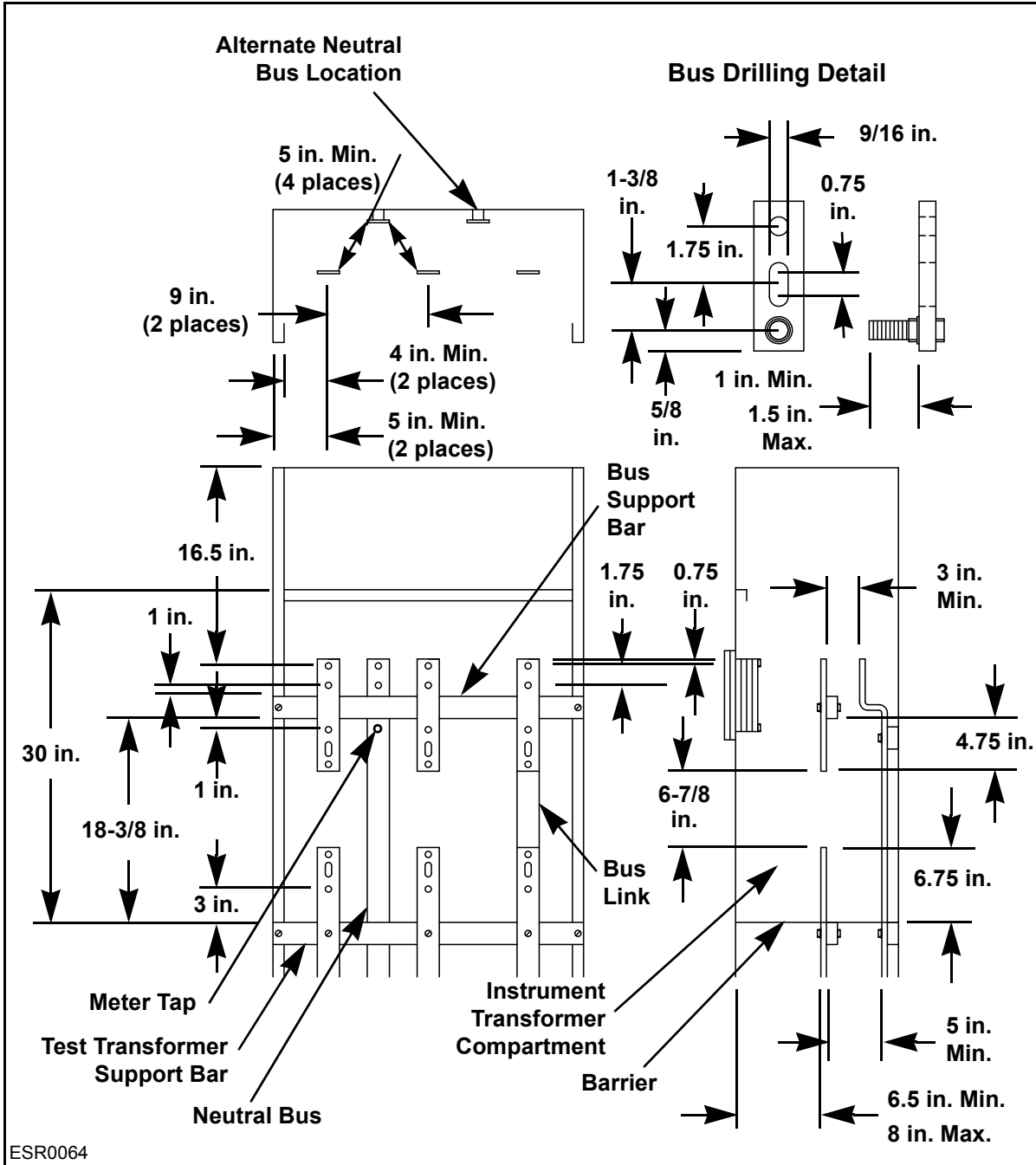


Figure 11-13: Current Transformer Compartment for Switchgear 0 to 1000 Amps,  
0 to 600 Volts, Three-Phase, Four-Wire Service (EUSERC 320)

### 11.3.2 Current Transformer Compartment for Switchgear 1001 to 3000 Amps, 0 to 600 Volts

Follow these additional requirements when installing a CT compartment for switchgear 1001 to 3000 amps, 0 to 600 volts, three-phase, four-wire service (EUSERC 322), such as that shown in **Figure 11-14**.

- Busways must remain in position when the removable section B is out.
- When horizontal-cross busways supply the service section phase buses, a neutral bus bar extension shall be provided in the instrument transformer compartment above the lower CT bus support.
- The Customer shall install a doughnut-style CT.

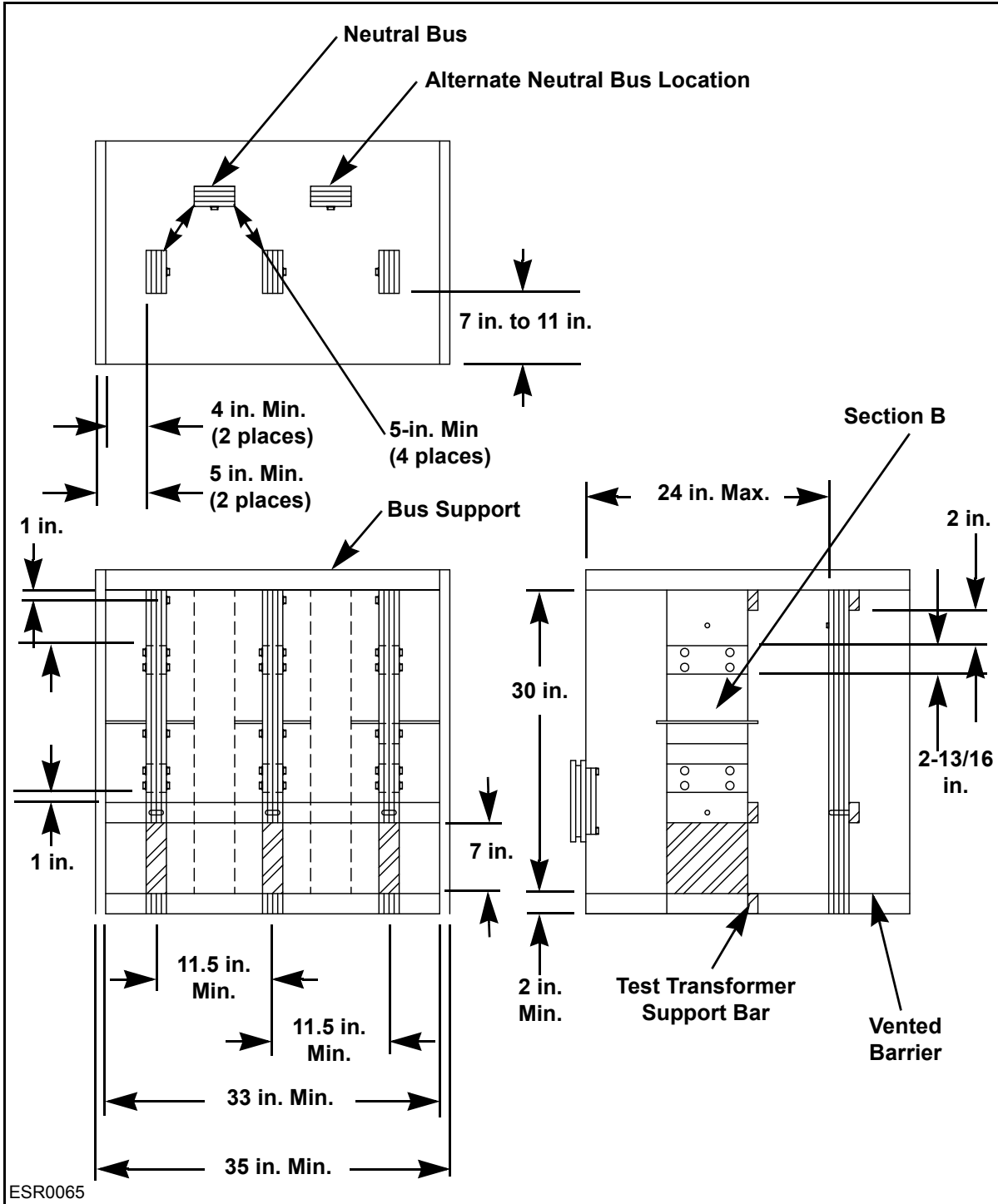


Figure 11-14: Current Transformer Compartment for Switchgear 1001 to 3000 Amps, 0 to 600 Volts, Three-Phase, Four-Wire Service (EUSERC 322)