

11 Commercial, Industrial, & Large Residential Services (801A or more)

11.1 Switchboard Metering

A EUSERC approved switchboard metering section is required when the service entrance rating is greater than 800 amperes (may also be used for three-phase services over 200 amperes and single-phase service over 320 amperes). The metering current transformers will be located in the current transformer compartment. The meter and test switch may be mounted on the compartment's hinged cover or located remotely. The area below this compartment's barrier may be used as a main switch (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 or breaker.

Mounting pad for all switchboard metering enclosures will be a minimum 4" thick concrete pad.

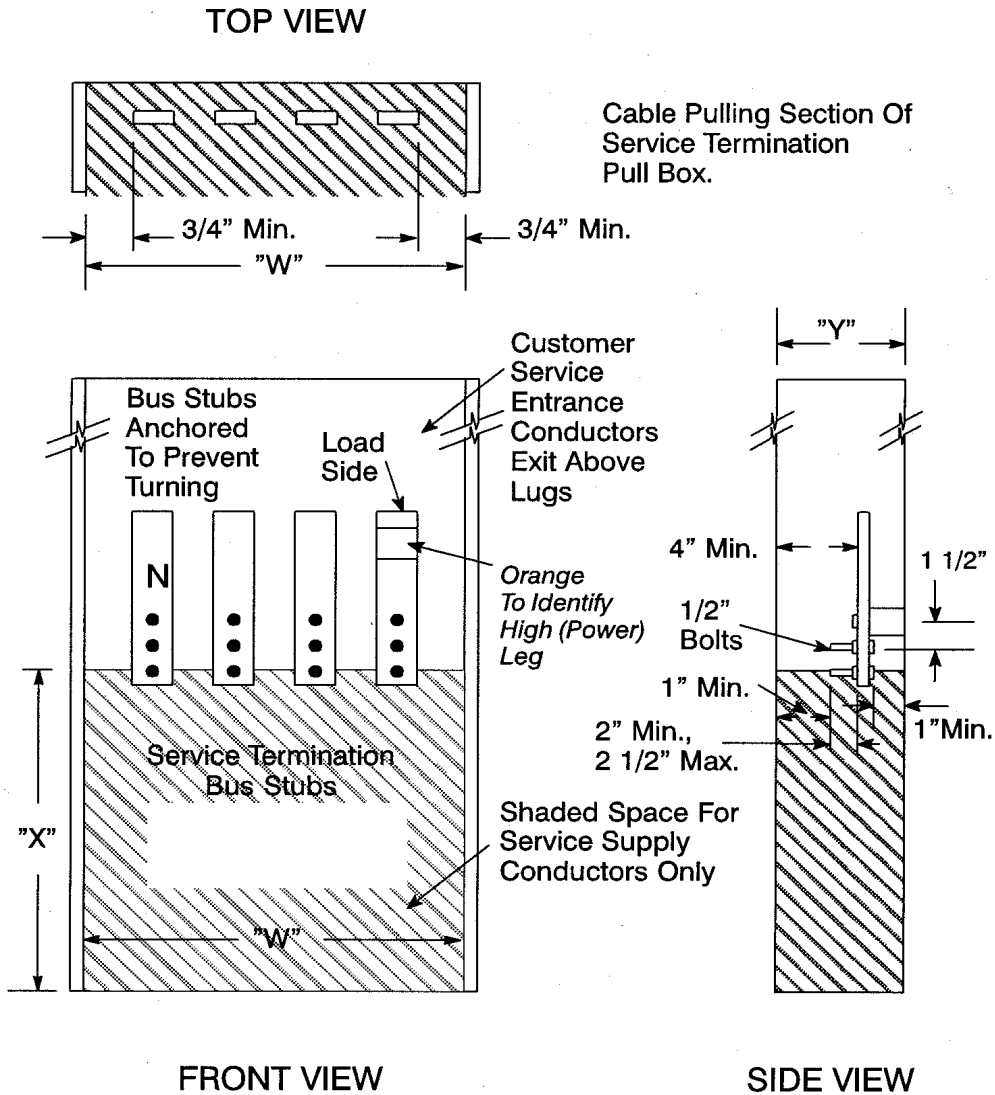
11.1.1 Switchboard Service Termination

- The Customer will provide the switchboard service section, instrument transformer mounting base, panels, meter socket, and provisions for a test switch.
- Meter and test switch are to be owned, provided, and installed by PGE in the Customer-owned metering compartment. Window or dough-nut type current transformers for switchboards are provided by PGE and installed and secured by the Customer.
- For 4-wire delta services the high (power) leg must be identified by orange tape. This marking must be consistent throughout 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.
- Customer locking means for the metering enclosure must provide for independent access by PGE.
- Customer owned conductors and devices (limiters, fuses, etc.) are not permitted in PGE sealed pull sections or metering compartments.

EUSERC Notes:

- Terminating bolts must be secured in place and shall be provided with nuts, flat washer, and a spring washer, and all parts must be plated to prevent corrosion. Buss bars are required from the pull section into the service section.
- The NEC requires a clear work space of 78" high by 30" minimum wide by 36" deep in front of switchboards.
- Bonding must meet NEC requirements. Lugs for terminating the Customer's bonding wire (or other bonding conductors) shall be located outside of the sealable section and shall be designed to readily permit the Customer's neutral system to be isolated, when necessary, from PGE's neutral.
- All removable panels and covers to the compartments used for terminating or routing conductors shall have sealing provisions.
- All pull and termination sections shall be full front access. Cover panels shall be removable, sealable, provided with two lifting handles, and limited to a maximum size of 9 square feet in area.

**Figure 11-1 Pull Box With Terminating Facilities– 0- 600 Volts, 0-1200 Amps
EUSERC 343A & 347**

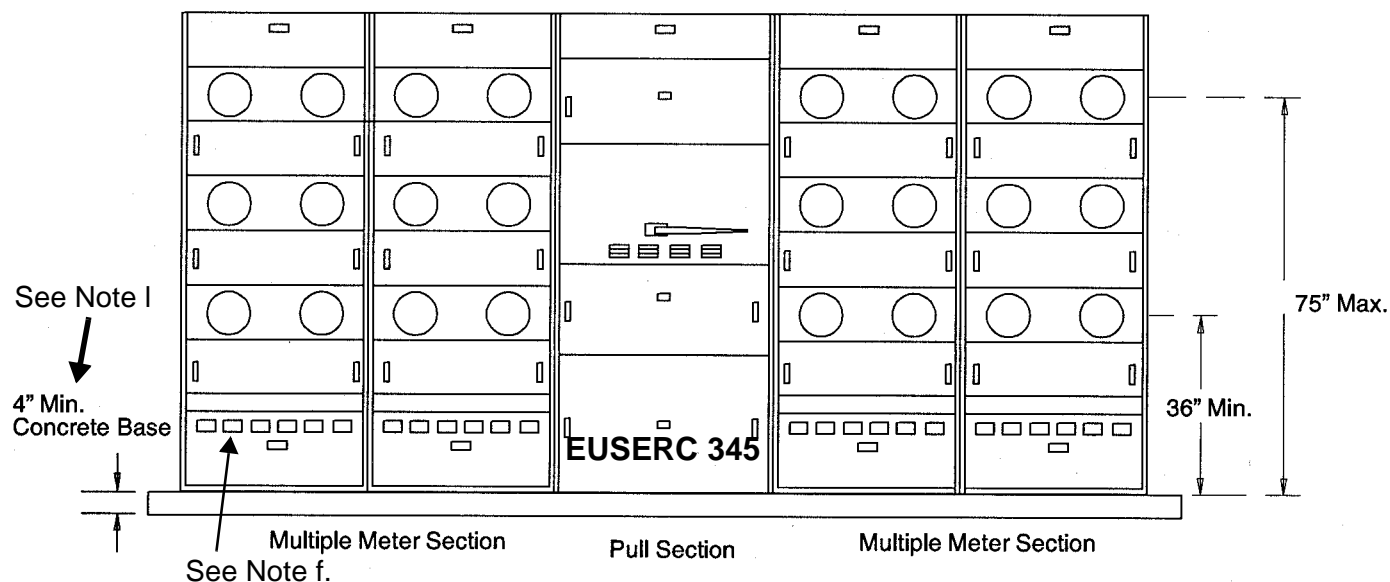


Note: See [Figure 5-2](#) for clear working space.

**Table 11-1. Minimum Dimensions for Pull Boxes With Terminating Facilities (EUSERC 343)
(Applies Only to PGE Portion of Pull Box)**

Total Service Amps	"W"		"Y" Depth	"X" Lug Height
	3 Wire	4 Wire		
0-200	10 1/2"	14"	6"	11"
201-400	10 1/2"	14"	6"	22"
401-800	16 1/2"	22"	11"	26"
801-1200	22 1/2"	30"	11"	26"

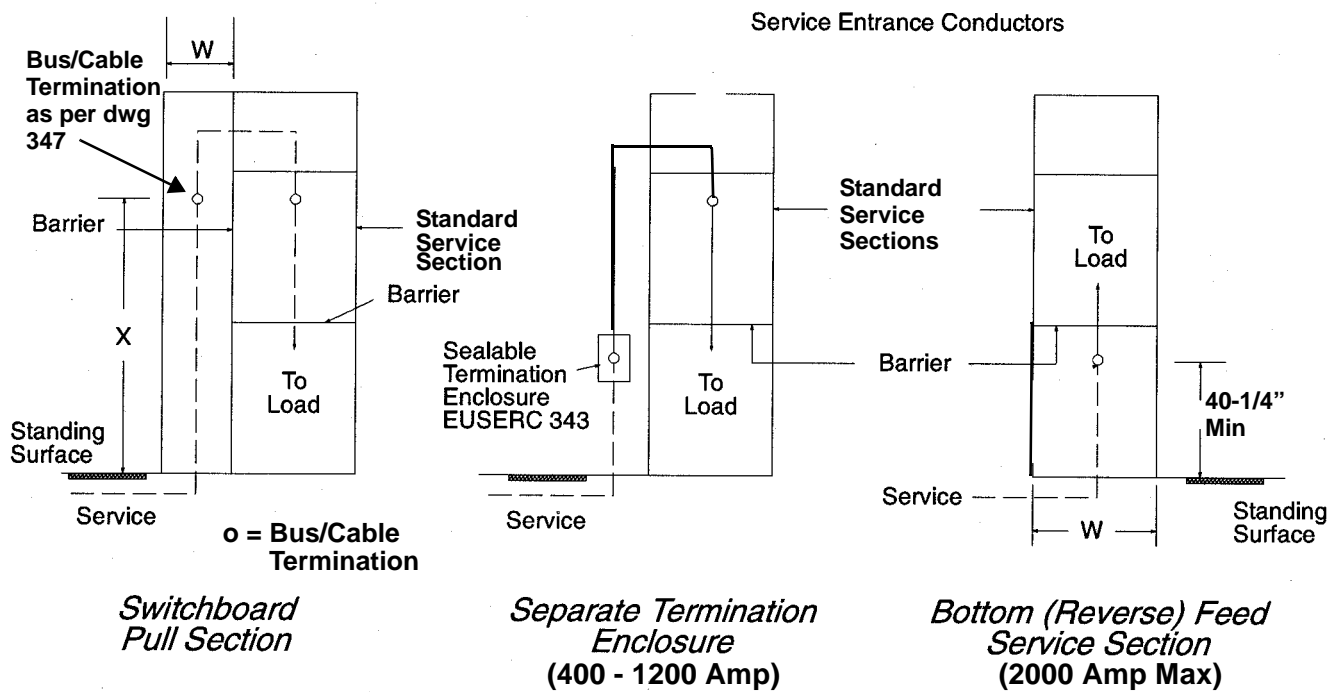
Figure 11-2 Commercial Multiple Metering
 (Direct-connect, Floor Mounted, Switchboard, 1201 Amps & Above)
 EUSERC 306/345



Notes:

- All removable panels and covers to compartments used for metering shall be sealable.
- Metering conductors shall not pass through adjacent metering compartments except in enclosed wireways.
- For 4-wire delta services the power (wild) leg must be identified by orange tape on the right side of the test blocks. This marking must be continuous throughout the equipment for all metering and PGE termination points.
- Test blocks with rigid insulating barriers shall be furnished, installed, and wired or bussed to the meter sockets. Test block cover panels shall be sealable and fitted with a lifting handle.
- Meter panels shall be removable but shall be non-removable when meter is in place.
- Each metered service must have a permanently engraved metal or hard plastic label with a minimum 3/8" high letters to identify the Customer's service address, before power is connected (see Figure 10-5). Each associated disconnect must also be labeled as to the unit, suite, or space number.
- For pull section details when used on underground services, see Figure 11-3 or EUSERC 345.
- The Customer must provide an acceptable concrete pad for all switchboard metering service sections and pull boxes.
- If free standing unit can be expanded beyond 6 sockets (from load growth), then a main disconnect will be required in the initial installation.

Figure 11-3 Underground Service Termination Switchboard Service Section
 400 to 3000 Amp, 0–600 Volts
 Based Upon EUSERC 345



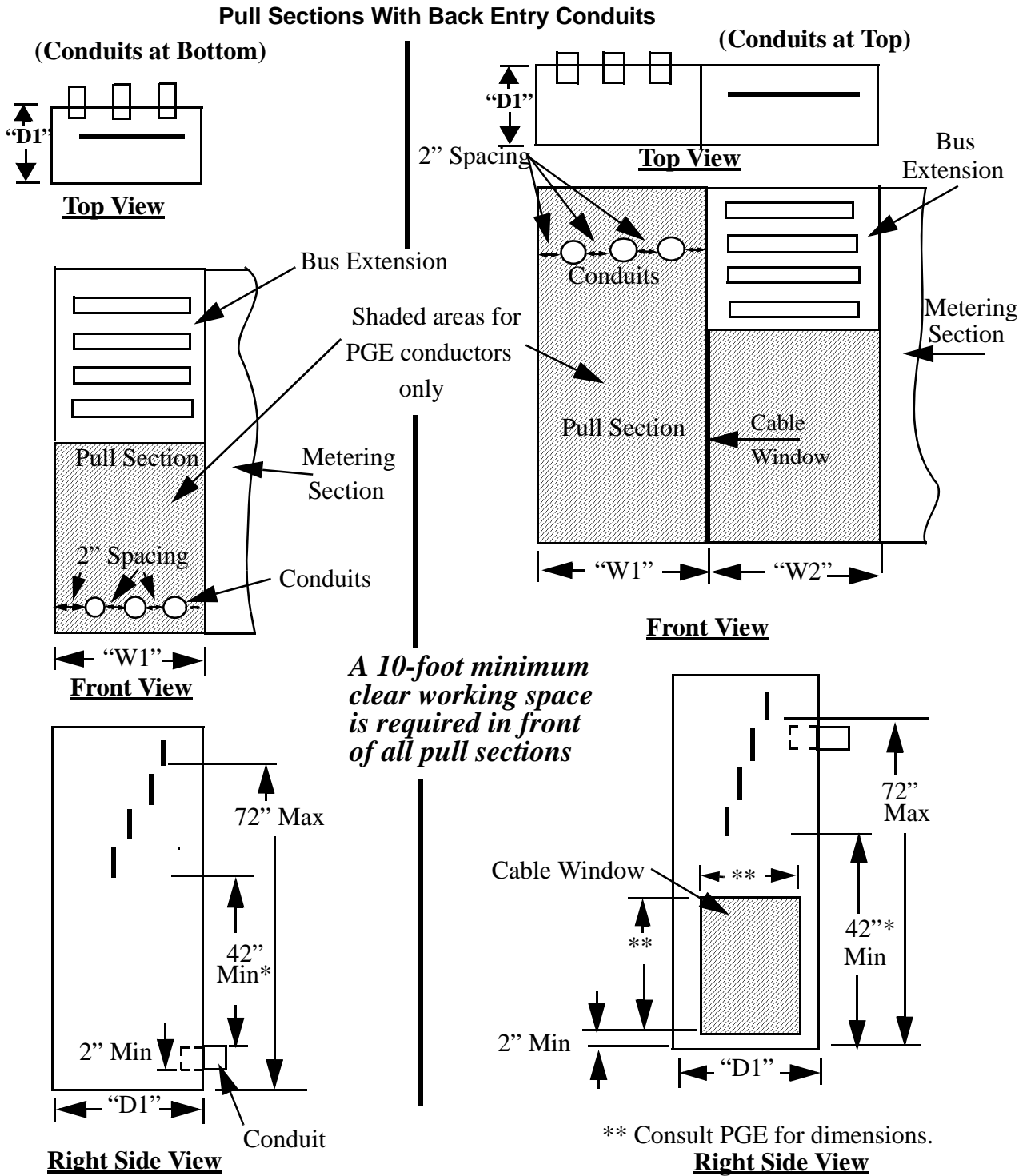
Minimum Pull Section Dimensions (For Figure 11-3 Only)

Switchboard Rating – Amps	Minimum Width "W"		"X" Minimum Dimension
	3-Wire	4-Wire	
200 - 800	24"	24"	42"
801 - 1200	24"	30"	42"
1201 - 2000	30"	35"	42"
2001 - 3000 See Note f	----	42"	60"

Notes:

- A switchboard pull section, a separate termination enclosure, or a bottom feed service section shall be provided for all switchboard 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 above 800 amperes, or when multiple metering is to be supplied.
- Minimum dimensions listed 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 the table (See Figure 11-3 and Table 11-2).
- All pull and termination sections shall have full front access. Cover panels shall be removable, sealable, provided with two lifting handles, and limited to a maximum size of 9 square feet in area.
- Customer shall provide a drawing with dimensions of proposed service equipment.
- Consult PGE for services larger than 2000 amps.

Figure 11-4 Underground Service Termination in a Pull Section Below Ground Level
 400-3000 Amps, 0-600 Volts, PGE Specification Not Based on EUSERC
Consult PGE Before Design (See Table 11-2)



*60" Min for 1201-3000 Amp

Figure 11-4 Continued

Pull Sections With Side Entry Conduits

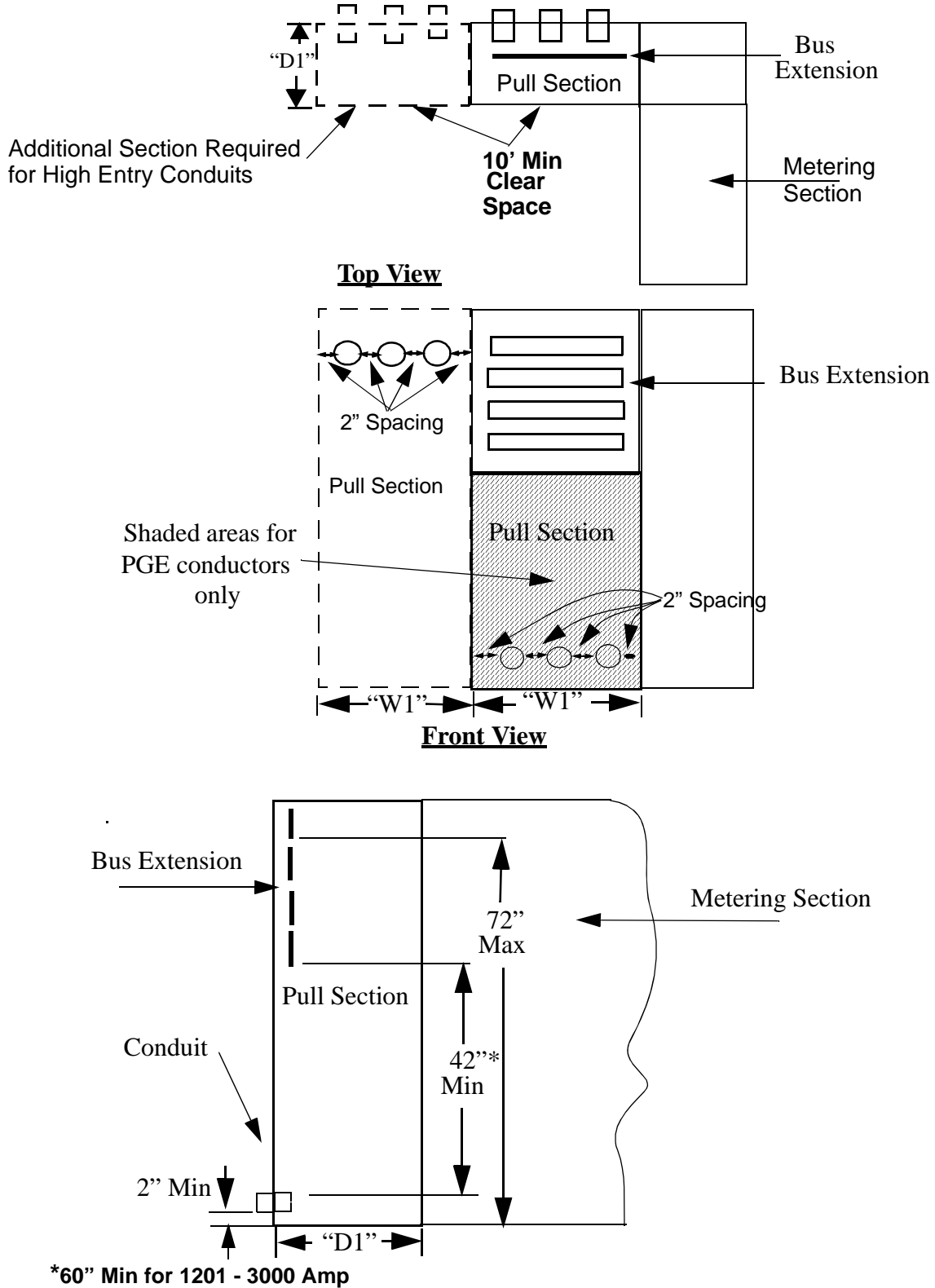


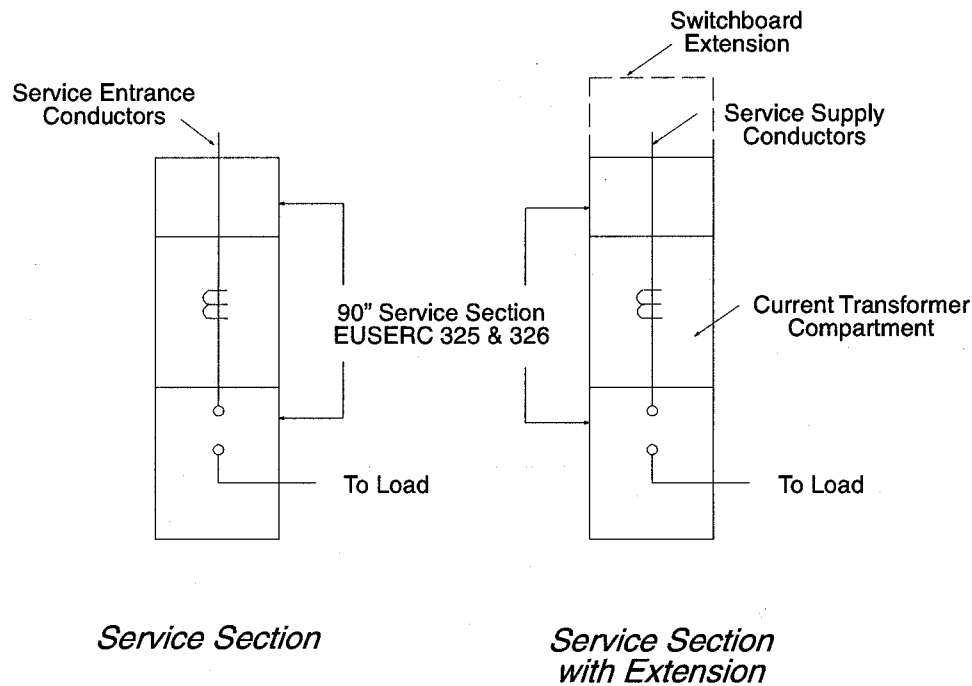
Table 11-2. Minimum Pull Section Dimensions (For Figure 11-4 Only)

Switchboard Rating	Pull Section Width "W1"		Wireway Width "W2"	Wireway Depth "D1"
	1-Ph, 3-Wire	3-Ph, 4-Wire		
401-800	24"	24"	24"	30" (24" 1-ph only)
801-1200	-----	30"	30"	30"
1201-3000	-----	42"	42"	48"

Cover panels on pulling and wireway enclosures shall be removable, sealable, provided with two lifting handles, and limited to a maximum of nine square feet in area.

1. The minimum access opening dimension ("W1" and "W2") are measured between the inside edges of the left and right side return flanges.
2. The shaded areas shown in Figure 11-4 are reserved for PGE supply conductors. No conduits or customer wiring shall be installed in or routed through this area.
3. The minimum clearance from any energized part to a removable access cover panel shall be 4 inches.
4. The edges of the cable window between the entrance wireway and the pull section, when used, shall be rounded or otherwise protected to prevent damage to the service supply conductors.
5. Potential water intrusion into service conduits and pulling/termination sections can occur when the source side of PGE facilities (e.g., transformer vault) are at a higher elevation than the pulling 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 pulling and termination sections. This can be accomplished by providing water collection system such as a concrete well under the pulling and termination sections with a gravity drain or sump pump to remove any standing water.
 - PGE shall review and approve of any water accumulation and drainage systems prior to installation.

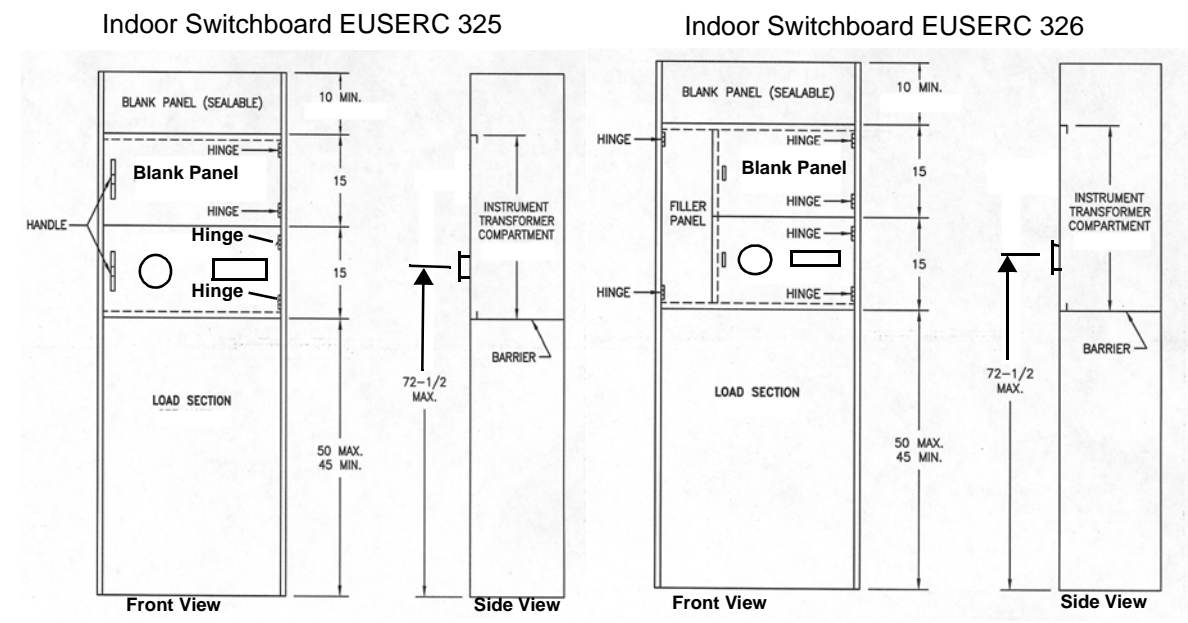
Figure 11-5 Overhead Service Termination Switchboard Service Section
 0–600 Volts
 EUSERC 348



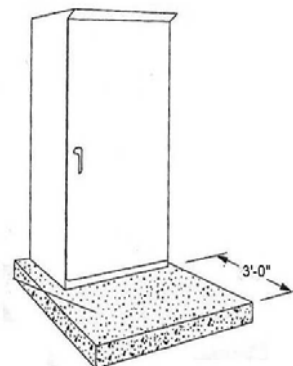
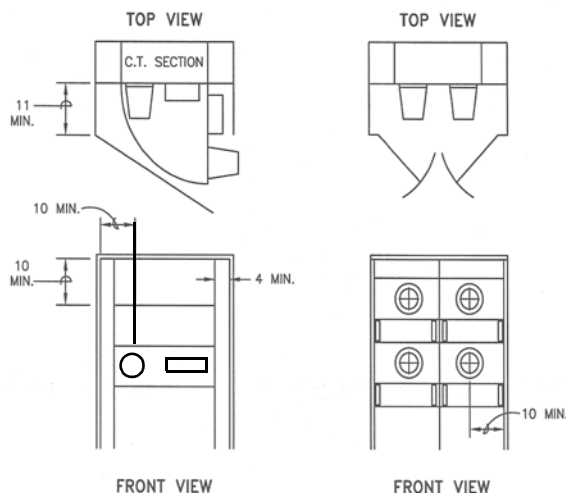
Notes:

- a. The service entrance conductors, cable or bus bar, are furnished and installed by the Customer in the following manner:
 1. When the switchboards are served with bus bar conductors, the conductors shall enter through the top or at the side or back in the upper 10" section.
 2. When the switchboards are served with cable conductors, the conductors shall only enter the top of the switchboard.
- b. When conduits enter from the side or rear, an extension may be required.
- c. The direction of feed is from top to bottom in the switchboard service section. Load conductors shall leave below the metering compartment and may not be routed back through the current transformer compartment in order to exit the service section.

Figure 11-6 Switchboard Metering



Outdoor Switchboard EUSERC 354

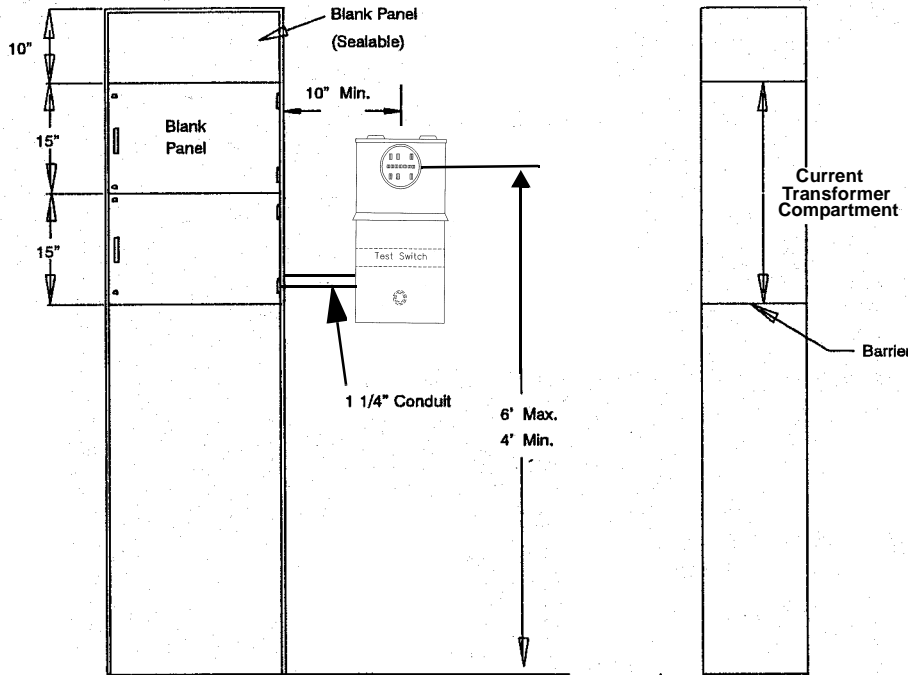


For outdoor switchboard installation on a pad, the customer shall supply and install a concrete pad with a dedicated 3' of concrete in front of the cabinet. Drainage must slope away from cabinet.

Notes:

- Exterior doors on outdoor switchboards must be sealable and must hold securely at 90° minimum when open.
- Meter panels shall not be hinged to a filler panel.
- Neutral terminal shall be permanently identified in clearly visible block lettering reading either "neutral" or "N".
- For 240/120 volts, three-phase, four-wire services, the power leg ("C" phase) terminal shall be permanently marked in orange color by the manufacturer.
- Prior approval must be obtained from PGE if the metering switchboard is to be installed indoors. Indoor switchboards must be accessible for maintenance and meter reading. (See [Section 5.1 \(Meter Clearances and Locations\)](#))

Figure 11-7 Remote Switchboard Metering Enclosure
EUSERC 325 & 339

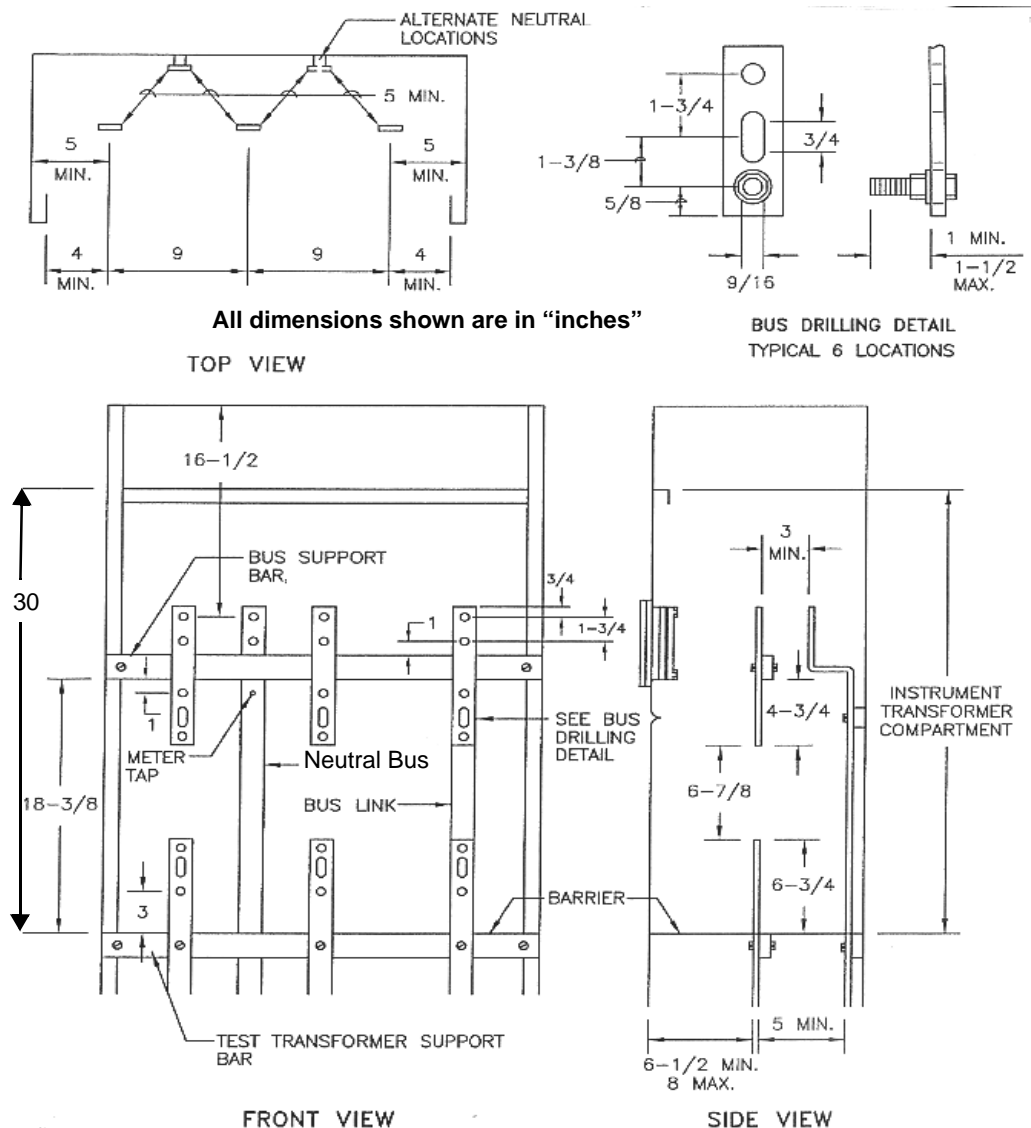


Notes:

- 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 switchboard section shall be PVC flex tubing and shall be terminated in the current transformer compartment in front of the current transformers. 90 degree sweeps (LB's or similar devices) are not permitted inside the enclosure.
- Neutral terminal shall be permanently identified in clearly visible block lettering reading either "neutral" or "N".
- For 240/120 volts, three-phase, four-wire services, the power leg ("C" phase) terminal shall be permanently marked in orange color by the manufacturer.
- If, in the opinion of PGE, the switchboard 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, metering switchboard section and 1 1/4" conduit for the metering secondary conductors. Refer to [Section 10.6.3 \(Current Transformer Metering Conduit\)](#) in this book for conduit requirements.

Figure 11-8 Current Transformer Compartment for Switchboards 0-1000 Amps, 0-600 Volts

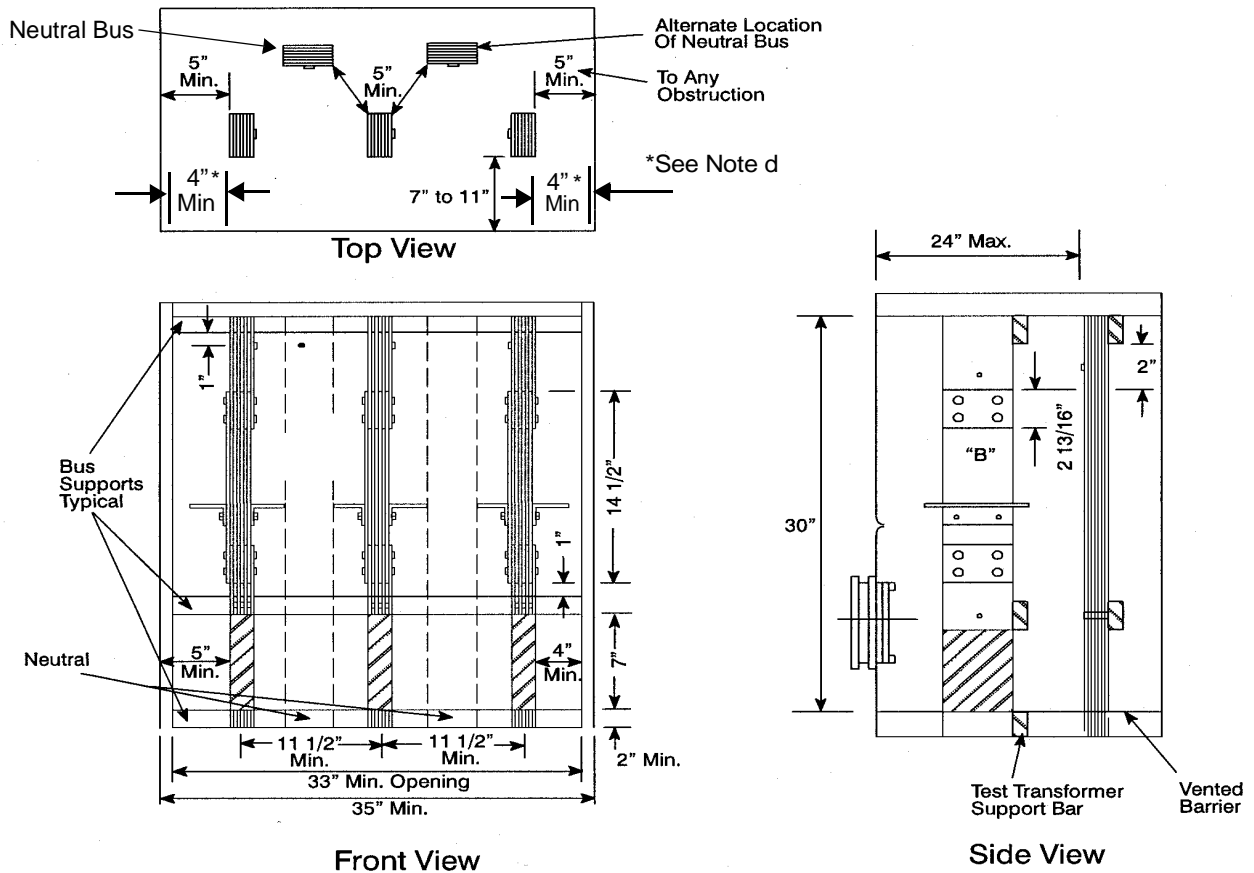
Three-Phase, Four-Wire, EUSERC 320



Notes:

- a. Set the direction of feed from the top or bottom. No other conductors shall pass through this compartment.
- b. Bus arrangement and supports shall be provided as shown, except the neutral bus may be located at either side or on either side wall.
- c. A clear unobstructed work space shall be provided around the current-transformer bus units from the barrier to the upper support bar.
- d. The barrier shall be constructed of rigid insulating material resistant to electrical arc tracking.
- e. Dimensions measured to inside edge of the compartment access opening.

**Figure 11-9 Current Transformer Compartment for Switchboards 1001- 3000 Amps,
0-600 Volts**
Three-Phase, 4 Wire Service
EUSERC 322



Notes:

- Busways must remain in position when the removable section "B" is out.
- Set the direction of feed from the top or bottom. No other conductors shall pass through this compartment.
- 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.
- Dimension measured to inside edge of the compartment access opening.
- Customer to install doughnut style CT's.