Chapter 3 – Customer Equipment Requirements – Primary Service

1. Specifications

The following requirements apply to specifications for primary service.

1. The local Electric Distribution Division office will provide primary service specifications to customers upon request. These specifications are for the customer's guidance only, and outline general PSE&G requirements for the customer's equipment. Any detailed engineering is to be performed by the customer or such agent as the customer may designate. PSE&G may be consulted with this process.
2. Billing meters shall normally be **Cold Sequence**, that is a disconnect device shall be located on the line side of the meters, unless otherwise requested by PSE&G.
3. The primary switchgear should be arranged so that the service enters through an incoming section that may include lightning arrestors, followed by a section containing an isolating switch and then a separate metering section, where PSE&G's metering transformers will be mounted.
4. PSE&G's review of major electrical equipment and approval of the final electrical plan must be secured by the customer before major equipment is purchased, or construction is started. Detailed plans shall be prepared by the customer and three copies submitted to PSE&G for review.

2. General Information

The following is general information applicable to customer equipment requirements for primary service.

1. PSE&G's standard service supply is alternating current with a nominal frequency of 60 Hz (cycles per second).
2. PSE&G will supply primary service from distribution circuits at nominal 2400/4160 (4 kV) volts or nominal 7620/13,200 (13 kV) volts, three-phase, four-wire, WYE. Determination of the supply voltage shall be made by PSE&G.
3. PSE&G will normally supply primary service from voltage regulated circuits. It is impractical to provide each and every customer on a distribution system with constant utilization voltage corresponding to the nameplate voltage of their devices. It is the customer's responsibility to provide and install equipment which will operate properly within the range of standard voltage being supplied, which can vary between 107% and 95% of nominal under emergency conditions. The normal expected range is between 105% and 100%.
4. Protection of electrical equipment against harmonics, loss of voltage, under voltage, transient under voltage or over voltage, voltage unbalance, phase reversal and short circuit currents is the responsibility of the customer. This should be considered in the design of the customer's equipment and relaying.
5. It should be noted that short-term low-voltage dips occur on PSE&G's system. It is recommended that time-delay, protective devices be installed on important motors or other critical equipment, but shall not be installed on the incoming service entrance devices.
6. It is recommended that an uninterruptible power supply or a power conditioner device be installed by the customer if continuity of service or quality service is required for critical computer or electronic equipment.

7. PSE&G will normally supply up to 3,000 kVA at 4 kV primary voltage and 5,000 kVA at 13 kV.
8. In 4 kV service areas where the conversion to 13 kV distribution is anticipated, all new primary customers will be required to install 13 kV entrance equipment. Service will initially be supplied at 4 kV. PSE&G will not supply 13 kV/4 kV step down transformers or reimburse the customer for the additional costs of dual ratio 13 kV/4kV transformers or for the additional costs for 13 kV switchgear.

   New Primary Voltage Customers

   It will be to the long-term economic advantage of PSE&G to have new primary customers install equipment suitable for 13 kV operation rather than accept 4 kV equipment, and supply 13 kV to 4 kV step-down transformers ahead of such loads in the future.

   Accordingly, effectively immediately, all new primary customers will be required to install switchgear designed for operation at 13 kV.

   New primary customers will also be requested to install dual ratio 13 kV/4 kV transformers and motors that operate at either 4 kV or 13 kV since service will initially be from 4 kV sources but may be upgraded in the future. These customers shall, however, be informed of the estimated time, if known, of the area conversion to 13 kV. It is up to the customer to make the choice to:

   – Install straight 4 kV end-use equipment at this time and replace it with 13 kV equipment at the time the service voltage is upgraded, or
   – Install dual voltage equipment initially, or
   – Install straight 4 kV end-use equipment at this time and install 13 kV/4 kV step down transformers at the time the service voltage is upgraded.
9. The customer shall provide at their expense any transformers which they require to obtain voltages other than the standard voltage supplied.
10. The following transformer requirements are for customer connections with no paralleled generation. For direct transformations from the primary service voltage supplied by PSE&G to other utilization voltages, the following neutral connections should be observed. When WYE-WYE transformers are used, the primary and secondary neutrals of the transformers should be interconnected with the neutral conductor and the customer's service equipment ground. For WYE-DELTA transformations, the primary neutrals of the transformers should be left “floating” (i.e., tied together at the transformer but not grounded or connected to a neutral conductor). DELTA-DELTA and DELTA-WYE transformations are acceptable; however, the loss of one primary phase will result in less than full voltage on the transformer secondary.
11. Customer connections with paralleled non-utility generation (**NUG**), inclusive of inverter based generation (solar, batteries, etc) must only install transformer type WYE-WYE for primary service. The Wye point **must** be grounded on the utility side. If the installation is greater than 1 MW, PSE&G will install a recloser, at the customer’s expense, upstream from the customer owned switchgear.
12. PSE&G will perform all work in the service run which involves poles, wires, cables and appurtenances up to the point of connection to the customer’s facilities, in accordance with Section 5 of its *Tariff for Electric Service* B.P.U.N.J. No. 15. Normally the line side of the customer’s main interrupting device or the line side of the isolating switches will be the point of connection. The customer shall furnish and install at their expense, and in accordance with the specifications of PSE&G, any conduit or manholes required in the service run.

3. Review Requirement

The following details the review requirements for customer equipment requirements – primary service.

1. Three sets of final plans and shop drawings (three hard copies and one electronic pdf file) shall be submitted to PSE&G for review. Such review must be completed prior to the fabrication of apparatus and purchase of equipment. PSE&G will not be responsible for field revisions resulting from failure to follow this requirement.
2. Specifically, the drawings submitted should cover the following items:
   a. A plot plan showing the location of the service entrance equipment.
   b. A plan and elevation detail of the service entrance equipment including metering facilities and branch or sub-main interrupting devices.
   c. A listing of the major service entrance equipment and materials unless these are detailed on the drawings.
   d. A one-line diagram of the high-voltage (primary) electrical system. This drawing should include the metering current and potential transformers and DC schematic diagrams of the relaying scheme if applicable.
   e. Conduit and manhole details.
3. PSE&G's review of the above final plans or drawings is for general arrangement and conformity with PSE&G's technical requirements only and does not indicate safe or faultless design. By review of the final plans or drawings, PSE&G is indicating that the design is compatible with PSE&G's equipment and service. Responsibility for proper design, operation, maintenance and safety of the customer's installation rests solely with the customer. In addition, all work and equipment must conform to municipal and all other applicable codes and requirements, including applicable provisions of the National Electrical Code (**NEC**) and the National Electrical Safety Code (**NESC**) in effect at the time of construction.
4. PSE&G will survey the electrical service entrance equipment when notified by the customer of its installation. In addition, PSE&G will require a certificate or letter of approval for the installation from the electrical inspection authority having jurisdiction before service is introduced.

Note

PSE&G will not be liable for damages or for injuries sustained by customers or by the equipment of customers or by reason of the condition or character of customers' facilities or the equipment of others on customer's premises. PSE&G will not be liable for the use, care, or handling of the electric service delivered to the customer after same passes beyond the point at which PSE&G's service facilities connect to the customer's facilities.

4. Revenue Metering

The following details the requirements for revenue metering.

1. PSE&G will not permit the connection of customer's ammeters, voltmeters, pilot or indicating lamps or any other current-consuming devices to the metering transformers used in conjunction with its revenue meters. No current consuming devices, other than current transformers required for automatic tripping or line sensing potential transformers for automatic transfer schemes, may be placed on the incoming line side of the metering transformers. Potential sensing lights, if operated by push buttons, may be connected to the customer's line sensing potential transformers on duplicate service installations.
2. PSE&G will furnish three current transformers, three potential transformers, metering control cable, meter enclosures and associated equipment.

   Customer shall identify and mark phases (A, B, C) in revenue metering compartment.
3. The customer's contractor will install these transformers in the revenue metering compartment and wire the high-voltage side. The transformers shall be mounted on substantial supports, which are not used as a support for buses or cables. In metal-clad switchgear both the current and potential transformers are to be mounted in a manner so as to be accessible for inspection while energized. The primary connections of the potential transformers are to be made on the line side of the current transformers. Polarity shall be observed in the installation of the current and potential transformers. **Polarity marks of current transformers shall face supply side of service.**

   Primary leads for the potential transformers shall be #2 AWG copper wire (minimum) connected on the line side of current transformers. If the wire is not fully insulated for the service voltage, it shall be installed on the approved insulators and/or shaped so as to provide proper clearances.
4. Mounting dimensions for revenue metering transformers are shown in Figure 3.1 (see Section 15. – Standard Layouts).
5. The conduit for the secondary control cable from the metering transformer secondaries to the meter panel shall be 2 in. threaded rigid metal conduit to be supplied and installed by the customer. Grounding bushings shall be installed on the ends of metal conduit.
6. The metering secondary control cables and wires will be furnished by PSE&G and when specified will be installed in this conduit by the customer. Secondary metering transformer connections, test switch and meter connections will be made by PSE&G.
7. The location, dimensions and mounting height of the equipment will be specified by the PSE&G Wiring Inspector. Conduit, as described in number 5 above, between the meter panel and metering transformers will be required. The customer shall install any meter mounting equipment or enclosures furnished by PSE&G in accordance with PSE&G requirements.
8. PSE&G's Metering Department shall designate the location of the metering enclosure and associated equipment. In no case shall the secondary leads length from the metering transformers to the revenue meters exceed 100 ft. Adequate lighting shall be in the vicinity of the billing meter if indoors.
9. A minimum clearance of 36 in. shall be provided in front of any meters and not less than 36 in. of clearance from gas metering and gas piping. Meter mounting height shall be such that the top of the meter mounting equipment shall be as close as practicable to 5 ft from the floor or finished grade, but no lower than 3 ft nor higher than 6 ft. Where meters must be located next to a walkway and there is less than a 24 in. clearance from the edge of the walkway to the back of the meter mounting equipment, the height shall be 78 in. from grade to the top of meter mounting equipment.
10. The customer shall provide required conduit (as specified by PSE&G) from the telephone entrance demarcation point to the meter panel. When required PSE&G will request the telephone line and pay all monthly charges.

5. Grounding

The customer shall provide, install and connect, in accordance with the current edition of the National Electrical Code and National Electrical Safety Code, all grounding requirements of service equipment and any required grounding of equipment furnished by PSE&G but installed by the customer.

The path to ground for circuits, equipment or enclosures shall be permanent and continuous. It shall have ample current carrying capacity to conduct safely any currents liable to be imposed on it and shall have impedance sufficiently low to limit the potential above ground and to facilitate the operation of the over-current devices.

A grounded neutral service conductor will be brought into the customer's installation by PSE&G. This conductor shall be connected to the grounding facilities of the customer's installation on a copper or aluminum neutral block or bus not less than 2 in. x 4 in. x 1/4 in. in size with standard NEMA drilled or tapped holes (see Section 15. – Standard Layouts, Figure 3.2: Customer's Substation – Grounding Details). Connectors shall be provided by the customer for the metering neutral and the customer's grounding electrode, grid system or equivalent.

In metal-clad switchgear, the ground bus must be available in the cable entrance compartment for the connection of the service neutral conductor, cable bonds and the customer's grounding conductor. The ground bus shall extend into the metering transformer compartment for grounding of the transformer bases and the primary and secondary neutral connections of the metering transformers. Ground Bus shall be a minimum of 1/4 x 2 in. copper.

Where a metal fence is used to enclose a primary installation, the fence shall be connected to the ground bus of the installation at as many points as may be necessary to provide adequate protection. All grounding electrodes at such an installation shall be interconnected (see Section 15. – Standard Layouts, Figure 3.2: Customer's Substation – Grounding Details).

The provisions for grounding shall be shown in detail on all plans for primary service installations submitted to PSE&G for review together with a grounding study that shall be performed to ensure safe step and touch potential in accordance with the latest IEEE 80.

6. Service Equipment Installations and Arrangements

The following details the requirements for service equipment installations and arrangements.

1. An incoming compartment dedicated specifically for line and cable termination shall be installed with hinged access doors to accommodate safe access of PSE&G workers for inspection and maintenance purposes. No less than 10 ft of unobstructed space in front of the cable termination compartment shall be maintained for installation and maintenance. (Refer to Section 9. for Surge Arrester placement).

   Customer shall identify and mark phases (A, B, C) in the incoming compartment.

2. The customer shall furnish, install and maintain a service entrance interrupting device which must be specifically reviewed by PSE&G. If this device has fault interrupting ability it must be capable of coordinating with protective devices on the PSE&G system for which the local Electric Distribution Division will supply the necessary information.

3. Where a circuit breaker is used for the service entrance interrupting device it shall have minimum ratings as specified in Table 3-1.

Table 3-1: Minimum Requirements for Customer Circuit Breaker

Description	Value	
PSE&G Nominal Voltage	4.16 kV	13.2 kV
Insulation Level (BIL)	60 kV	95 kV
Continuous Current Rating	600 A	600 A
Rated Interrupting Time-Cycles	5	5
Short Circuit Interrupting Duty at Nominal Voltage: Symmetrical Amps	10 kA	10.5 kA

If parallel operation of the customer's generation or unusual customer equipment arrangements are involved, higher interrupting ratings may be required. All such cases shall be brought to the attention of the local PSE&G Distribution Division for special recommendations.

4. A fused or unfused load-break switch may be used for the service entrance interrupting device. Switches shall be actuated through a quick-make, quick-break mechanism to assure high speed opening and closing independent of the speed of the operating handle. Also, switches shall be capable of closing into the maximum available fault current after which it must be capable of carrying and interrupting its rated continuous current. Service entrance switches shall have minimum ratings as specified in Table 3-2.

Table 3-2: Minimum Requirements for Customer Switches

Description	Value	
PSE&G Nominal Voltage	4.16 kV	13.2 kV
Insulation Level (BIL)	60 kV	95 kV
Continuous Current Rating	600 A	600 A*
Momentary Current Duty	40 kA	40 kA
Short Circuit Interrupting Duty at Nominal Voltage: Symmetrical Amps	10 kA	10.5 kA
Note: *A 200 A rating may be used, with PSE&G review, where appropriate.		

5. In addition, the associated fuses must meet the following conditions:
   a. Be adequate for load current as well as anticipated in-rush current;
   b. Be capable of proper coordination with PSE&G system;
   c. Have a three-phase symmetrical short circuit interrupting rating of at least 10 kA at 4.16 kV and 10.5 kA at 13.2 kV.

Note

The customer shall maintain a supply of spare fuses. PSE&G does not stock fuses.

Cubicles housing fused load-break switches must be of adequate strength to withstand possible explosive forces which may develop under fault conditions.

6. The service entrance interrupting device must provide a visible break in all ungrounded conductors and isolate the metering transformers from all customer-owned equipment, including relaying and control transformers.

   Generally this requirement will be met with a single gang-operated device on the load side of the revenue metering transformer (hot sequence metering) unless specified otherwise. If the visible break device is located between the PSE&G supply-side and the revenue metering transformers (cold sequence metering) then the isolating device for any control or relaying transformer connected to the main bus without a gang-operated switch must be clearly identified. Identification must be made with appropriate durable signage specified by PSE&G to alert operating personnel of a possible backfeed source.

   Cold sequence metering may be approved for duplicate service when a single revenue metering installation is utilized.

   If the isolating device is not rated for load break operation it must be interlocked with a load break device in such a way that the nonload break device cannot be operated when the load break device is in the closed position. Interlocks may consist of a substantial direct mechanical lock or be of the tumbler key interchange type. Electrical interlocks will require specific review.

7. Primary service cable size will be determined by PSE&G. Five inch conduit shall be installed by the customer to accept the service cables which will be installed by PSE&G. In addition, a spare conduit is recommended. Larger size conduits and/or manholes may be required due to the cable size, length of run, or number and degrees of bends in the conduit. Special provisions may be required to facilitate cable pulling. Where PSE&G elects to install direct buried cable, the customer shall provide the trench and appropriate backfill. For additional information refer to the latest PSE&G Information and Requirements for Electric Service book, Exhibit 7.

8. Stress cones or cable terminators will be necessary depending upon cable type and size. A minimum of 42 in. of vertical clearance from the end of the service conduit to the point of connection at the customer's service entrance equipment is required to install stress cones and cable terminators. Cable supports may be required. Bottom entry cable is preferred. Bus stabs into the cable compartment may be required to permit vertical connection of cables.

9. Clearances for switchgear from walls or other obstructions shall be as required by the latest edition of the National Electrical Code.

7. Metal-Clad or Metal-Enclosed Switchgear

The entire assembly shall conform to the latest published ANSI, NEMA, and IEEE Standards as a minimum and be tested in conformance therewith.

Refer to Section 4. for revenue metering requirements.

Operating handles shall be externally mounted, and should be non-removable in the closed position and have provisions for padlocking in both the open and closed positions. Switch position indications shall be plainly visible.

Doors giving access to power fuses and/or interrupter switches shall be mechanically or key interlocked to prevent opening the door if the switch is closed or closing the switch if the door is open.

All compartments shall be identified with an engraved plastic or metal tag on the exterior.

Remote breaker control switches should be installed to operate breakers from external location.

8. Service Circuit Breaker

The service circuit breaker can function as:

1. A load disconnecting device for normal operation.
2. An automatic disconnecting device to remove from the PSE&G system any short circuits within the customer's installation, which are not satisfactorily removed by other devices.

Where a circuit breaker is used as a service entrance interrupting device, automatic tripping must be specifically reviewed by PSE&G and provided by the customer in accordance with the following:

1. For a 4 kV breaker, it is recommended that automatic tripping be provided by the use of acceptable microprocessor-based time-delay overcurrent relays with a very inverse characteristic and with an instantaneous element, which provide both time and current selection, particularly when the customer requires several steps of fault selection to the point of utilization.
2. For a 13 kV breaker, automatic tripping must be provided by using acceptable microprocessor-based time-delay overcurrent relays with an extremely inverse characteristic and with an instantaneous element.
3. Where a DC tripping scheme is used, the circuit breaker shall be equipped with a DC trip coil rated at not less than 12 V and energized from a 40 A-hour storage battery of not less than 24 V equipped with a suitable automatic charger. A 12 V tripping source with a 12 V trip coil is not permitted because of the contact voltage drop. A monthly inspection of the battery is recommended to ensure proper operation of the equipment.
4. To actuate the automatic tripping scheme, the customer’s installation must include one current transformer for each phase. Where practicable, these should be installed on the supply side of the circuit breaker. For 4 kV or 13 kV service, current transformers should be 1200/5, five tap, multi-ratio. The rating of the CT’s, as specified in ANSI/IEEE C57.13 should be appropriate for the relaying equipment used. CT’s of C-100 accuracy class are recommended.

No form of tripping device, other than those given above, shall be used unless specifically reviewed by the PSE&G.

All trip coils must be easily disconnected for test. Where a direct-trip AC device is used, test connection facilities reviewed by the PSE&G must be provided to permit tripping tests to be made with sufficient safe working distance from energized primary equipment.

No device to provide closing power for a service circuit breaker shall be connected on the line side of the metering transformers.

Also see Section 3. paragraph 1 for drawings to be submitted to PSE&G for review.

Adequate relay test facilities must be provided by means of test switches such as the ABB FT-1 switch.

The microprocessor relay type selected for use must be approved by PSE&G for each individual installation.

PSE&G will review the relay settings and will witness the initial trip checks of these relays before the service can be energized.

All relays and associated equipment shall be maintained by the Customer.

9. Surge Arresters

Surge arresters shall be installed on customer's entrance equipment. They have to be connected to the PSE&G side of the customer's isolating switch and located in the entrance cable compartment. The primary leads from the arresters are to be terminated separately with a suitable connector such that the leads may be readily joined to or separated from the termination points to permit isolation of leads and arresters for the purpose of testing the cable. The arrester leads shall be terminated in such a position that isolation of leads and arresters can be accomplished without hazard to personnel from other equipment, which may be energized.

Surge Arresters shall be Intermediate Class and duty cycle rated 3 kV for installation on 4 kV systems and 10 kV on 13 kV systems.

10. More Than One Source

Where the customer's load can be supplied from more than one source, such as the customer's own generation or duplicate service from PSE&G, barriers shall be incorporated into the switchgear design so that when a supply or service cable is de-energized by PSE&G and the customer's isolating switch is open, there will be no energized equipment capable of being contacted in the service entrance cable compartment.

Additional requirements may be specified by PSE&G depending upon the customer's equipment and/or arrangement.

11. Mimic Bus

It is recommended that a Mimic Bus or schematic representation illustrating the arrangement of the devices and apparatus contained in the cubicles comprising the switchgear be displayed on the front panels.

12. Other Requirements

"Danger High Voltage" signs shall be installed as in accordance with applicable requirements of the NEC and the NESC in effect at the time of construction.

13. Animal Deterrent

It is required to mitigate interruptions and equipment damage resulting from animal intrusion into electric power supply substation by using the means of animal deterrent recommended by the latest IEEE Guide 1264.

14. Arc Flash Hazard Calculation Study

It is required to perform Arc Flash Hazard Calculation Study in accordance with the latest IEEE STD 1584 and NFPA 70E and have it reviewed by PSE&G.

The arc-flash calculation study report should include the following information as a minimum:

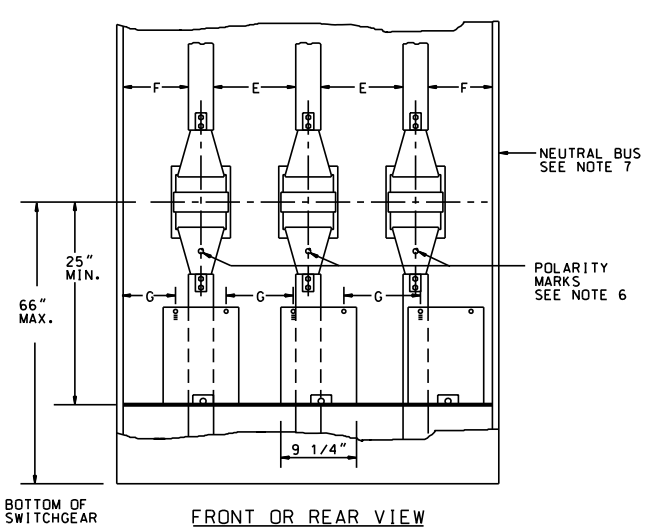
1. Executive summary.
2. Narrative describing the scope and results of the study and the methodology used.
3. Description of power system modes of operation and details of the scenarios evaluated.
4. Results of short-circuit analysis listing equipment that is applied above its short-circuit current rating, and recommendations if appropriate.
5. Results and recommendations of time-current analysis, including time-current curves.
6. Arc-flash spreadsheet: A tabulated form including a listing of all equipment that had arc-flash hazard values calculated as part of the study. This listing should include the calculated three-phase bolted fault current, arcing fault current, identity of overcurrent protection device with its opening time, working distance, arc-flash protection boundary, and incident energy.
7. A tabulated form showing the worst case incident energy calculated for each bus and the associated mode of power system operation. Report may include incident energy calculated for each bus for each mode of operation.

Note This may be a part of the arc-flash spreadsheet.

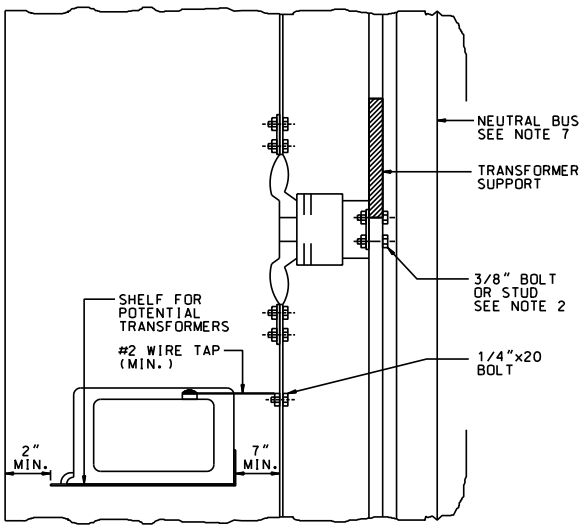
8. Documentation of all study input data, including utility available fault currents; cable sizes, types, and lengths; motor data; breaker types and settings; fuse sizes and types; etc.
9. Up-to-date single-line diagram(s).
10. Documentation of the software manufacturer, exact version of software used, and configuration settings used to do the study.
11. List of assumptions that were made for cable lengths, CT ratios, transformer impedances, etc.
12. Additional information may be included where it enhances understanding of the electrical system and arc-flash study.
13. Advisory statements covering the impact of changes to the power system, including overcurrent protective devices or system operation and potential impact on arc-flash incident energies.

15. Standard Layouts

Figure 3.1: Mounting Dimensions for Current and Potential Transformers in Compartment Bar Type 75 A to 800 A 4,150 V and 13,200 V



FRONT OR REAR VIEW



SIDE VIEW

Figure 3.1.1

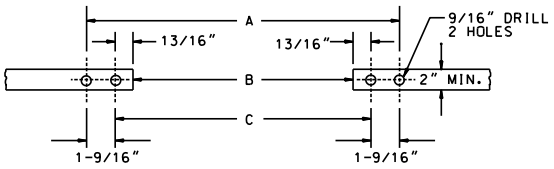


Figure 3.1.2

BUS BAR DRILLING DIMENSIONS

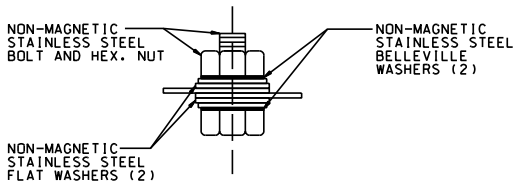
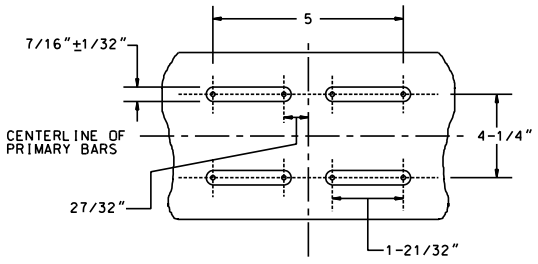


Figure 3.1.3

DIMENSIONS IN INCHES

KV	A	B	C	D	E	F	G
4,150	14	9	10-7/8	5-3/4	4-1/2 MIN.	3" MIN.	3" MIN.
13,200	22	7-1/4	18-7/8	9	7-1/2 MIN.	5" MIN.	5" MIN.

FOR NOTES REFER TO SPECIFICATIONS FOR POTENTIAL AND CURRENT TRANSFORMERS IN CUBICLE IN THE METER AND WIRING MANUAL.



STANDARD BASE DIMENSIONS FOR CURRENT TRANSFORMER

PEPP-001945-01-0309

Specifications for Potential and Current Transformers in Compartment (Notes for Figure 3.1)

1. Metering transformer supporting members shall provide rigid anchorage for the transformer bases.
2. Four 3/8 in. mounting studs shall be provided for each current transformer. They shall be inserted from the rear of the transformer supports, welded or threaded into place, and dimensioned as shown in side view.
3. The bases of all metering transformers shall be solidly bonded to the grounding bus with bus bars or #4 AWG (minimum) copper wire.
4. The customer shall supply 1/2 in. non-magnetic, stainless steel nuts, bolts and washers as follows for connecting the primary of each current transformer:
   a. Copper Bus Bars – four nuts and bolts, eight washers and eight Belleville Washers 17/32 in. I.D. - 1-3/8 in. O.D. tensile strength 5,000 lb.
   b. Aluminum Bus Bars – four nuts and bolts, eight washers and eight Belleville Washers 17/32 in. I.D. - 1-3/8 in. O.D. tensile strength 5,000 lb.
5. If aluminum bus bars are to be connected to the current transformers, the following shall apply:
   a. When the areas of contact have been plated, be careful not to abrade or scratch the plating. Bolt together as in Figure 3.1.1 and Figure 3.1.3.
   b. When the areas of contact have not been plated, brush the contact areas with a stiff fine wire brush until they are smooth and clean. Apply a liberal coat of oxide-inhibiting compound. Wire brush again through the compound to remove the oxide film. Without removing the compound, bolt the two surfaces together as shown in Figure 3.1.3 using the lubricated bolts. Do not wipe away the compound that has been forced out of the joint.
   c. Tighten nuts until the Belleville washers flatten.
6. Polarity marks of current transformers shall face supply side of service.
7. The neutral bus shall be in the same compartment as the metering transformers and shall be located under or near hinged access door.
8. Primary leads for the potential transformers shall be #2 AWG copper wire (minimum) connected on the line side of current transformers. If the wire is not fully insulated, it must be installed on the approved insulators and/or shaped so as to provide proper clearances.
9. Bus anchorage shall be such that bars shall remain in position when current transformers are removed.
10. Secondary leads for the meter transformers shall be insulated for 600 V minimum and shall be supported and shaped to maintain phase-to-ground clearances between the leads and primary conductors.

Figure 3.2: Customer's Substation – Grounding Details

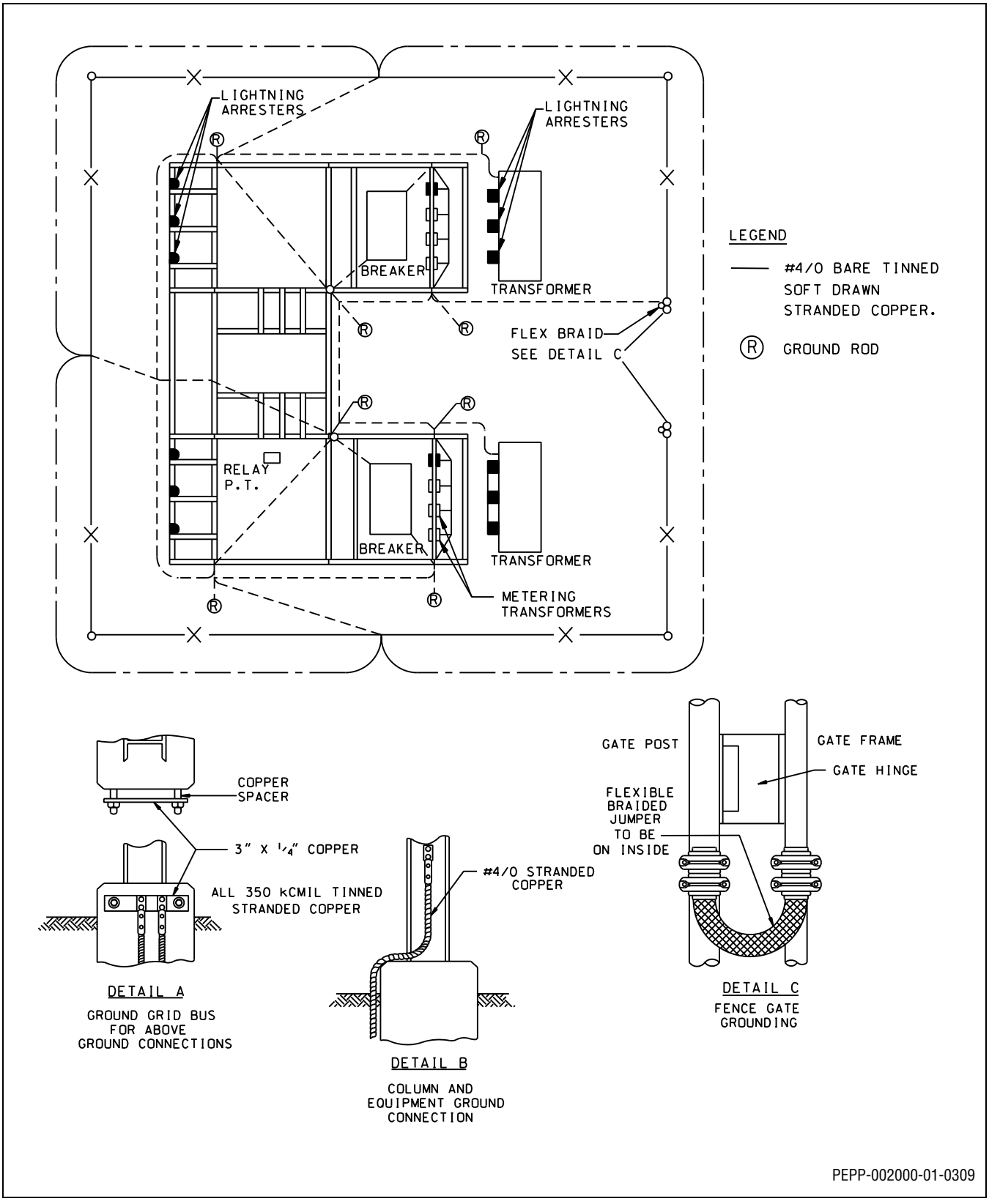


Figure 3.2 Notes:

1. The main station ground grid is to be made of # 4/0 AWG Bare Tinned Stranded Copper (minimum).
2. Connections between the ground grid bus, structure, and various pieces of apparatus are to be direct copper connections of # 4/0 AWG Stranded or 2 in. x 1/4 in. Bar (minimum).
3. Ground connectors may be of the welded, bolted or compression type. Bolted connectors must utilize at least two independent bolts or two U-Bolts.
4. Where connectors are in direct contact with structural steel members surfaces, the surface of the connectors shall be tinned.