CHAPTER 4

Commercial Metering

This chapter contains information on the metering equipment required for connection of a new or upgraded commercial electric service. Call our Meter department at (360) 992-8854 regarding questions about commercial electric service metering.

The following outlines the primary areas of interest in this chapter and provides page numbers for quick reference:

General commercial metering

The following information applies to all metering systems installed for Clark Public Utilities' commercial customers.

Responsibilities

Clark Public Utilities

The utility is responsible for furnishing, installing and maintaining the following commercial metering equipment:

- ***Self-contained*** and transformer-rated meters.
- ***Current transformers (CTs)*** and test switch.
- ***Potential (voltage) transformers (PTs)***.
- Associated low-voltage CT meter system wiring.

Only qualified and authorized Clark Public Utilities personnel shall unlock, remove, install and seal meters.

Commercial customer

The customer is responsible for providing, installing and maintaining the following commercial meter equipment:

- Meter base.
- Current transformer (CT) enclosure.
- Switchgear and cabinet.
- Connectors and insulating covers.
- Service conductors.
- Metering conduit between CT enclosure and meter base.
- Protection equipment.
- Equipment grounds.

Commercial meter bases

The following general requirements apply to all commercial meter bases called for by the utility and installed by the customer:

- Ring-type socket.
- Rated for exterior use and rain tight.
- ***Underwriters Laboratories (UL)*** rated.
- All unused openings in the enclosure are tightly sealed from the inside of the socket.
- Installed level, plumb and fastened securely to a rigid structure.

Grounding requirements

All meter equipment including bases, enclosures, switchgear and conduit shall be bonded and grounded in accordance with the NEC and the local governing office.

Service inspection and approval

The customer is responsible for securing the electrical wiring permit and requesting an electrical inspection. Once the metering equipment is installed, the State of Washington, or city with jurisdiction, requires that the installation pass an electrical inspection ***prior*** to being energized by the utility. Clark Public Utilities will not connect a new or upgraded commercial electric service without notification of approval from the local governing office.

Additional customer equipment

Customer-owned load monitoring equipment and current-limiting fuses are not allowed inside a meter base, CT enclosure or distribution transformer. Clark Public Utilities requires all customer-owned equipment to be installed on the load side of the meter system, inside the customer's service panel or a separate enclosure between the meter base and panel.

Protection

A safety socket style self-contained meter base is required for all three-phase commercial services and any single-phase 480 volt service, 200 amps or less. Single-phase self-contained metering installed inside an approved meter enclosure also requires a safety socket. Manual link bypass meter bases are acceptable for commercial single-phase services less than 480 volts. See ***Meter socket types*** section on page 29 of this chapter for additional information on safety socket and manual link bypass meter bases.

CT metered installations require a test switch provision mounted inside the meter base.

The ampacity rating of the main circuit breaker, or safety switch, cannot exceed the maximum rating on the meter base. Three-phase services, with continuous ampacity exceeding 200 amps, require CT metering.

All meter equipment is installed ahead of the main disconnect unless otherwise agreed upon by Clark Public Utilities.

Meter equipment installed in areas accessible to vehicular traffic may require the installation of guard posts. The customer is responsible for providing, installing and maintaining these posts when required by a utility representative. See ***Guard post installation*** section and ***Figure 5*** on pages 19 and 20 of this handbook for requirements.

Meter equipment location

Clark Public Utilities currently requires all meter bases and associated equipment (CT enclosures, switchgear, etc.) be attached to the outside of a permanent, fixed structure.

Customer-owned commercial meter systems must be installed in a location that allows 24-hour access to utility personnel for meter reading, testing and maintenance. This location is to remain free of obstruction, vibration, corrosives and abnormal temperature fluctuation. All meter equipment locations are subject to approval by a Clark Public Utilities representative prior to installation.

Approved commercial meter equipment locations:

- Outside of the structure being served.
- On the ground floor, with the center of the meter 5 to 6 feet above finished grade (5 feet preferred).
- In an area that is ***not*** subject to being fenced-in or enclosed.

NOTE: Utility-provided ***lockboxes*** or hasp locks may be required to allow utility personnel 24-hour access to metering equipment.

These locations allow Clark Public Utilities to:

- Read the meter in a cost-effective manner.
- Maintain the meter efficiently.
- Disconnect the service in case of emergency.

Do not locate meter equipment:

- On poles owned by Clark Public Utilities.
- On customer-owned poles or posts without prior utility approval.
- Where shrubs or landscaping could obstruct access.
- Above a stairway or window well.
- Inside a breezeway or fenced area.
- On a mobile structure such as a trailer.
- In a drive thru where vehicular traffic could obstruct access.

Metering installed in a vehicle traffic area will require guard posts. See guard post requirements listed on pages 19 and 20 for additional information.

Electrical equipment rooms

Clark Public Utilities requires all commercial meter equipment to be mounted on the outside of the structure containing the load being served. In certain situations the commercial structure may have an electrical equipment room. These installations require prior approval from a utility representative ***before*** construction begins and must provide 24-hour access to all meter equipment, without the need to call for an appointment.

To maintain safety and allow maintenance of metering equipment, Clark Public Utilities has the following requirements for electrical equipment rooms:

- Utility approval of the electrical equipment room design prior to construction.
- 24-hour access to all utility-maintained equipment.

- An access door that leads directly to the outside with the door opening outward.
- A minimum door size of 2 feet 8 inches by 6 feet 8 inches.
- Signage on the exterior of the door stating "Electrical Room." The utility will also attach a small Clark Public Utilities identifying sticker.
- Well lit inside the room and the entrance.
- Contains electrical and communications equipment only, no storage of other items.
- Maintain proper working space and clearances around all metering equipment ***(Figures 6 and 7)***.
- A lockbox containing the access key, card key or door combination.

Lockbox requirements

Clark Public Utilities will provide and install the required lockbox for meter systems installed in an electrical equipment room. Lockboxes installed for access to electrical equipment rooms have the following requirements:

- Visible from and installed within 10 feet of the equipment room door.
- Key, card key or door combination provided by the customer to the Meter department, prior to any meters being set.
- Door combinations must be engraved on a hard plastic or metal tag no larger than 2 inches long by 1 inch in height, with a 1/16 inch hole punched in the top left corner for hanging.
- If equipment room door locks are changed, it is the customer's responsibility to contact the utility as soon as possible to coordinate the exchange of new keys, card keys or combinations.

Clearance requirements for meter installations

Meter clearances are measured from the center of the meter socket or from the center of the face of the meter. The customer is required to provide and maintain these clearances at all times. The following clearances are required for all commercial meters:

- The center of the meter shall be between 5 and 6 feet above finished grade (5 feet preferred).
- A clear working space, 3 feet deep ***(Figure 6)*** in front of the meter, CT enclosure and switchgear. This space is to be kept clear of any obstructions including landscaping.
- There is a 10-inch minimum horizontal and vertical clearance between the center of the electric meter and any obstruction ***(Figure 6)***.
- If a recessed meter base is installed, a 10-inch radial clearance is required from the center of the meter to the closest portion of the wall ***(Figures 6 and 7)***.
- If a flush or recessed meter base is installed, the siding or finished surface of the structure shall not overlap the cover of the meter base.

- The opening around a flush or recessed meter base must extend a minimum of 3 inches ***(Figure 7)***.
- Meters located near natural gas piping require a minimum of 3 feet of clearance.

Meter base installation tips

When installing a commercial meter base the following mechanical checks will ensure the installation runs as smoothly as possible. After installing the meter base, verify:

- Conductors are not under undue strain on the terminals.
- Terminals are rated for the size and type of conductor used.
- Strands have not been removed to make conductors fit under-sized terminals.

Figure 6 Meter equipment minimum work clearances

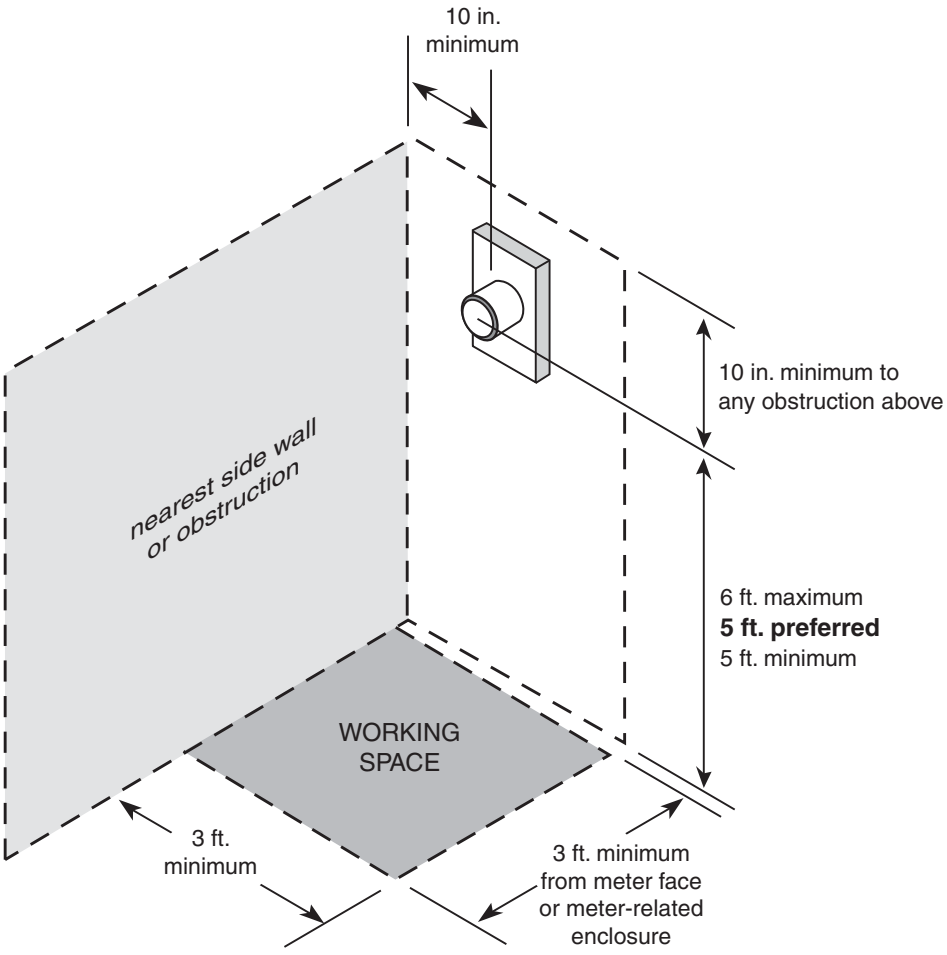
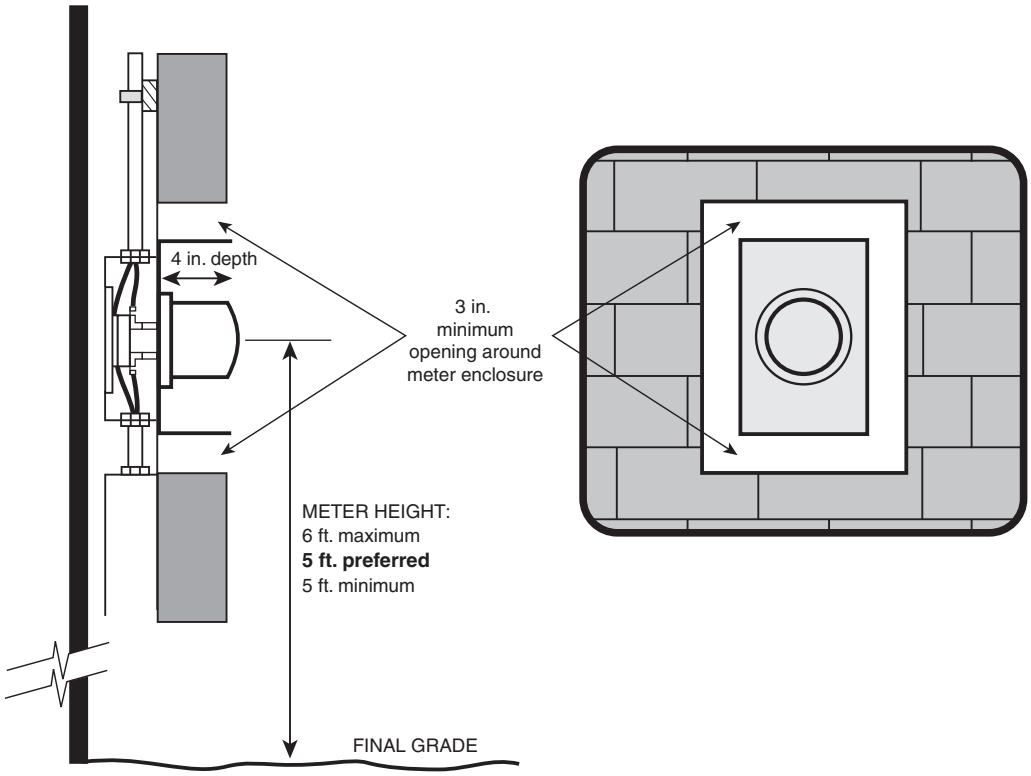


Figure 7 Recessed meter base detail



Meter socket types

The table located on page 30 ***(Table 5)*** provides useful information on the requirements of the most common commercial meter sockets accepted by Clark Public Utilities.

Self-contained metering systems

Self-contained, or direct connect meters, carry full load current and connect directly across full line voltage. A safety socket or bypass meter socket is required for all self-contained commercial meter systems.

Self-contained metering can be installed for the following services:

- Single-phase, up to 400 amps (320 amps continuous).
- Three-phase, up to 200 amps 120/208 or 120/240 volt with a maximum motor load of 60 hp.
- 277/480 volt services, up to 200 amps with a maximum motor load of 125 hp.

NOTE: Structures with loads greater than 320 amps of continuous current require CT metering.

Table 5 Commercial meter socket requirements

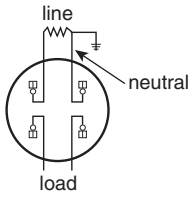
SC = Self-contained CT = Current transformer B-Line part numbers are for cross reference only.

Source Voltage	Ampacity	Meter Base	Reference B-Line Part Number or Equivalent	# of Terminals	Manual Block Bypass	Safety Socket	Test Switch Required	Meter Configuration Diagram
SINGLE-PHASE								
120 2 wire	0–100 amp	SC	U121314	4	Yes	No	No	A
120/240 3 wire	0–200 amp	SC	U264	4	Yes	No	No	B
	201 to 320 amp	SC	324N, 324NF	4	Yes	No	No	B
	Over 400 amp	CT	12146	6	n/a	n/a	Yes	CT rated
120/208 3 wire (network)	0–200 amp	SC	U264, U121315 (<100 amp)	5*	Yes**	No	No	C
	Over 200 amp	CT	12148	8	n/a	n/a	Yes	CT rated
THREE-PHASE								
120/208 4 wire wye	0–200 amp	SC	127TB	7	No	Yes	No	D
	Over 200 amp	CT	121413	13	n/a	n/a	Yes	CT rated
120/240 4 wire delta	0–200 amp	SC	127TB	7	No	Yes	No	E
	Over 200 amp	CT	121413	13	n/a	n/a	Yes	CT rated
277/480 4 wire wye	0–200 amp	SC	127TB	7	No	Yes	No	D
	Over 200 amp	CT	121413	13	n/a	n/a	Yes	CT rated

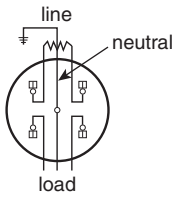
* 5th terminal is purchased from supplier separately

** House meters that are part of a residential meter pack do not require a manual bypass

Single-phase self-contained meter socket configurations



A



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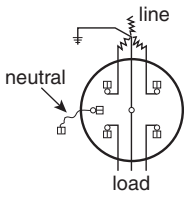

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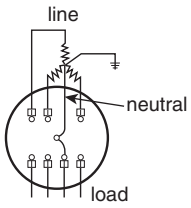
Three-phase self-contained meter socket configurations



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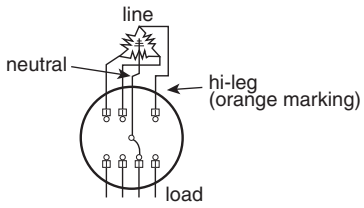

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Safety socket

A safety socket allows the utility to maintain self-contained metering systems without interrupting service to the commercial customer. The meter terminals are de-energized allowing utility personnel to safely perform routine meter maintenance. A safety socket style meter base is required for the following services:

- All commercial three-phase services.
- Single-phase 240/480 volt services (municipal lighting only).
- Temporary commercial services that are three-phase or 480 volt.
- Single-phase services with metering installed inside a meter enclosure. Contact Clark Public Utilities' Meter department for additional information on vandal-proof meter enclosures for commercial services.

NOTE: All 480 volt services, regardless of phase, require a safety socket.

Manual bypass

Manual bypass meter sockets also allow maintenance of self-contained metering equipment while maintaining service to the customer. Meter terminals are not de-energized when bypassed. This style of meter base is acceptable for lower voltage (less than 480 volts), single-phase commercial services only. A manual bypass meter socket is required for:

- All single-phase commercial services 240 volts or less.
- 120/208 volt single-phase commercial network meters.

NOTE: Single-phase services with metering installed inside a meter enclosure require a safety socket.

The following commercial metering exceptions do not require a manual bypass or safety socket style meter base:

- Single-phase commercial temporary services (120/240 or 120/208 voltages).
- House meter sockets included in a factory-built multifamily residential ***meter pack***.

Current transformer metering

Clark Public Utilities provides and installs the CTs, meter, test switch and associated wiring. The customer provides and installs any additional metering equipment beyond the ***point of delivery***. The location of CT metering equipment is subject to the approval of Clark Public Utilities. See ***Figure 8*** for meter and enclosure clearances.

Current transformer (CT) metering is required in the following situations:

- Three-phase service exceeding 200 amps.
- Single-phase service exceeding 400 amps (320 amps continuous).

NOTE: Services over 800 amps also require a switchboard.

The CT metering equipment installed by the customer shall meet the following general requirements:

- Securely mounted, plumb and level on the outside of the structure.
- Rain tight and NEMA 3R-rated.
- 6 feet maximum height to top of cabinet or center of meter.
- Grounding and bonding of both the meter base and CT enclosure in accordance with the NEC and local governing office.

In addition to the requirements previously listed the CT enclosure shall meet the following:

- Bottom of cabinet a minimum of 18 inches from finished grade or floor.
- Side opening, hinged door with sealing provisions.
- Factory-installed hinges located on the opposite side of the enclosure from where the ***meter socket*** is located.

Table 6 provides enclosure dimensions, based on phase and service size.

NOTE: A CT enclosure cannot be used as a junction box or bus gutter.

CT metering conduit

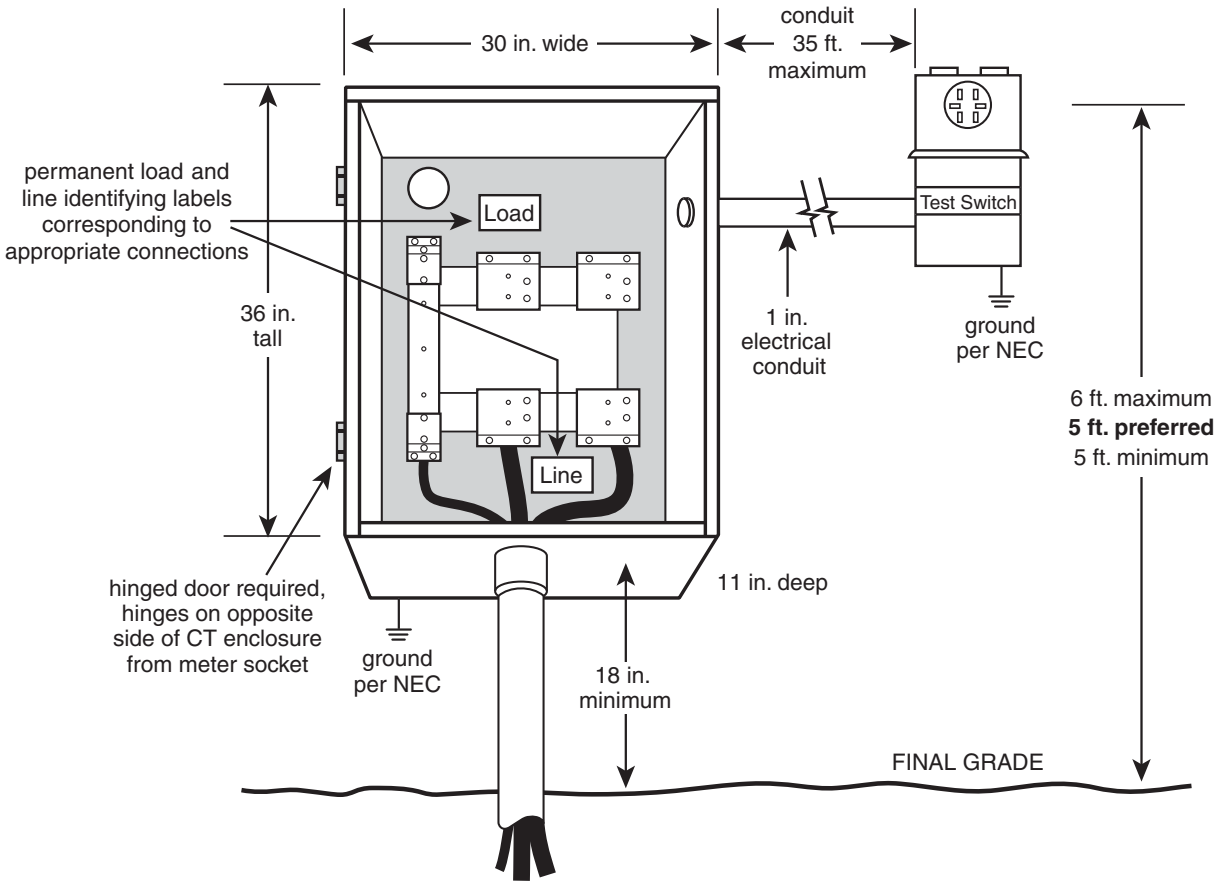
Customer-installed conduit between the meter base and CT enclosure requires:

- 1-inch minimum electrical conduit for single-phase services; 1¼-inch minimum for three-phase services.
- Schedule 80 PVC or rigid galvanized conduit. (Flex conduit is not acceptable.)
- Grounding bushings at both ends of the run if galvanized conduit is used.
- A maximum length of 35 feet (pull cord required for runs over 25 feet) between the enclosure and meter base.
- A continuous run, with no ***conduit bodies*** (LB joints, condulets, etc.).
- Conduit installed with no more than three 90-degree elbows in the total length (270 degrees total).
- Conduit entering the meter enclosure adjacent to the test switch (See ***Figure 8***).

Table 6 CT enclosure and mounting base specifications

Amperes	Phase	Dimensions (W" x H" x D")	CT mounting base
200–400 amps	Single-phase	24"x30"x11"	6019-HAL (lug lug)
401–800 amps	Single-phase	30"x36"x11"	6019-HEL (lug lug)
200–400 amps	Three-phase	30"x36"x11"	6067-HAL
401–800 amps	Three-phase	36"x48"x11"	6067-HEEL

Figure 8 Typical 401–800 amp single-phase current transformer (CT) metering



CT mounting base

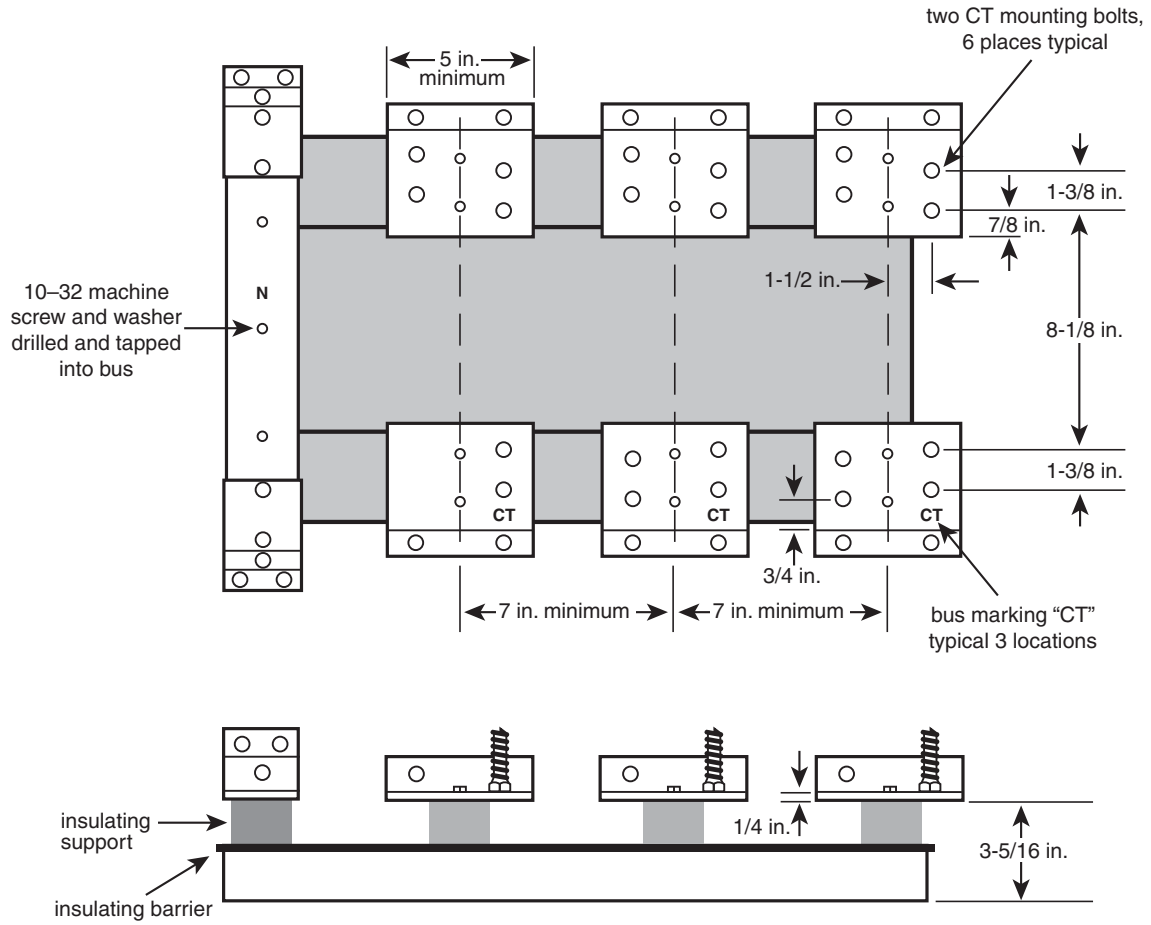
Installation requirements for current transformer mounting bases are as follows *(Figure 9)*:

- Mounting base is rated for a minimum of 50k amps fault current.
- Line and load side terminations require two bolts per connector and two bolts on the ***neutral*** bus.
- The customer furnishes all lugs and terminates both load and line side conductors to the bus.
- A 4-wire delta service requires orange marking of the high leg.

Switchboard metering

Switchboard metering is required for three-phase services over 800 amps. At the customer's option, this type of metering may be installed for services sized 201 to 800 amps. The customer-installed equipment must be EUSERC-approved.

Figure 9 Commercial three-phase CT mounting base



NOTE: For additional information see EUSERC drawing 329B.

All customer-installed switchboards require a:

- Current transformer (CT) mounting base.
- Service section.
- Set of bus bars/links.
- Panel(s).
- Meter base with provisions for a test switch.
- Means for locking the meter enclosure with independent 24-hour access to utility personnel.
- Concrete mounting pad.
- Case ground as required per the NEC.

NOTE: Customers requiring more than 480 volts of service will have primary metering. Ownership and maintenance agreements for primary metered services will be mutually agreed upon with Clark Public Utilities.

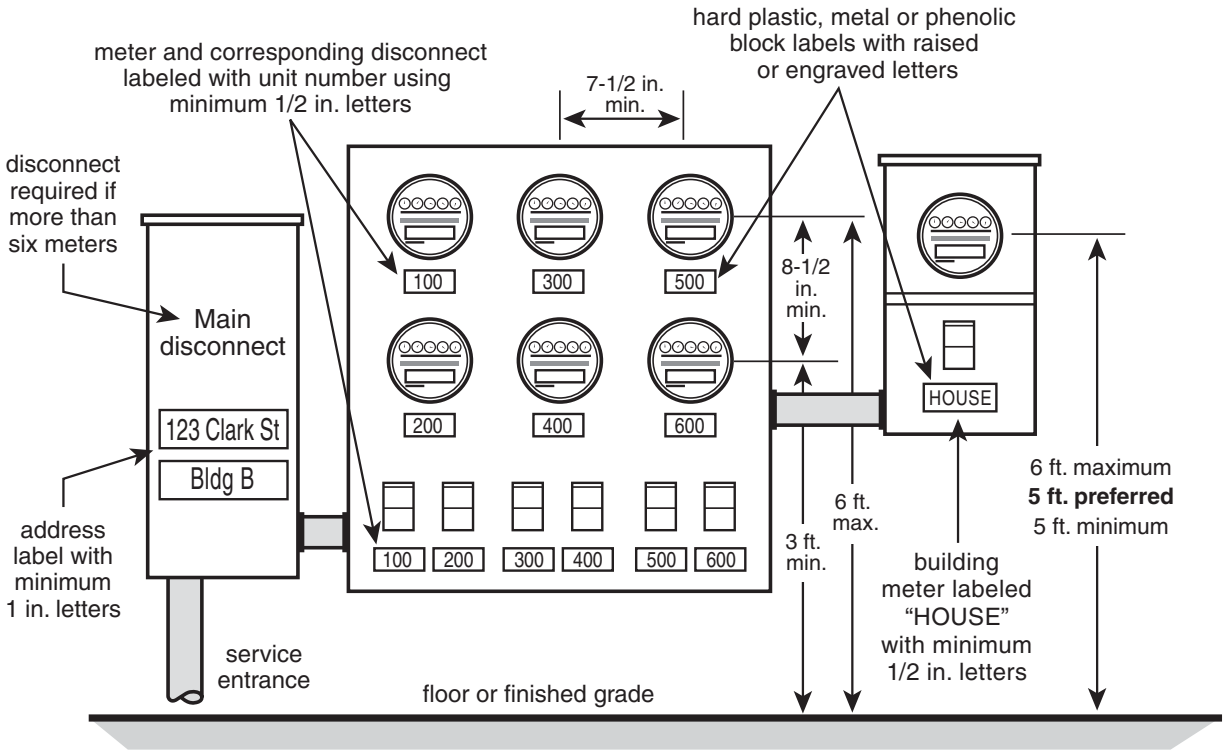
Multiple metered services

Commercial tenant spaces

Non-residential multiple meter installations such as ganged, modular and switchboard metering have the following requirements:

- Spacing to socket centers a minimum of 3 feet and a maximum of 6 feet above the finished grade or the floor of an approved equipment room (factory-built meter packs require meters installed at least 3 feet above the ground).
- Meter packs with more than six meters require a main disconnect per the NEC ***(Figure 10)***.
- All self-contained meter bases require a safety socket or a manual link bypass.
- Each metered service is permanently labeled. (See ***Multiple meter labeling*** section for additional information.)
- Panel covers must be secured prior to connection of the service.

Figure 10 Multiple meter socket detail



NOTE: See page 31 for meter base bypass requirements.

Residential multifamily

Multiple meter installations for residential services such as multifamily units or duplexes shall meet the following requirements prior to the utility connecting the service:

- Spacing to socket centers a minimum of 3 feet and a maximum of 6 feet above the finished grade or the floor of an approved equipment room (factory-built meter packs require meters installed at least 3 feet above the ground).
- Meter packs with more than six meters require a main disconnect per the NEC *(Figure 10)*.
- Meter bases cannot be used as junction boxes.
- Three-phase house service meters, seated in a separate meter base require a safety socket.
- Stand-alone single-phase house meter services require a manual block bypass socket.
- Each metered service is permanently labeled per Clark Public Utilities' design requirements. (See ***Multiple meter labeling*** section for additional information.)
- Panel covers must be secured prior to connection of the service.

Multiple meter labeling

Multiple meter installations require permanent labeling that identifies the unit and/or building address of the structure being served. The customer is responsible for ensuring that all meter bases, corresponding breakers, electrical panels, unit doors and the building's main disconnect are correctly labeled.

Label requirements

- Hard plastic, metal or ***phenolic block labels*** with raised or engraved letters are required. These types of labels are available at trophy and sign shops. ***NOTE:*** The use of label maker tape or permanent felt tip marker is not acceptable labeling.
- Meter equipment labels must correspond to permanent unit numbers attached to or next to corresponding unit doors.
- The main building (house) meter is labeled "HOUSE".
- Each electrical panel requires a label displaying the number of the unit it serves. Electrical panel labels may be affixed to the outside or the inside of the hinged panel door.
- A minimum of 1/2-inch height letters are required for the labels of the meter, corresponding breaker, electrical panel, and building (house) meter.
- A minimum of 1-inch height letters are required for the building's main disconnect label. If there are less than seven meters and no main disconnect, the address/building number label may be attached to the meter pack.
- Multi-unit structures with less than seven meters (duplex, triplex, etc.) also require corresponding labeling, as outlined above, at the meter, panel and unit door.

Building (house) meter service connect

Clark Public Utilities will not connect electrical service to the building (house) meter until permanent labeling has been completed at all required locations (meter base, corresponding breaker, electrical panel and main disconnect).

Individual unit meter service connect

Individual unit meters, their corresponding disconnect, electrical panel, and unit door require appropriate labeling at the time that meter is set. Proof of final addressing from the county or city with jurisdiction is required when permanent service connection to an individual unit is requested.

NOTE: Labeling of residential multifamily meter bases may have additional requirements. Contact your utility representative for more information.