

CHAPTER 4

METER INSTALLATIONS

There are three basic ways to measure electricity consumption:

1. Small and medium services are metered directly using direct-connect meters
2. Large services are metered using current transformers (CTs) and instrument-rated meters
3. Very large services are metered at switchboards housing CTs and instrument-rated meters

The customer provides and installs all equipment beyond the point of delivery: meter sockets, cabinets and enclosures, connection lugs, conduit, grounding, protection devices, and wiring from the socket to the load.

NAED provides and installs the meter, current transformers and transformer meter socket (where required), and local wiring associated with the meters and CTs.

METER TAMPERING

Massachusetts law provides penalties for tampering with electric equipment owned by an electric utility company. See Massachusetts General Laws, Chapter 164, Section 127 and 127A.

IDENTIFICATION OF METER SOCKETS

Installations consisting of more than one meter shall have each meter permanently identified for the part of the building supplied by that meter using a permanently engraved metal or hard plastic label which identifies the billing address.

NUMBER OF METERS

The number of meters required for a building is determined by the customer. The customer should note however, that a house meter shall be required in most multi-family houses or multi-tenant business locations where there is common space. Contact the local Building Inspectors office for applicability.

METER MOUNTING

Meter sockets shall be mounted plumb and secured firmly to supports. Where the meter socket is installed on a masonry wall, expansion bolts or anchors shall be used. Wooden plugs driven into holes in masonry are not acceptable.

By-PASSES AND JUMPERS

No contractor shall by-pass or install jumpers in any meter socket in the NAED system.

METER COVERS

The contractor shall install a transparent polycarbonate cover on all new meter sockets. NAED will install a meter once an application for service and an inspection have been received.

LOCATING THE METER

It is in the mutual interest of the customer and NAED to install the meter in a location suitable for meter reading, testing, repair, and removal. Meter locations are subject to approval by NAED. The customer must obtain a service request number prior to the start of any work.

The meter for single-family or multi-family residences must be located:

- ✓ Outside
- ✓ On the first floor
- ✓ On the front of the house, or on a side wall within 6 feet of the street side of the house
- ✓ If the meter is not located on the building, it must be on a meter pedestal, or on an overhead pole accessible by a bucket truck

The requirements listed above for residences also apply to meters for outbuildings such as detached garages, barns, shops, storage buildings, pump houses, and other structures that do not provide living spaces.

The location of a meter for a business must be:

- ✓ Convenient to NAED'S distribution system
- ✓ On the padmount transformer
- ✓ On the first floor, or the basement
- ✓ On the front one-third of the structure closest to normal public access, if the meter is outside. If the meter is inside, it must be in an electrical equipment room readily accessible by NAED

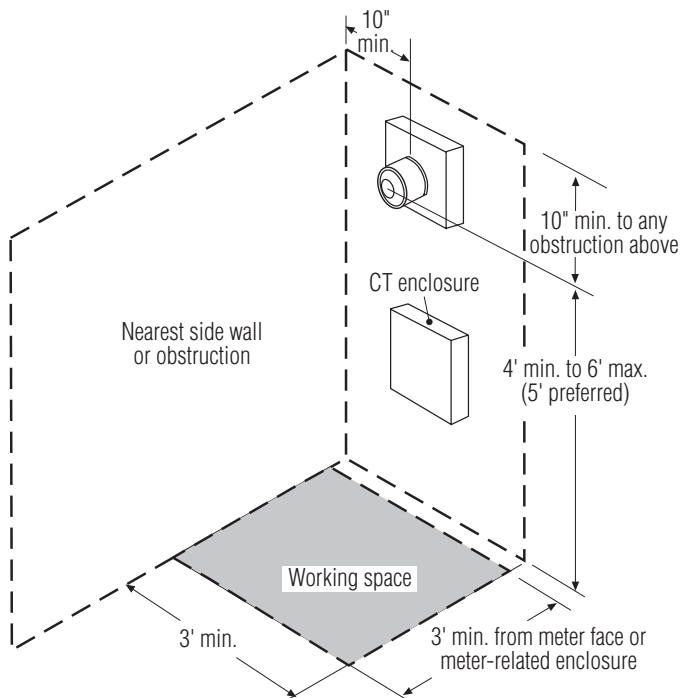
Do not locate meters here:

- ✓ Behind a fence or enclosure
- ✓ In areas subject to being fenced or enclosed such as patios, pool areas, decks, porches, and backyards
- ✓ Where shrubs or landscaping could obstruct access to the meter
- ✓ In an unsafe or inconvenient location, such as above a stairway or window well
- ✓ On a mobile structure such as a mobile home
- ✓ Outside bedrooms or bathrooms, and near doors and windows, to respect customer privacy.
In a place where safety could be compromised
- ✓ In a location with abnormal temperature, vibration, or corrosive air
- ✓ On a pole owned by NAED or another utility, unless approved by NAED

Electrical Equipment Rooms

Meters for business services may be located in an electrical room. Electrical equipment rooms must:

- Contain only power and communication equipment
- Not be used for storage
- Be accessible during normal business hours
- Be well lit
- Be accessible through a door that opens directly to the outside, or with prior approval by NAED, opens directly to the lobby of the building's main entrance. If the facility could be locked during normal business hours (such as a school, church, or meeting hall), the electrical equipment room door must open directly to the outside. The door must be at least 2 feet 8 inches wide and 6 feet 8 inches high, and open outward. The exterior of the door must have a sign saying "Electrical Room." The customer must supply a key to the door.

CLEARANCES AROUND THE METER

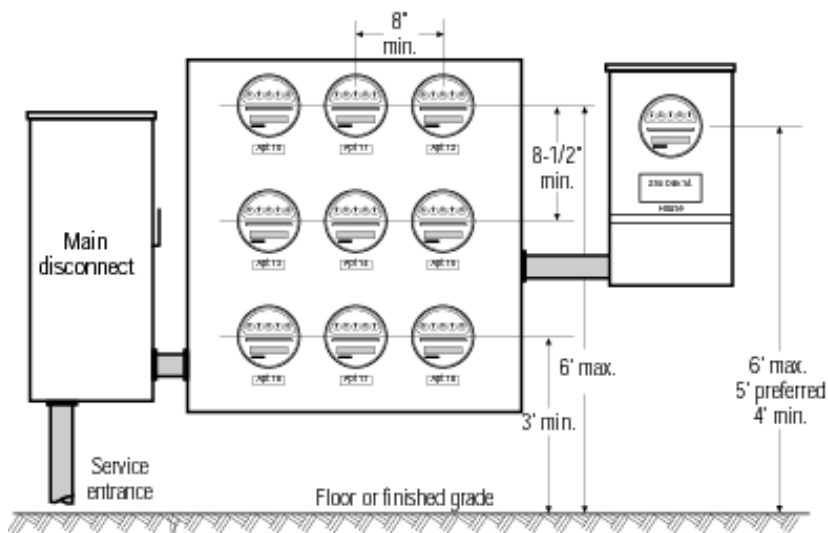
Meter clearances are measured from the center of the meter socket, or from the center of the face of the meter.

Install the meter socket between 4 feet and 6 feet above finished grade (except meter pedestals). A height of 5 feet is preferred.

Keep a clear working space 3 feet square, in front of the meter. This space must be permanently free of all obstructions, including landscaping.

Allow 3 feet of clearance from a gas meter, and 3 feet from windows or doors for customer privacy.

INSTALLATION FOR AN APARTMENT BUILDING

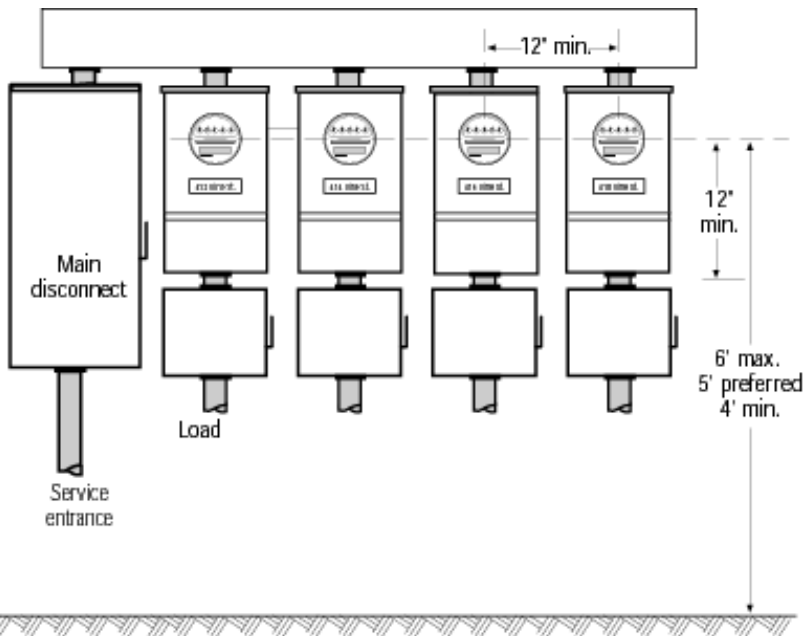


A main disconnect is required for all multiple meter installations

House meter sockets require a manual bypass

A main breaker or switch may be required at each meter to conform to the National Electric Code.

INSTALLATION FOR AN OFFICE/COMMERCIAL BUILDING






This is a typical multiple-meter installation for services of 400 amps or less. A main disconnect is always required.

A manual bypass is required for all commercial meters.



The clearances shown for this installation also apply to factory-built multiple meter panels, except meters must be at least 3 feet above the floor.

METER SOCKETS

Meter sockets come in five configurations. The services used with each type are shown here.

Socket	Voltage	Current	Comment
For single-phase circuits			
	120/240V, 3-wire	Up to 200 amps	Direct-connect socket 2S
	120/208V, 3-wire	Up to 400 amps	Direct-connect socket 12S
	120/240V, 3-wire	201-400 amps	Direct-connect 320A socket 2S

For three-phase circuits

	120/208V, 4-wire 120/240V, 4-wire 277/480V, 4-wire	Up to 400 amps	Direct-connect socket 16S
	120/208V, 4-wire 120/240V, 4-wire 277/480V, 4-wire	Above 400 amps	With CT's 9S

GENERAL REQUIREMENTS FOR METER SOCKETS

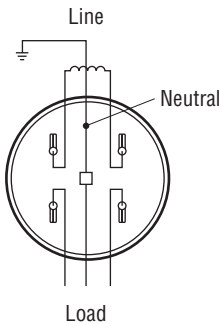
Meter sockets must be:

- Ring-type, to accept a meter sealing ring
- Rated NEMA 3R - for exterior use and raintight
- Installed level, plumb, and fastened securely to a rigid structure
- All unused openings in the enclosure, closed with plugs and secured tightly from the inside
- If live lines are installed, covered and sealed with a transparent cover
- Not jumpered to provide power
- Acceptable to NAED and Underwriters Laboratories (UL)

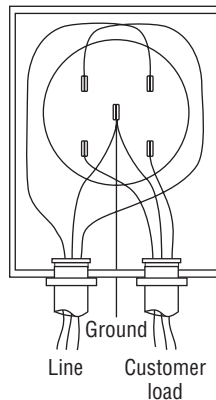
Sockets for Residential and Temporary Services

Most residential services, and all temporary services, use a socket with four jaws and a ground terminal.

Overhead service



Underground service



GROUNDING A METER SOCKET

Grounding the meter socket protects personnel and equipment in the event of an external line surge, lightning strike, or accidental contact between phase and neutral conductors.

Where the meter socket is installed on the line side (hot sequence) of the service disconnecting means the socket shall be grounded by bonding to the grounded (neutral) conductor. Where the meter socket is installed on the load side (cold sequence) of the service disconnecting means the socket shall be grounded by means of an equipment grounding conductor. Above all, follow the requirements of the NEC, Section 230 and 250.

METER INSTALLATION TIPS

Cable Runs

- Metered circuits and un-metered circuits must not be intermixed in raceways or enclosures, except in special situations approved by NAED.
- Customer equipment is not allowed inside a meter enclosure or CT cabinet.
- Customer load monitoring equipment, if installed, must be on the load side of the meter.
- Line-side conductors are connected to the top terminals of the meter socket, load-side conductors are connected to the bottom terminals of the meter socket.

- After the installation is complete, make these mechanical checks: Conductors are not under undue strain on their terminals, connections are tight, terminals are rated for the size of conductor used, and strands have not been removed to make conductors fit under-sized terminals.

Protection

- All residential services above 200 amperes and all business services require a manual bypass that meets the following requirements:
 - ✓ Have single handle operated mechanism
 - ✓ The non-bypassed, in service position of the operating mechanism must be visible when the meter is installed
 - ✓ It must not be possible to replace the meter socket cover when the operating mechanism handle is in the bypass position
 - ✓ All sockets with bypasses rated 200 amperes or more shall have a mechanism which locks the meter blades in the socket jaws
- A safety socket is required for all 480-volt services.
- The ampacity rating of the main circuit breaker, or safety switch, must not exceed the maximum rating of the meter socket. For three-phase services, if the marked continuous ampacity exceeds 320 amperes, the customer must install CT metering.
- All service equipment must be metered ahead of the disconnect switch, except in special situations approved by NAED.

- Current limiting fuses, which protect the customer's electrical system from excessive current, must be located in the customer's service panel or in a separate enclosure between the socket and the panel.
- When metering equipment is installed in a location where it might be struck by a vehicle, the customer must install and maintain protection for NAED owned equipment.

DIRECT-CONNECT METERS

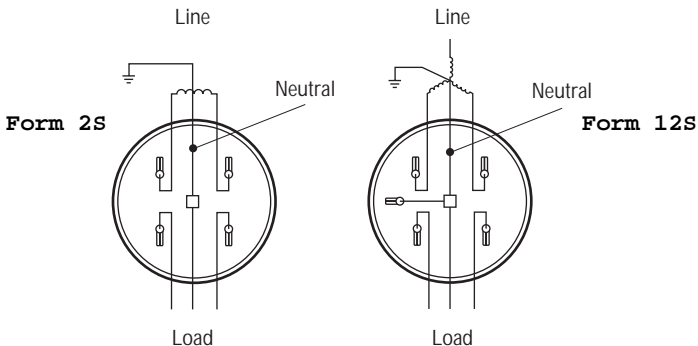
Direct-connect meters carry full load current and connect directly across full line voltage. Direct-connect meters are also called self-contained meters. Direct-connect, socket-type meters are installed on these services:

- Single-phase, up to 400 amps (320A continuous)
- Three-phase, up to 400 amps (320A continuous). Services larger than these are metered using instrument-rated meters with current transformers.

SERVICES METERED USING DIRECT-CONNECT METERS

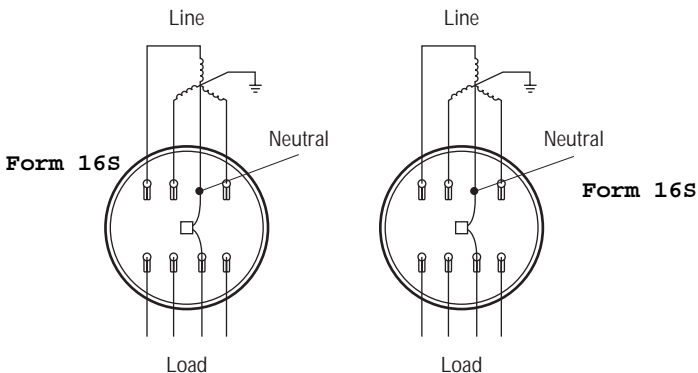
Services metered by direct-connect meters, are illustrated here.

For single-phase services:



120/240V 3-Wire 120/208V 3-Wire network

For three-phase services:



120/208V 4-Wire wye 277/480V 4-Wire wye

CURRENT TRANSFORMER METERING

Current transformers are used with instrument-rated meters, to meter three-phase services greater than 400 amps (320 amps continuous). Smaller services use direct-connect metering.

The preferred location of current transformers will be at the secondary terminals of the transformer when serving a single customer.

Current Transformer Cabinet

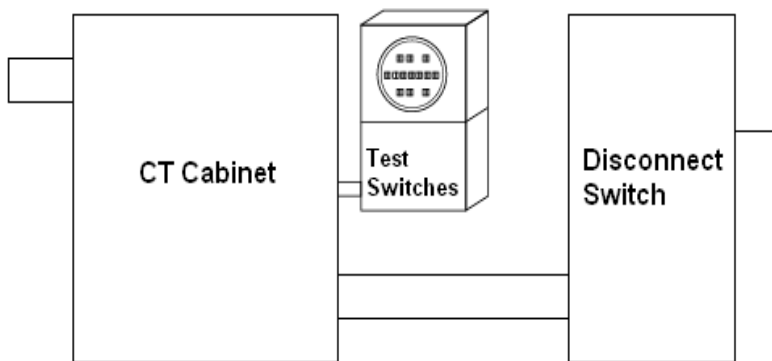
Where necessary the customer shall furnish and install a UL listed, steel, weather tight, NEMA 3R rated, CT cabinet to NAED specifications. The cabinet is to have a side-hinged, sealable door. When open, the door must not block a safe exit. In no case shall the cabinet be smaller than 36"x36"x10".

The top of the cabinet must be no higher than 7 feet above the floor, and the bottom of the cabinet must be at least 6 inches above the floor. The location of the CT cabinet is subject to the approval of NAED.

The CT cabinet contains only the main service conductors. A maximum of four main service conductors may be served from the load side of each termination bolt, as long as the lugs are not stacked and do not restrict mounting the CTs. Use "stair step" lugs if more than two conductors are terminated at a CT. Line side connections to other meters shall not be made in the CT cabinet.

Meter Socket, Enclosure, and Conduit

Sockets with provisions for test switches will be furnished by NAED and installed by the customer. Meter test switches will be furnished and installed by NAED. A 1¼" conduit of rigid steel, IMC, EMT or schedule 40 PVC shall be furnished and installed by the customer between the CT cabinet and the meter socket. Flex conduit is not permitted. The distance between the meter socket enclosure and the CT cabinet is not less than 10 inches and not more than 35 feet. Distances greater than 5 feet require the Customer install a pull string. Secondary metering conductors will be furnished and installed by NAED.



SWITCHBOARD METERING

The switchboard will include the switchboard service section, current transformer (CT) mounting base, meter socket, provisions for a test switch, and means for locking the meter enclosure with independent access by NAED. The customer must submit one set of drawings to NAED for approval, prior to shipment of the switchboard from the manufacturer.

The point of delivery must be no more than 5 feet vertical or horizontal inside the building from the point of entrance. Locate the metering compartment on the supply side of the main switch or breaker, with the CTs in a CT compartment. The compartment shall have a barrier that physically isolates the CT's from all other equipment. The meter socket and test switch may be mounted on the CT compartment's hinged cover, or located remotely. The space below this compartment's barrier may be used as the main switch (breaker) compartment, or a load distribution compartment, or a bottom-fed terminating pull section.

NAED will own, provide, and install the meter and test switch.

CTs may be installed either by the customer or the NAED. NAED is responsible for the wiring between the CTs and the meter.

Mount each socket on the switchboard, or remotely, and connect it to the switchboard with approved conduit.

Switchboard Meter Installation

A typical switchboard meter installation is shown below, with three options for locating the meter:

- Remotely mounted
- Flush with the panel
- Surface-mounted on the face of the panel

