Eastern Maine Electric Cooperative

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Eastern Maine Electric Cooperative New Electric Service Installation Manual

Guide to install electrical services in the Eastern Maine Electric Cooperative Territory

F I R S T E D I T I O N

This edition supersedes all other drawings and specifications supplied by Eastern Maine Electric Cooperative with respect to service installations prior to December 1, 2017.

First edition, First Printing: December 1 2017.

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Purpose of this Document

This document is to be used as a guide in the in the installation of new electric service to Eastern Maine Electric Cooperatives' members. The intention is to give standard drawings and guidelines for the safe installation for standard residential services. It is the responsibility of the homeowner to obtain the properly trained and licensed personnel that is suited for the task that it is to be completed. These requirements do not replace the regulations of appropriate State, County or Municipal authorities having jurisdiction or the National Electrical Code (NEC) or the National Electrical Safety Code (NESC). The booklet is not intended to address all possible situations. This is not to be considered a do it yourself handbook and EMEC takes no liabilities for the customer's wiring of the individuals premises, equipment or equipment operation.

CHAPTER 1 Introduction

Installing new electric service is a joint project between the customer and Eastern Maine Electric Cooperative (EMEC). EMEC is responsible for bringing power to the site, for installing the meter in the socket provided by the customer, and for energizing the service. The customer is responsible for obtaining permits and inspections, providing the overhead path or underground trench conduit and wire, and for installing the equipment at the service entrance.

Prior to any service connection the customer needs to contact EMEC (207) 454-7555 option 5 **(New Service)** and schedule a Staking Engineer to review all options available to the customer. It is at this time all fees, permits and right of way issues can be discussed and reviewed with the engineer.

These specifications are based on and supplementary to the latest edition of the National Electrical Code (NEC) issued by the National Fire Protection Association, and are not intended to conflict with the NEC or municipal and state ordinances. The NEC is hereby made a part of these requirements by reference. Each customer is responsible for having all wiring installed in accordance with the NEC and the requirements of any local inspection authority, and maintained in a safe condition. The local or state electrical inspector is the "authority having jurisdiction" and is, therefore, responsible for interpretation and enforcement of the NEC.

Permanent Service

Permanent service is defined as the long term service to the dwelling, garage or other permanent facility to be served by EMEC. Voltage for permanent services may be single phase 120/240 volts or three phase voltages (120/208 or 277/480), with exceptions for special situations. Services up to 400 amps may be metered directly. Services that require more than 400 amps will have CT rated metering and will be

dealt with case by case.

Current Rating	Typical Use	Comment
100 amps	Small & Medium	Very common service
200 amps	Large Homes/ Small Commercial	A common service
400 amps	Medium Commercial	Typical for small businesses
>400 amps	Large Commercial	Larger industrial

Table 1-1. Typical services.

Temporary Service

Temporary service is defined as electric service to a site for less one year or no longer than the term of construction, whichever is shorter. The most common use of temporary service is to deliver power during the construction phase of a project. When the project is complete, the temporary service is replaced by permanent service.

Temporary services are usually 120/240 volts, single-phase, 100 or 200 amperes. This service does require a state electrical permit.

Permits

Permits are the responsibility of the customer to obtain. In the majority of cases electrical permits are obtained from the state through a Maine State licensed electrical contractor. Should a homeowner decide to do their own work they must obtain applicable permits through the Maine State Electrical Inspector. Information from the state may be obtained at the follow website: http://www.maine.gov/pfr/professionallicensing/professions/electricians/permit.html.

Other permits may apply, which may be necessary to comply with each town or state ordinance as applicable to the individual location.

CHAPTER 2 Overhead Service

Prior to any service connection the customer needs to contact EMEC (207)454-7555 option 5 (New Service) and schedule a Staking Engineer to review all options available to the customer. It is at this time all fees, permits and right of way issues can be discussed and reviewed with the engineer.

Overhead Service

The Overhead Service is typically the simplest and most cost effective method to connect a permanent structure to the utility. EMEC will provide service from the EMEC facilities to the qualified "Service Point" if it meets all state and federal codes/permitting and is qualified under EMEC's Terms and Conditions.

The customer is responsible for providing, installing, and maintaining all equipment from the service point except for the meter.

EMEC is responsible for providing and installing the meter and making the final connections at the service point.

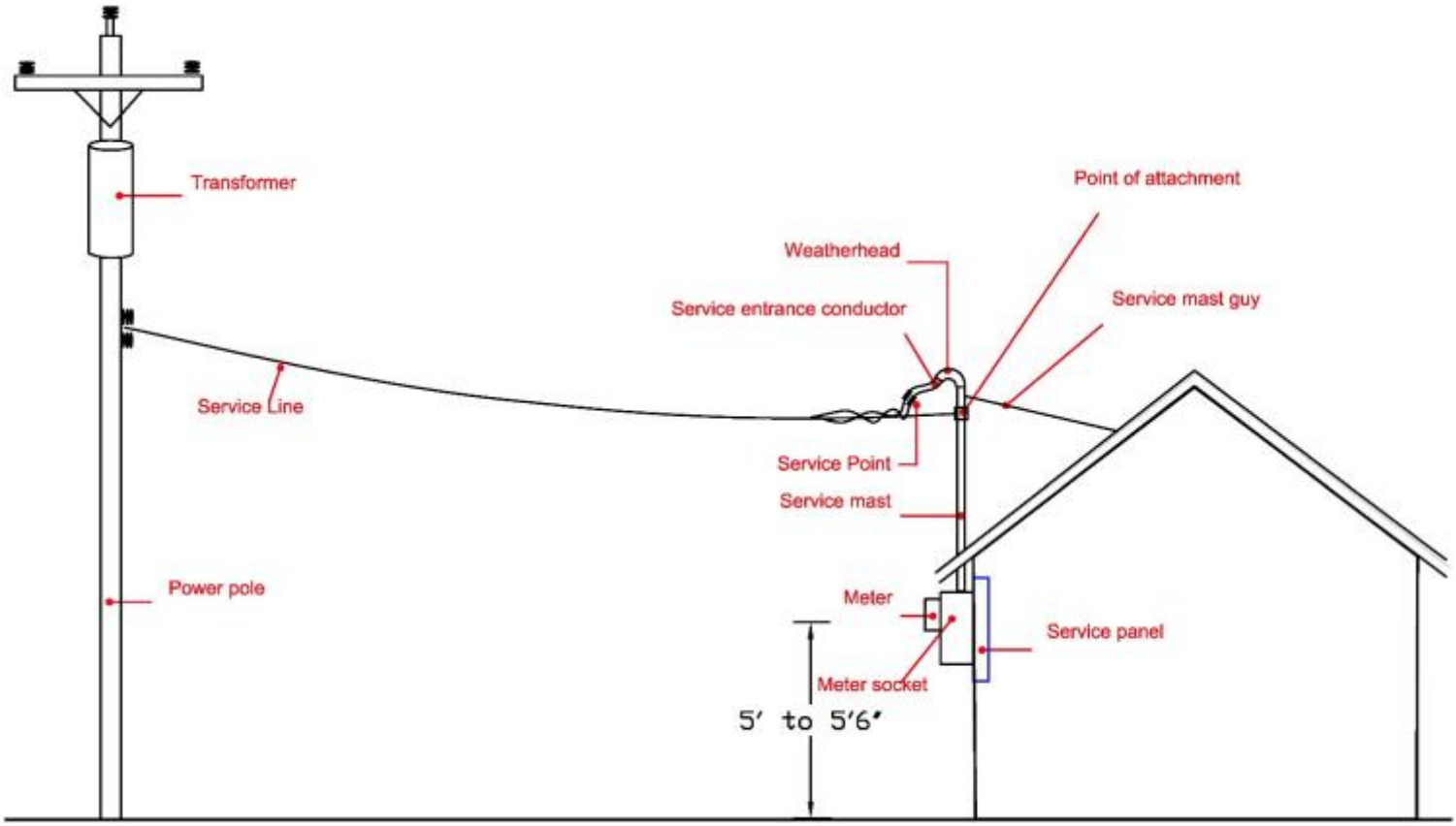

Figure 2-1 Common Features of an overhead mast type service.

Figure 2-1 shows a finished installation of overhead mast type service, using a service mast. The customer provides everything shown here, except the meter, the overhead service line, and the power pole and pole-mounted equipment. After the electrician installs the required equipment, EMEC installs the meter in the meter socket, strings the service line, attaches the service line supporting wire (neutral) to the insulated clevis (house knob), and splices the conductors together.

Figure 2-2 Common Features of an overhead service without a mast.

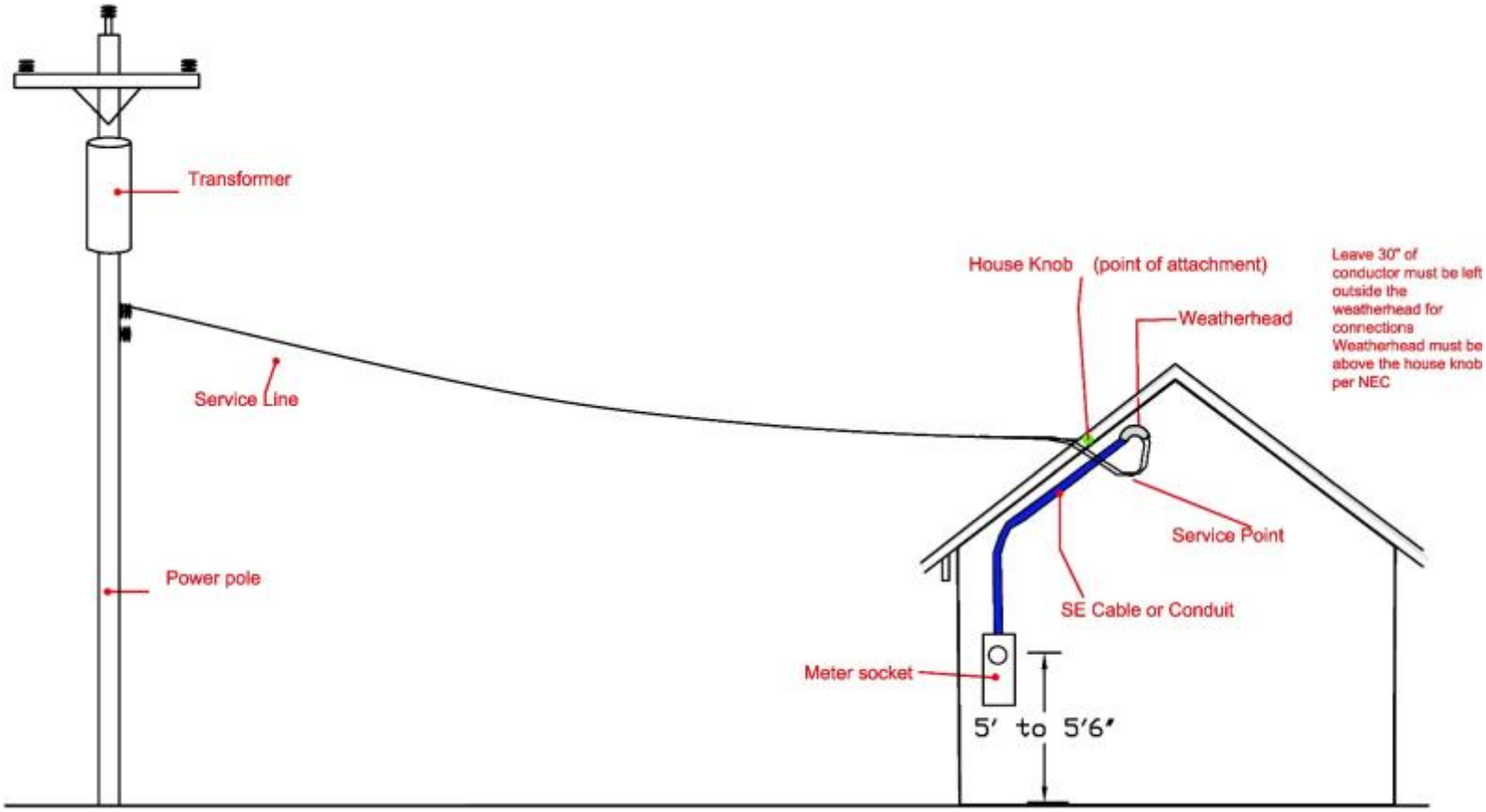

Figure 2-2 shows a finished installation of overhead service that does not utilize a mast. The customer provides everything shown here, except the meter, the overhead service line, and the power pole and pole-mounted equipment. In this installation the weatherhead must be above the House Knob per NEC. In both installations the customer must leave a minimum of 30" of conductor outside the weatherhead in order for EMEC to make its connections.

Overhead Line Clearances

Figures 2-3, 2-4, 2-5 and 2-6 show clearances under overhead service lines, for the conditions most commonly encountered. For other situations and for details, see the National Electric Code, the National Electrical Safety Code, or contact the electrical inspector for your area.

The customer is required to provide a point of attachment high enough and strong enough, to allow the utility to install the service line to meet the required clearances. If the span of the service line exceeds 125 feet, an intermediate support pole may be required to relieve the tension on the service connection.

For new installations the customer is responsible to clear the right of way to EMEC specifications for the Service Line. Consult with the Staking Engineer at the time of planning to discuss.

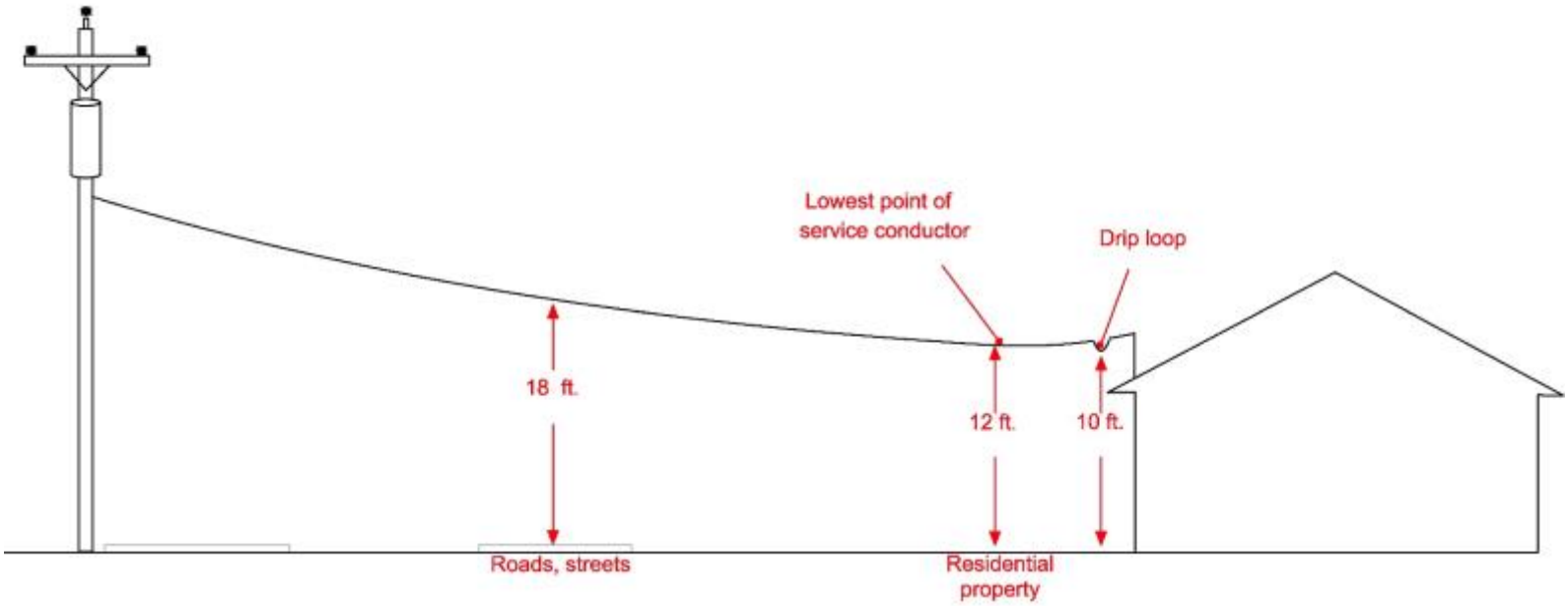

Figure 2-3 Clearances from ground.

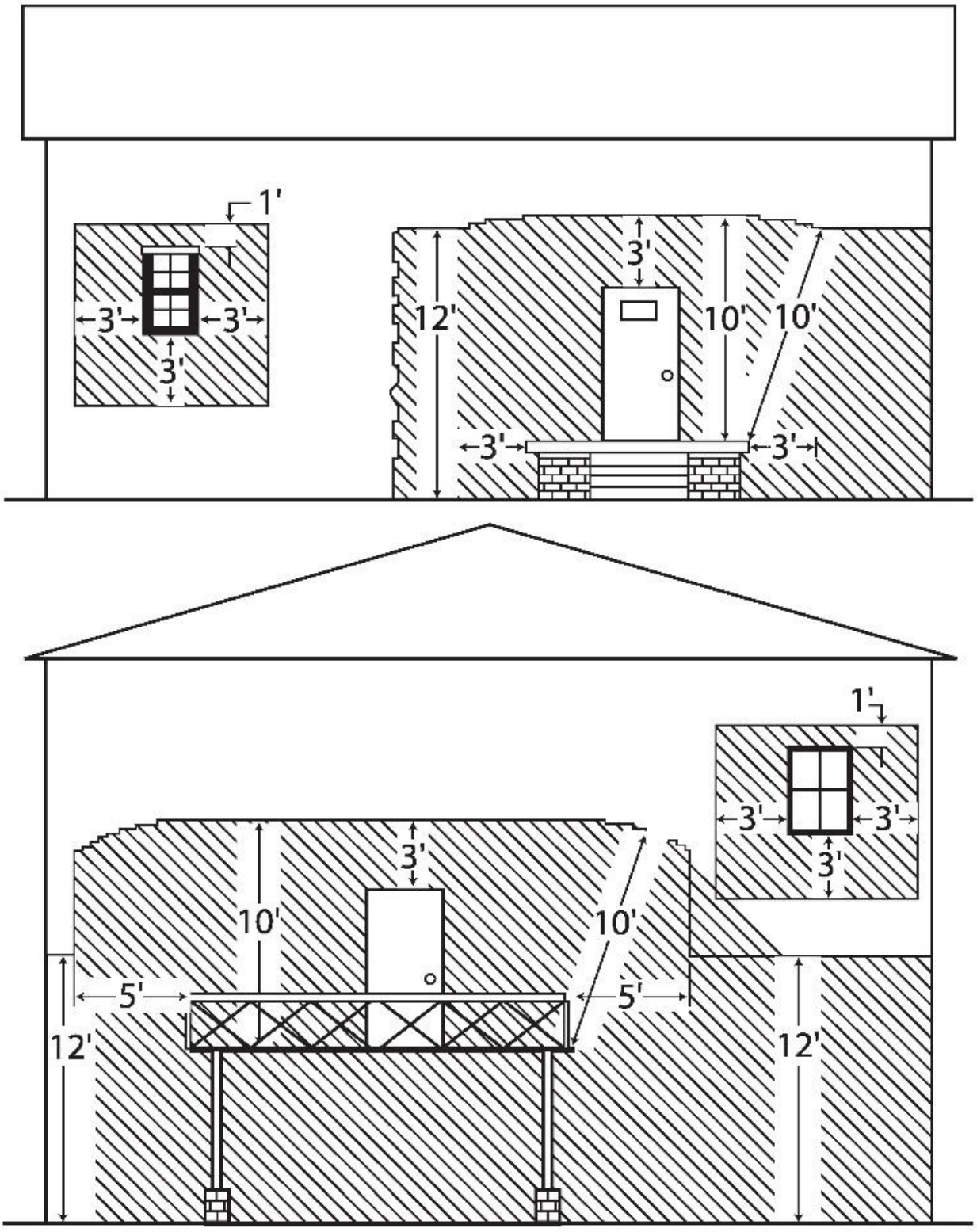

Figure 2-4 NESC Code clearances section 235

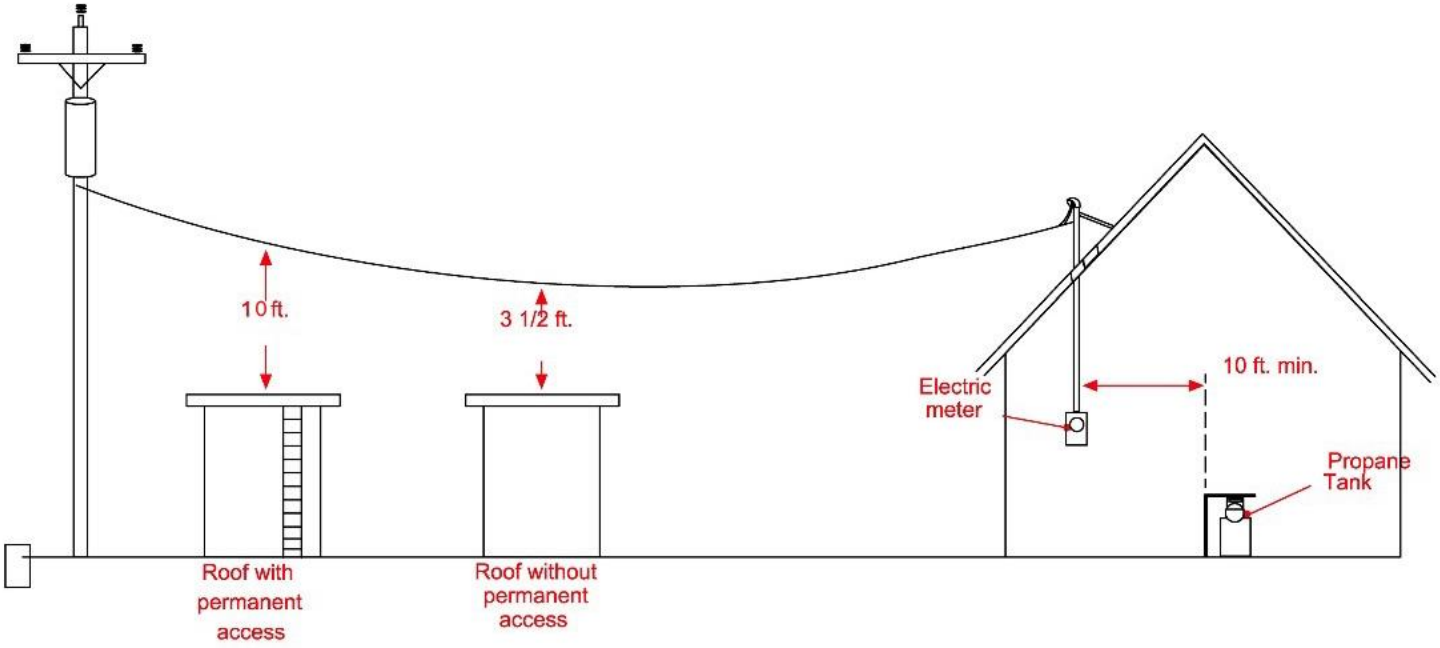

Figure 2-5. Clearances over other structures.

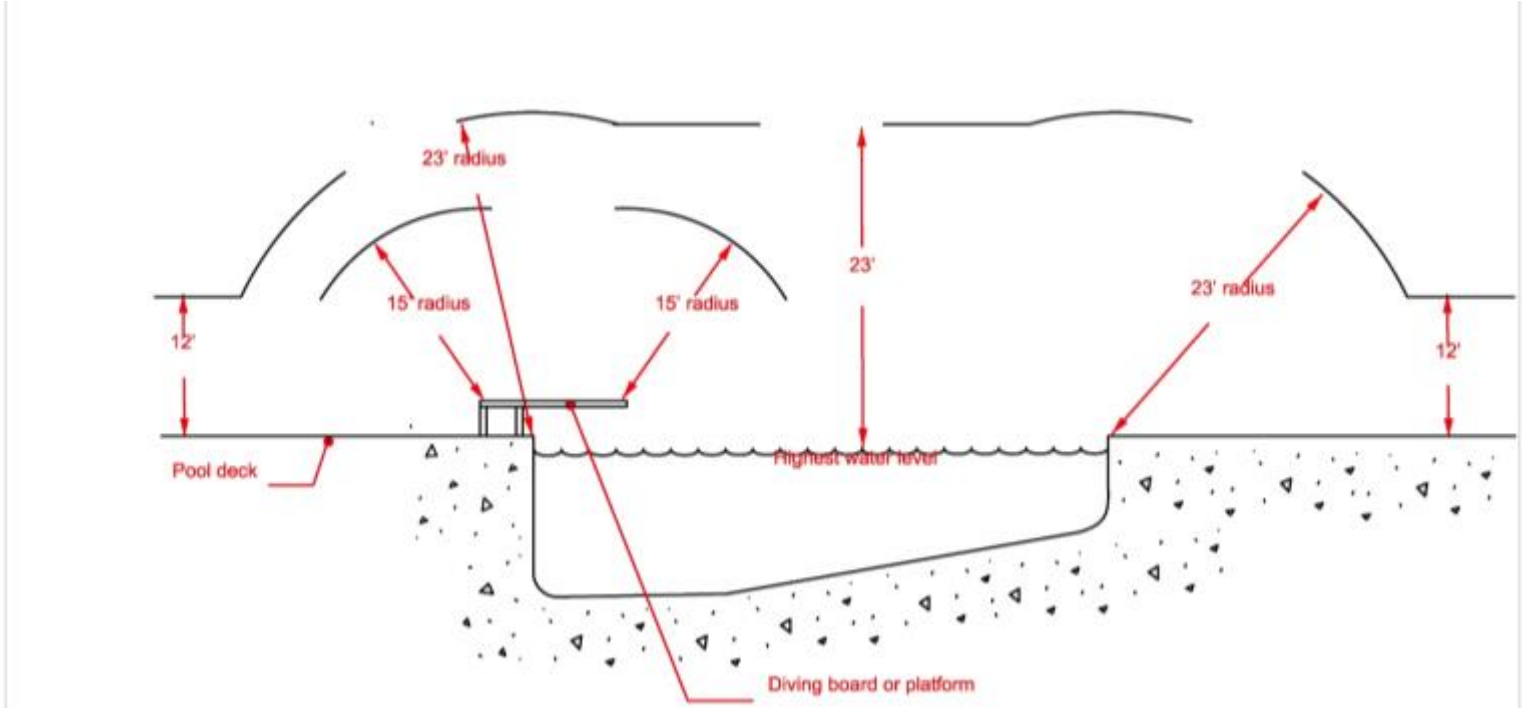

Figure 2-6. Overhead service clearances over swimming pools.

Check List for Installing Overhead Service

The customer is responsible for providing, installing, and maintaining all equipment from the Splice -service point to the service panel, except for the meter.

EMEC is responsible for providing and installing the meter, and making the final connections at the service point.

To obtain new overhead service, the customer:

1. Contacts the utility to open an account, to determine where the service line will originate from, request service and set a meeting with a staking engineer if needed.
2. Obtains all permits as required by the state and local authorities.
3. Working with EMEC's Staking Engineer, selects a location for the meter. The service line strung from the power pole to the meter location must not cross property belonging to others. Figures 2-2 through 2-6 have details on overhead line clearances. At this time the staking engineer will determine if any easements are required and it is up to the customer to obtain these easements.
4. Installs the Service Entrance Equipment.
5. Once all contracts are processed (if applicable), permits are received, fees are paid and the planning work is completed by the Staking Engineer, contact EMEC's working supervisor in your area to arrange for a connect date.

EMEC then:

1. Strings the wires from the pole to the Point of Attachment.
2. Attaches the neutral to the insulated clevis on the mast or house knob.
3. Splices the service line conductors.
4. Installs the meter in the meter socket.

Note: EMEC has the right to refuse connection on any service it deems unsafe.

Service Mast, Surface-Mount Meter

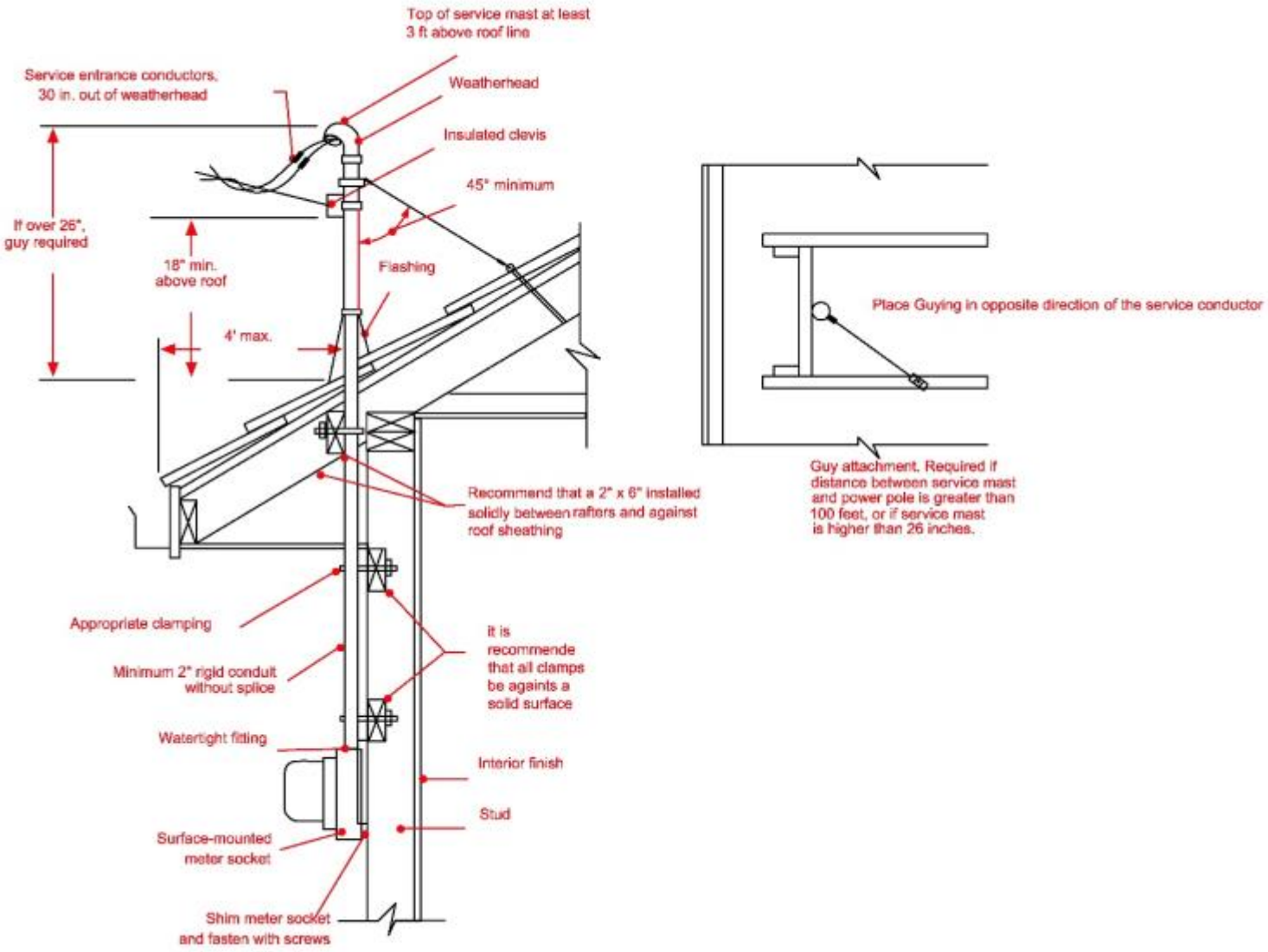

Figure 2-7. Surface mounted meter with a mast installation.

Figure 2-7 shows details of a service mast, with the meter on the surface of the building. The service could be wired to an exterior meter as shown here. The customer installs everything in the picture, except the meter.

After the customer installs the Service Entrance Equipment, EMEC installs the meter in the meter socket, strings the service line, attaches the service line supporting wire (neutral) to the insulated clevis, and splices the conductors together.

Temporary Overhead Service, Meter Post

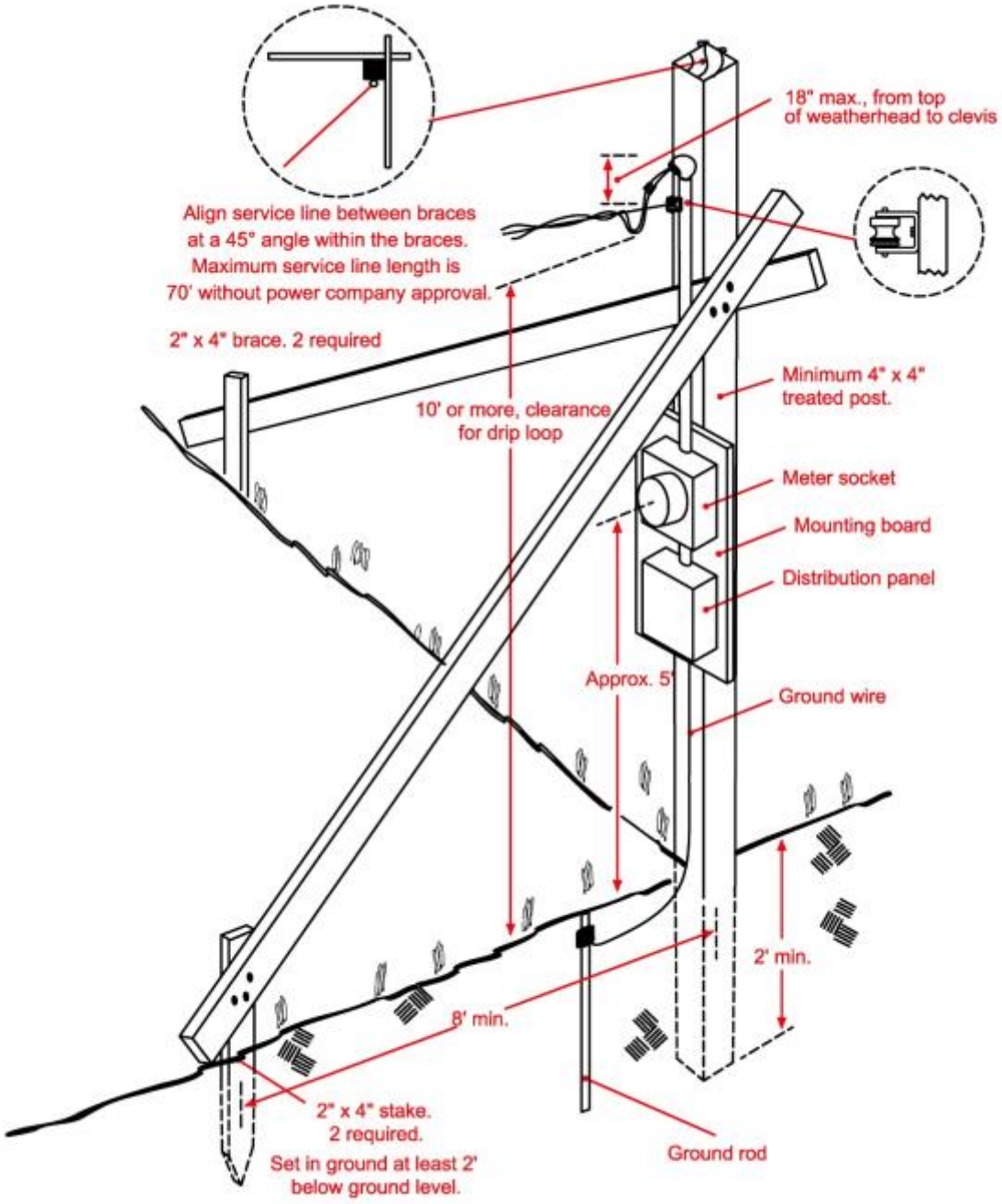

Figure 2-8. Temporary overhead service.

Figure 2-8 shows a finished installation for temporary service, using a meter post. The service is overhead from EMEC to the post. The customer provides everything

shown, except the meter and the overhead service line.

After the customer installs the Service Entrance Equipment, EMEC strings the service line, attaches the service line supporting wire (neutral) to the insulated clevis, and splices the conductors together and installs the meter in the meter socket.

CHAPTER 3 Underground Secondary Service

Prior to any service connection the customer needs to contact EMEC (207)454-7555 option 5 (New Service) and schedule a Staking Engineer to review all options available to the customer. It is at this time all fees, permits and right of way issues can be discussed and reviewed with the engineer.

Underground services is an option available to qualified services. EMEC's staking engineer shall determine if the structure qualifies.

An underground service is defined as a secondary voltage running from an existing or newly placed EMEC owned utility pole or equipment to the customer's structure or meter pedestal. No underground services will be placed in state right-of-way. Meters generally will not be allowed on EMEC's poles. Meters shall be placed on the side of the structure to be served or a pedestal located in a convenient location to the customer and EMEC.

The customer is responsible for providing, installing, and maintaining all equipment from the service point to the service panel, except for the meter.

EMEC is responsible for providing and installing the meter, and making the final connections at the service point.

Check List for Installing Underground Service

To obtain new obtain underground service, the customer:

1. Contacts the utility to discuss the project, to determine where the service line will originate from and the service point, and to request the service.
2. If requested, provides EMEC with:
    - Site drawings
    - Load information
    - An easement for permanent equipment owned by EMEC and installed on the customer's property
    - Payment for pre-construction costs
3. Obtains an electrical work or other permit as required by the state and local authorities.
4. Selects the type meter installation that fits the situation. There are two options:
    - Surface-mount meter
    - Pedestal-mount meter
5. Calls the locating service ("Dig Safe" dial 811) to locate any existing underground wires, cables, or pipes. It is the customer's responsibility for the digging and the safety of the job site. EMEC's will do the locating of EMEC Owned conductors. However Dig Safe must be contacted for all other utilities. (Consult local authorities for water and sewer)
6. Installs the Service Entrance Equipment.

7. Install grounding per NEC rules
8. Digs a trench from the connection point to the meter location or structure.
9. Places the conductors in pipe and installed in accordance with NEC an NESC specifications.
10. Labels the conductors at the meter location, and connects the conductors to the meter socket, if applicable. Specifically label the neutral on both ends.
11. Covers the wire/conduit in the trench.
12. Contacts the utility.

Then the utility:

1. Connects the conductors at the Service point.
2. Installs the meter in the socket.

Locating Underground Utilities

The customer must call the underground utilities locating service at least two full working days (48 hours) before trenching or excavating for underground service. One call to the locating service notifies all utilities that locates are required. In some areas, not all utilities are members of the one-call system. In those areas, the customer must contact each utility individually. Contact EMEC at (207)454-7555 option 5 to request a dig safe for EMEC owned conductors.

Do not begin excavation until the locations of underground wires, cables, and pipes have been marked, or the utilities have informed the customer that they have no facilities in the area.

Any digging within 24 inches of location marks must be done by hand.

The color code for marking underground utilities is:

Color	Underground Service
Red	Electric
Yellow	Gas, Oil, Steam
Orange	Telephone, Cable TV
Blue	Water
Purple	Reclaimed water
Green	Sewer
Pink	Temporary survey marks
White	Proposed excavation

Table 3-1. Color code for marking underground services.

Trenching

The customer is responsible for digging the service trench and installing conduit and secondary conductors. The customer backfills and compacts the trench.

Trenching rules and tips:

- Dig trenches in straight lines between takeoff points, to the greatest extent possible.
- Trench to the nearest side of the pole, or transformer, leaving the conduit or conductors exposed.
- Any trenching within 2 feet of power company facilities must be done by hand.
- If any conductors or pipes are encountered while digging, leave them covered.
- If rock or other extremely difficult digging is involved, contact EMEC to discuss the situation.
- Provide extra depth when digging joint-use trenches to allow for soil falling into the trench during the laying of the first cables, reducing the depth of the trench for other cables.
- Schedule the trenching so the trench is open for the shortest practical time to avoid creating a public hazard and to minimize the possibility of the trench collapsing due to other construction activity, rain, etc.
- Place 4 inches of clean bedding material at the bottom of the trench. Clean bedding material is defined as sand or clean soil with no solid material larger than 1 inch. Place the conduit on top of this bed. Then cover the conduit with a 6-inch layer of clean bedding material. Compact the bedding material carefully, so the conduit will not be damaged.
- The remainder of the trench is backfilled using available clean material. Pieces of scrap cable and other construction items must not be buried in the trench. Tamp the soil, leaving a slight mound to allow for settling.
- All rock, debris, scrap cable, and other construction items must be removed from the site.

The customer may place telephone, cable TV, or other electronic signal conductors in a trench with electric utility wires, providing the installation meets the requirements of the electric utility, and all other parties.

In certain cases, gas pipes may be installed in a common trench.

In special situations, water and sewer lines may be installed in a common trench. Installation of a “wet” service in a trench with electric utility wires requires prior approval by the electric utility.

Installing Secondary Conductors in a Trench

When installing secondary conductors in a trench, there are two options: conduit or direct-burial conductors. Conduit is required if the service line will cross under any permanent structure such as a driveway, sidewalk, or deck.

Direct-Buried Conductors

Direct-buried secondary conductors can only be placed if there is a fused disconnect preceding the conductor and must follow the rules of the NEC.

Place the cable in the trench by hand. While the cable is being installed, be certain it is free from visible defects. It might be necessary for power company personnel to supervise cable placement.

Install the appropriately sized conductor from the meter socket to the service point. Consult the NEC for the correct wire size. Leave 5 feet of extra wire at the stub-out or hand-hole, and 15 feet at the transformer.

If more than one service is being placed in the trench, the telephone cable and cable TV lines must be separated at least 12 inches from the power line. Any soil falling into the trench during the laying of the first cable must not raise the trench floor to less than the depth required for the last cable. If this happens, remove the excess soil by hand, or with equipment that will not damage the installed cables.

EMEC will energize the circuit after the customer completes backfilling the trenches to the power company's satisfaction.

Underground Secondary Conduit

Install conduit from below the meter socket, to EMEC's pole, pad-mount transformer, or junction box. Conduit and cable must be sized in accordance with NEC specifications based on service size. All best practices shall be used to install the cable to ensure no damage is done to the service conductor. The trench shall be backfilled with clean gravel and no debris.

EMEC will energize power after the customer completes backfilling the trench to the power company's satisfaction.

The customer is responsible for sealing around conduit where it enters service panels, and grouting where it enters power company vaults, to prevent water and other substances from entering.

If the conduit will enter the power company's vault, the customer contacts EMEC to discuss the entry location and procedures.

Underground Service, Surface-Mount Meter

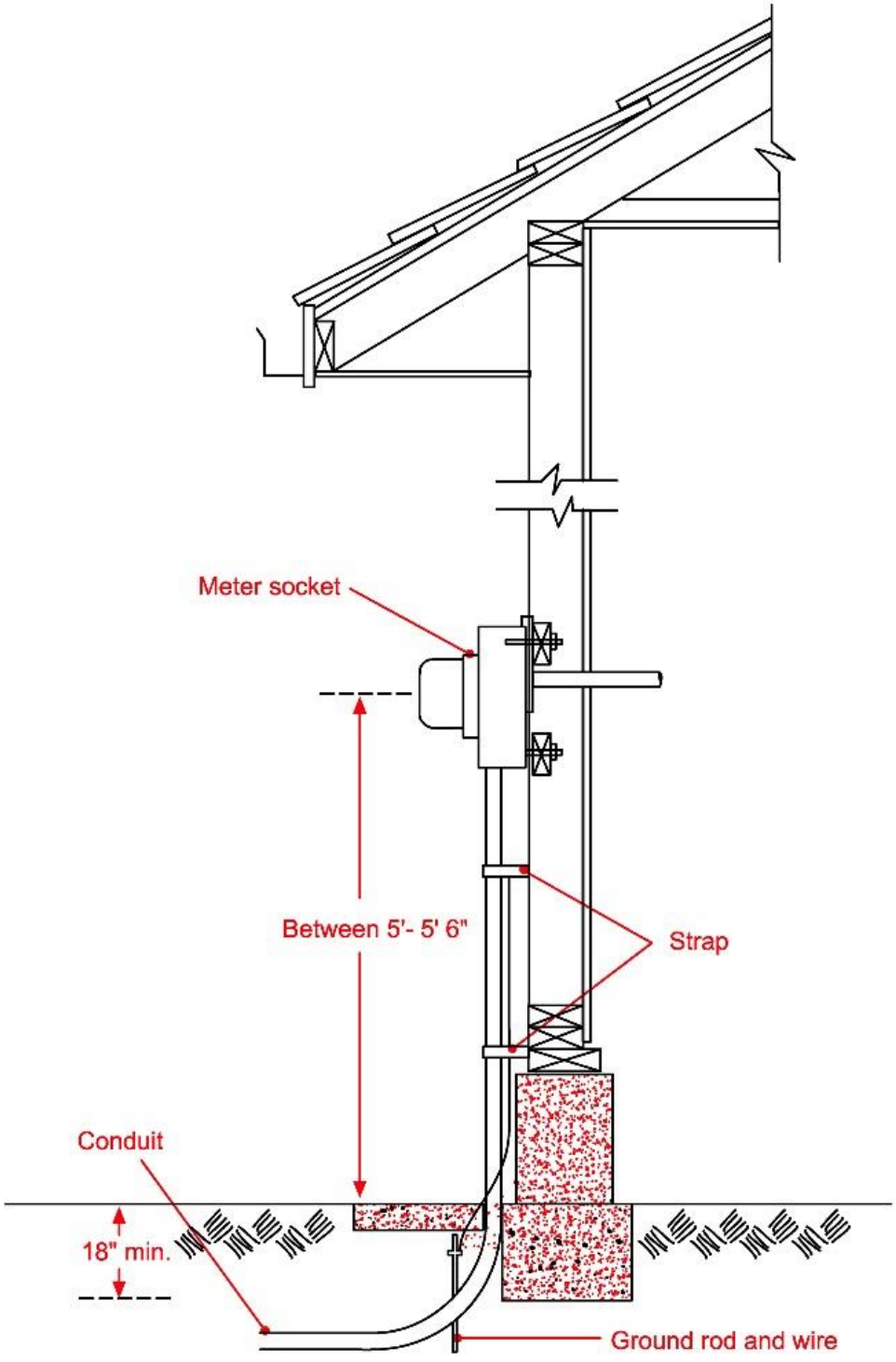

Figure 3-1 Underground service to surface-mount meter

Figure 3-1 shows a finished underground installation with the meter on the surface of a house. The customer is responsible for everything shown here, except the meter.

The service is underground from EMEC to a stub out, handhold, or padmount transformer (off to the left and not shown here). Conductors placed in the trench bring the power to the conduit at the base of the service entrance.

After the customer installs the Service Entrance Equipment Service, EMEC installs the meter in the meter socket. EMEC also completes the connections of the wires.

Underground Service, Pedestal Meter

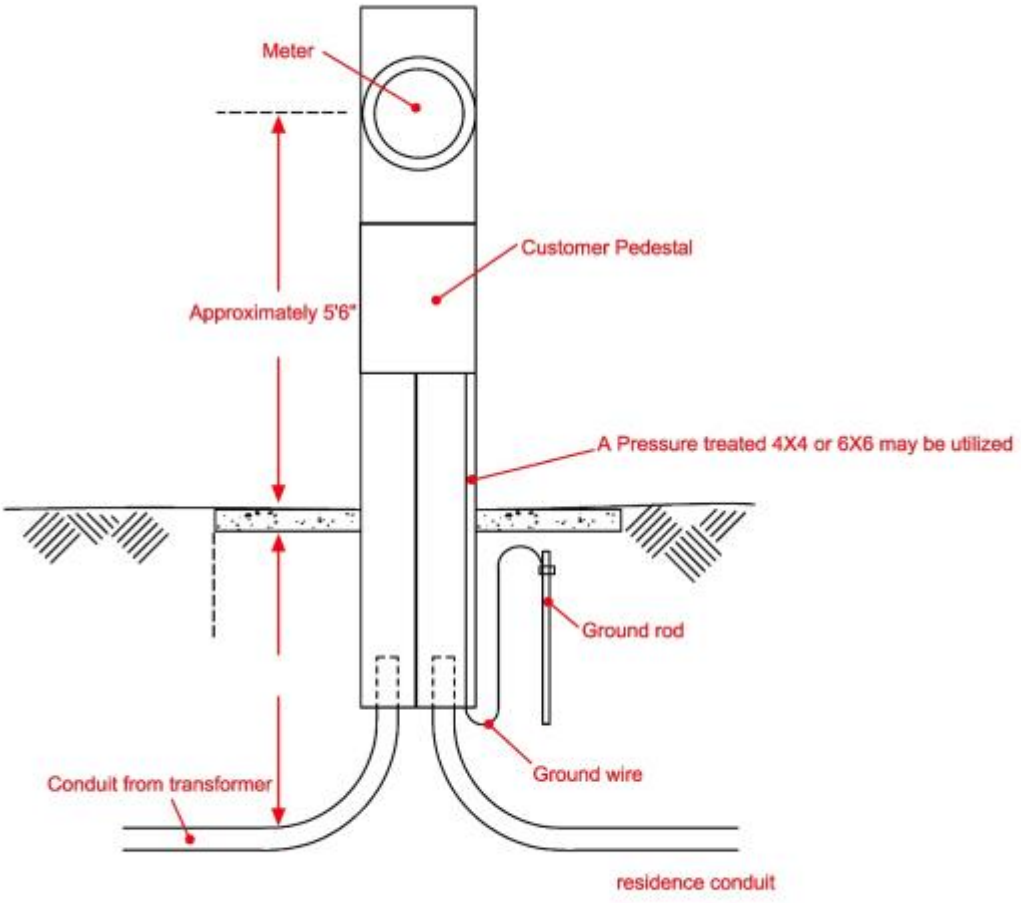

Figure 3-2 Underground service to a pedestal meter

A meter pedestal is a free-standing structure that supports service equipment for underground service. It is most commonly used with manufactured homes. If a meter pedestal is called for, it is the customer's responsibility to purchase and install it.

Install the meter pedestal between the home and normal public access. The pedestal usually contains the disconnect switch.

Underground Service, Meter Post

Figure 3-3 shows a finished installation for temporary service, using a meter post. The service is underground from EMEC to a stub-out, hand-hole, or padmount transformer. Conductors placed in the trench bring the power to the base of the post. The customer provides everything shown, except the meter and the service line to the stub-out, hand-hole, or padmount transformer.

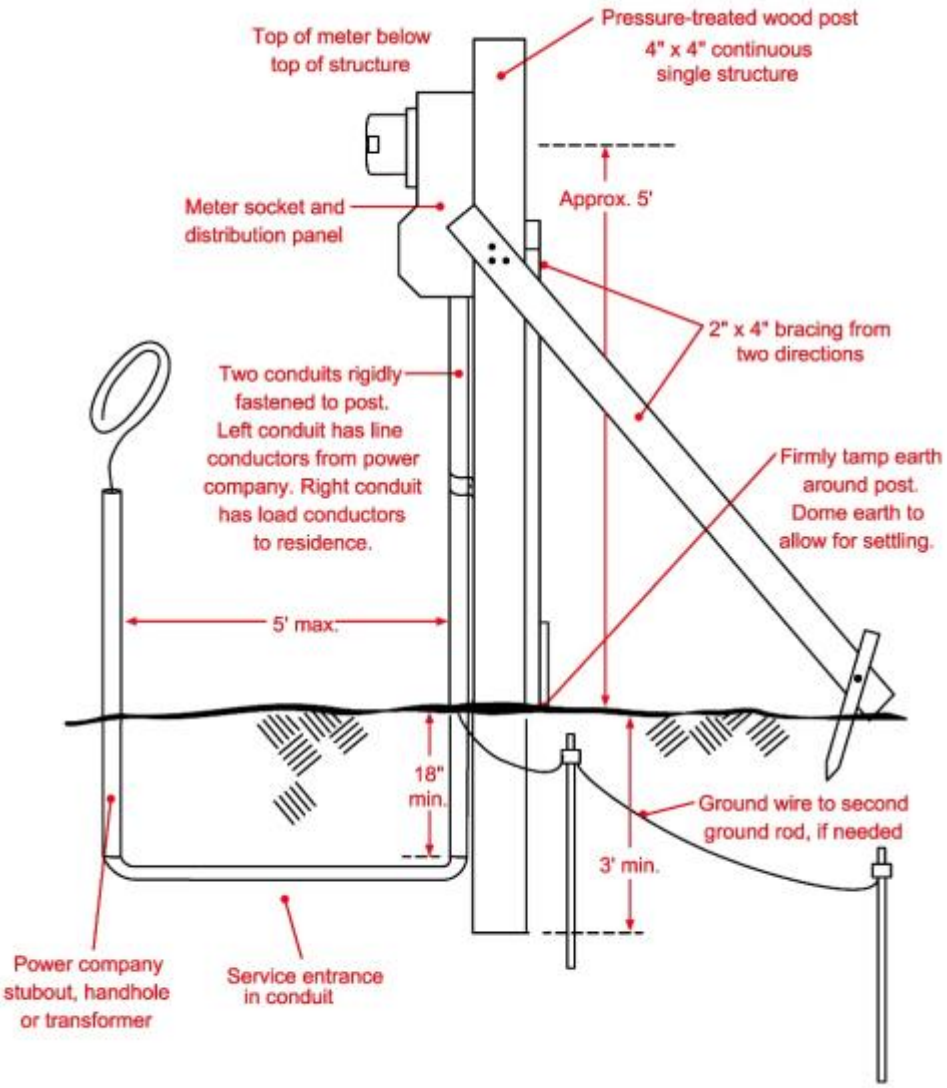

Figure 3-3 Temporary underground service

Secondary Riser

The secondary riser is where the service conductor runs from EMEC's pole (either a primary pole or a secondary pole.) When running a secondary riser the follow apply.

1. During the planning phase it will be determined the route and location of the riser. Should the riser be located in or near any vehicle traffic including the possibility of plowing, the first 10 feet of pipe must be rigid pipe.
2. Riser that are located on a secondary pole the customer's electrician is responsible for running the riser up the entire length of the pole in most circumstances.
3. If multiple pipes are going to be on a pole stand-off brackets will be required otherwise attaching directly to the pole is acceptable only with the use of metal pipe clips,
4. The customer will place all conductors in pipe prior to EMEC making its connections at the point of attachment.
5. The first 10 feet of pipe must be installed prior to EMEC's arrival for connection.
6. The customer will arrange with the area supervisor to make the final connections. The customer is responsible to be there at the time of connection to work with the crews to install the last sections of pipe.
7. The customer is responsible for supplying all pipe, pipe clips, weatherhead, cement, wire and miscellaneous material to complete the installation.
8. The customer shall supply enough conductor beyond the weatherhead for 30" on a secondary pole and 84" on a primary pole. this will be discussed during planning
9. EMEC will assist in the assembly of the final sections of pipe and weatherhead (on primary poles) and will make the final connections to the service point/attachment. The electrician must be present at all times during this portion.
10. If a metal pipe is used, it will require a ground per NEC. If an existing pole ground is available the pipe may be bonded to the pole ground otherwise a new ground rod must be installed by the customer.

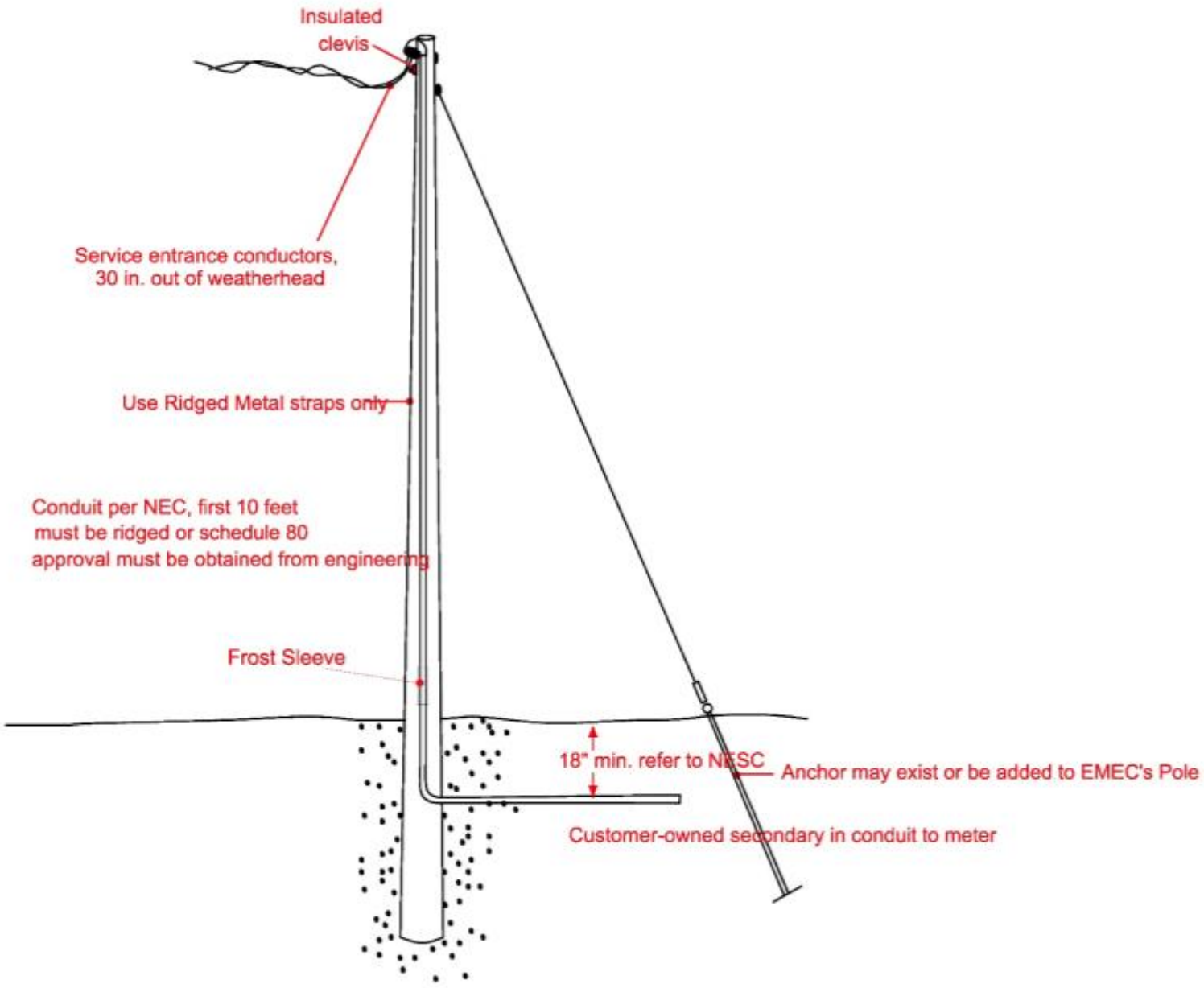

Figure 3-4 Secondary Riser

Transformer Installations

EMEC is responsible for installing a padmount transformer at or near the customer's site. Conductors to the primary side of the transformer enter at the left side of the

transformer; conductors to the secondary side enter at the right. The trench runs from the right side of the transformer to the customer's service.

The customer is responsible for installing the service conductors in the trench, from the transformer to the building.

Safety Clearances around Transformers

Clearances from padmount transformers to structures are measured from the nearest metal portion of the transformer, to the structure or any overhang.

The clearance from a building is 3 feet if the building has non-combustible walls (brick, concrete, steel, or stone), 10 feet if the building has combustible walls (including stucco).

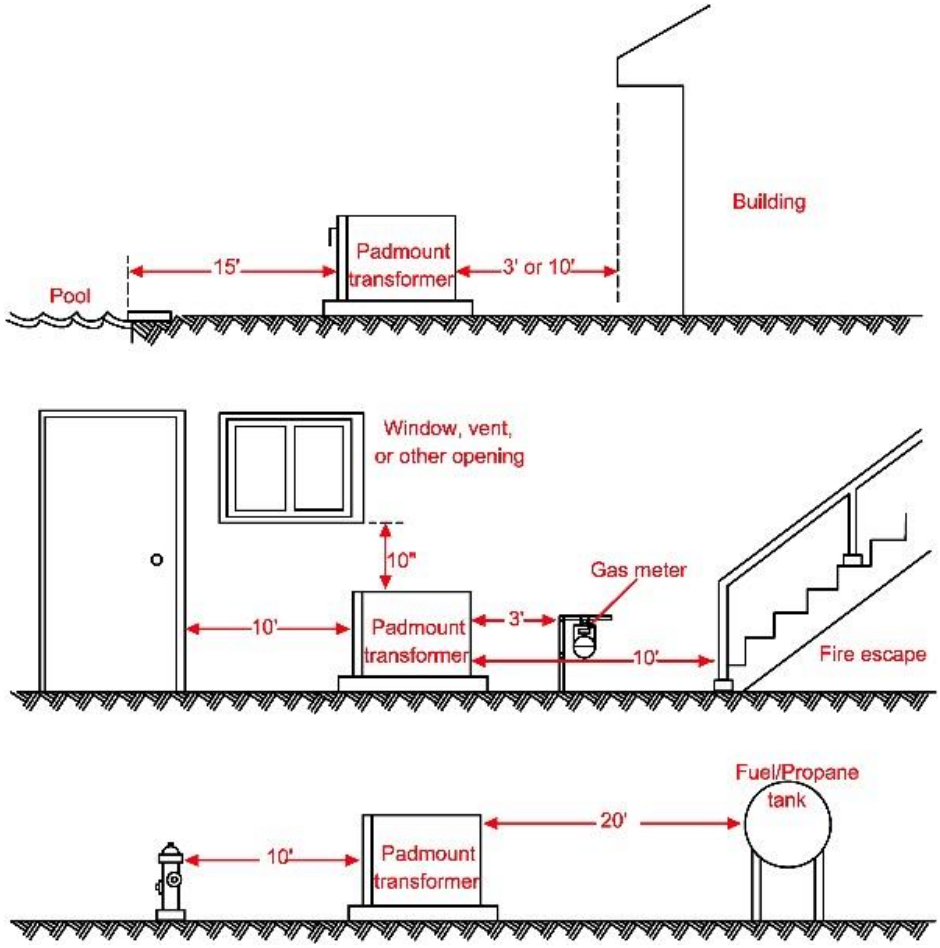

Figure 3-5 Safety clearances around a padmount transformer

Work Clearances around Transformers

A minimum clearance of 10 feet of clear, level working space is required in front of a padmount transformer, to allow use of hot sticks.

Landscaping and other obstructions must not encroach on these clearances.

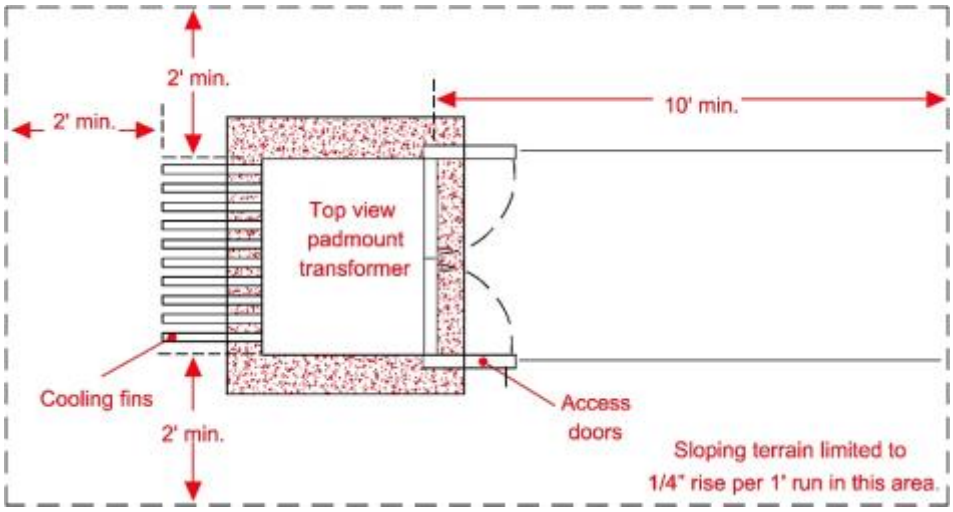

Figure 3-6 Work clearances around a padmount transformer.

Guard Posts

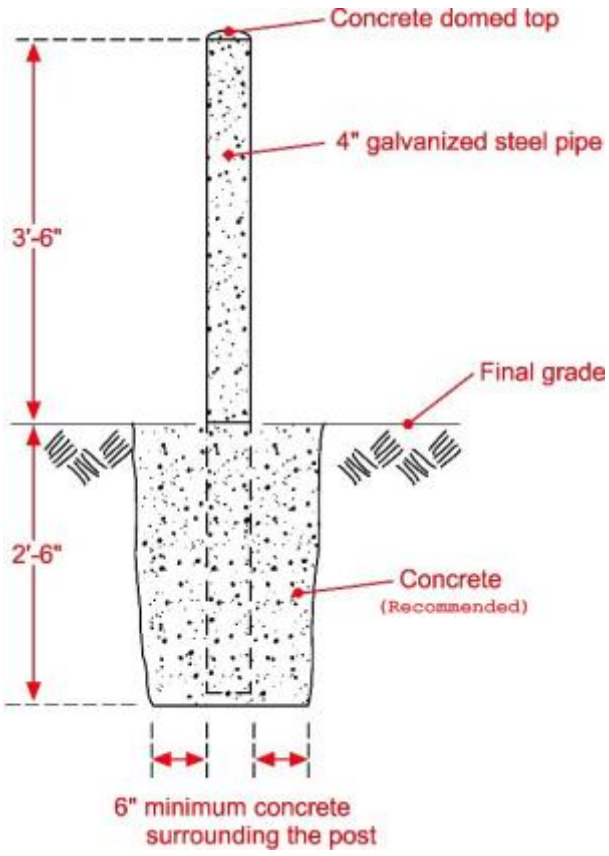

Figure 3-7 Equipment guard post

It is the customer's responsibility to install and maintain guard posts where power company equipment is exposed to vehicular traffic.

Guard posts are also required where minimum clearances around equipment cannot be met. For example: Guard posts are required where pad mounted devices cannot be given 3 feet clearance from the back and sides of the device, and 10 feet from the front.

If the post is placed in stable soil, it is recommended to surround it with 6 inches of concrete. If the soil is unstable or sand, it is recommended surround the post with 12 inches of concrete.

If several guard posts are used, locate them no more than 5 feet apart. For extra visibility, paint the posts traffic yellow.

In some situations a 6-inch diameter post is required, not the 4-inch post illustrated here.

CHAPTER 4 Meter Installations

The customer provides and installs all equipment beyond the service point: meter sockets, cabinets and enclosures, connection lugs, conduit, grounding, protection devices, and wiring from the socket to the load. Meter Sockets will be standard for all single-phase and three-phase installations where the load does not exceed 200 amperes and 400 amperes. All direct metered poly-phase services and 400 amp single-phase meter sockets must have a single handle-operated manual bypass which locks the meter blades in the socket jaws. The manual bypass operating mechanism must be visible when the meter is installed. It must not be possible to override the bypass by replacing the cover or sealing ring when the operating mechanism handle is in the bypassed position.

On CT rated services, EMEC provides and installs the meter, current transformers meter socket, and local wiring associated with the meters.

Locating the Meter

It is in the mutual interest of the customer and EMEC to install the meter in a location suitable for meter reading, testing, repair, and removal. The meter location is subject to approval by EMEC.

Meter Location for a Residence

The meter must be located:

- Outside (EMEC must have access to the meter at all times)
- On ground level with the meter 5' to 5' 6" above the ground level.
- If the meter is not located on the building, location must be approved by EMEC.

Do not locate meters:

- Behind a locked 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 houseboat or mobile home
- Do not place meter inside an enclosed cabinet that is not readily visible and accessible.
- These are just a few items of major concern and is not a complete listing of where not to locate the meter. The meter location must comply with all NEC and NESC rules and EMEC does have final approval for the location of the meter location

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.

Meter Location for a Business

The location of a meter for a business must be:

- Convenient to EMEC's service point
- On exterior wall 5' to 5' 6" above finished grade.
- If the meter is inside, it must be in an electrical equipment room and must be approved by EMEC. EMEC must have access to this room at all times
- Readily accessible by EMEC personnel

Meters must not be located:

- Behind a fence or enclosure
- In a place where safety could be compromised
- In a location with abnormal temperature, vibration, or corrosive conditions
- On a primary line pole
- On a mobile structure such as a trailer
- Areas where shrubs or landscaping could obstruct access to the meter
- These are just a few items of major concern and is not a complete listing of where not to locate the meter. The meter location must comply with all NEC and NESC rules and EMEC does have final approval for the location of the meter location

Electrical Equipment Rooms (with prior approval)

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

- Not be used for storage
- Be accessible during normal business hours and have an emergency contact number after hours.
- Be well lit
- Be accessible through a door that opens directly to the outside, or with prior approval by EMEC, 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, or a key box approved by EMEC near the door.

Clearances around the Meter

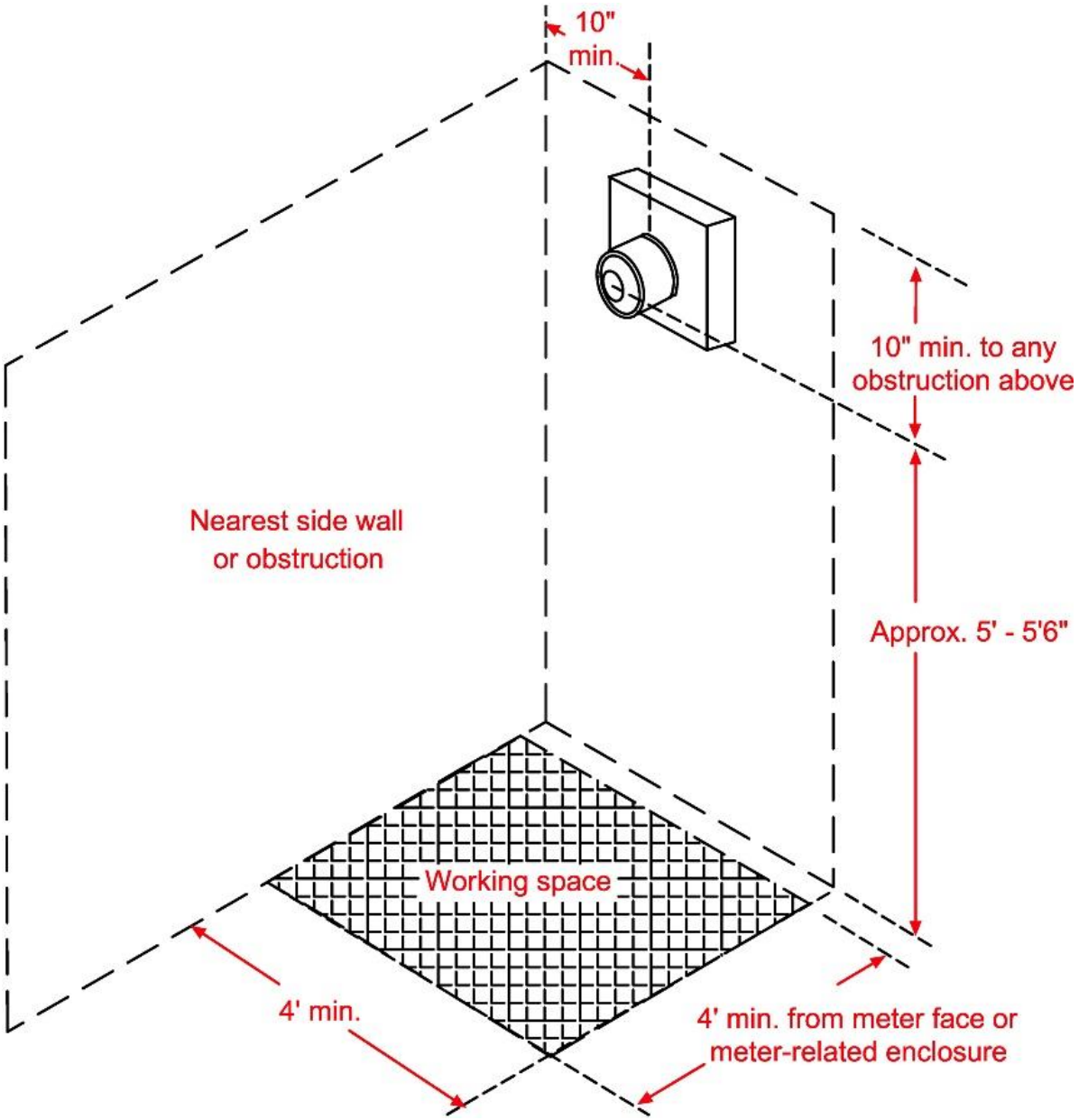

Figure 4-1 Clearances around the meter.

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

The 10-inch clearance at the top and left side of the meter allows the meterman to see and align the meter blades to the meter socket jaws when installing the meter.

Install the meter socket between 5' and 5' 6" above finished grade.

Keep a clear working space 4-feet square, in front of the meter. This space must be

permanently free of all obstructions.

Maintain a minimum clearance of 10 inches radially around the meter.

Allow 3 feet of clearance from a gas meter, and 3 feet from doors (if door open in towards the meter). EMEC has the final approval of meter location in an equipment room.

Meter Sockets

Meter sockets come in six configurations. Residential services use the first two sockets shown here. Appendix 1 contains a list of approved meter Sockets.

Voltage	Current	Comment
120/240V, 3-wire	100 and 200 amps	Direct-connect socket
120/208V, 3-wire	Up to 200 amps	Direct-connect socket
120/240V, 3-wire	201-320 amps	Direct-connect 320A socket
120/240V, 3-wire	Above 400 amps	With CTs

Sockets for single-phase circuits

Voltage	Current	Comment
120/208V, 4-wire	Up to 320 amps	Direct-connect socket
120/240V, 4-wire		
277/480V, 4-wire		
120/208V, 4-wire	above 400 amps	With CTs
120/240V, 4-wire		
277/480V, 4-wire		

General Requirements for Meter Sockets

Meter sockets must:

- Be ringless.
- Be rated NEMA 3R – for exterior use and rain tight.
- Be installed level, plumb, and fastened securely to a rigid structure.
- Have all unused openings in the enclosure, closed with plugs and secured tightly from the inside.

- Be covered and sealed with a transparent cover if live lines are installed.
- Not be jumpered to provide power.
- Be acceptable to EMEC and Underwriters Laboratories (UL).
- See attachment 1 "EMEC Approved Meter Sockets" Other meter sockets may be used but require prior approval from the engineering department. A cut sheet should be submitted prior to installation for approval.

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

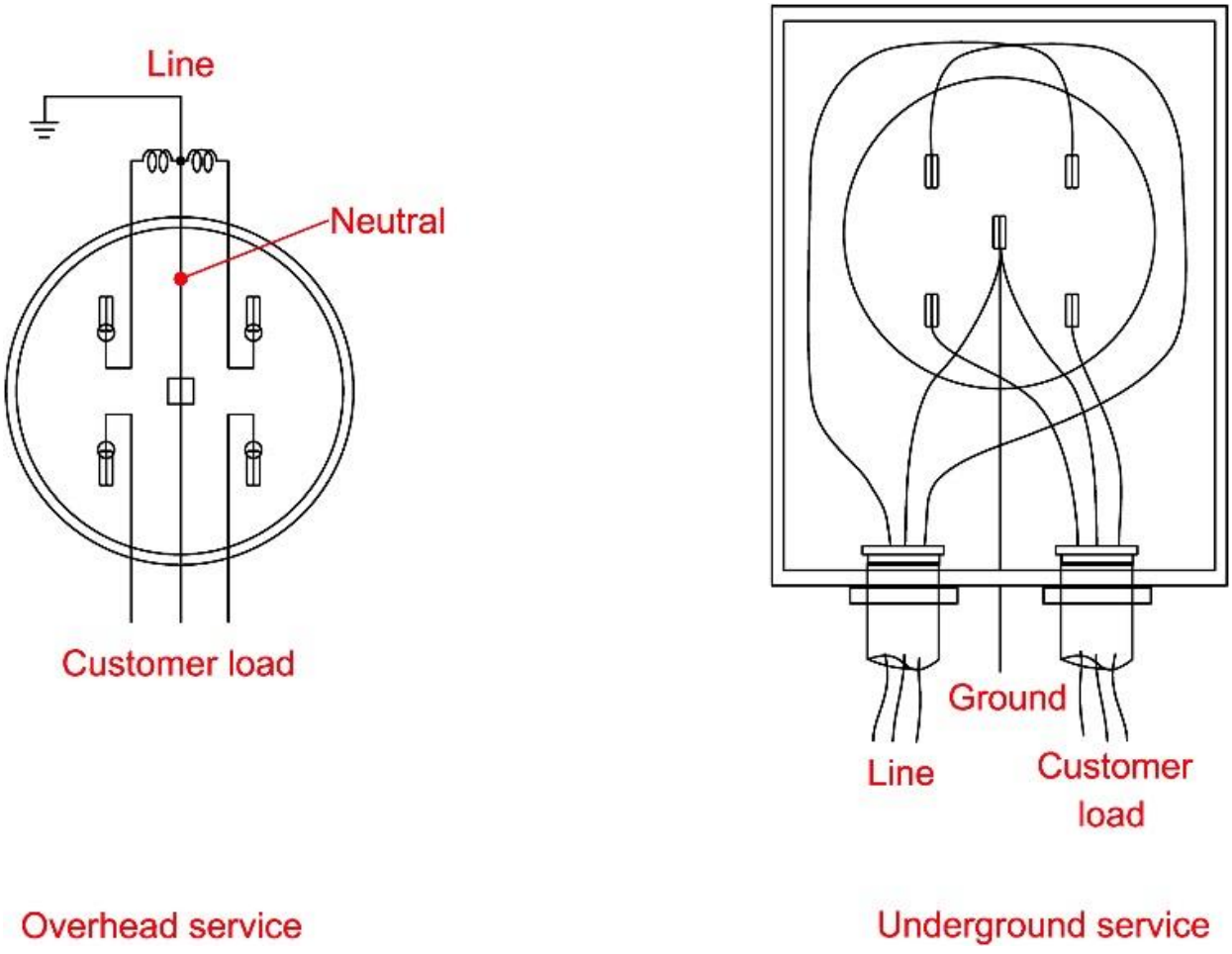

Figure 4-2 Residential meter socket connections.

Grounding a Meter Socket

Grounding must conform to the NEC. It is recommended that two ground rods are used unless the customer has 25 ohms or less and the service with one ground rod.

After installation, leave the connection to the ground rod visible for electrical

inspection.

For safety, the top of the ground rod should be flush with or below ground level.

Factors which affect the ability of the ground rod to dissipate power surges include:

- The type soil at the site. Examples; Clay soil has high conductivity which is good, gravel has low conductivity which is bad.
- The condition of the soil; Damp is good, contact with the water table is very good, high salt content is good, frozen soil is bad.
- The size of the ground rod. The longer the rod and the larger the diameter, the better.
- The ground rod material. Copper is better than steel. Copper-clad steel is better than steel alone.
- The resistance across clamps and connections. ***Note:*** The integrity of these connections tends to deteriorate with time.

Meter Socket Installation Tips

Cable Runs

Metered circuits and un-metered circuits must not be intermixed in raceways or enclosures, except in special situations approved by EMEC. 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.

Note: This is to be done prior to any wire being energized

Services Metered Using Direct-Connect Meters

Socket wiring diagrams for services metered by direct-connect meters are illustrated in Figures 4-3 and 4-4.

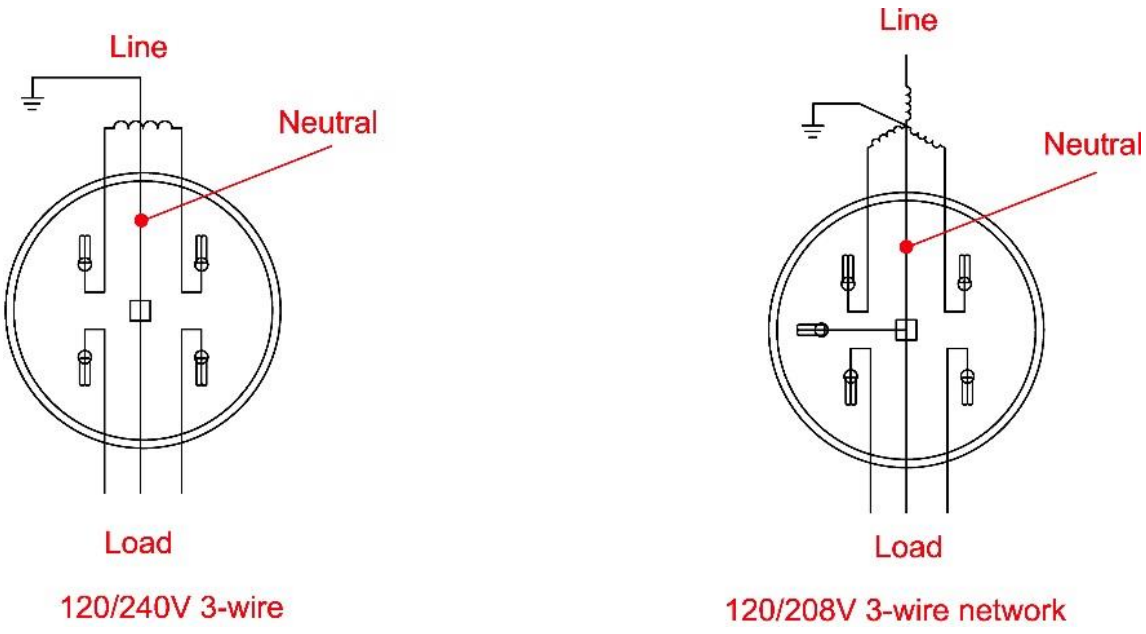

Figure 4-3 Connections for single-phase services using direct-connect meters.

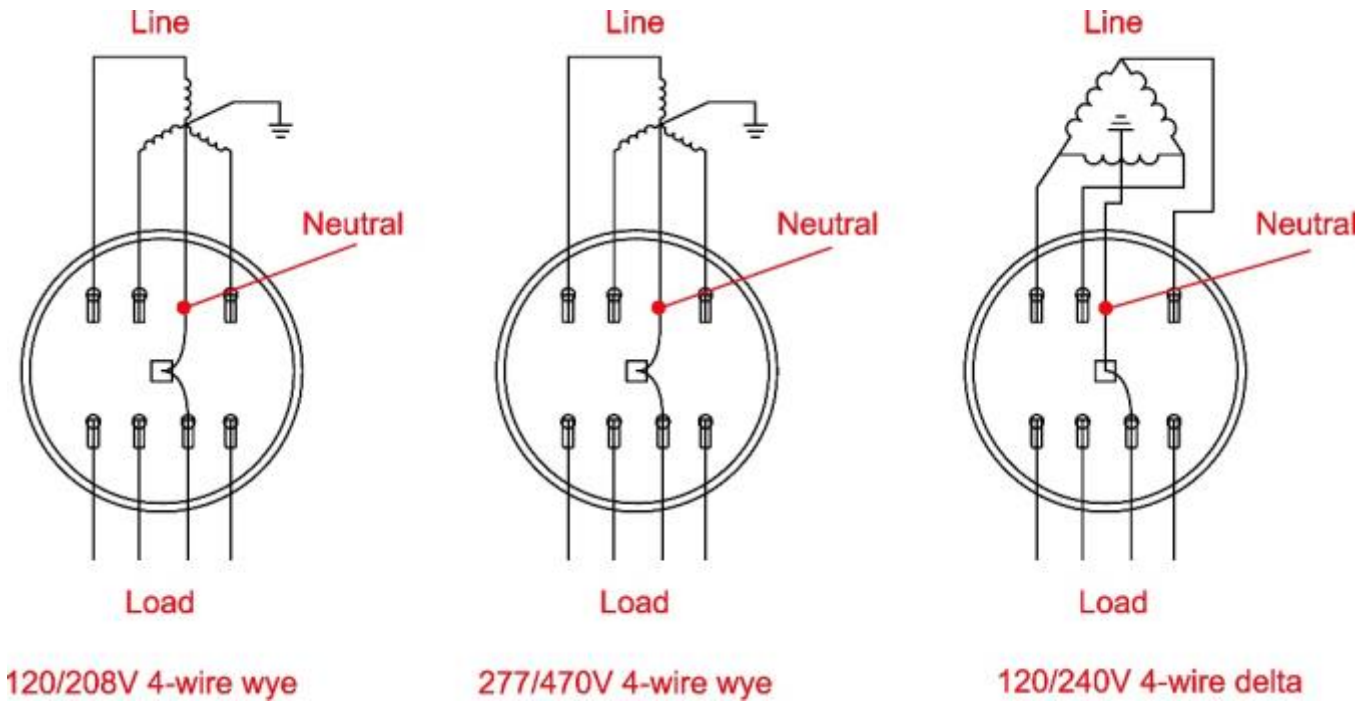

Figure 4-4 Connections for three-phase services using direct-connect meters

Current Transformer Metering

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

EMEC provides and installs the meter, current transformers, test switch, and local wiring associated with the meter, test switch, and CTs.

Multi-Meter Installations

Figures 4-5 and 4-6 show a typical multiple-meter installation for services of 200 amps or less. If the installation has more than six meters, a main disconnect is required.

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

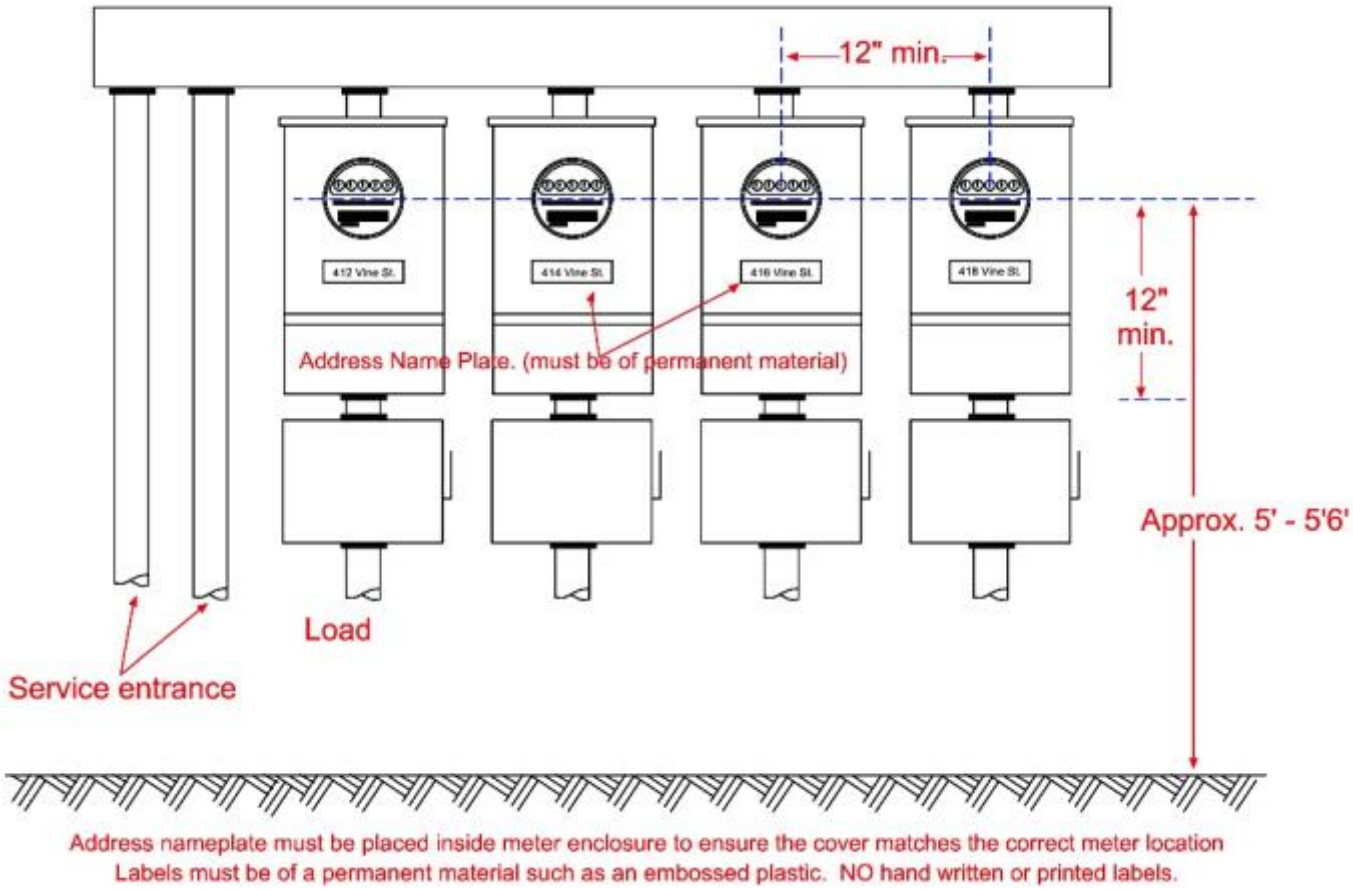

Figure 4-5 Installation for an office building.

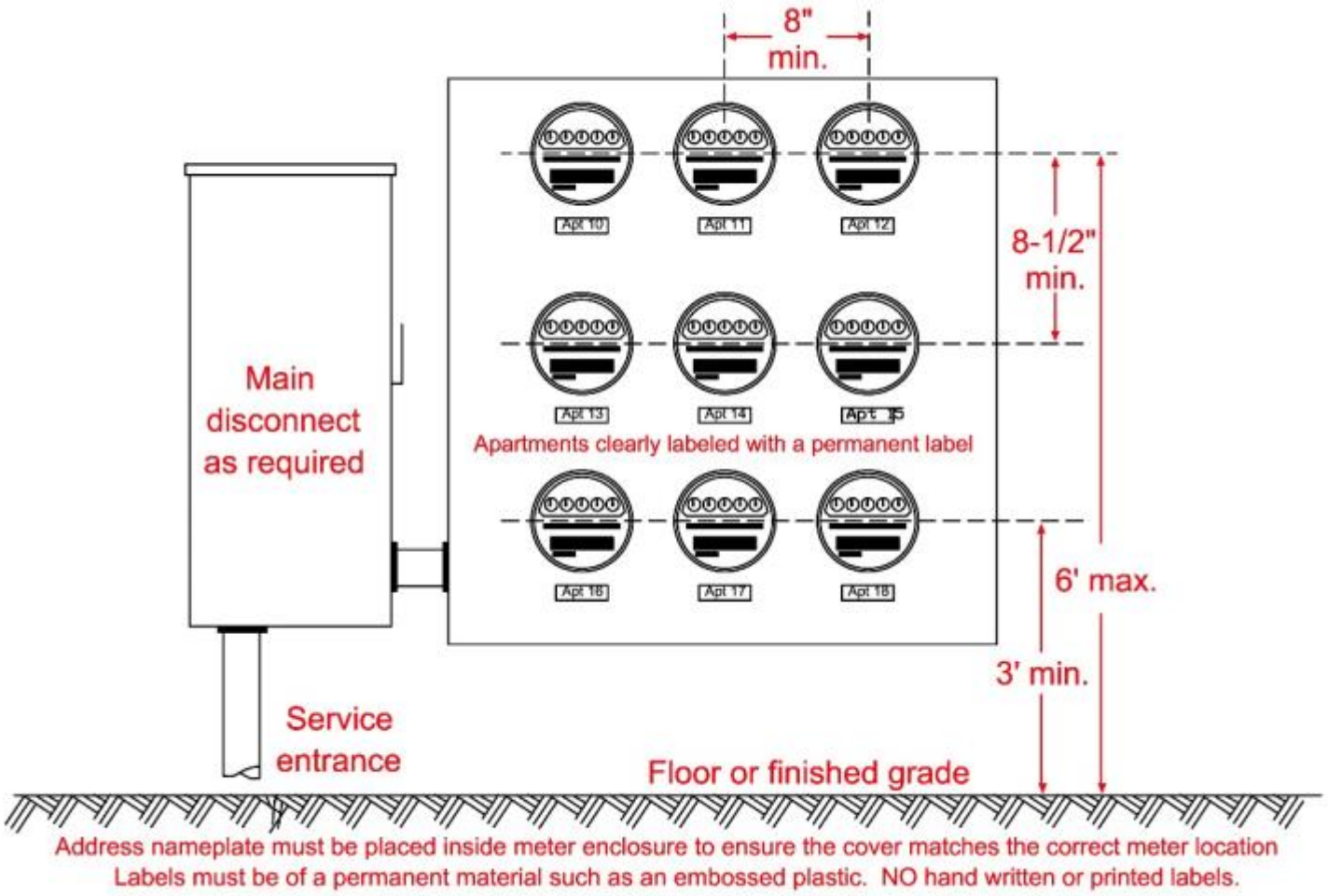

Figure 4-6 Installation for an apartment building.

Glossary of Metering Terms

ANSI – American National Standards Institute. An independent administrator and coordinator of voluntary industry standards.

bypass – A device which shunts current around the socket, so the meter can be removed without interrupting service.

clearance –A specified minimum distance between two objects to assure adequate space for safety, security, or access.

common ground point – The point where the grounding electrode connects to the equipment-grounding conductor and/or the circuit-grounding conductor.

conduit – A pipe with a smooth interior surface for easy drawing-in of electrical conductors. Conduit may be metallic or non-metallic.

corrosion inhibiter – An electrical joint compound used to retard oxidation at electrical connections.

current transformer – A transformer whose secondary current is a precise fraction of its primary current. Using current transformers, high-current circuits can be measured with conventional meters. Abbreviation: CT.

demand – The average rate at which energy (kilowatt hours) is consumed during a specified interval of time.

direct-buried cable – Cable which may be installed in the ground without the protection of a conduit.

direct-connect meter – A meter which carries full load current and connects across full line voltage. Also called a self-contained meter.

drip loop – A downward loop in the customer's conductors, near where the customer's conductors attach to the power company's overhead conductors, to prevent water from entering the service mast at the weatherhead.

fault – A partial or total failure of insulation which causes a short circuit between conductors, or between a conductor and ground, causing an abnormal current to flow. Also, a failure (break) in a conductor which causes an open circuit.

fault current – A current which flows between conductors, or between a conductor and ground, due to an abnormal connection between the two. A fault current flowing to ground may be called a ground fault current.

guy – A cable or brace that supports a mast or pole.

hand-hole - A shallow form of manhole giving access to a top row of ducts in an underground electrical system

high leg – In a four-wire delta service, the phase with a voltage higher than the other two phases. Also called wild leg, delta leg.

house knob - Insulated Wireholder, Reinforced Screw Type, typically used on the eve of a house for the point of attachment.

instrument transformer – A transformer which delivers as its output, a precise

fraction of the input line current or line voltage. Instrument transformers allow standard meters to measure high currents and voltages.

instrument-rated meter – A meter used in conjunction with instrument transformers, to measure high-voltage or high-current services. Also called a transformer-rated meter.

line conductor – A service conductor installed by the electric utility, to the meter.

load conductor – A service conductor to the customer's load, after the meter.

manual link bypass – Provision for manually installing conductive links between the line and load terminals in the meter socket. These links maintain electrical service to the customer when the meter is removed. Also called manual circuit-closing block.

manufactured home – A factory-assembled structure built on a permanent chassis, transportable in one or more sections, and designed to be used as a dwelling with a permanent foundation. Also called a modular home. New electric service to a manufactured home has the same requirements as installing new service to a permanent single-family residence.

meter jaw – A spring-loaded receptacle inside a meter socket which captures the terminals (blades) of a meter, and connects the meter terminals to the service conductors.

meter pedestal – A factory-built assembly containing a meter socket and disconnect switches.

meter ring – A metal ring which secures the meter to the meter socket, which can be sealed by the electric utility to prevent tampering with the meter.

meter socket – The mounting device consisting of meter jaws, connectors, and enclosure for receiving a socket-type meter.

mobile home – A factory-assembled structure built on a permanent chassis, transportable in one or more sections, and designed to be used as a dwelling without a permanent foundation. Overhead service to a mobile home is provided by a meter pole. Underground service to a mobile home is provided by a meter pedestal.

NEC – National Electrical Code. National regulations for the installation of electrical equipment inside buildings. Published by the National Fire Protection Association. NEC rules apply to equipment on the customer's side of the service point.

NEMA – National Electrical Manufacturers Association. A trade association which publishes standards for manufacturers of electrical equipment, including enclosures and racks.

NESC – National Electrical Safety Code. National regulations for the installation, operation, and maintenance of electric supply and communication lines. Published by Institute of Electrical and Electronics Engineers. NESC rules apply to equipment on the electric utility's side of the service point.

neutral – The grounded conductor in a single-phase three-wire, or three-phase four-

wire system.

point of attachment – The point at which the utility's service conductors are mechanically attached to the customer's premises. For overhead services, the point of attachment is usually an insulated clevis.

power factor – Technically, the cosine of the phase angle between the circuit voltage and current waveforms. Since phase angles are difficult to measure, power factor is usually derived by measuring power or impedance. Power factor is the ratio of active power to apparent power (watts divided by volt-amperes). Power factor has no units, but is commonly expressed as a percentage. For example, if active power is 96 kW and apparent power is 100 kW, the power factor is 96%.

primary voltage – The voltage at which electricity is delivered from substations to distribution transformers. Primary voltage is greater than 600 volts.

raceway – An enclosed channel for holding wires or cables. If designated for line conductors, the raceway must be sealable. The intermixing of line and load conductors in the same raceway is not permitted.

seal – A locking device to secure a meter or other service equipment.

secondary voltage – The voltage at which electricity is delivered from distribution transformers to customers. Secondary voltage is less than 600 volts.

select backfill – Soil or sand free from sharp objects, rocks, scrap building material, and corrosive material.

self-contained meter – A meter which carries full load current and connects directly across full line voltage. Also called a direct-connect meter.

service drop – For overhead service, the power company's service line between the distribution transformer and the point of delivery.

service line – Conductors from the distribution transformer to the customer's point of delivery. See service drop, service lateral.

service entrance equipment – The service equipment which is supplied by the customer: conduit, conductors, mast, weatherhead, meter base, enclosures, disconnects, and panels.

service lateral – For underground service, the service line between the distribution transformer and the point of delivery.

service mast – For overhead service, the conduit rising above the meter to provide mechanical protection to the customer's conductors and to support the service drop from the power company.

service point – The point where the utility's service line makes the electrical connection to the customer's wires. For overhead services, the point of delivery is the splice between the utility's and the customer's conductors. For underground services, the point of delivery is the secondary lugs of the distribution transformer, or the service stubout, or the secondary hand hole – if the utility's existing service is on the customer's property. If the utility's existing service is not on the customer's property, the point of delivery is the customer's property line. The utility determines

the point of delivery based, in part, on convenient access to existing service.

socket – The mounting device for socket meters. Includes spring-loaded meter jaws, connectors for line and load conductors, and an enclosure.

stub-out - The location where the wires are terminated.

temporary service – Electric service during the construction phase of a project.

test switch – A device used to isolate connections to a meter from its instrument transformers.

transformer-rated meter – A meter used in conjunction with instrument transformers, to measure high-voltage or high-current services. Also called an instrument-rated meter.

UL – Underwriters Laboratories. An independent product-testing and certification organization.

voltage transformer – A transformer whose secondary voltage is a precise fraction of its primary voltage. Using voltage transformers, high-voltage circuits can be measured with conventional meters. Abbreviation: VT, or PT (potential transformer).