

CHAPTER

3

Commercial Underground Services

Preparing for the installation

The following checklist will assist in preparing a project for the installation of a commercial underground electric service. After these items have been completed, Clark Public Utilities will connect the service and set the meter.

To obtain new commercial underground electric service, the financially responsible party is asked to:

- Contact Clark Public Utilities' Construction Services department at (360) 992-8558 to initiate a request for service.
- Provide the following information:
 - Job site address and/or Assessor's Parcel Number (APN).
 - Description of commercial business to be served.
 - Contact person's full name and phone number.
- Obtain an electrical work permit from the Washington Department of Labor and Industries (360) 896-2300 or from the City of Vancouver (360) 487-7802.
- Provide the utility's designer with the following information:
 - Civil drawings of the planned structure including any required street lighting.
 - Site plan with feasible location for electrical equipment indicated.
 - Voltage requirements.
 - Load information (panel size and expected load).
 - Itemized load summaries.
 - Notice of future road improvements surrounding the job site.
 - Documentation of any existing utility easements.

NOTE: All required easements must be secured by the customer prior to service connection.
- Call the national "Call Before You Dig" locating service by dialing 811 or 1-800-424-5555 to determine the location of existing underground utilities.
- Obtain a primary voltage and/or secondary service electrical design from a Clark Public Utilities designer.
- Pay all pre-billed utility construction charges.

- Hire a primary electrical contractor from Clark Public Utilities' approved primary contractors list to purchase and install the required underground facilities, materials and metering system as outlined in the approved utility design.
- Have the Clark Public Utilities approved electrical contractor call (360) 992-8839 to request inspections of all primary equipment and trenches.
- Contact the utility's Meter department at (360) 992-8001 to schedule delivery and installation of CTs and the meter *prior* to the final service inspection.
- Obtain an electrical service inspection from the authority having jurisdiction.
- After inspection and approval, *backfill* the trench to final grade. Complete backfill of the primary trench is required prior to the utility scheduling the job to be energized.

NOTE: The electrical inspector will notify Clark Public Utilities after the service has been approved.

Once Clark Public Utilities has received verification of *approval* and the customer has completed backfilling the trench, the utility will:

- Energize all electrical facilities required.
- Connect underground primary and secondary conductor in an energized source facility.
- Set the electric meter in the customer-owned meter base.

Design responsibilities

Clark Public Utilities

A Clark Public Utilities designer will provide a design of system upgrades and new electrical facilities required to serve the commercial job site. Once the electrical design is complete, the customer is responsible for hiring a utility-approved contractor to trench and install the primary voltage electrical equipment as outlined in the utility's electrical design.

Commercial customer

The customer's electrical designer is responsible for providing a design of all electrical services required to serve the commercial structure. This includes designs for the following customer-owned and maintained services:

- ▶ Service to the commercial structure.
- ▶ Street light locations, as required by the authority having jurisdiction.
- ▶ Fire-pump services. This service may require a dedicated circuit.

Ownership and maintenance responsibilities

Clark Public Utilities takes over ownership and maintenance of newly energized underground facilities up to the connectors inside the secondary junction box/pedestal. If no secondary junction box/pedestal exists, utility ownership ends at the secondary connectors inside a padmounted transformer or at the secondary connection point of an overhead transformer.

All electrical equipment and wiring on the customer's (load) side of the transformer (including the service mast of overhead services) is owned and maintained by the commercial customer. The customer is responsible for facilitating any necessary repairs or changes to the service and metering equipment. This includes the underground conductor, conduit, entrance equipment, meter base and ***associated equipment***.

NOTE: Commercial customers installing primary metering will have ownership and maintenance agreements that are mutually agreed upon. In most cases, the customer owns and maintains all facilities and equipment beyond the primary metering.

Commercial street lighting

Commercial job sites within incorporated cities of Clark County may require street lighting as part of the project. Once the customer-provided lighting design has been approved by the incorporated city with jurisdiction, the customer's design firm is required to submit this plan to Clark Public Utilities' design group. A utility designer will provide a design of electrical facilities needed to serve the new street lights.

It is the commercial customer's responsibility to request a design for the lighting service and coordinate the installation of facilities to serve both the commercial structure and street lighting.

Street lighting ownership and maintenance

Customers submitting approved lighting designs that call for Clark Public Utilities' standard lighting materials will have the option of purchasing these materials from the utility. The utility will maintain approved materials that are installed to Clark Public Utilities' specification.

Street lighting fixtures installed within Vancouver or Camas city limits are maintained by the City of Vancouver and City of Camas. Overhead and underground conductors providing service to these street lights are maintained by Clark Public Utilities.

Lighting designs calling for non-standard materials are customer-owned and maintained. The utility requires metering installed ahead of all customer-owned street lighting services.

Site preparation

The following site requirements must be met before the installation of a new commercial service can begin:

- ▶ A Clark Public Utilities primary design has been completed.
- ▶ The customer has hired a primary electrical contractor from Clark Public Utilities' current list of approved contactors.
- ▶ All required permits have been secured (right-of-way, street crossing, etc.).
- ▶ The site is at final grade or acceptable sub-grade in the area of construction.
- ▶ The trench route is clear of construction material and any obstructions.

Primary trench

Trench width and depth

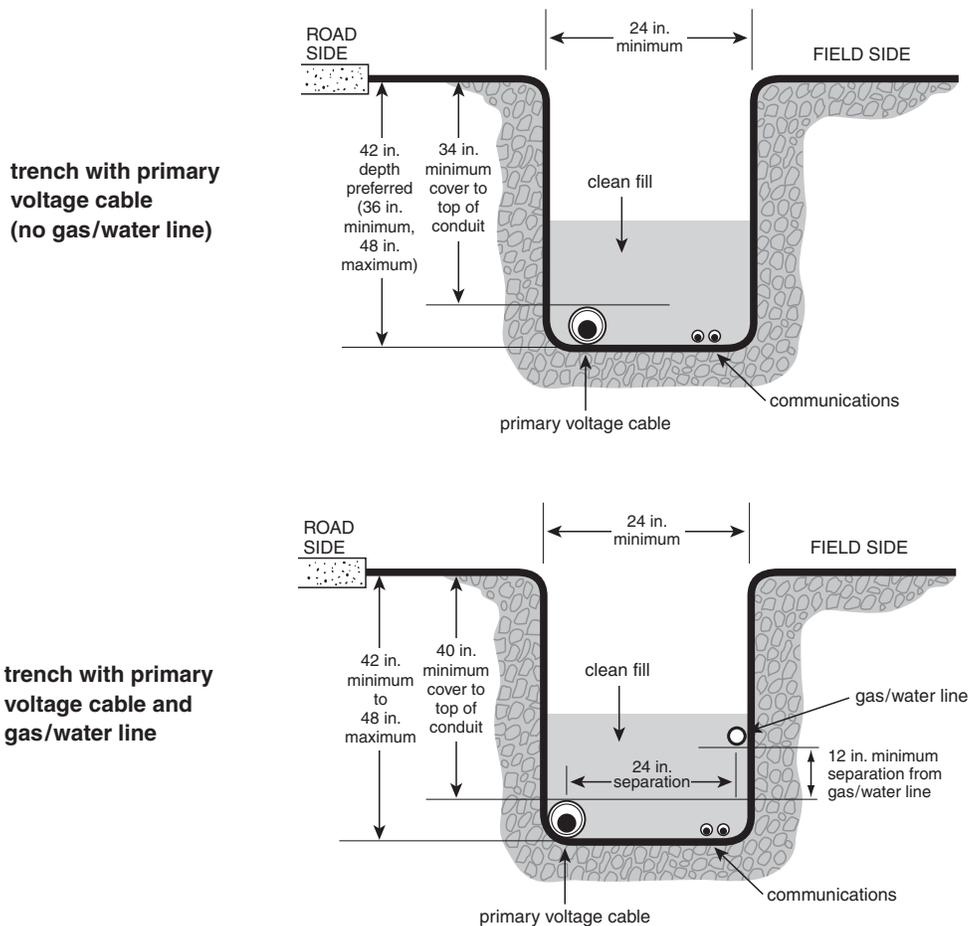
The primary trench width is 24 inches unless otherwise approved by utility personnel. The excavator may need to increase the trench width to accommodate other conduits and/or lines installed in a joint use trench. When increasing the trench width, remember to allow a minimum of 12-inch horizontal separation between Clark Public Utilities' electrical conduits and other utility service lines.

The preferred trench depth for commercial primary electrical lines is 42 inches with 36 inches of cover. The minimum depth trench is 36 inches with a minimum of 34 inches of cover, measured from the top of the electrical conduit over the entire length of the trench. The maximum trench depth allowed is 48 inches.

Figure 1 illustrates the utility's width and depth requirements for commercial primary line extension trenches with and without a natural gas/water service line.

NOTE: Sewer lines, water mains and storm drainage systems are *not* allowed in a joint trench with Clark Public Utilities' electric service lines.

Figure 1 Typical commercial utility trenches with primary voltage cable



NOTE: The maximum trench depth allowed is 48 inches.

Trench excavating requirements

The following trench requirements must be met before primary power conduits can be installed:

- ▶ The customer is responsible for applying for and securing right-of-way work permits required within incorporated city limits.
- ▶ Trenching or installing a crossing for primary voltage service in the public road right-of-way of unincorporated Clark County requires a public roadway use permit, applied for and issued to Clark Public Utilities by the authority having jurisdiction. Fees for utility-secured permits will be added to the customer's construction billing.
- ▶ No work in the right-of-way shall be performed until required permits have been secured.
- ▶ A licensed and bonded excavation contractor hired by the customer must perform all work in the public road right-of-way.
- ▶ The approved contractor shall comply with all roadway use permit requirements.
- ▶ All road crossings shall be a minimum 42-inch to maximum 48-inch depth depending on the other utilities that will share the crossing.
- ▶ Trenches and crossings within the state right-of-way require five feet of cover, measured from the top of the conduit.
- ▶ Any work in the public right-of-way must meet the erosion and sediment control requirements of the local jurisdiction.
- ▶ Trenches shall be excavated according to the trench detail, and Clark Public Utilities' electrical design.
- ▶ Trenches shall be straight and the bottom smooth, level, and free from rocks, obstructions and construction debris.
- ▶ The customer shall remove all water in primary voltage and secondary electric service trenches prior to inspection by pumping or draining.
- ▶ The customer is responsible for roadway restoration and clean-up as required by the permit issuing agency. Electrical facilities will not be energized until final approval of restoration has been issued by the authority having jurisdiction.

Directional drilling/boring

Directional drilling/boring used to install primary voltage electric service must meet the following requirements:

- ▶ Pre-approval of the drilling/boring route from a Clark Public Utilities representative prior to the beginning of construction.
- ▶ The utility-approved electrical contractor hired by the customer contacts the new construction superintendent at least one week prior to the start of work for site approval and specification review.
- ▶ Road crossing and right-of-way work permits have been secured prior to the start of work.

NOTE: If drilling/boring is used to cross a driveway or street *only*, the customer is not required to notify the construction superintendent.

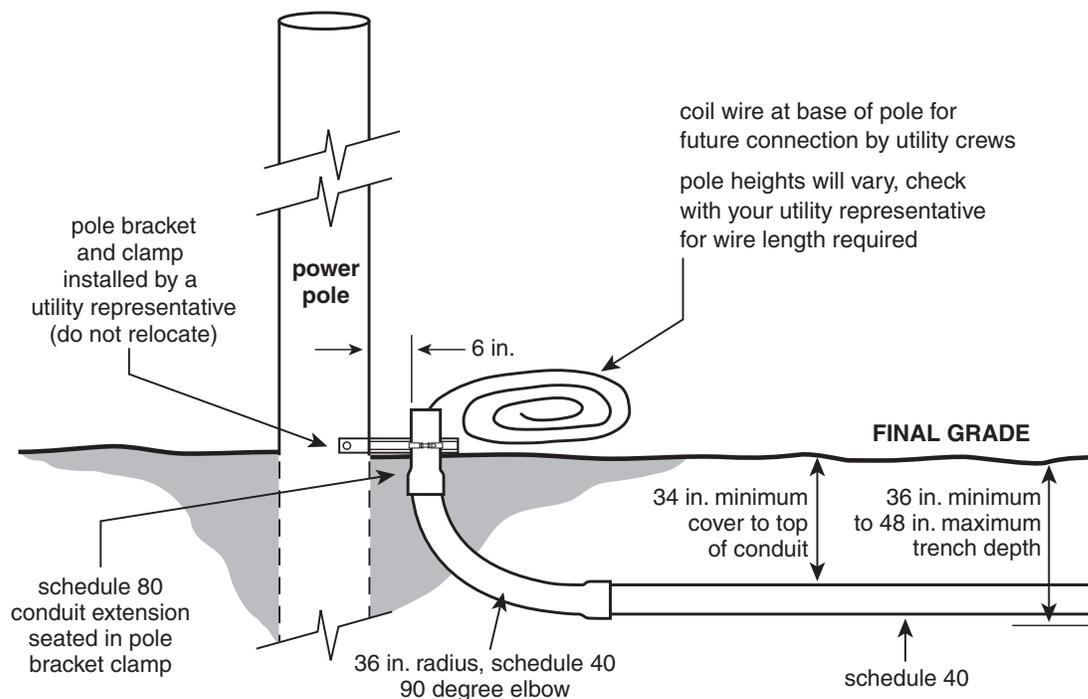
Primary voltage conduit

Clark Public Utilities requires the installation of a continuous conduit for all primary voltage conductors. Conduit is installed by a utility-approved electrical contractor hired by the customer. It is the electrical contractor's responsibility to contact the utility and request the conduit inspection.

The primary voltage conduit shall meet the following specifications:

- ▶ 2-inch diameter, one conduit per phase of service, or one 4-inch diameter conduit containing three phases of conductor. A Clark Public Utilities designer will specify the required conduit on the electrical design.
- ▶ Electrical grade, UL listed, schedule 40, PVC.
- ▶ Gray in color.
- ▶ Overhead to underground commercial services require a schedule 40 conduit elbow seated in the trench and a schedule 80 conduit extension installed in the pole bracket clamp attached to the pole base (*Figure 2*).
- ▶ Conduit size, wall thickness and total degree of bends allowed will be outlined on the approved utility design.
- ▶ Install only manufactured radii. *Heat bending conduit is not acceptable.*
- ▶ All conduit joints shall be permanently connected using PVC cement.

Figure 2 Primary voltage overhead to underground pole bracket installation



NOTE: Trench depths vary; review your utility-provided design for required depth.

Secondary service conduit

The design firm hired by the customer will provide conduit specifications for the secondary service. These requirements are dictated by the NEC and fall under the jurisdiction of the Washington State Department of Labor and Industries or the City of Vancouver.

The number of secondary service circuits and size of conduit may be limited by the source facility. A three-phase transformer (75 kVA-1500 kVA) on a standard pre-cast concrete pad will allow six secondary circuits with a maximum wire size of 750 kcm. Transformers with a pre-cast pad and secondary vault will allow up to eight secondary runs.

The requirements of each job site vary. A Clark Public Utilities designer will review the secondary service design and advise the number of secondary circuits and conduit size allowed.

Trench backfill requirements

Clark Public Utilities will not energize electrical facilities until all primary trenches are backfilled to final grade by the customer.

Once primary inspections are complete, the customer is responsible for the following:

- ▶ Allowing PVC cement to cure according to manufacturer's recommendations prior to backfill.
- ▶ Providing a minimum 4- to 6-inch layer of clean backfill (with rocks no larger than 5/8 inch and no sharp objects) placed above power conduit(s). The remaining trench shall be backfilled with soil that is free of rocks larger than 5 inches and any foreign objects.
- ▶ Completing backfill as soon as practical after facilities are placed and inspected.
- ▶ Backfilling with controlled density fill (CDF)/select backfill when required by utility personnel.
- ▶ Carefully placing backfill to prevent damage or movement of the conduit(s).
- ▶ Completing backfill up to and around customer-installed elbows attached to the pole bracket assembly (*Figure 2*).
- ▶ Relocation costs due to change in grade or alignment.

Transformers

Transformer sizing

Transformers are sized by a Clark Public Utilities designer. Customer-provided load information will be analyzed by the utility designer and the transformer will be sized accordingly.

Maximum available fault current

The customer is responsible for providing and installing equipment to withstand fault currents. *Table 3* on the following page provides the maximum available

short-circuit current for Clark Public Utilities’ most commonly installed padmounted transformers. These values are based on measures taken at the transformer’s secondary bushings and do not account for the secondary conductor.

Short-circuit current information on existing or additional transformer types and sizes are available by calling your utility representative.

NOTE: To allow for future system expansion or upgrades, always calculate using the next larger size transformer.

Table 3 Maximum short-circuit current for new single-phase and three-phase padmount transformers

SINGLE-PHASE			
KVA	240/120	Min. Z%	Max. Z%
25	10k	1.04	2.0
50	10k	2.08	3.0
75	10k	3.13	4.0
100	14k	2.98	4.0
THREE-PHASE			
KVA	208Y/120	Minimum Z%	
75	10k	2.08	
150	22k	1.89	
300	42k	1.98	
500	65k	2.14	
750	65k	3.20	
1000	85k	3.27	
KVA	480Y/277	Minimum Z%	
75	14k	.64	
150	14k	1.23	
300	25k	1.44	
500	30k	2.01	
750	30k	3.01	
1000	50k	2.41	
1500	50k	3.61	
2000	50k	4.81	
2500	55k	5.46	

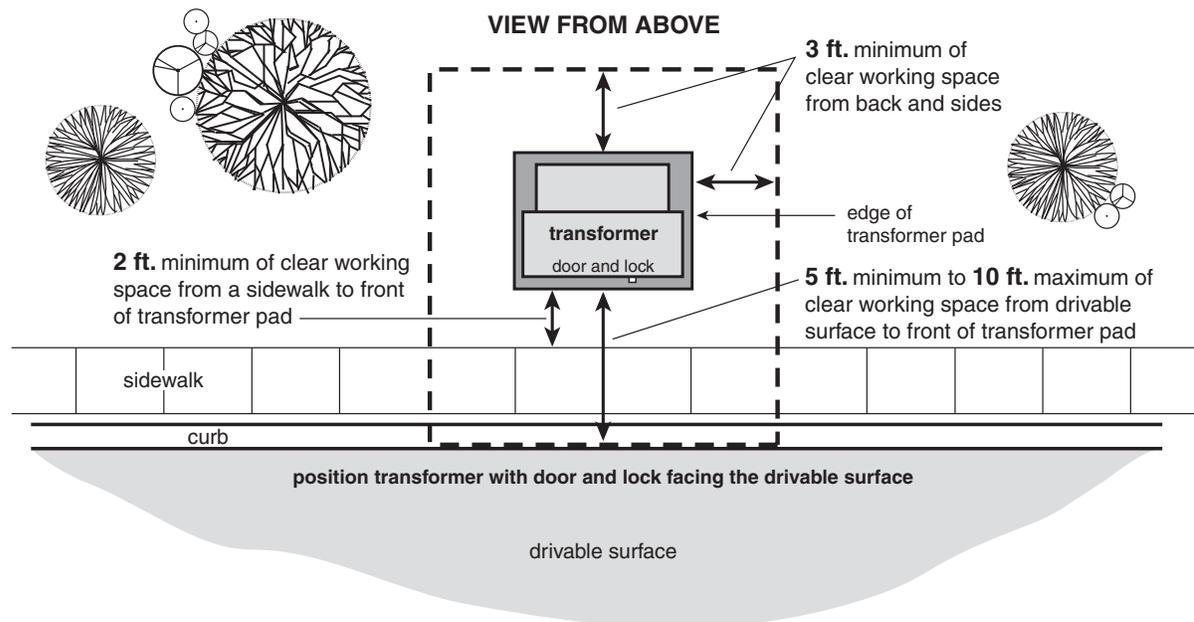
Transformer location and access

Underground electrical facilities must be readily accessible by the utility during construction and for future operation and maintenance. The area around padmounted electrical equipment must provide a clear and level working space and remain free from obstructions such as landscaping, poles, retaining walls, structures, fences, etc.

All transformers and padmounted equipment are to be located:

- ▶ Within 10 feet of a drivable surface but not closer than 5 feet (**Figure 3**).
- ▶ With the front of the equipment (door and lock side) facing toward the drivable surface.
- ▶ With the transformer pad parallel to the edge of the drivable surface.
- ▶ Allowing 10 feet of clearance in front and 3 feet from the back and sides of the equipment (**Figure 3**).
- ▶ At least 2 feet from a sidewalk for pedestrian safety.

Figure 3 Commercial padmounted transformer location and access



Transformer safety clearances

Clearances from padmounted 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 10 feet if the building has combustible walls, and 3 feet if the building has non-combustible walls as shown in *Figure 4*.

Table 4 provides additional safety clearances that apply to any oil-filled electrical equipment.

Figure 4 Commercial padmounted transformer minimum safety clearances

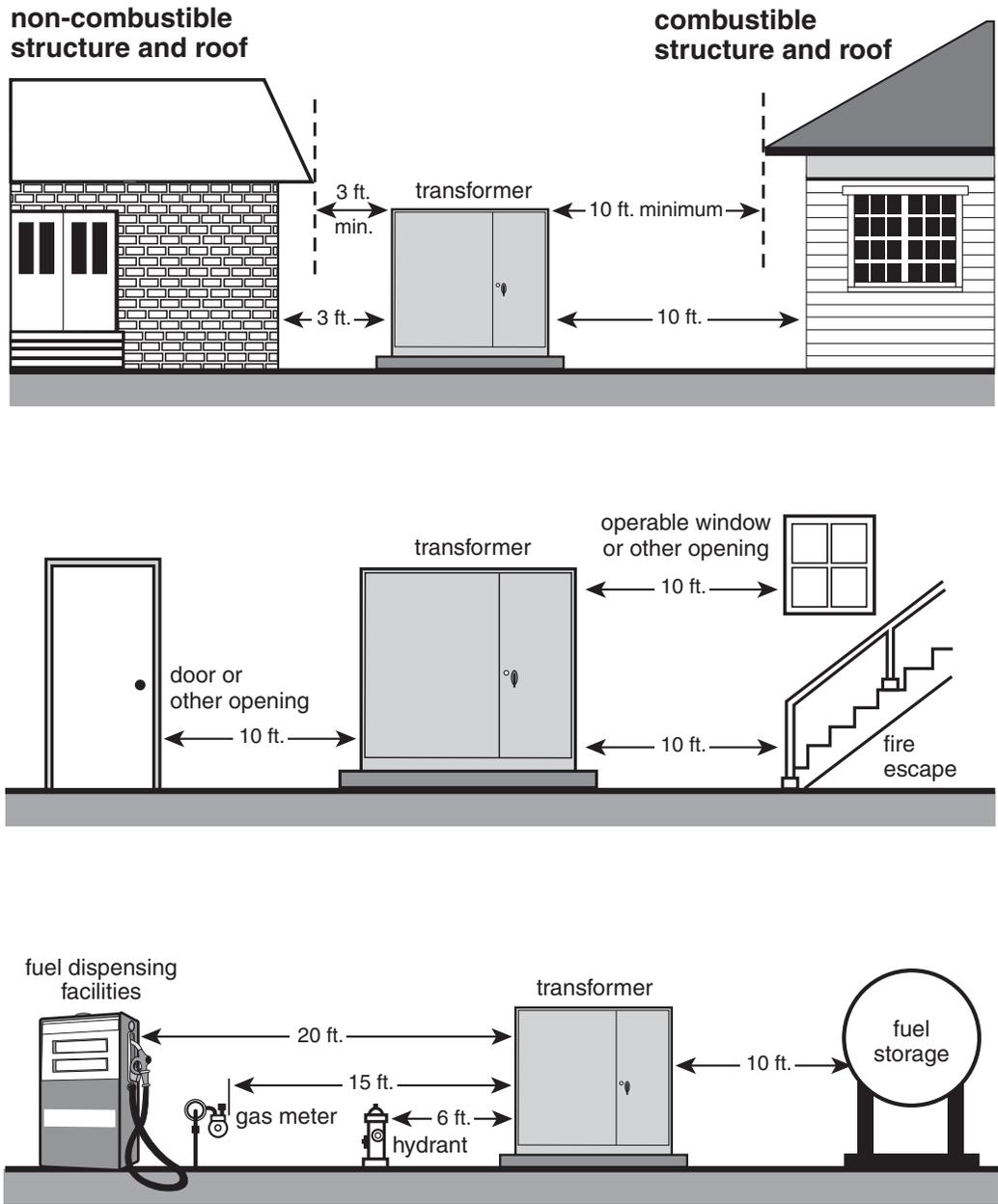


Table 4 Electrical equipment safety clearances

Feature	Clearance distance
Combustible walls or roof (including stucco)	10 feet
Non-combustible walls (including brick, concrete, steel and stone), provided the side of the transformer facing the wall does not have doors. Materials that pass UBC standard 2-1 or ASTM E136-79 are considered to be non-combustible.	3 feet
Fire sprinkler valves, standpipes and fire hydrants	6 feet
Doors, windows, vents, fire escapes, and other building openings	10 feet
The water's edge of a swimming pool or any body of water	25 feet
Facilities used to store hazardous liquids or gases (e.g. service station fuel storage tank filler opening or emergency generator fueling points)	10 feet
Facilities used to dispense or store hazardous liquids or gases (e.g. service station gas pumps or propane bulk dispensing tanks)	20 feet
Gas service meter relief vents	15 feet

Guard post installation

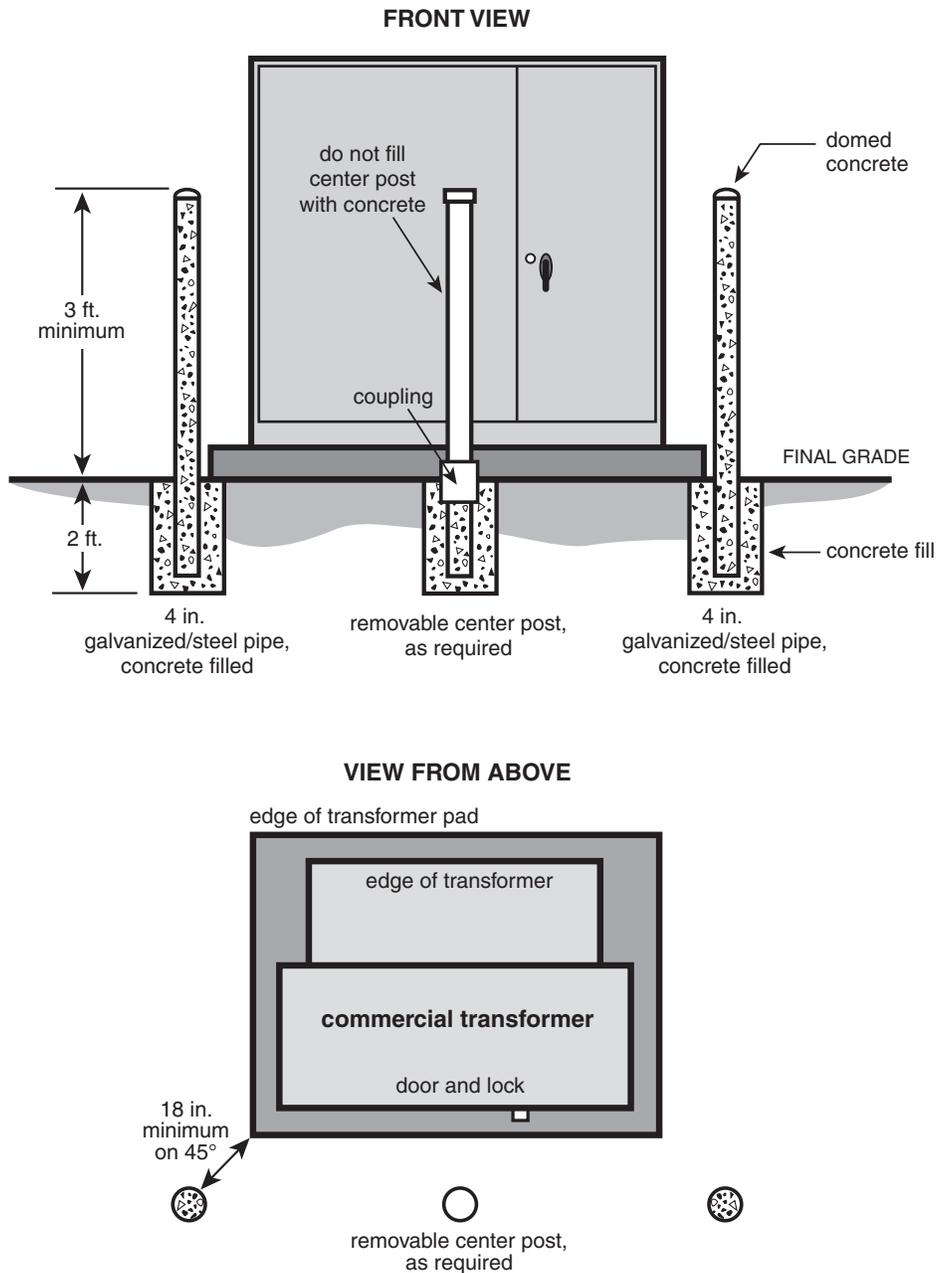
The installation of **guard posts** (bollards) may be required when electrical equipment is exposed to vehicular traffic or minimum clearances around equipment cannot be met. It is the customer's responsibility to supply, install and maintain guard posts when required by Clark Public Utilities personnel. See *Figure 5*.

Materials and installation requirements:

- ▶ 5-foot by 4-inch galvanized or steel pipe.
- ▶ Set each post 24 inches deep.
- ▶ Fill posts with concrete.
- ▶ Posts set in stable soil are to be surrounded by 6 inches of concrete.
- ▶ Unstable soil or sand requires 12 inches of concrete surrounding each post.
- ▶ If several guard posts are used, locate them no more than 5 feet apart or as otherwise specified by a Clark Public Utilities representative.

- ▶ If the distance between the corner posts exceeds 5 feet, a removable center post is required (*Figure 5*).
- ▶ If a removable center post is installed, the threaded joint requires treatment with an anti-seizing agent.
- ▶ Paint exposed section of post “traffic yellow.”

Figure 5 Guard post (bollard) installation for commercial transformers



NOTE: Additional guard posts may be required at back and sides of transformer.

Underground secondary junction box/pedestal

Site preparation and excavation

Prior to the installation of an underground secondary junction box/pedestal the job site requires:

- ▶ Staking of property lines.
- ▶ Excavation to final grade.
- ▶ Curbs poured.

A utility representative will determine the size of the junction box/pedestal required. Dimensions and equipment location will be indicated on the utility-provided electrical design.

The customer is then responsible for:

- ▶ Excavating the site to the dimensions provided by the utility representative.
- ▶ Installing the appropriate junction box/pedestal as called for in the electrical design.
- ▶ Installing appropriate labeling as called for on the utility-provided electrical design.
- ▶ Backfilling around the equipment to flush with final grade if in a hard surfaced area or 2 inches below the junction box/pedestals' indicated grade line if in a landscaped area.

Conduit and cable installation

Prior to Clark Public Utilities energizing a secondary junction box/pedestal the customer is responsible for:

- ▶ Installing conduit for all cables entering the **enclosure**.
- ▶ Installing conduits so that cable is pulled toward the bell ends.
- ▶ Providing, installing and marking all required futures.
- ▶ Capping all conduit futures that are plumbed into the enclosure.
- ▶ Requesting a standby with qualified utility personnel (two business days notice required) to plumb conduit and cable into any energized secondary enclosures.

Primary voltage installations to utility pole bases

A utility representative will install a pole bracket and clamp assembly at the base of the source pole. The commercial customer is responsible for providing and installing the following equipment up to Clark Public Utilities' pole bases (See *Figure 2* on page 14 of this chapter):

- ▶ 36-inch minimum depth (42-inch preferred) trench up to and exposing the pole base.
- ▶ Conduit and wire as outlined in the utility design.

- ▶ Schedule 40 conduit elbow seated in the trench next to the pole base.
- ▶ Schedule 80 conduit extension installed in the pole bracket clamp attached to the pole base.
- ▶ Secondary junction box or pedestal as required by the utility design.
- ▶ Minimum 45-foot tail of wire coiled at the pole base (coil length varies based on pole height).

Additional pole base installation information:

- ▶ Do not trench to or install service to a utility pole that does not have a pole bracket assembly installed. Contact the utility designer to install or reattach the assembly.
- ▶ Do not remove or relocate a utility-installed pole bracket assembly.