

Electric Service Requirements Manual

ESR – 1st Edition

Service and Metering Requirements for
Residential, Commercial, and Industrial Customers

Columbia River PUD | A Community-Owned Utility



2022 Electric Service Requirements Manual

1st Edition

This manual shall be distributed and interpreted in its entirety.

Individual pages will not represent all the requirements necessary for an installation.

Printed versions of this document may be out of date.

Please consult our website or office for the most recent version.

General Terms and Conditions supersede the contents of this manual.

Cover photo of Columbia River PUD, OR Michael Arend



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Preliminary Information

About This Book

This 2022 edition of the Electric Service Requirements (ESR) book was prepared to help you obtain electric service from Columbia River PUD (CRPUD). The information in this book is provided as a reference for customers and contractors doing work in CRPUD service area. The intent of this manual is to clarify electric service requirements for the Columbia River PUD customers prior to and during construction.

We strongly recommend that you consult CRPUD to resolve any complications and answer any questions you might have concerning the requirements in this book. We will do our best to meet your needs for electric service by providing quality services at the lowest practical cost.

The ESR book is meant to be read and interpreted in its entirety. Individual figures or pages do not represent the complete requirements for service.

Note: Do NOT use figures in this book as construction plans by themselves as oftentimes the images lack important information necessary for construction. Please note that construction lead time varies with workload. Contact one of CRPUD's friendly Field Engineers as early in your design process as possible in order to ensure a successful project.

The information in the ESR book is accurate at the time of publication but is subject to change without notice. Please visit our [website](#) that contains the most up-to-date and definitive information.

Contact Information

Contact	Role	Phone Number	Address
Main Office	General Inquiries, 24-Hour Outage & Emergency	(503) 397-1844	64001 Columbia River Hwy, Deer Island, OR 97054
Customer Service	Billing & Payment Information	(503) 397-0590	custsvc@crpud.org
Engineering	Cost Estimates, Service Design & Coordination	(503) 397-0760	engineering@crpud.org
Energy Services	Efficiency Rebates & Net Metering Inquiries	(503) 366-9912	experts@crpud.org

Glossary

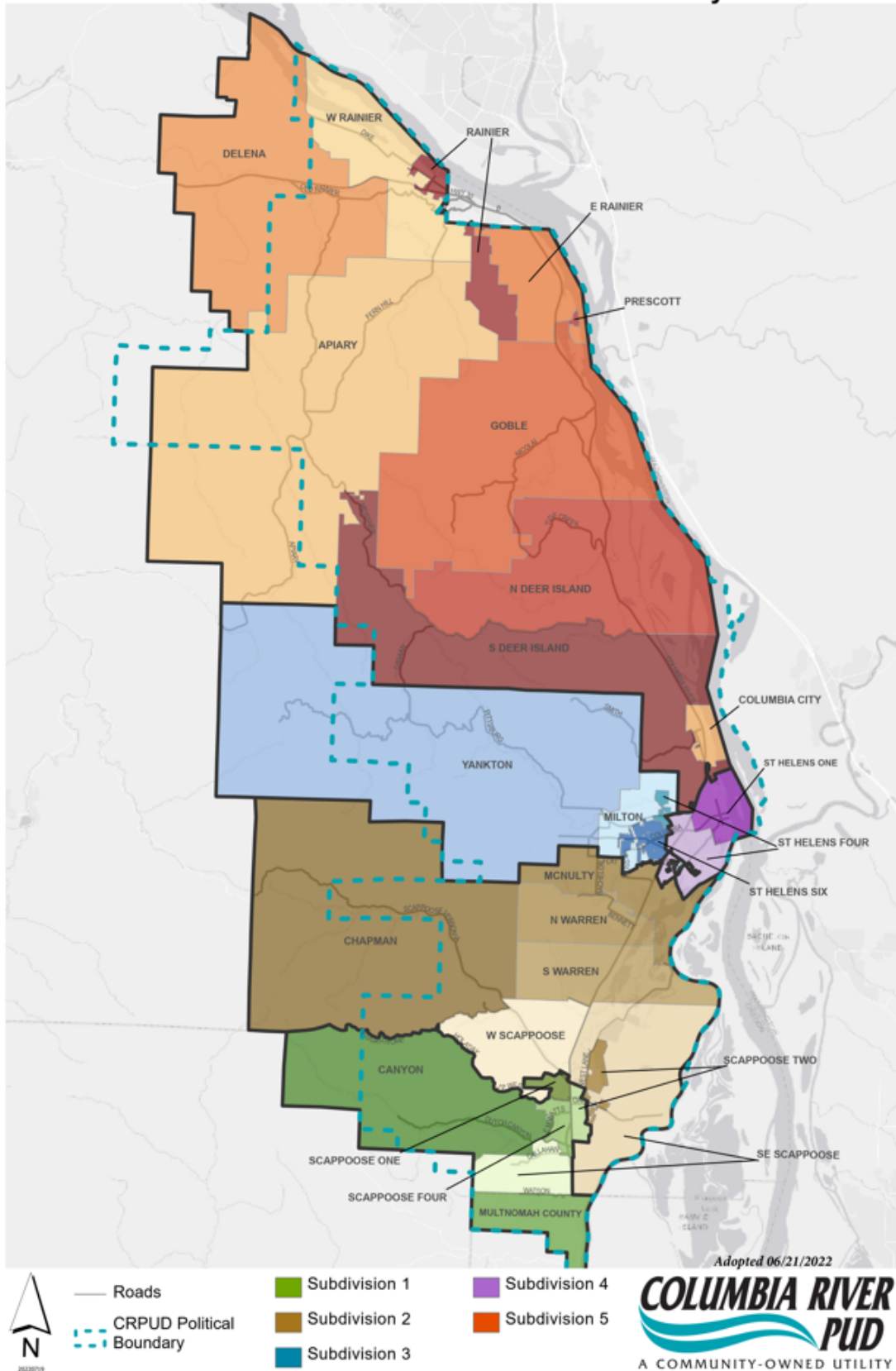
Bypass	A method that allows for service continuity to the customer while the meter is removed for testing or inspection.
CRPUD	Columbia River People's Utility District
Current Transformer (CT)	A device used to measure the current flow of larger services (401 amps or greater) in conjunction with a low voltage meter.
Customer	The individual or party requesting electrical service from the Columbia River PUD.
Easement	A permanent permitted right to access and use someone else's property for the purpose of installing, repairing, and/or maintaining utility lines.
Electric Service	The availability of electric Energy at the Point of Delivery for use by the Customer, regardless of whether any Energy is actually used.
Energy	Electric Energy measured in kilowatt-hours (kWh).

Line Extension	The overhead and/or underground electric facilities required to connect CRPUD's existing power line to a Customer's Point of Delivery. This may include poles, anchors/guys, primary wiring, secondary wiring, transformer(s), and other items associated with providing Electric Service to the Customer.
Meter Base	Customer-owned weather-tight metal enclosure with mounting device for socket-type meters consisting of jaws and connectors. Also referred to as a "Meter Socket."
NEC	National Electrical Code
NESC	National Electrical Safety Code
Net Metering	Measuring the difference between the electricity supplied by an electric utility and the electricity generated by a customer-generator and fed back to the electric utility over the applicable billing period.
Overhead Service	Electric Service supplied from CRPUD to the customer utilizing overhead conductors.
Permit	The granting of a temporary right to use the property of another for a specific limited purpose. Permits are often granted for specified periods of time. They are subject to revocation and are generally non-transferrable.
Point of Attachment	The location where CRPUD overhead service attaches to the customer's structure.
Point of Delivery	The interconnection point at which CRPUD's Electric Service is attached to the Customer's electrical system without regard to voltage, the location of CRPUD's meter, transformer, or other apparatus, unless otherwise designated by a Special Contract. This is also sometimes referred to as the Point of Service.
Power Factor	The ratio of kilowatt-hours to kilovolt ampere-hours, expressed as a percentage.
Safety Socket	A device consisting of a manual link bypass facility and a circuit-closing nut-and-bolt assembly that will de-energize the meter base while the meter is removed for test or inspection is required for all self-contained meter bases.
Self-Contained	In reference to meter bases; a device designated and rated to continuously carry the entire capacity of the service entrance equipment through the meter.
Switchboard	A large single-phase frame or assembly of panels on or in which are mounted switched, over current, and other protective devices, buses, instruments, and meters. Also referred to as "switchgear."
Underground Service	Electric Service supplied from CRPUD to the customer utilizing underground conductors.

**Please note that any terms not in the list above may be further defined in our General Terms & Conditions.

Map of CRPUD's Service Territory

CRPUD Board Subdivision and Columbia County Precincts



General Requirements

Purpose and Scope

Electric service is supplied to the customer under the rates, rules, and regulations approved by CRPUD's "General Terms, Conditions, Rules, and Regulations for Electric Service" document. Rates for residential, commercial, and industrial customers are determined based on the type of customer and the amount of energy consumed at the site. The services we provide typically have a monthly basic charge associated with a fee based on the amount of electricity used. CRPUD's Field Engineers can assist you in determining the rate schedule for a new or upgraded service. Call our Engineering department at, (503) 397-0760.

Responsibilities of Customers

Customers shall comply with federal, state, and local laws and regulations concerning activities in the vicinity and territory of CRPUD's electrical lines and equipment. The customer shall comply with such laws in order to protect themselves, their family, their employees, CRPUD and its employees, contractors, and all third parties from injury, loss, or damage.

Safety: Call Before You Dig

State laws require the customer/excavator to call 8-1-1 or 800-544-1794 for underground utility cable locations at least 48 hours prior to any excavation. Excavation shall not start until facilities have been marked by an underground locator service.



**Know what's below.
Call before you dig.**

Work Activity Near High-Voltage Overhead Power lines (Over 600V)

To protect those working near overhead power lines from accidental contact, Oregon has enacted laws and rules addressing work around high voltage overhead lines.

Please refer to the Oregon statutes and Occupational Safety and Health Administration (OSHA) regulations that clearly identify the distance you must maintain while performing any work near overhead power lines. If you or a contractor are going to be working near overhead line, please contact CRPUD at (503) 397-1844. We will work with our customers on taking the appropriate precautions, and in accordance with, "Oregon's Overhead Line Safety Act," the following laws must be followed:

- Coordinate work activity schedules.
- Place temporary mechanical barriers.
- Temporarily de-energize and ground the lines.
- Temporarily raise or move the lines.

Please note that the customer is responsible for the cost of implementing satisfactory precautions. The wire running along our secondary service line from CRPUD electrical facilities is typically at a service voltage of 600 V or less.

Grounding and Bonding

Grounding and bonding are critical for safety and electrical reliability. The customer is responsible for ensuring that the electrical wiring and service equipment is grounded and bonded in accordance with NEC.

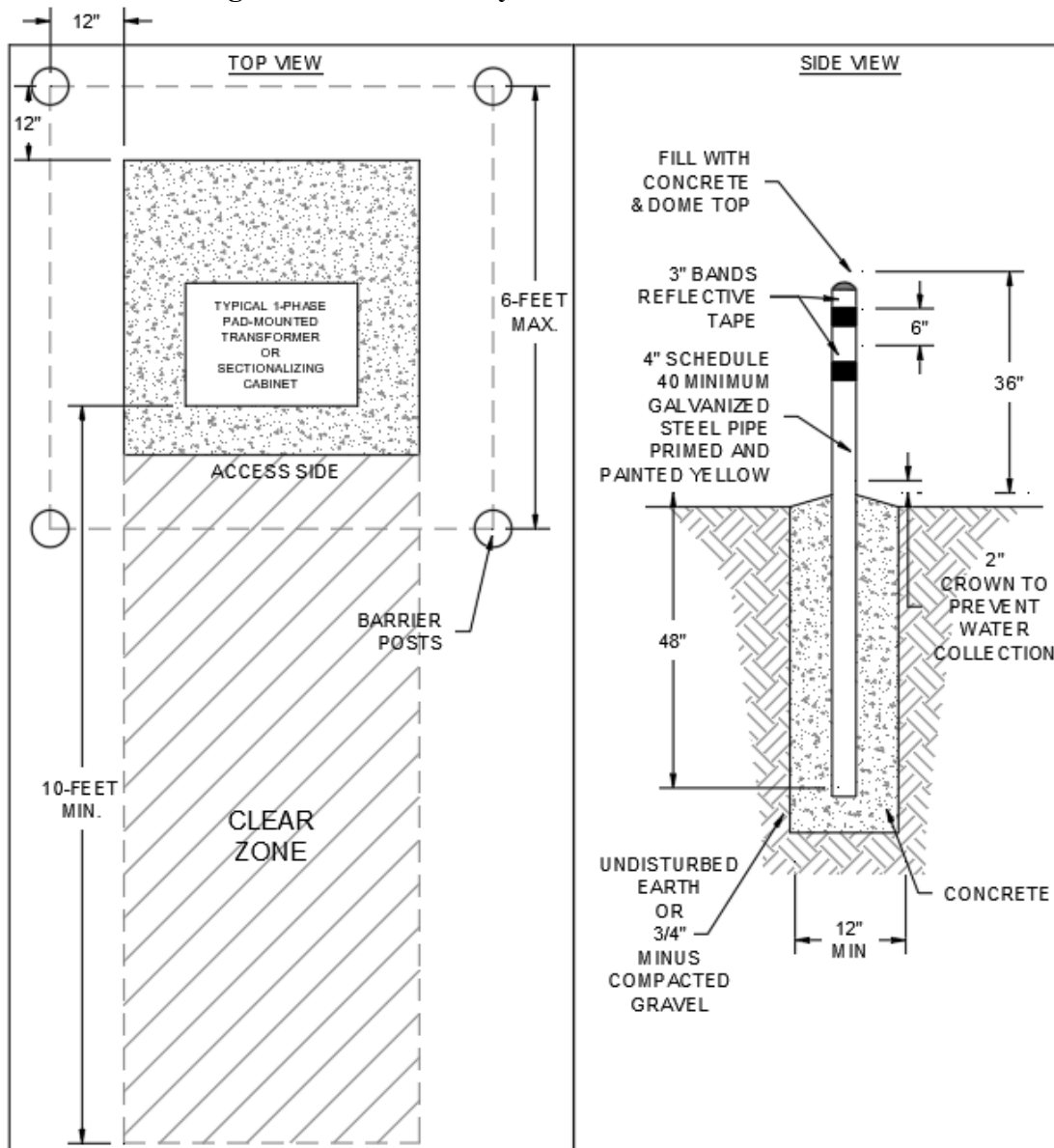
All grounding is represented by the following symbol in the figures of this manual:



Protecting CRPUD Equipment with Barrier Posts

Customers are required to install barrier posts in areas where the equipment is exposed to vehicle traffic. Please note that barrier posts must be installed before service is energized and all customers must verify the equipment dimensions with CRPUD's Field Engineers prior to installation. Please reference [Figure 1](#) for medium duty barrier posts and [Figure 2](#) for heavy duty barrier posts.

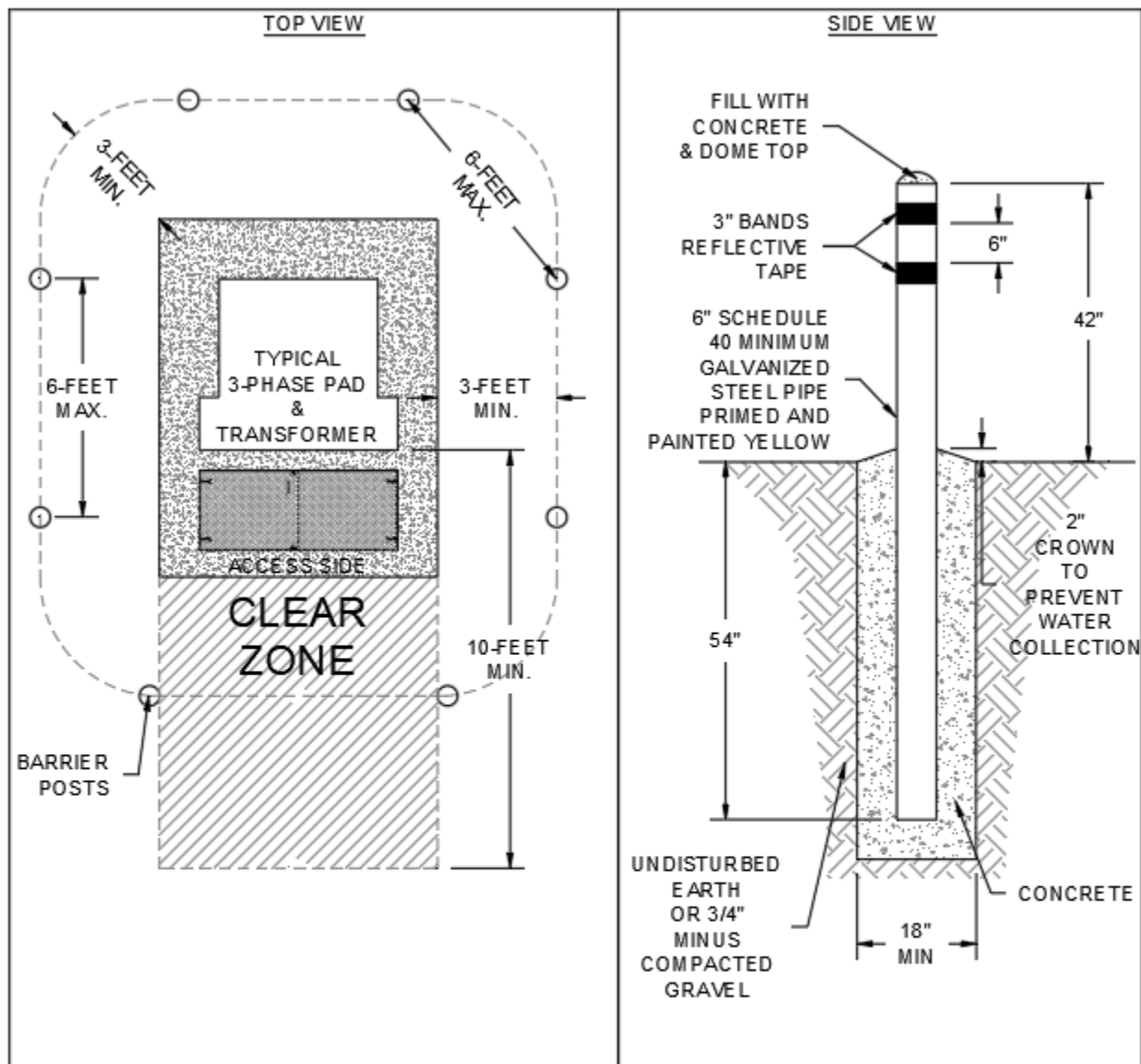
Figure 1: Medium Duty Barrier Post Installation



NOTES:

- 1) VERIFY DIMENSIONS OF EQUIPMENT WITH CRPUD ENGINEERING PRIOR TO INSTALLATION.
- 2) EQUIPMENT EXPOSED TO MOTORIZED VEHICLES SHALL BE PROTECTED BY THE USE OF BARRIER POSTS.
- 3) CUSTOMER TO INSTALL BARRIER POSTS ONLY AT LOCATIONS DESIGNATED WITH A SOLID DOT AS DETERMINED BY CRPUD.
- 4) 1-FOOT MINIMUM CLEARANCE FROM EDGE OF EQUIPMENT PAD TO CENTER OF BARRIER POST(S).
- 5) 6-FEET MAXIMUM DISTANCE MEASURED BETWEEN CENTERS OF BARRIER POSTS.
- 5) BARRIER POST INSTALLATION MUST PROVIDE FOR A "CLEAR ZONE" WITH 10-FOET MINIMUM CLEARANCE FROM EQUIPMENT ACCESS DOORS.
- 6) BARRIER POSTS INSTALLED ON ACCESS-SIDE OF EQUIPMENT MUST BE ENTIRELY OUTSIDE OF "CLEAR ZONE."

Figure 2: Heavy Duty Barrier Post Installaion



NOTES:

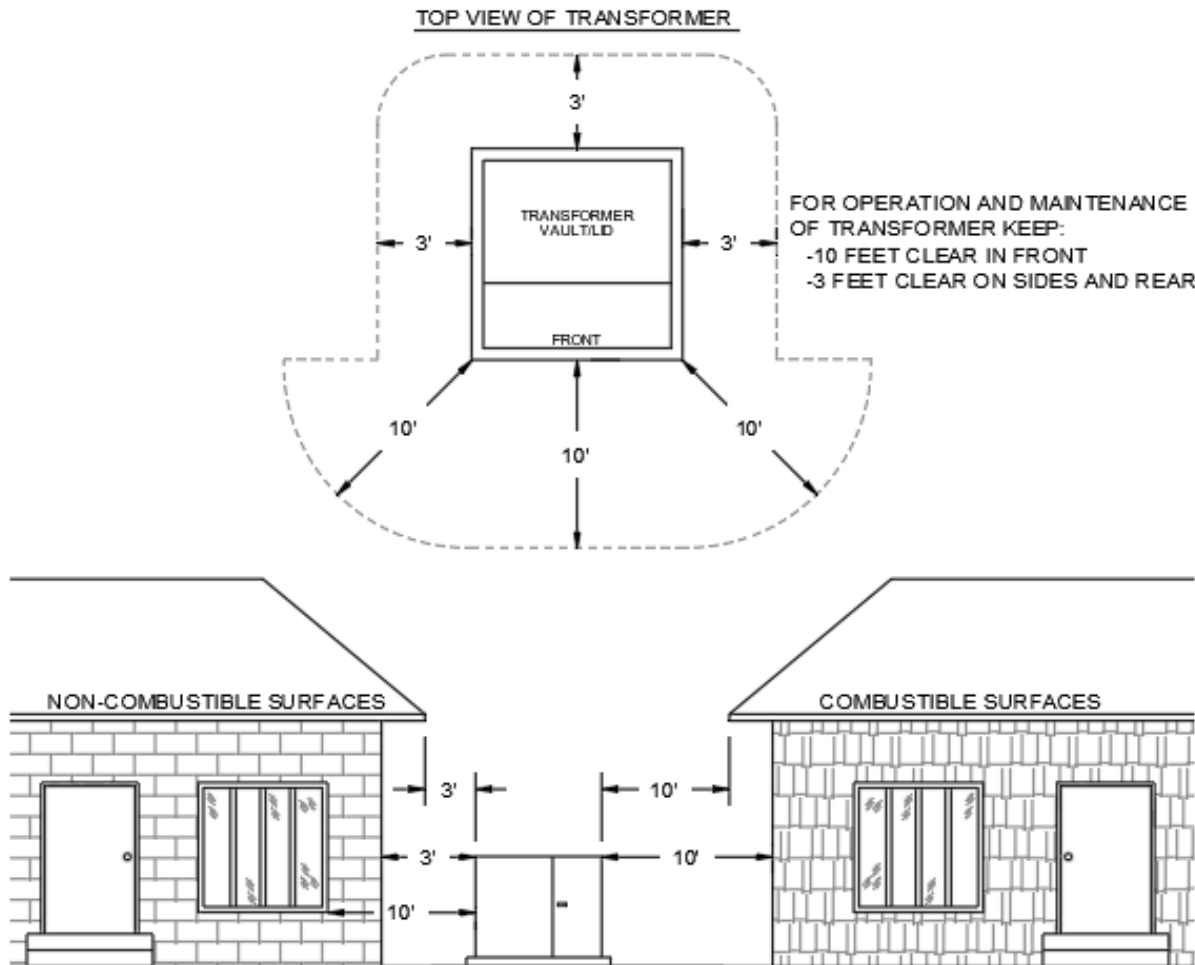
- 1) EQUIPMENT EXPOSED TO MOTORIZED VEHICLES SHALL BE PROTECTED BY THE USE OF BARRIER POSTS.
- 2) CUSTOMER TO INSTALL BARRIER POSTS ONLY AT LOCATIONS DESIGNATED WITH A SOLID DOT AS DETERMINED BY CRPUD.
- 3) 3-FOOT MINIMUM CLEARANCE FROM EDGE OF VAULT-LID TO CENTER OF BARRIER POST(S).
- 4) 6-FOOT MAXIMUM DISTANCE MEASURED BETWEEN CENTERS OF BARRIER POSTS.
- 5) BARRIER POST INSTALLATION MUST PROVIDE FOR A "CLEAR ZONE" WITH 10-FOOT MINIMUM CLEARANCE FROM TRANSFORMER ACCESS DOORS.
- 6) BARRIER POSTS INSTALLED ON ACCESS-SIDE OF EQUIPMENT MUST BE ENTIRELY OUTSIDE OF "CLEAR ZONE."

Landscaping & Vegetation

To meet safety requirements established by the National Electrical Safety Code (NESC), it is necessary for customers to maintain any and all landscaping near CRPUD equipment. Please reference [Figure 3](#) for specific measurements and rules regarding proper clearance. If landscaping or vegetation encroaches on CRPUD's facilities, CRPUD has the right to remove it to do their work safely with no obligation to restore it to the original condition.

In addition, CRPUD equipment shall not be enclosed or obstructed by fences, landscaping, walls, or other structures in any manners that prohibits access to CRPUD equipment. Such information can be found in subsection 6.1 and 6.3, "Right of Access," located in CRPUD's [General Terms and Conditions](#).

Figure 3: Padmount Transformer Clearance Requirement



MINIMUM CLEARANCES REQUIRED FROM PADMOUNT TRANSFORMER

3 FEET FROM ANY STRUCTURE OR ROOF OVERHANG CONSISTING OF NON-COMBUSTIBLE MATERIAL

10 FEET FROM ANY STRUCTURE OR ROOF OVERHANG CONSISTING OF COMBUSTIBLE MATERIAL

10 FEET TO ANY OPENINGS SUCH AS WINDOWS, DOORS, AIR INTAKE OR EXHAUST VENTS, ETC.

BUILDING SURFACE TYPE SHALL BE DEFINED BY THE LATEST EDITION OF THE UNIFORM BUILDING CODE (UBC).

NOTES:

- 1) IT SHALL BE THE RESPONSIBILITY OF THE OWNER OR THEIR REPRESENTATIVE TO COMPLY WITH ALL APPLICABLE CODE REQUIREMENTS. CONSULT STATE REQUIREMENTS AND LOCAL BUILDING AND FIRE CODES.
- 2) LOCATE PADMOUNT TRANSFORMER SUCH THAT MAIN ACCESS DOORS ARE DIRECTED AWAY FROM BUILDING WALLS OR OTHER BARRIERS AND TOWARDS DRIVABLE ACCESS.
- 3) PADMOUNT TRANSFORMER SHALL BE INSTALLED IMMEDIATELY ADJACENT TO AN ALL-SEASON/ALL-WEATHER ROAD FOR FUTURE MAINTENANCE.
- 4) WHERE EXPOSED TO MOTORIZED VEHICLES, THE CUSTOMER MUST INSTALL AND MAINTAIN CRPUD APPROVED BARRIER POSTS TO PROTECT TRANSFORMER. SEE "BARRIER POST INSTALLATION" STANDARD.
- 5) CONSULT CRPUD FOR ANY ADDITIONAL REQUIRED CLEARANCES OR UNIQUE LOCATIONS NOT DISCUSSED HERE.

Power Quality

A Customer's equipment shall not create unusual voltage fluctuations. Harmonic distortion or other disturbances on CRPUD's system that exceeds the limits specified in IEEE Standard 519 or exceeds the voltage variation limits specified in ANSI Standard C84.1 may require the Customer to install corrective equipment at their expense. CRPUD reserves the right to refuse to serve highly fluctuating and intermittent loads, including but not limited to arc welders, large motors, and x-ray machines, which may cause interference or disturb the quality of service to other Customers.

Power Factor

Low power factor may cause inferior performance of the customer's electrical system. CRPUD recommends that the customer install corrective devices to make the most effective use of the electrical system. If the customer would like to determine potential savings during design, they should consult with a Field Engineer early on in the design process.

Motors

To ensure adequate safety and protection, the customer is responsible for providing and maintaining code-approved protective devices to protect motors against overloading, short circuits, ground faults, low voltage, and single-phasing of three-phase motors.

Motor starts may cause unacceptable voltage dips to other customers. Frequently-started motors, or large motors on certain systems, may require reduced-voltage or soft-start motor controls. When the customer's motor creates unacceptable voltage dips, the customer is responsible for correcting the issue. This may include modifications to CRPUD's facilities at the customer's expense.

Customer Generation

CRPUD will work with customers to interconnect local distributed generation according to Oregon's ORS 757.300. Interconnections will be evaluated on a case-by-case basis, and if allowed, will need to enter into a net metering agreement. Consult CRPUD before interconnection with any type of generating device.

An emergency, or standby, generator is permanently connected to the customer's wiring system and provides energy when the normal source is lost. CRPUD requires the installation of a CRPUD-approved double-throw transfer switch that disconnects conductors from CRPUD's system prior to connection to the generator. The transfer switch prevents connection of the generator to CRPUD's system during any mode of operation. The customer shall comply with these requirements to prevent an accident.

Net metering is a debit and credit metering process for an account in which the customer owns and operates a qualified generating device, such as solar generation, that interconnects with CRPUD's electrical facilities. Interconnection requirements vary from system to system; consult CRPUD's [General Terms and Conditions](#) to determine the process for interconnection prior to acquiring equipment.

Permits & Applications

The customer is responsible for all permits, right of way, and easements required for the installation and maintenance of electrical facilities that serve the customer.

Codes & Ordinances

The consultation of new or remodeled services/installations must conform to CRPUD's requirements and to the applicable provisions of the following:

- National Electrical Code (NEC)
- National Electrical safety Code (NESC)
- State rules and regulations

- City and county ordinances and codes
- Occupational Safety and Health Administration (OSHA)

Permits, Rights of Way, and Easements

In new subdivisions, a Public Utility Easement (PUE), ten feet wide, is typically required. Any and all other easements, permits, and rights of way shall be on forms approved in advance by CRPUD. Safe, unobstructed success shall be provided to CRPUD at all times.

If a customer wants to obtain electrical service via CRPUD facilities located on someone else's property, an easement will be required. The customer will need to work with the CRPUD Field Engineer to aid the easement process.

Pre-Design Support

Creating a developmental partnership between your project team and CRPUD at the beginning of a project is critical to the successful and timely delivery of electrical service. New and existing services require extensive planning for utility facilities, conflicts, safety clearances, and adherence to jurisdictional requirements. To plan ahead, please contact your Field Engineer. Planning might include:

- Discussion of overhead and underground service options
- Evaluating possible meter locations
- Discussion of clearances and utility conflicts
- Understanding solar, battery, EV, and other green energy goals
- Consideration of installation of area or street lighting.

Applying for Service: Step by Step Procedure

To ensure a smooth process for your new or modified electric service we encourage you to read through the following checklist to guide you through the process.

Electric Service Checklist

1. Requirements Needed Prior to Receiving a Cost Estimate

- ☐ Completed load sheet, signed and dated.
 - a. Fill out the appropriate form; please see [residential service load data sheet](#), and [commercial service load data sheet](#), with all contact information including phone number, email, and mailing address and the site address (if assigned).
- ☐ Approved site plans shared with CRPUD Field Engineer.
 - a. A CRPUD Field Engineer will review your site plan and contact you to arrange a site visit, create a design and cost estimate and outline the job requirements

2. Requirements to be Met Prior to CRPUD Construction:

- ☐ Paperwork signed and returned.
 - a. CRPUD cost estimate letter and associated paperwork must be signed and returned to the Engineering department.
- ☐ Estimate amount paid in full.
- ☐ Line Extension Agreement signed and notarized, if applicable.
 - a. Customers are welcome to utilize the CRPUD's notaries.
- ☐ All required easements are executed and received.
 - a. CRPUD will send the easement to the county clerk for recording.
- ☐ Obtain the appropriate County Electrical Permit.
- ☐ Copy of Right of way permit shared with CRPUD, if applicable.

- a. Necessary when excavating in city, county or state road right of way.
- ☐ Trench inspection completed, for all underground conduit installations.
- a. If you are installing an underground service, Oregon law requires you to contact the [Oregon Utility Notification Center](#) at least 48 business hours before you dig, call 8-1-1.
- b. CRPUD will need to inspect your trench and conduit before you backfill, please call the Engineering Department at (503) 397-0760 at least two days before you need the inspection so we can schedule appropriately.
- ☐ Mule tape installed, if underground service.
- ☐ Trench backfilled, if underground service.
 - a. The trench shall not be backfilled until inspection has been completed by a CRPUD Field Engineer.
- ☐ Temporary or permanent customer provided meter base installed, inspected and green tagged.
 - a. Contact Columbia County Electrical Inspector at (503) 397-1501 or Multnomah County Electrical Inspector at (503) 988-3043 to schedule an inspection.
- ☐ Notify CRPUD Engineering Department once you have received a green tag of approval from the County Electrical Inspector.

Services

Available Voltages

The following table details the voltages CRPUD offers. Voltages not listed below are not available for new service.

Service Type	Nominal Voltage	Service Rating (Amperage)	Meter Socket
Single-Phase	120/240V, 3-Wire	200 A	4 Jaw
		320 A	
		400A +	6 Jaw
	120/208V, 3-Wire (Wye, Network)	200 A	5 Jaw
Three-Phase	120/208V, 4-Wire (Wye)	200 A	7 Jaw
	277/480V, 4-Wire (Wye)		
	120/240V, 4-Wire (Delta)		
	240/480V, 4-Wire (Delta)		
	120/208V, 4-Wire (Wye)	400A +	13 Jaw
	277/480V, 4-Wire (Wye)		
	120/240V, 4-Wire (Delta)		
	240/480V, 4-Wire (Delta)		

Mixed-Use Facilities

Service to mixed use facilities, with both residential and commercial customers, are complex. Before plans are completed or electrical equipment is purchased, consult a CRPUD Field Engineer for availability of service voltages, overhead or underground service options, transformer locations, and service entrance requirements.

The customer must provide the necessary space for the installation of CRPUD equipment, which may include poles, down-guy wires, pad-mounted transformer(s), pedestals, etc.

Connecting and Disconnecting

Connecting new Electrical Service is only implemented after all required steps are complete. If a service has been removed at the customer's request, or the facility is "unused," the installation must be upgraded to current CRPUD requirements if it is re-established.

Relocation of Services and Facilities

The modification, upgrade, relocation, or conversion of overhead facilities to underground at the customer's request, will be done at their expense per the [General Terms & Conditions](#).

Meter Installations

Meters must be accessible at all times for metering reading and testing. An electric meter shall be located on the outside of the building in a location approved by your Field Engineer. The electric meter shall not be located inside any building or in carports, breezeways, porches, or similar locations historically proven to have a high probability of becoming enclosed.

Meter Locations

Metering equipment shall be installed on the outside of buildings, service structures, or on a CRPUD approved meter pole in a readily accessible area that is without risk of bodily harm to CRPUD employees and free from vibration, corrosive atmosphere, and abnormal temperatures. Locations must be approved by CRPUD prior to installations.

Meter Base Requirements

All meter bases shall be Underwriter's Laboratory (UL) listed and National Electrical Manufacturer's Association (NEMA) rated 3R for exterior use, and must be "ring-type" and accept a minimum of 3-inch PVC conduit for underground service. Please note that "ring-less" meter bases are not acceptable and will not be allowed.

Customer-Owned Equipment on CRPUD Poles

Customer-owned switching devices, conduits, conductors, luminaries, signs etc., shall not be mounted on CRPUD power poles at any time. Please see CRPUD's [General Terms and Conditions](#), section 38 "Unauthorized Attachments."

Metered Temporary Service

General

Upon request and approval from CRPUD and the appropriate county electrical inspector, CRPUD will supply temporary service at a location adjacent to CRPUD's facilities in accordance with the following:

Criteria for Temporary Service

Underground and overhead temporary service structures must meet the following requirements or CRPUD may decline to provide service. The requirements are listed as below:

- Underground Temporary Service: [Figure 4](#)
- Overhead Temporary Service: [Figure 5](#)

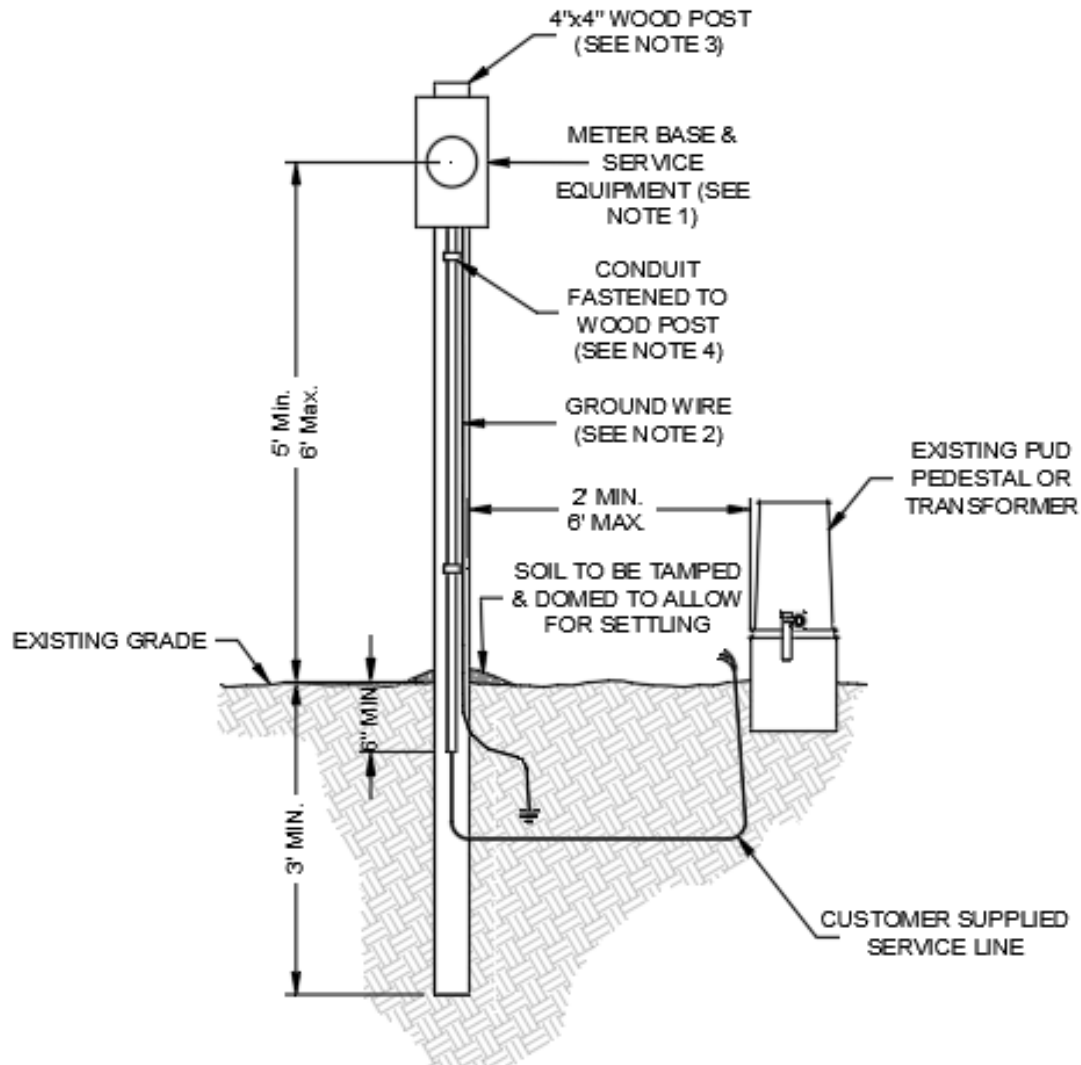
Figure 4: Underground Temporary Service

BEFORE CRPUD WILL CONNECT/ENERGIZE SERVICE:

HEIGHT OF METER BASE, WEATHER HEAD, AND DRIP LOOK
CLEARANCE MUST BE INSPECTED AND APPROVED BY CRPUD.

TEMPORARY ELECTRIC SERVICE SHALL NOT EXCEED A TWELVE (12)
MONTH PERIOD.

ELECTRICAL LABEL
OR PERMIT MUST
BE DISPLAYED ON
METER BASE



ALL ITEMS IN THIS FIGURE ARE THE CUSTOMER'S RESPONSIBILITY UNLESS OTHERWISE NOTED.

1. METER BASE AND SERVICE EQUIPMENT MUST BE NEMA TYPE 3R (RAINPROOF) AND IN GOOD CONDITION WITH NO HOLES, BENDS OR DAMAGE, AND BE PLUMB IN ALL DIRECTIONS. GROUND FAULT PROTECTION SHALL MEET NEC (ARTICLE 305 TEMPORARY WIRING).
2. GROUND IN ACCORDANCE WITH THE LATEST ISSUE OF THE NEC (ARTICLE 250 GROUNDING).
3. 4" X 4" X 10' MINIMUM PRESSURE TREATED WOOD POST, FIRMLY SET IN THE GROUND A MINIMUM OF 3'.
4. CONDUIT SHALL BE RIGIDLY FASTENED TO WOOD POST WITHIN 3' OF METER BASE.

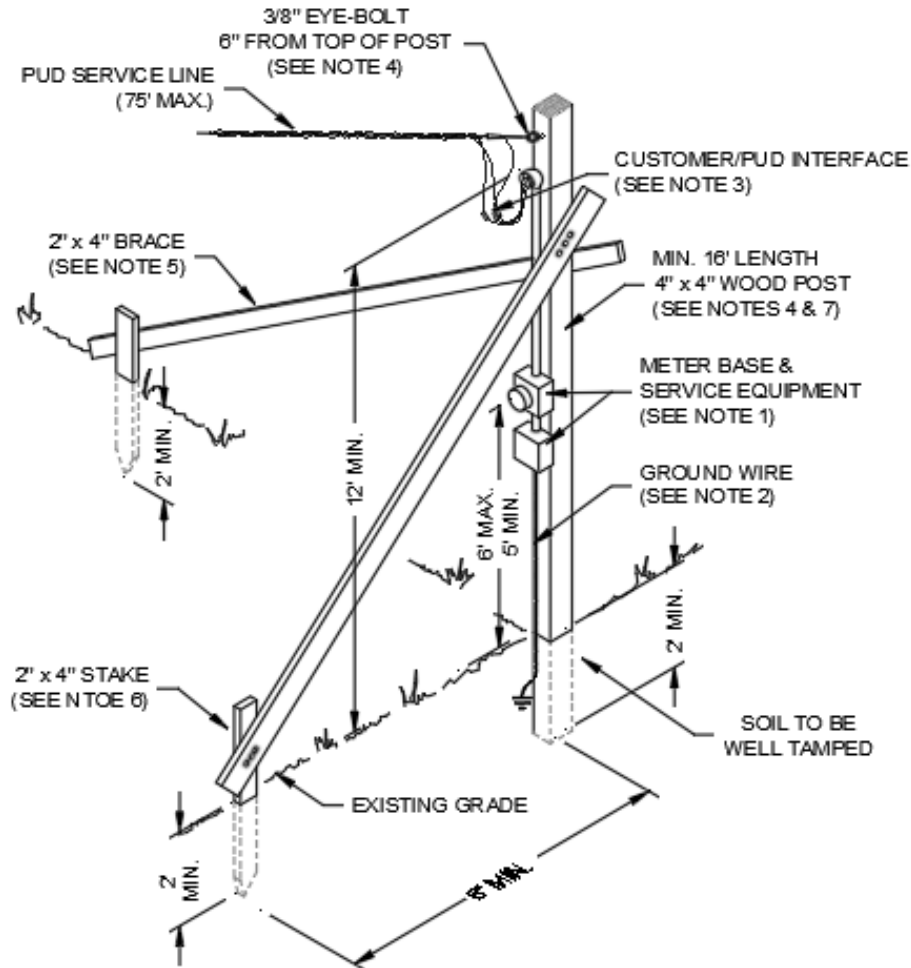
Figure 5: Overhead Temporary Service

BEFORE CRPUD WILL CONNECT/ENERGIZE SERVICE:

HEIGHT OF METER BASE, WEATHER HEAD, AND DRIP LOOP
CLEARANCE MUST BE INSPECTED AND APPROVED BY CRPUD.

TEMPORARY ELECTRIC SERVICE SHALL NOT EXCEED A TWELVE (12)
MONTH PERIOD.

ELECTRICAL LABEL
OR PERMIT MUST
BE DISPLAYED ON
METER BASE



THE CRPUD WILL INSTALL THE METER AND OVERHEAD SERVICE LINE, ALL OTHER ITEMS SHOWN IN THIS FIGURE ARE THE CUSTOMER'S RESPONSIBILITY.

1. METER BASE AND SERVICE EQUIPMENT MUST BE NEMA TYPE 3R (RAINPROOF) AND IN GOOD CONDITION WITH NO HOLES, BENDS OR DAMAGE, AND BE PLUMB IN ALL DIRECTION. NEC APPROVED COVERS MUST BE PROPERLY SECURED. GROUND FAULT PROTECTION SHALL MEET NEC (ARTICLE 305 TEMPORARY WIRING).
2. GROUND IN ACCORDANCE WITH THE LATEST ISSUE OF THE NCS (ARTICLE 250 GROUNDING).
3. CUSTOMER'S SERVICE ENTRANCE CONDUCTORS MUST PROJECT 24" OUTSIDE OF THE WEATHER HEAD.
4. 4" X 4" X 16' MINIMUM, PRESSURE TREATED WOOD POST, FIRMLY SET IN THE GROUND A MINIMUM OF 2' AND DRILLED WITH A 3/8" EYE-BOLT A DISTANCE OF 6" BELOW THE TOP OF THE POLE, IN-LINE WITH THE SERVICE DROP.
5. 2" X 4" WOOD BRACES. MINIMUM 12' IN LENGTH.
6. 2" X 4" STAKES, SET IN GROUND MINIMUM OF 2'.
7. MINIMUM ATTACHMENT HEIGHT AND POST LENGTH MAY NEED TO INCREASE TO MEET CLEARANCE REQUIREMENTS ABOVE ROADS, DRIVEWAYS, ETC., CONSULT CRPUD ENGINEERING.

Clearances and Location Requirements

General

This section provides information on required clearances for meter bases, clear working space, overhead services, and underground services.

Meter Location Criteria and Clearances

The customer must provide suitable location, space, and provisions for mounting a meter base, which must be approved in advance by CRPUD. Any and all metering equipment must be installed in locations that are accessible to CRPUD employees and their equipment. In addition, metering equipment are prohibited in the following locations unless approved by CRPUD:

- Any unsafe location, as determined by CRPUD.
- Any hazardous location, as defined by CRPUD.
- Directly over any window well, stairway, ramps, or steps.
- Surfaces with excessive vibration, moisture, fumes, and dust that could interfere with meter operation and testing.
- On CRPUD poles or equipment carrying more than 600 V.

Please see [Figure 6](#) and [Figure 7](#) for underground and overhead service requirements, respectively. For more clarification on residential meter clearance requirements, see [Figure 8](#).

Figure 6: Underground Residential Service

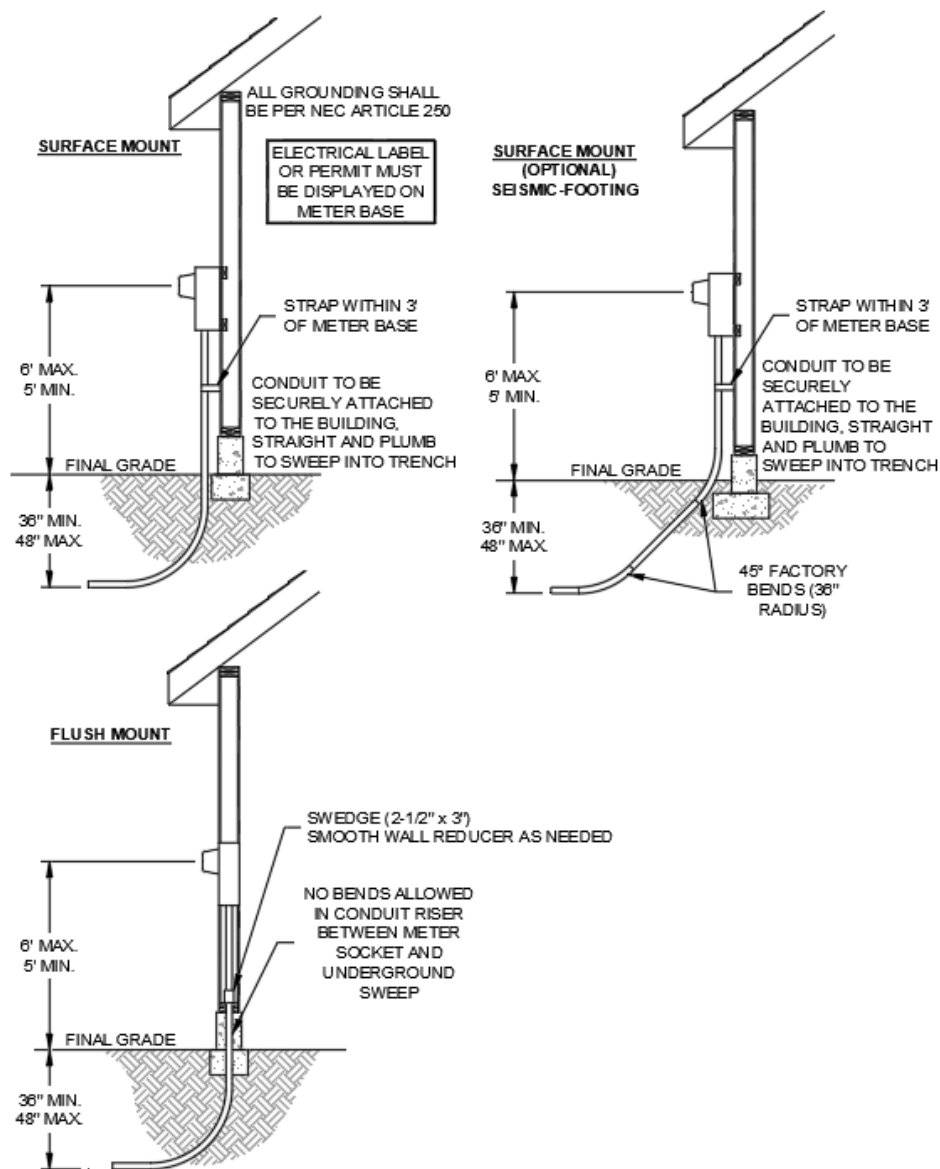
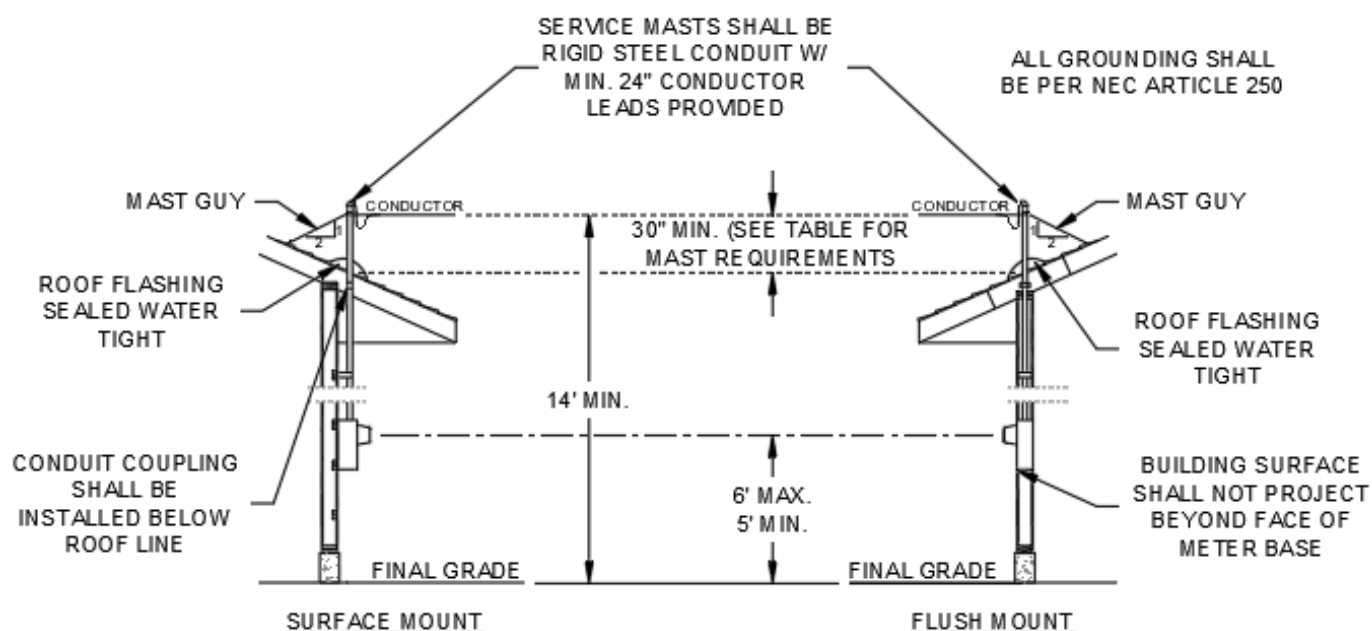


Figure 7: Overhead Residential Service



SERVICE RISER/MAST REQUIREMENTS

SERVICE SIZE	SERVICE MAST (RIGID STEEL CONDUIT) SIZE	CRPUD SERVICE LENGTH	SERVICE MAST HEIGHT	SERVICE MAST GUY OR PUSH BRACES REQUIRED?
320 AMPS OR LESS	2"	LESS THAN 100'	30"-36"	NO
		OVER 100'	OVER 36"	YES
		OVER 100'	30" MIN.	YES
320 AMPS	2.5"	LESS THAN 80'	30"-36"	NO
		OVER 80'	OVER 36"	YES
		OVER 80'	30" MIN.	YES
OVER 320 AMPS	PLEASE CONSULT WITH CRPUD			

ELECTRICAL INSPECTOR MUST AFFIX "APPROVED TO CONNECT" STICKER TO THE OUTSIDE OF THE METER BASE PRIOR TO PUD INSTALLATION SCHEDULING.

ADDITIONAL REQUIREMENTS PER NESC/NEC MAY NEED TO BE MET

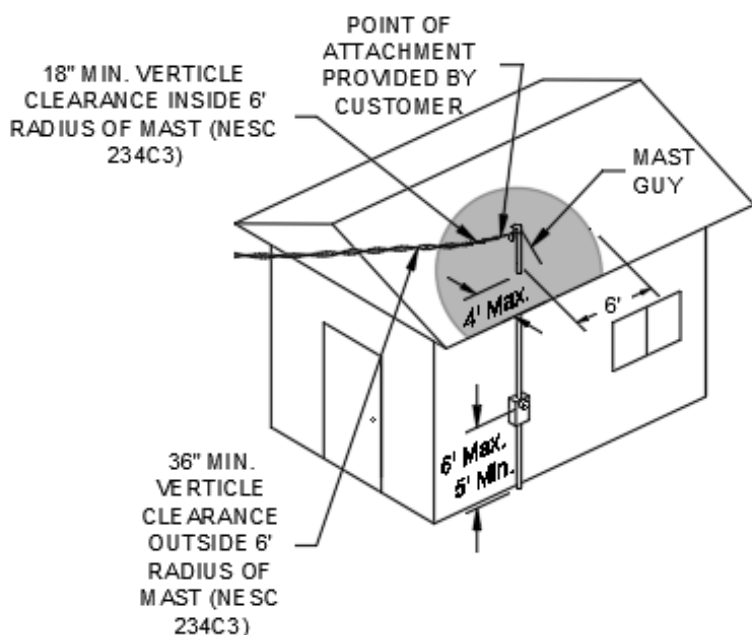
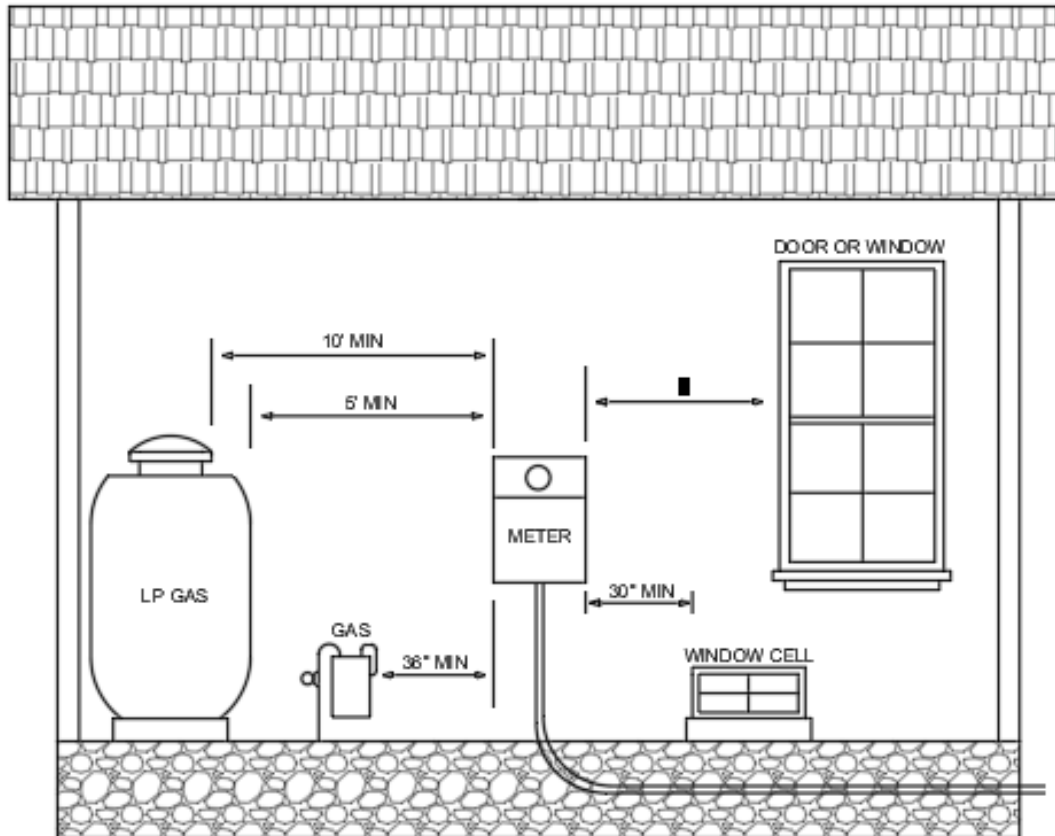


Figure 8: Residential Meter Clearances



NOTES:

- 1) CUSTOMER MUST PROVIDE A MINIMUM 4 X 4 FOOT LEVEL WORKSPACE IN FRONT OF ALL METERING EQUIPMENT. CRPUD WILL ASSIST IN DETERMINING THE LOCATION OF METERING EQUIPMENT.
- 2) VERIFY METER BASE LOCATION WITH A CRPUD FIELD ENGINEER, KNOWN AS "METER SPOT," BEFORE INSTALLATION.

Clearances for Overhead Services

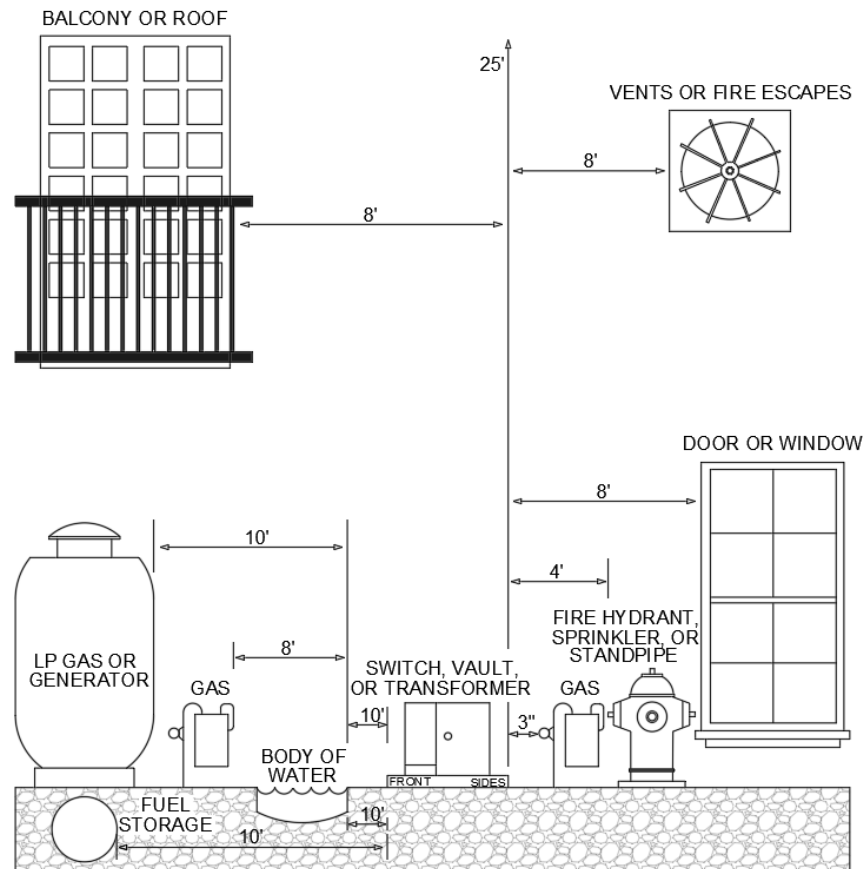
The clearances in the table below are in accordance with the National Electric Safety Code (NESC) which corresponds with CRPUD standards. Additional information can be found on the Oregon Joint Use Association (OJUA) [website](#).

Type of Clearance	Type of Structure	Minimum Clearance (feet)
Service Drop Clearance	Over roads, streets, and other areas subject to truck traffic	17
	Over alleys, parking lots, and driveways	
	Over land traveled by vehicles	
	Over state highways (ODOT may require greater clearances)	19
	Over spaces and way accessible to pedestrians	12
Clearances at the Point of Attachment	At height of attachment	14
	Drip loops of service drops for 120/240 V, 208Y/120V, and 480Y/277 V	12
From Buildings for Service Drops Not Attached to the Building	Vertical clearance over or under balconies and roofs accessible to pedestrians	
	Vertical clearance over or under balconies and roofs not accessible to pedestrians	3.5
	Horizontal clearances to walls, projections, windows, balconies, and areas accessible to pedestrians	5
	Radio and television antennas not accessible to pedestrians	3
From Service Drops Attached to a Building Over or Along the Installation to Which They are Attached	Vertical clearance from the highest point of readily accessible roofs, balconies, decks, fire escapes, or other attached structures over which they pass or to which they are attached	11
	From the highest point of roofs, decks, or balconies over which they pass above a not-readily-accessible roof and terminating at a through-the-roof service conduit or approved support, the service and its drip loops set not less than 18-inches above the roof; not more than 6 feet of the service cable over the roof located not more than 4 feet from the edge of the roof	1.5
	From the highest point of roofs, decks, or balconies over which they pass in any direction from doors and windows that are designed to open	3

Locations and Clearances for Transformers, Switches, Vaults, and Other Electrical Equipment

CRPUD will select the location of electrical equipment using the clearances in the table below, in addition to any NESC clearances, the size of the transformer, and the working space clearances for the equipment. CRPUD equipment clearances must not be obstructed by landscaping, parking areas, sidewalks, driveway areas associated with truck loading docks, or other obstructions. Please see [Figure 9](#) that depicts clearances for CRPUD Electrical Equipment.

Figure 9: Clearances from CRPUD Electrical Equipment



Combustibility of Building Material

The combustibility of a building is evaluated in one of two ways:

1. By the building structure only
2. By the building structure in combination with the finish surface material applied to its inside or outside.

The National Fire Prevention Association (NFPA) lays out these requirements for a noncombustible material: *“The material, in the form in which it is used, and under the conditions anticipated, will not ignite, burn, support combustion, or release flammable vapors when subjected to fire or heat, of which no part will ignite and burn when subjected to fire.”* (NFPA 5000, Section 7.1.4.1.1)

Drivable and Accessible Surface for CRPUD Equipment

CRPUD must have access to any and all CRPUD equipment in case of an emergency and for ease of maintenance. Access is necessary in order to provide the space necessary granting a drivable and accessible surface for CRPUD vehicles and equipment. All CRPUD equipment must be within 15 feet of a drivable surface that is accessible and reliable all season and in all weather conditions. Drivable surfaces traversed by cars, trucks, and other equipment may require barrier posts for protection of CRPUD equipment. Please see [“Protecting CRPUD Equipment with Barrier Posts”](#) located in an earlier section.

Working Areas Around CRPUD Transformers, Switches, Vaults, and Other Electrical Equipment

For the safety of our line crew, CRPUD requires a clear and level working area that is to be maintained around the electrical equipment. Clearances should be free of any structures, walls, landscaping, parking spots, fences, gates, and/or any other obstructions.

Clearances Around Pad-Mounted Electrical Equipment

CRPUD requires the following working clearances, as measured from the edge of the pad or vault:

- At least 10 feet clear in front of the transformer.
- 3 feet clear on all sides and backside of transformer.
- 30 feet of vertical clearance above the final grade.

[Figure 3](#) shows the required clearances for pad-mounted electrical equipment adjacent to combustible and non-combustible buildings. [Figure 9](#) shows the required clearances for pad mounted equipment to other electrical equipment.

Underground Requirements

General

The customer is responsible for providing all trenches, backfill, conduit, equipment foundations, and boring. The customer shall meet the requirements described in this section to complete construction for underground installation of services. Consult your Field Engineer for conduit layout, and for equipment foundation requirements for secondary and primary extensions. The customer shall give consideration to local ground and frost conditions such that the installation remains structurally sound. Please note that before installing any conduit, the customer shall have received a design and cost estimate from, and coordinate with, their Field Engineer for trench and conduit inspections. Backfilling is not allowed until after a scheduled inspection has been completed by your Field Engineer.

Trenching and Conduit Requirements

The intent and purpose of these trenching and conduit installation standards is to provide a helpful guide for receiving underground electric service. Please contact CRPUD as early as possible in your construction process as construction lead times vary, so that electrical facilities can be installed in a timely manner.

Locates, Permits, and Trenching

The trench depth shall be a minimum of 36-inches and a maximum of 48-inches below final grade. The trench shall be free of sharp objects or obstructions that could damage the conduit. The bottom of the trench shall be uniform, having no abrupt high or low spots, prior to installing the conduit. After the conduit is installed, the first 6-inches of backfill shall be free of large rocks, sharp objects, or scrap building materials.

If the trench is shared with electric, gas, water or sewer, a minimum vertical and horizontal separation of 12-inches is required between utilities. The separation between CRPUD's lines and telephone, fiber optics or cable TV, with the utilities' concurrence, may be less than 12-inches.

Telephone, fiber optics and cable TV wires/conduit shall be located at least 3 feet away from the ends of the conduit to allow room for our electrical equipment i.e. - poles/transformer/etc.

If you are trenching to a utility pole, CRPUD will install a conduit stand-off bracket, near the ground level, on the pole and you will need to attach the conduit toward the end of the bracket. Conduit that extends out of the ground shall be plumb in all directions (parallel to the pole).

Trench Route

The centerline of the trench shall be in a straight line whenever possible. The power line shall not be routed under buildings or other permanent obstructions.

Maximum Conduit Bends

The maximum bends in the individual conduit runs must not exceed a total of 270 degrees (90 degree sweeps at either or both ends must also be included in the total) and no one bend shall be greater than 90 degrees. Please note that field heat bends are not acceptable, all bends must be factory made.

Conduit Size/Type

Conduit shall be electrical grade (gray) schedule 40 PVC – size as noted on the drawing that is included with the cost estimate. Conduit joints shall be fully seated and glued per the manufacturer’s specification. Conduit shall be sealed at both ends to keep the conduit free of dirt and debris.

Continuous duct may be used in horizontal directional drilling (boring) applications. Continuous duct shall be Schedule 40 or SDR 13.5 High Density Polyethylene (HDPE) and either gray or black with three equally spaced extruded red stripes. HDPE duct sections must be joined by mechanical fittings that have barbed threads on both ends, such as “Certa-Lok” or “Bore-Gard,” or by a swedge coupler with two-part conduit adhesive such as, “*BonDuit*.”

All HDPE installations must have mule tape installed, regardless of length. For horizontal directional drilling (boring) applications, Schedule 40PVC will be allowed only when using mechanical connections, such as Certa-Lok, Bore-Gard, or a similar mechanical connection product. Please note that CRPUD requires factory-made PVC/fiberglass bends.

Conduit Elbows

Elbows must be factory made “long radius” sweeps with a minimum radius of 36-inches for 2-inch and 3-inch conduit and a radius of 48-inches for 4-inch conduit. Conduit runs greater than 400 feet in total length require fiberglass elbows with PVC couplings attached to the elbow. Customers can pick up the fiberglass elbows (not conduit) from the PUD. Please provide at least 24 hours advance notice by calling the Engineering Department at (503) 397-0760 prior to picking up the fiberglass elbows.

Pull Rope

Flat Mule Tape shall be installed on conduit runs exceeding 20 feet. The mule tape shall be installed inside the conduit, with 6 feet extending from each end. You shall verify the mule tape is not glued to the conduit (the mule tape should move freely inside the conduit). Customers can pick up the mule tape from the CRPUD, please provide at least 24 hours advance notice by calling the Engineering Department.

Transformer/Sectionalizing Cabinet Locations

The customer/contractor is responsible for providing the final grade for setting transformers and sectionalizing cabinets. The final grade shall be even with adjacent sidewalks, curbs, streets or the top of the pavement. The minimum clearance of our electrical equipment from fences and shrubs is three feet around the back/sides and ten feet in the front.

Secondary Pedestal (Secondary Junction Box)

Please see [Figure 10](#) for installation requirements for pedestal installation.

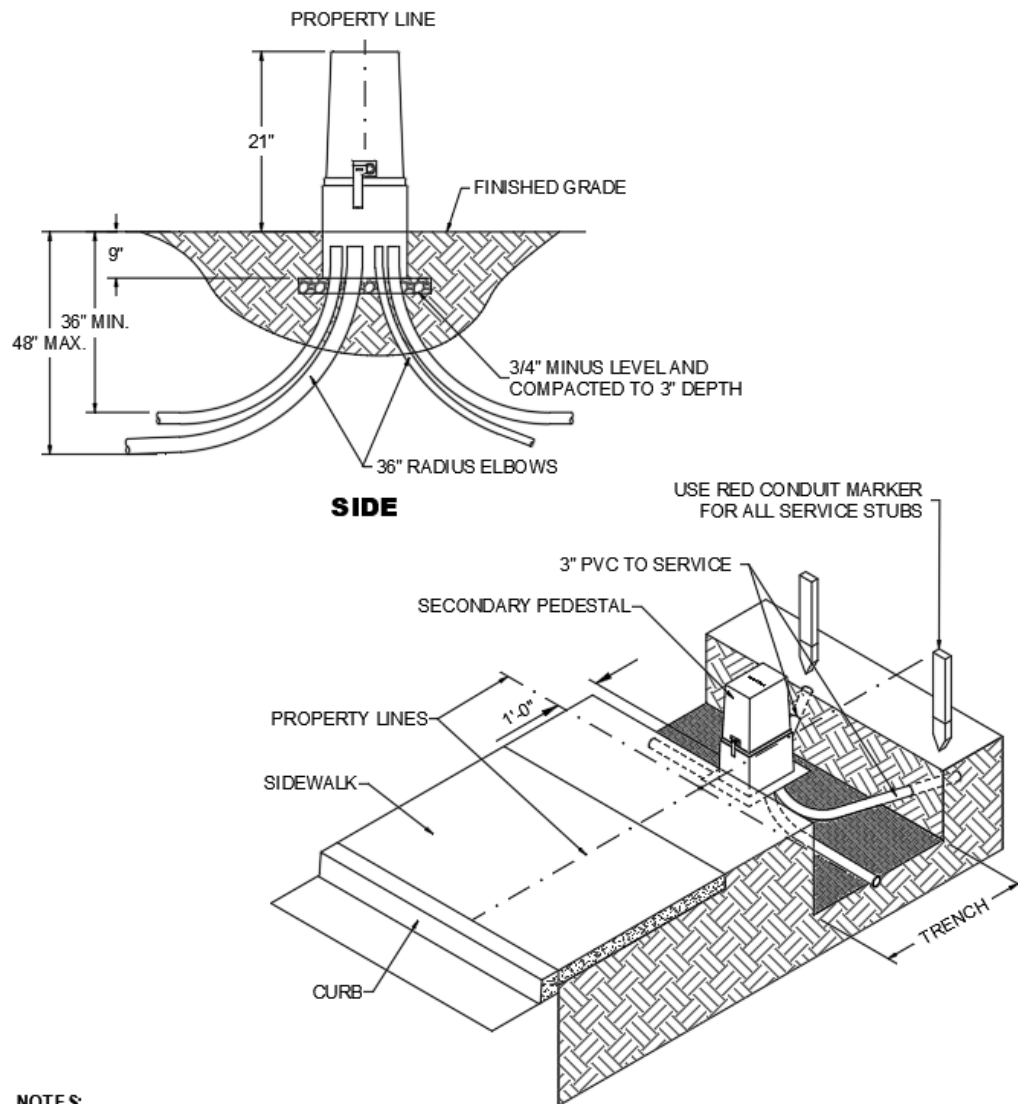
Concrete Pads and Vaults for a Pad-Mounted Transformer

Installing conduit underneath an energized transformer or vault must be done under the direct supervision of CRPUD. To schedule this work please contact our Operations department at (503) 397-1844 with reasonable advance notice. Failure to do so may result in serious injury.

Gravel Pad Preparation

Before moving onto the installation stages for a pad-mounted transformer, CRPUD requires the gravel pad preparation to be completed. Please see [Figure 11](#) that details the requirements of gravel pad preparation.

Figure 10: Typical Pedestal Installation



NOTES:

1. 3/4" MINUS GRAVEL AT A MINIMUM DEPTH OF 3" REQUIRED UNDER PEDESTAL BASE, COMPACTED AND LEVELED.
2. LATCH/LOCK MUST FACE TOWARD STREET.
3. PEDESTAL SHALL BE LEVEL AT FINAL INSTALLATION.
4. ALL CONDUIT TO BE CUT SMOOTH AND FLUSH WITHIN 2" OF FINAL GRADE.
5. TELEPHONE/CABLE PEDESTALS TO BE 1'-2' FROM CRPUD SECONDARY PEDESTAL.

Vault

Some installations require the installation of a concrete vault by the customer, which will be determined by your CRPUD Field Engineer.

Excavation and Backfill

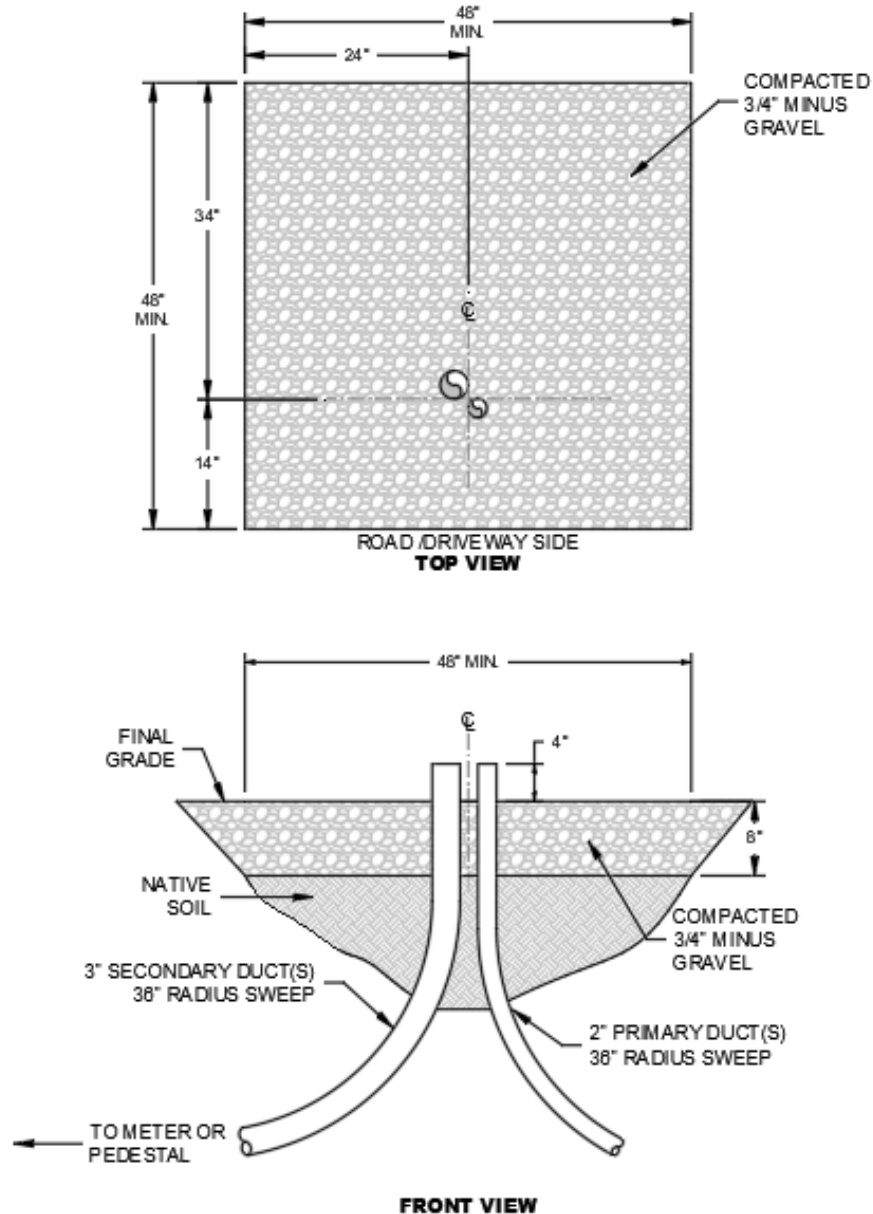
All backfill under or near the vault must be compacted with 3/4-inch minus gravel at a minimum depth of 8-inches. Gravel is to prevent settling and may require additional compacted material depending on existing soil stability. Prepare the bottom of the excavation so the vault will rest on solid undisturbed earth with an 8-inch base of crushed rock.

Underground Distribution Vaults & Cabinets

Three-Phase transformers will require the installation of a vault, see [Figure 12](#) and [Figure 13](#). In limited circumstances, a concrete pad may be substituted per CRPUD's discretion, see [Figure 14](#).

- [Figure 15](#): Sectionalizing Cabinet Fiberglass Ground-Sleeve Installation
- [Figure 16](#): 4X4 Vault
- [Figure 17](#): Three-Phase Switching Vault
- [Figure 18](#): Parallel Transformer Vault Installation
- [Figure 19](#): Perpendicular Transformer Vault Installation

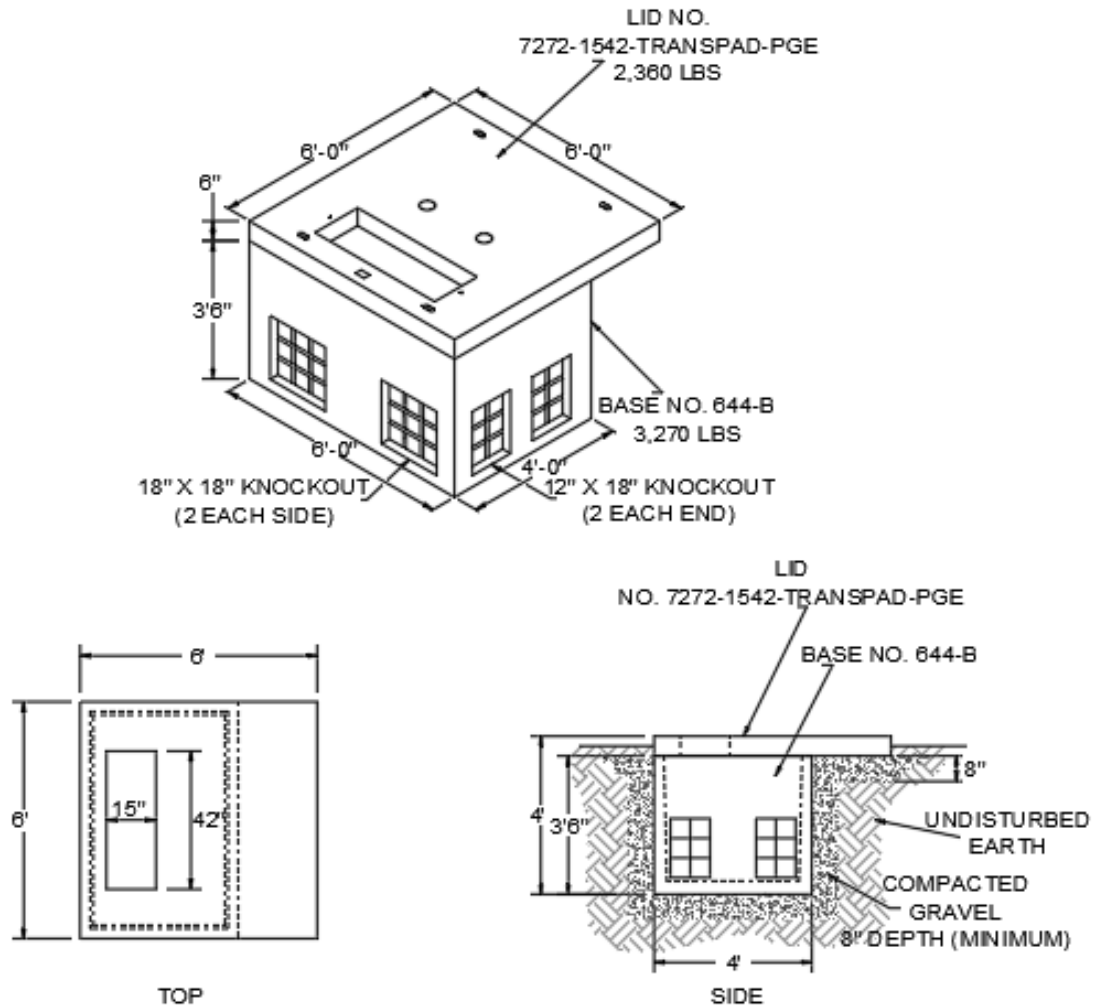
Figure 11: Gravel Pad Preparation Single-Phase Transformer



NOTE S:

1. CONDUIT MUST BE POSITIONED AS SHOWN AND APPROVED PRIOR TO TRANSFORMER INSTALLATION.
2. GRAVEL PAD MUST BE COMPLETED AS SHOWN BEFORE JOB WILL BE RELEASED FOR CONSTRUCTION.
3. GRAVEL PAD SHALL BE LEVEL AND COMPACTED 3/4" MINUS GRAVEL, 48" X 48" IN AREA AND MINIMUM 8" DEPTH.
4. SEE PADMOUNT TRANSFORMER CLEARANCE REQUIREMENTS SECTION IN ESR.
5. IT SHALL BE THE RESPONSIBILITY OF THE OWNER OR THEIR REPRESENTATIVE TO COMPLY WITH ALL APPLICABLE CODE REQUIREMENTS.

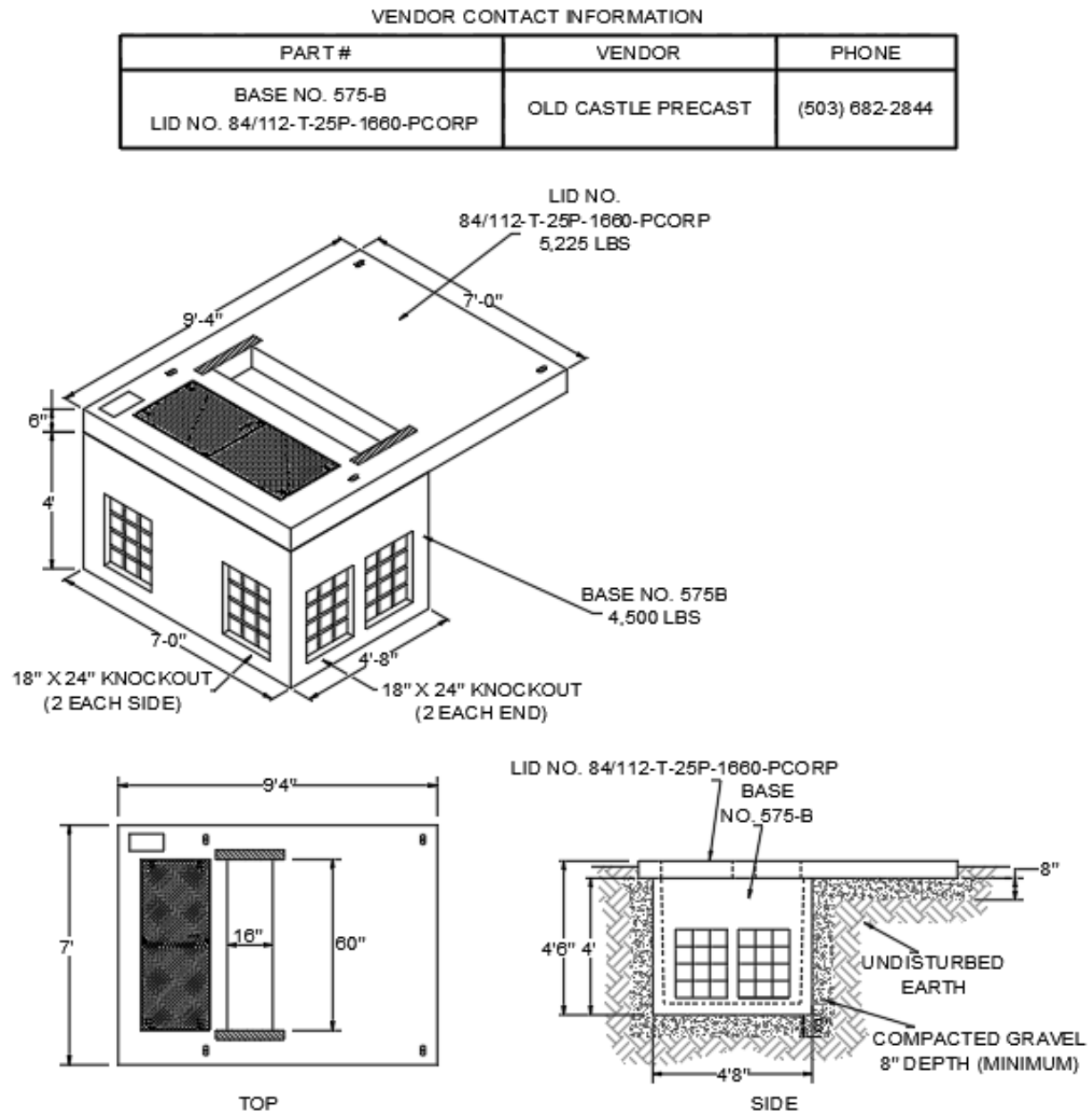
Figure 12: Small Three-Phase Transformer Vault Base/Lid



NOTES:

1. ALL BACKFILL UNDER OR NEAR THE VAULT AND PAD/LID MUST BE COMPACTED WITH 3/4" MINUS GRAVEL AT A MINIMUM DEPTH OF 8". GRAVEL IS TO PREVENT SETTLING AND MAY REQUIRE ADDITIONAL COMPACTED MATERIAL DEPENDING ON EXISTING SOIL STABILITY.
2. SET VAULT AT AN ELEVATION THAT WILL PLACE THE TOP OF THE PAD/LID 2" \pm ABOVE FINISHED GRADE.
3. ALL CONDUITS TO BE CUT SMOOTH AND FLUSH WITH INSIDE VAULT WALL.
4. KNOCKOUTS TO BE FILLED WITH SMOOTH-FINISHED GROUT.
5. FOR MORE INFORMATION ABOUT TRANSFORMER CLEARANCES, SEE "CLEARANCE REQUIREMENTS" SECTION IN ESR.

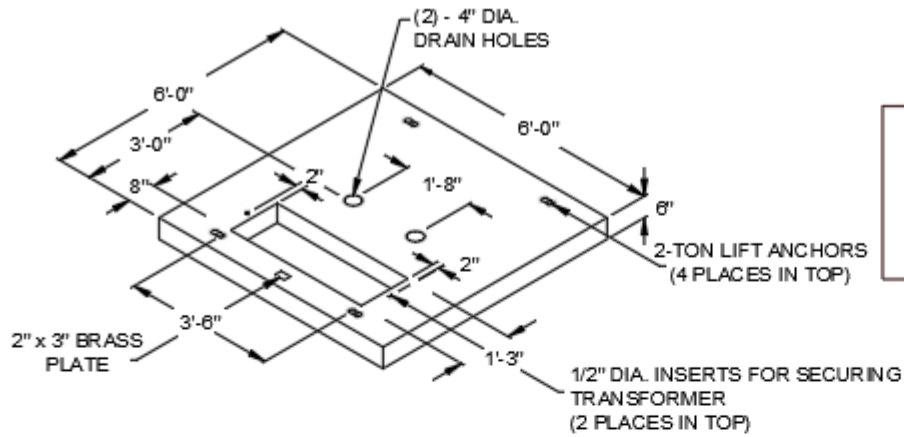
Figure 13: Large Three-Phase Transformer Vault Base/Lid



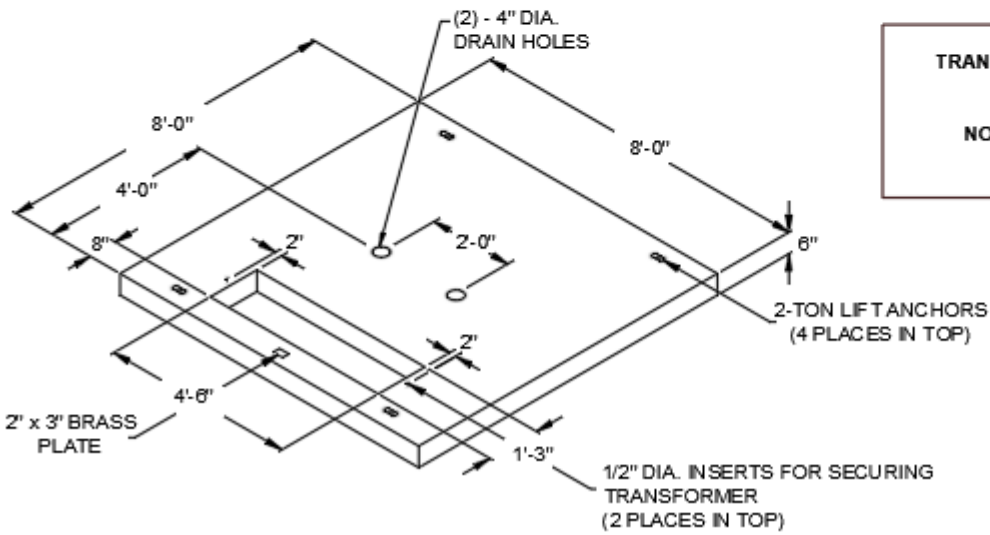
NOTES:

1. ALL BACKFILL UNDER OR NEAR THE VAULT AND PAD/LID MUST BE COMPACTED WITH 3/4" MINUS GRAVEL AT A MINIMUM DEPTH OF 8". GRAVEL IS TO PREVENT SETTLING AND MAY REQUIRE ADDITIONAL COMPACTED MATERIAL DEPENDING ON EXISTING SOIL STABILITY.
2. SET VAULT AT AN ELEVATION THAT WILL PLACE THE TOP OF THE PAD/LID 2" ± ABOVE FINISHED GRADE.
3. ALL CONDUITS TO BE CUT SMOOTH AND FLUSH WITH INSIDE VAULT WALL.
4. KNOCKOUTS TO BE FILLED WITH SMOOTH-FINISHED GROUT.
5. FOR MORE INFORMATION ABOUT TRANSFORMER CLEARANCES, SEE "CLEARANCE REQUIREMENTS" SECTION IN ESR.

Figure 14: Three-Phase Transformer Pad

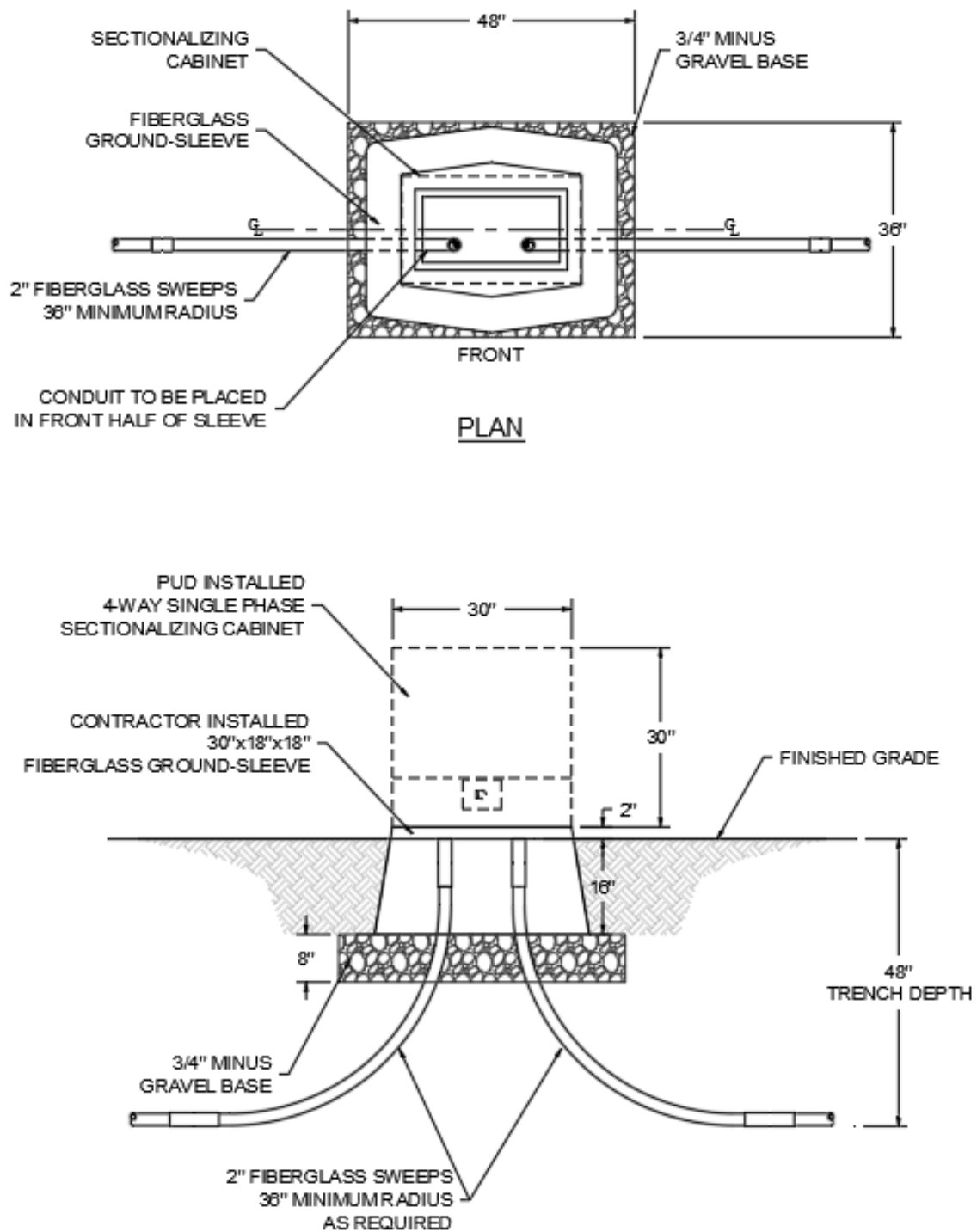


**TRANSFORMER PADMOUNT - THREE
PHASE
75 - 300 KVA
NO. 7272-1542-TRANSPAD-PGE
2,360 LBS.**



**TRANSFORMER PADMOUNT - THREE
PHASE
500 - 1500 KVA
NO. 9696-1554-TRANSPAD-PGE
3,250 LBS.**

Figure 15: Sectionalizing Cabinet Fiberglass ground-Sleeve Installation



NOTES:

1. GRAVEL BASE SHALL BE 48" X 36" X 8" AND MUST CONSIST OF LEVELED AND COMPACTED 3/4" MINUS GRAVEL.
2. BROAD SIDE OF FIBERGLASS GROUND-SLEEVE MUST FACE TOWARD ROADWAY.
3. GROUND-SLEEVE SHALL BE LEVEL AT FINAL INSTALLATION.

Figure 16: 4X4 Vault

VENDOR CONTACT INFORMATION

PART #	VENDOR	PHONE
BASE NO. 504-B-48 LID NO. 55-332P	OLD CASTLE PRECAST	(503) 682-2844

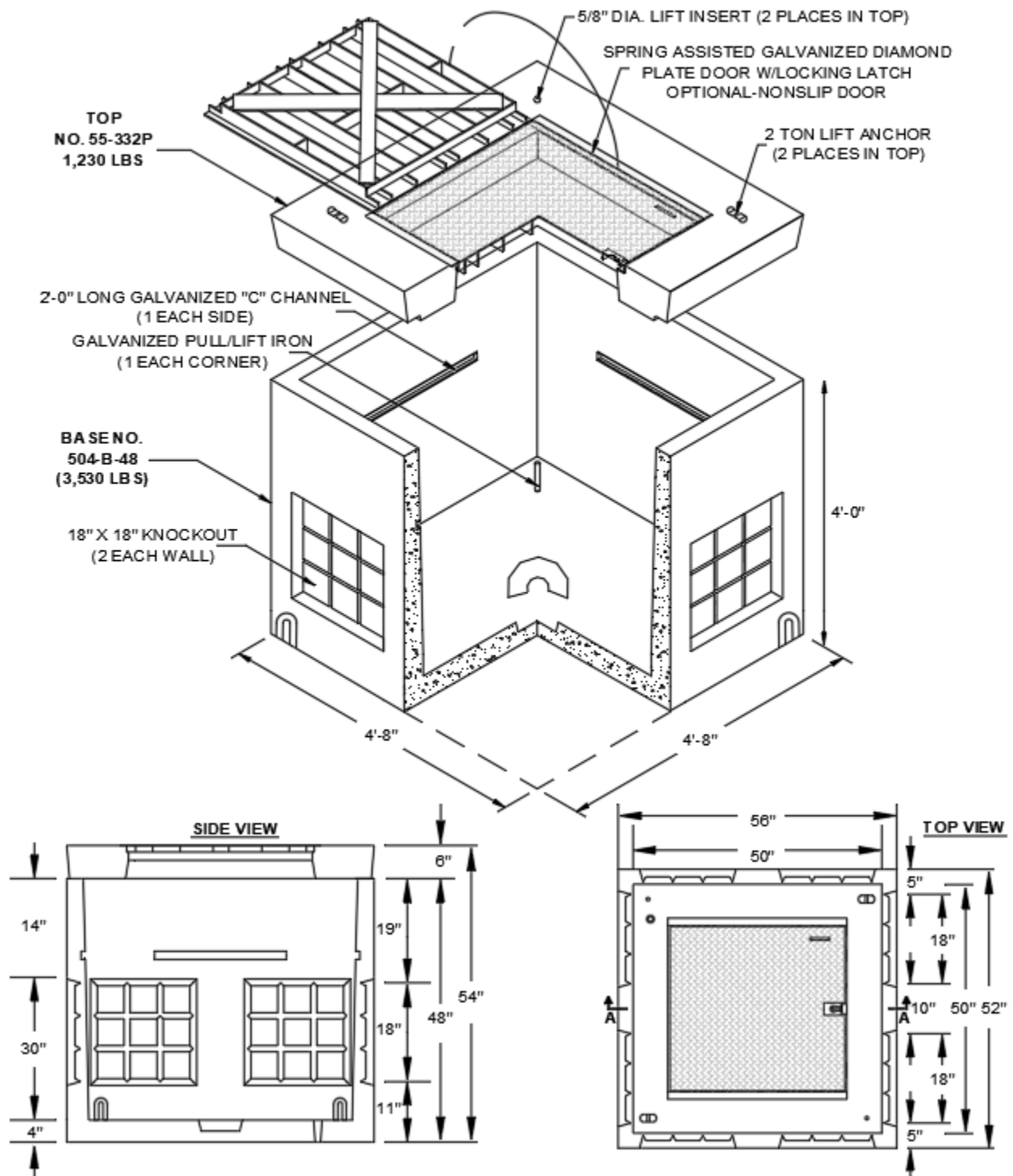
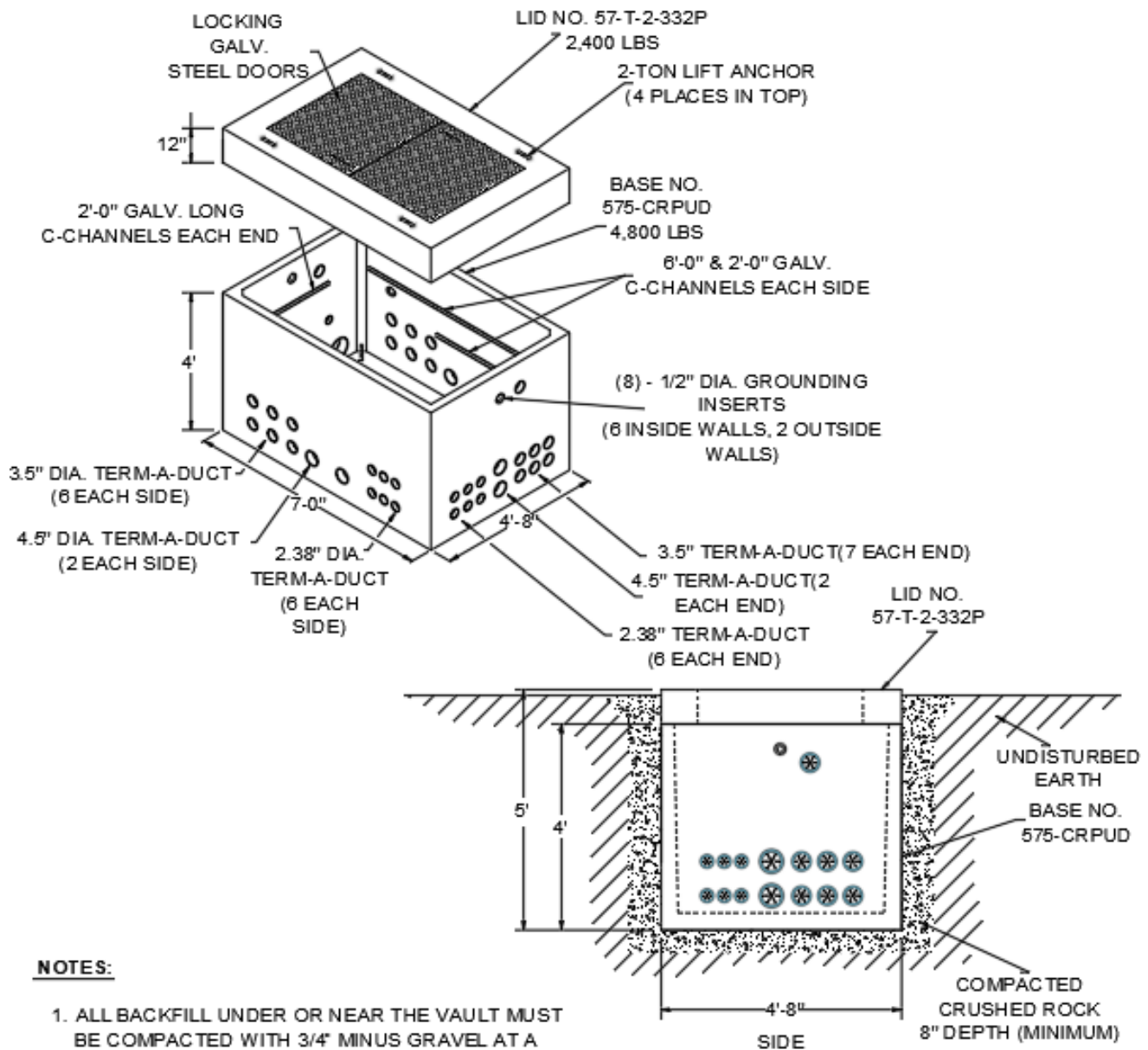


Figure 17: Three-Phase Switching Vault

VENDOR CONTACT INFORMATION

PART #	VENDOR	PHONE
BASE NO. 575-CRPUD LID NO. 57-T-2-332P	OLD CASTLE PRECAST	(503) 682-2844



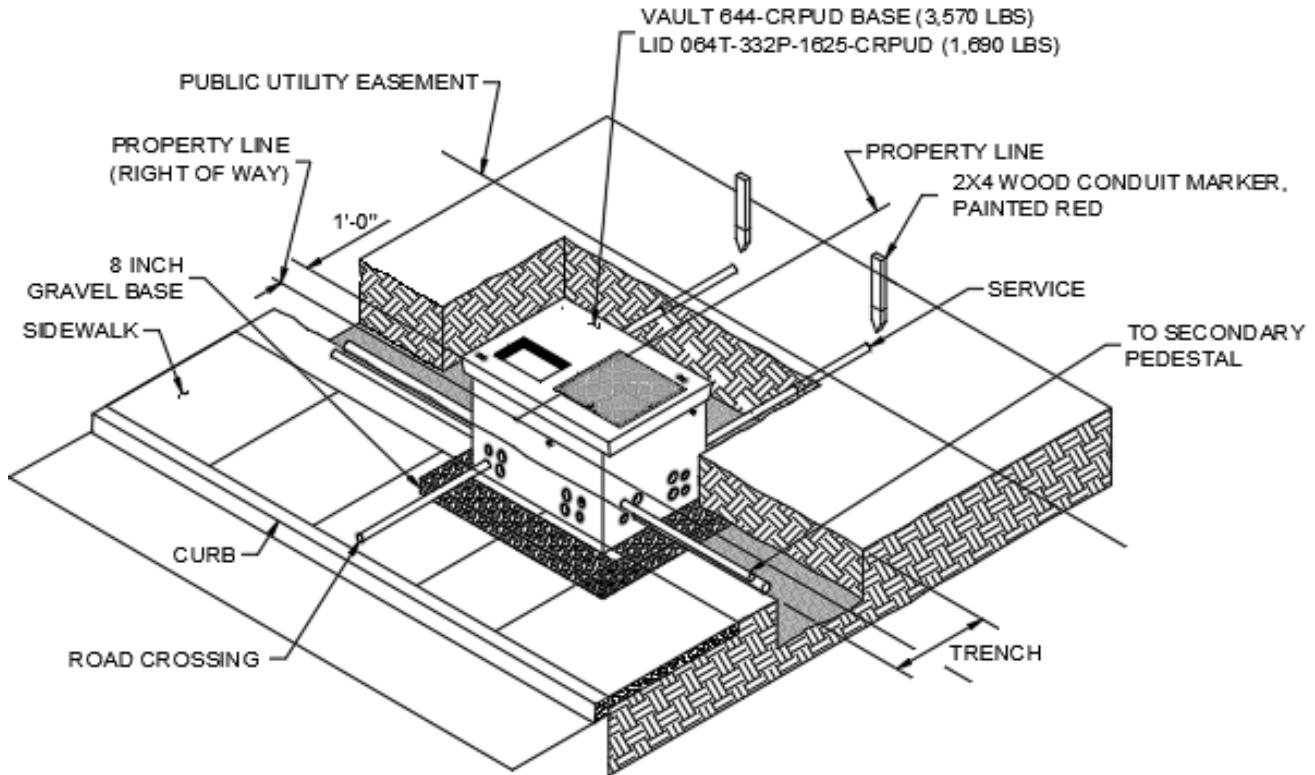
NOTES:

1. ALL BACKFILL UNDER OR NEAR THE VAULT MUST BE COMPACTED WITH 3/4" MINUS GRAVEL AT A MINIMUM DEPTH OF 8". GRAVEL IS TO PREVENT SETTLING AND MAY REQUIRE ADDITIONAL COMPACTED MATERIAL DEPENDING ON EXISTING SOIL STABILITY.
2. SET VAULT AT AN ELEVATION THAT WILL PLACE THE TOP OF THE LID 2" ± ABOVE FINISHED GRADE.
3. TERM-A-DUCTS ARE A POLYSTYRENE BASED ABS PLASTIC AND REQUIRE THE USE OF ABS TO PVC TRANSITION CEMENT.

Figure 18: Parallel Transformer Vault Installation

VENDOR CONTACT INFORMATION

PART #	VENDOR	PHONE
VAULT: B644-CRPUD BASE LID: 064T-332P-1625-CRPUD	OLD CASTLE PRECASTT	(503) 682-2844

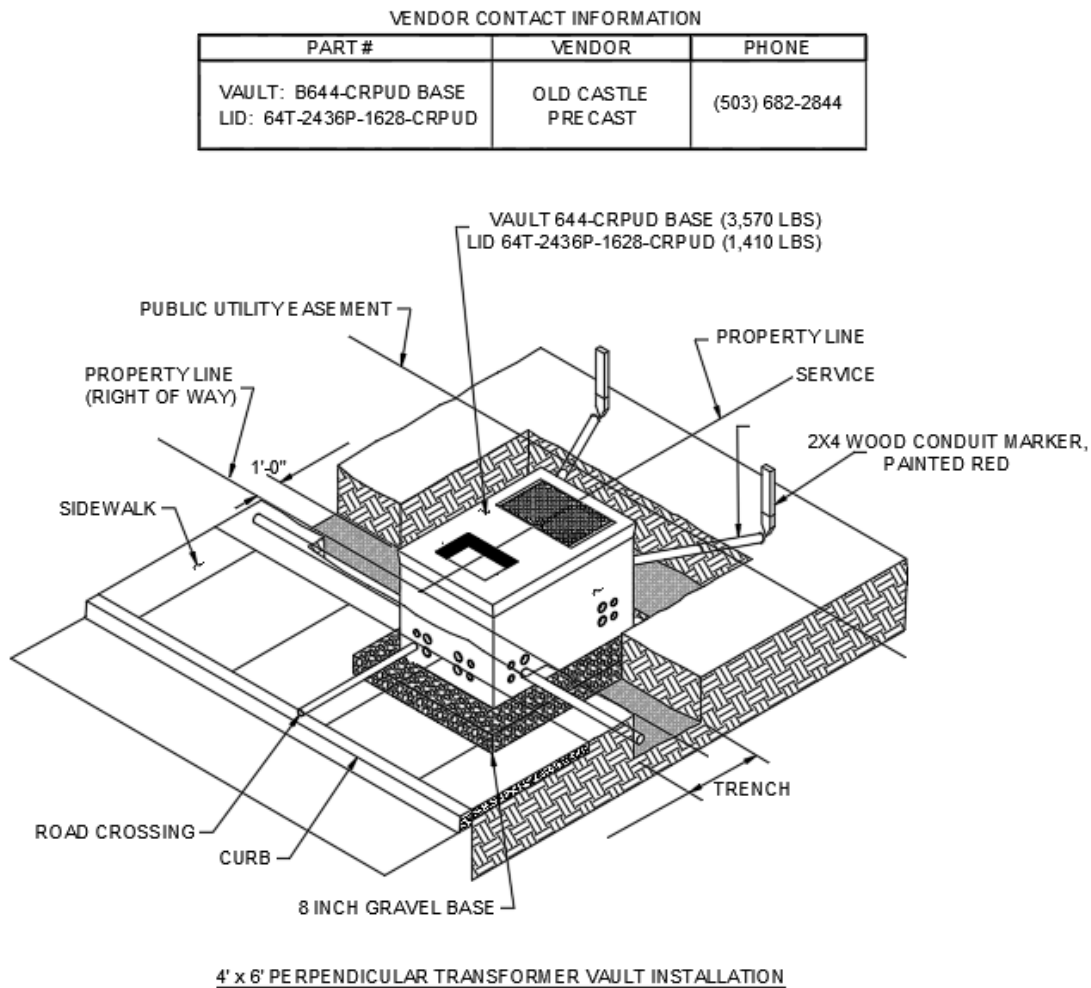


4' X 8' PARALLEL TRANSFORMER VAULT INSTALLATION

NOTES:

1. PREPARE THE BOTTOM OF THE EXCAVATION SO THE VAULT WILL REST ON SOLID UNDISTURBED EARTH WITH AN 8 INCH BASE OF CRUSHED ROCK.
ALL BACKFILL UNDER OR NEAR THE VAULT AND PAD MUST BE COMPACTED WITH 3/4"
2. MINUS GRAVEL TO PREVENT FUTURE SETTLING. THE GRAVEL LAYER MUST BE AT LEAST 8 INCHES THICK BUT MAY REQUIRE ADDITIONAL COMPACTED MATERIAL DEPENDING ON THE EXISTING SOIL STABILITY.
3. THE PAD SHALL BE LOCATED SO THAT NO PART OF THE TRANSFORMER IS CLOSER THAN 10 FEET TO A COMBUSTIBLE SURFACE, WINDOWS, DOORS OR 3 FEET TO A NON-COMBUSTIBLE SURFACE.
4. FRONT SIDE MUST HAVE 10 FEET OF CLEAR ACCESS FOR MAINTENANCE.
5. SET VAULT SO TOP OF LID IS APPROXIMATELY 2 INCHES ABOVE THE FINISHED GRADE IN LANDSCAPED AREAS AND FLUSH WITH THE FINISHED GRADE WITHIN 12 INCHES OF A SIDEWALK OR OTHER PAVED AREA.
6. WHERE SLOPES EXIST, LANDSCAPING WALLS MAY BE REQUIRED.
7. TERM-A-DUCTS ARE A POLYSTYRENE BASED ABS PLASTIC AND REQUIRE THE USE OF ABS TO PVC TRANSITION CEMENT.

Figure 19: Perpendicular Transformer Vault Installation



NOTES:

1. PREPARE THE BOTTOM OF THE EXCAVATION SO THE VAULT WILL REST ON SOLID UNDISTURBED EARTH WITH AN 8 INCH BASE OF CRUSHED ROCK.
2. ALL BACKFILL UNDER OR NEAR THE VAULT AND PAD MUST BE COMPACTED WITH 3/4" MINUS GRAVEL TO PREVENT FUTURE SETTLING. THE GRAVEL LAYER MUST BE AT LEAST 8 INCHES THICK BUT MAY REQUIRE ADDITIONAL COMPACTED MATERIAL DEPENDING ON THE EXISTING SOIL STABILITY.
3. THE PAD SHALL BE LOCATED SO THAT NO PART OF THE TRANSFORMER IS CLOSER THAN 10 FEET TO A COMBUSTIBLE SURFACE, WINDOWS, DOORS OR 3 FEET TO A NON-COMBUSTIBLE SURFACE.
4. FRONT SIDE MUST HAVE 10 FEET CLEAR ACCESS FOR MAINTENANCE.
5. SET VAULT SO TOP OF LID IS APPROXIMATELY 2 INCHES ABOVE THE FINISHED GRADE IN LANDSCAPED AREAS AND FLUSH WITH THE FINISHED GRADE WITHIN 12 INCHES OF A SIDEWALK OR OTHER PAVED AREA.
6. TERM-A-DUCTS ARE A POLYSTYRENE BASED ABS PLASTIC AND REQUIRE THE USE OF ABS TO PVC TRANSITION CEMENT.
7. WHERE SLOPES EXIST, LANDSCAPING WALLS MAY BE REQUIRED.

Residential

Single-Family Service

General

This section covers the requirements for permanent service to residential single-family and duplex buildings, including manufactured and mobile homes. The electric service checklist above can be used as a guide when preparing single-family and duplex buildings for electrical service. Any deviations from the requirements in this section must be approved in writing by CRPUD prior to installation.

Meter Bases

A single-phase, self-contained residential meter base must be ring-type. All single-phase, self-contained bases rated for 320 A continuous must be approved for a manual link. For a 200 A service for single-family residential services, a bypass meter base is acceptable, but not required. Consider a bypass meter base if power interruptions during routine meter service would be a problem in the residence. If the service will be over 320 A continuous, the requirements in the Commercial, Industrial and Non-Residential section shall be met.

Underground Service

Before preparing for underground service, the customer must obtain specifications and approval from CRPUD for the proposed installations. The customer must furnish and install CRPUD-approved conduit. In addition, the customer is responsible for the cost of all trenches, conduits, vaults, excavation, backfill, and site restoration on the residential premises. CRPUD will install, own, and maintain the underground service lateral from its distribution line to the customer's point of delivery. For additional information, please see the, "[Underground Requirements](#)" section above.

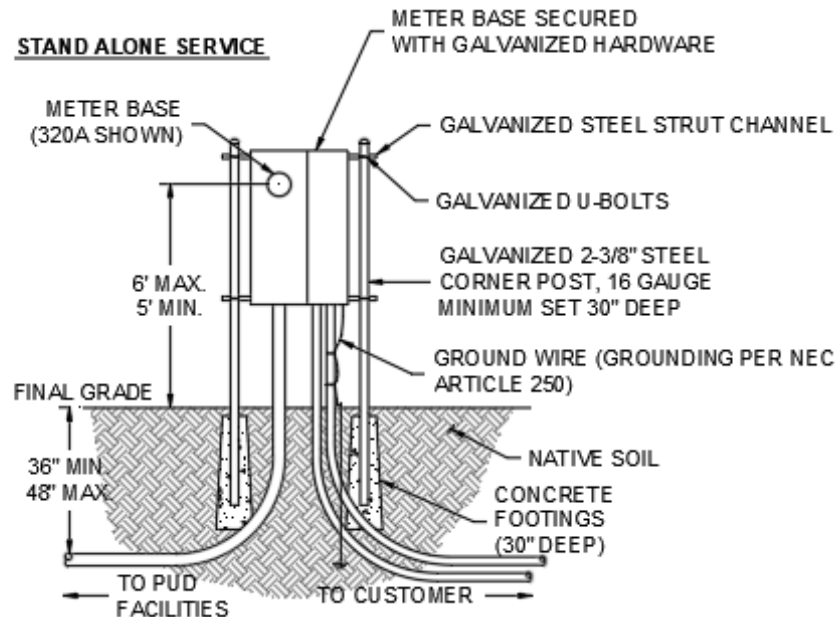
Flush-Mount and Surface-Mount Installations

If the meter base is recessed into a building's exterior wall, a flush-type box designed specifically for that purpose shall be installed such that the face of the meter cabinet projects beyond the building's exterior surface. More common is the installation in which the meter base is mounted to the exterior of a building and fully projects beyond the building's exterior surface, referred to as "Surface Mount." For specific requirements, please see [Figure 6](#).

Installing an Underground Stand-Alone Service

Follow the requirements shown in [Figure 20](#) for an underground stand-alone service.

Figure 20: Underground Stand-Alone Residential Service



Overhead Service

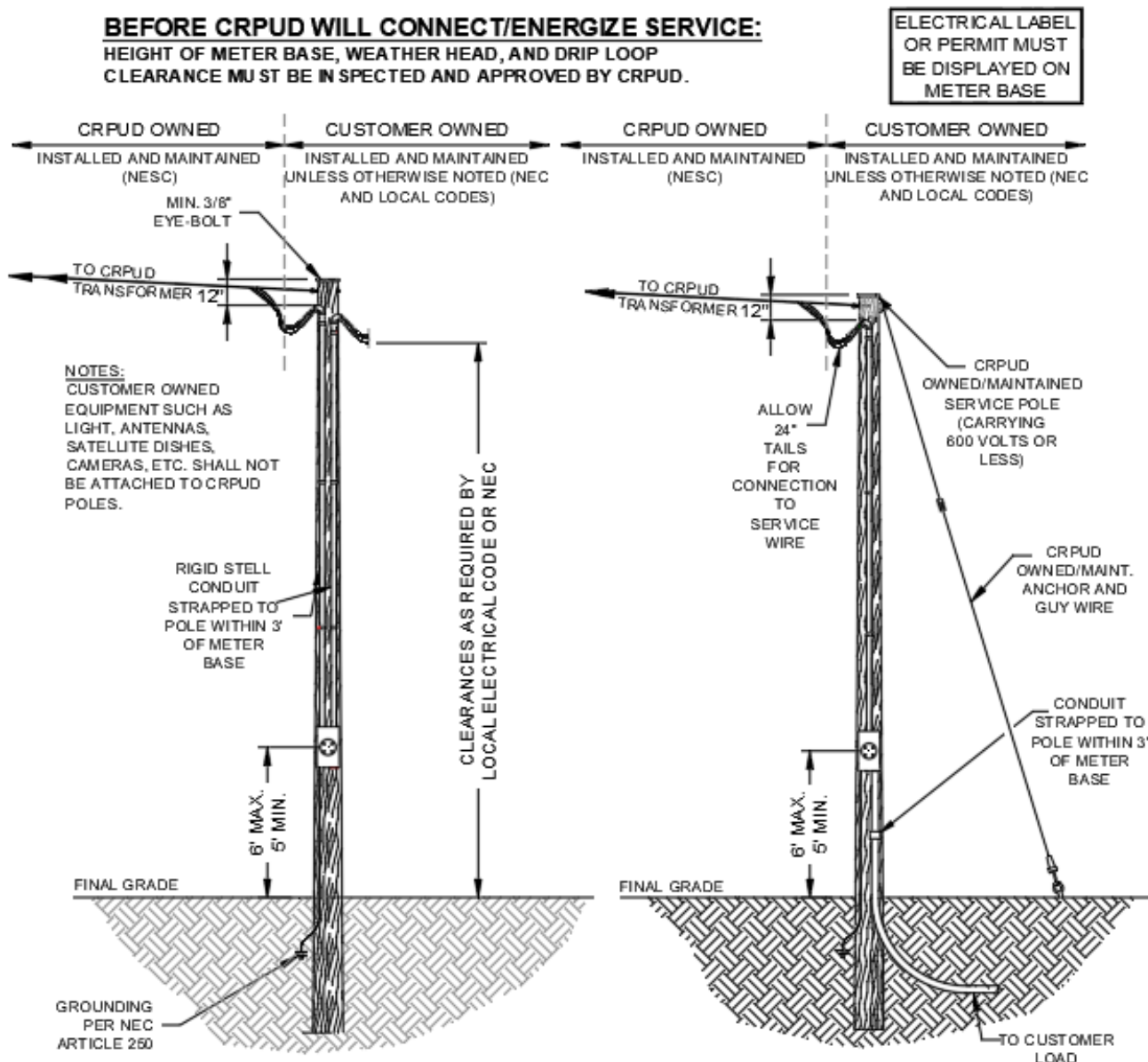
CRPUD owns and maintains the overhead service from its source to the point of delivery at the weatherhead, in addition to the electric meter. The customer owns the meter base and all wiring in the weatherhead and on the load-side of the meter base.

[Figure 7](#) depicts the requirements and measurements necessary for overhead service including information about mast guy and anchor requirements. CRPUD may also install underground services in an overhead area, please see [“Underground Service.”](#)

Meter Poles

Meter poles shall be furnished, installed, owned, and maintained by the CRPUD according to CRPUD Line Extension Policies, located in our [General Terms and Conditions](#), section 23. Customer metering equipment may only be placed on CRPUD-owned secondary and service poles carrying voltages of less than 600 V. For additional information on meter poles, please see [Figure 21](#).

Figure 21: Meter Pole



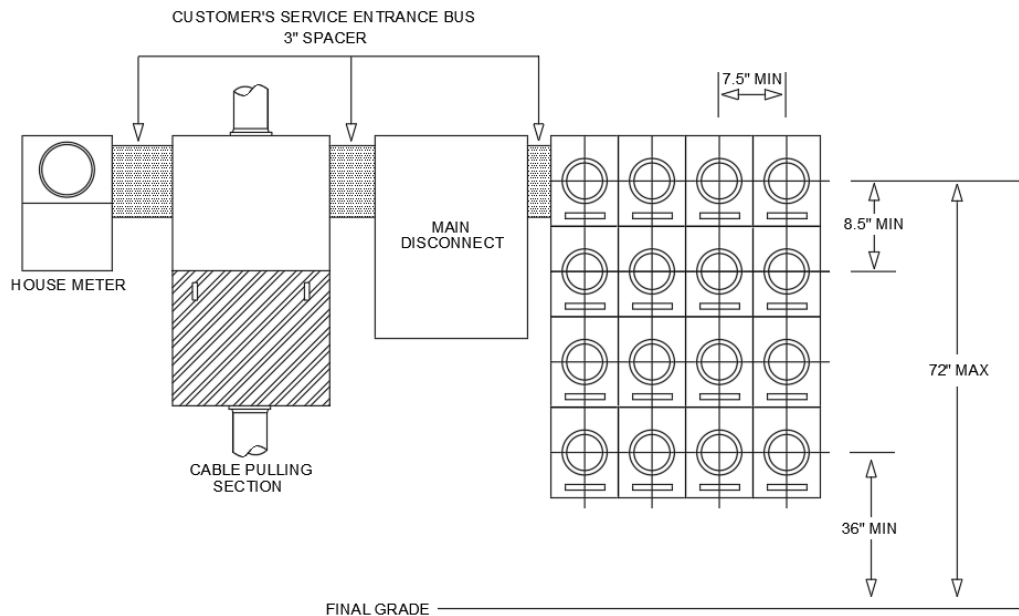
Multiple-Family Service

CRPUD requires that service entrances be grouped at a common point for multiple-family units such as duplexes, apartments, or accessory dwelling units.

Main Disconnect

CRPUD requires a main disconnect in front of all meter banks that contain more than six meters. The main disconnect must be in the same location as the meter bank as shown in [Figure 22](#) for underground and overhead service.

Figure 22: Meter Base Installations for Multiple-Family Services (Underground & Overhead)



Basic Requirements

The following requirements apply to a multiple-family service:

- Meter bases shall not be used as junction boxes.
- Meter bases must be ring-type.
- A “house service” requires a safety socket for all non-residential meter bases.
- A main disconnect is required when more than six services are connected. If an existing installation expands beyond six services, a main disconnect shall be installed.
- Each service shall have a lockable and easily accessible disconnect within sight of the meter base location. If the disconnect is not in sight of the meter base, a label shall be placed at the meter base location indicating the location of the disconnect.
- On overhead services, the customer must furnish all lugs and connect conductors to the line-side terminals. The customer is responsible for bringing the service entrance conductor to the connection of the CRPUD service drop.
- All unused openings shall be covered and secured by the customer.
- Meters and metering equipment shall be located outdoors.
- Locate the main disconnect handle far enough away from the meter and the pull box to allow full operation without interference.
- Panel covers must be secured in place prior to service equipment being energized.
- The conduit must be rigidly attached to the building, straight, and vertical to the sweep in the trench.

Locational Requirements

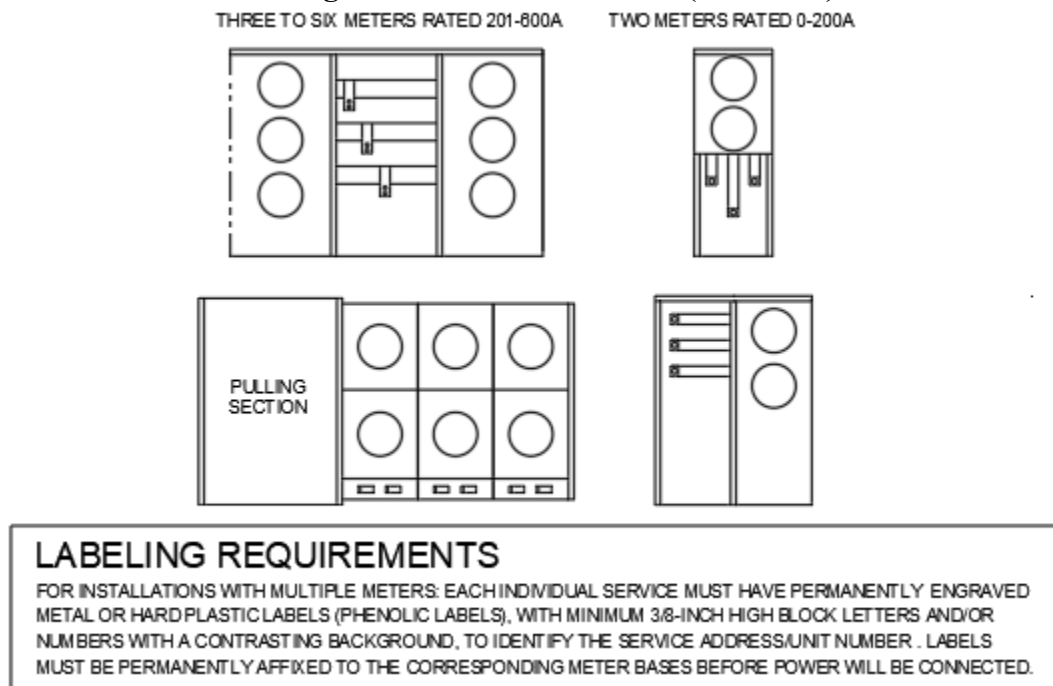
These requirements apply to the location of underground service:

- CRPUD will determine the exact location of the meters.
- A minimum 3-inch spacer is required between the disconnect or pull section and the meter base panel, as shown in [Figure 22](#).

Service-Terminating Arrangements

[Figure 23](#) depicts a typical service-terminating arrangement for two-meter base modules rated 0 to 200 A and three to six meter base modules rated for 201 to 600 A.

Figure 23: Service Terminating Arrangements for Two Meters (0-200A) and Service Terminating Arrangements for Three Meters (201-600A)



Overhead Service

Multi-family services served overhead shall meet the same requirements as above.

Manufactured & Mobile Home Service

CRPUD will provide underground service to a manufactured home under the same requirements as single-family service if the home meets these requirements: The home is site-specific, it occupies a private lots, and/or it has a permanent foundation as defined by the local jurisdiction. If it does not meet the above requirements the customer's service entrance must be mounted as a stand-alone type installation, or be served overhead and mounted to a meter pole.

Residential Subdivision

CRPUD requires that all materials necessary for residential subdivision base systems be provided by contractors. Please see the subdivision material list below that details the specific requirements and [Figure 24](#) to see the specs for Base Streetlight Pole Precast.

1. Termaduct Reducer Bushings

Termaduct Reducer Bushings 6"-4"

Termaduct Reducer Bushings 6"-2"

Termaduct Reducer Bushings 4"-2"

Termaduct Reducer Bushings 3"-2"

Purchase through: Ferguson Enterprises – Several Locations (Portland and Longview)

2. *Fiberglass Elbows (For all conduit runs over 400')*

Elbow, Fiberglass 2"X90°X36" Heavy Wall w/ PVC Coupling Attached Champion or Equal

Elbow, Fiberglass 3"X90°X36" Heavy Wall w/ PVC Coupling Attached Champion or Equal

Elbow, Fiberglass 4"X90°X36" Heavy Wall w/ PVC Coupling Attached Champion or Equal

Elbow, Fiberglass 6"X90°X60" Heavy Wall w/ PVC Coupling Attached Champion or Equal

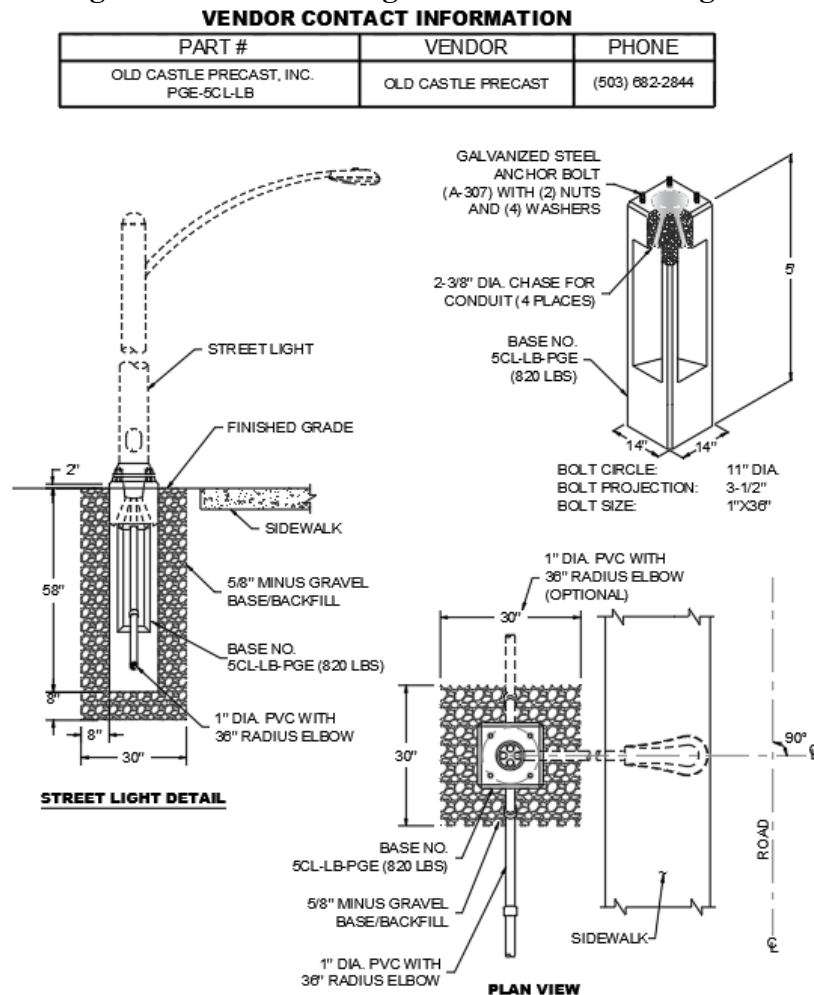
Purchase through: Platt – Several Locations (Portland and Longview), General Pacific, Wessco-Anixter, and Ferguson Enterprises – Several Locations (Portland and Longview)

3. *Mule tape (Must be installed in all conduit runs)*

Mule Tape, 5/8" Wide w/ Min. 1800 lbs. Breaking Strength - Neptco, Inc. WP-1800P

Purchase through: General Pacific, Wesco-Anixter, Platt – Several Locations (Portland and Longview), and Wagner-Smith Equipment

Figure 24: Base Streetlight Pole Precast Footings



NOTES:

1. GRAVEL BASE SHALL BE 30" X 30" X 8" AND MUST CONSIST OF LEVELED AND COMPACTED 5/8" MINUS GRAVEL.
2. GRAVEL BACKFILL SHALL SURROUND BASE BY A MINIMUM OF 8" AND MUST CONSIST OF 5/8" MINUS GRAVEL.
3. STREETLIGHT BASE MUST BE LEVEL AT FINAL INSTALLATION.
4. CONTRACTOR SHALL USE 1" PVC CONDUIT WITH 36" RADIUS PVC ELBOWS, UNLESS OTHERWISE APPROVED BY CRPUD.

NOTE:
ORIENT BASE SO THAT
MAST-ARM WILL BE
PERPENDICULAR TO ROAD
CENTERLINE

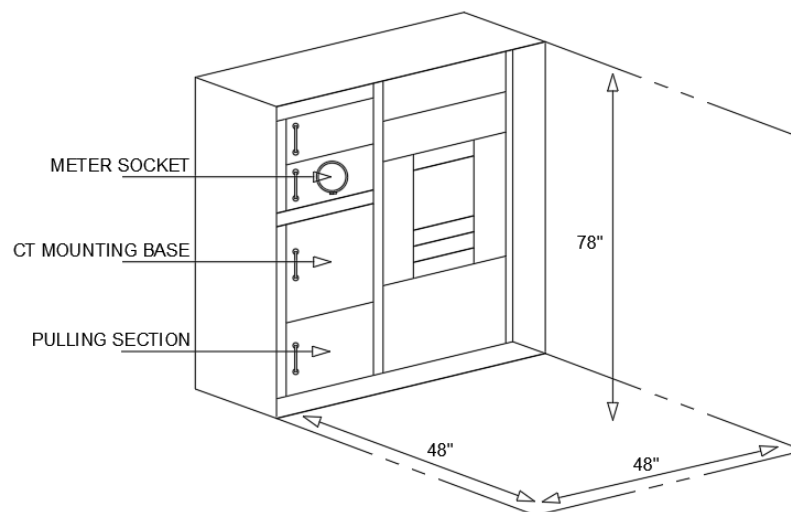
Commercial, Industrial, and Non-Residential Services

General Requirements

This section provides CRPUD's requirements for commercial, industrial, and non-residential services, including single-phase and three-phase services for self-contained and current transformer (CT) metering. CT-rated equipment is required for all single-phase services greater than 320 A continuous, in addition to three-phase services greater than 200 A. All customers must coordinate their service requirements with CRPUD.

1. All meter bases shall be ring type.
2. On overhead services, the customer must furnish all lugs and connect conductors to the line-side terminals. The customer is responsible for bringing the service entrance conductor to the connection of the utility overhead service conductor.
3. For underground services 600 A or greater, the customer is responsible to provide line-side cables and connectors, and will terminate on the line-side of equipment.
4. Cable termination connectors should have two bolts per connector. When mechanical lugs are used, two setscrews per conductor should be used where feasible.
5. All unused openings shall be covered and secured by the customer.
6. Meters and metering equipment shall be readily accessible to the CRPUD and be located outdoors.
7. A concrete mounting pad shall be placed for switchgear enclosures.
8. A flat permanent surface, such as a concrete pad, extending a minimum of 48-inches out from the front of the working section of the metering equipment. Please see [Figure 25](#) for more details.

Figure 25: Typical Switchboard



For multi-meter installations, the following requirements also need to be met:

A main disconnect is required when more than six services are connected. If an existing installation expands beyond six services, a main disconnect switch shall be installed.

1. Each service shall have a lockable and easily accessible disconnect in sight of the meter socket location. If the disconnect is not in sight of the meter socket, a label shall be placed at the meter socket location indicating the location of the disconnect.
2. It is the responsibility of the customer to ensure the meter sockets are labeled correctly. All required labels shall be correctly installed before the service is energized. Labels shall:
 - a. Be permanently affixed to the equipment and not on a removable cover.

- b. Be of sufficient durability to withstand the local environment. Engraved metal or hard plastic labels are required.
3. Each metered service and associated breaker shall be labeled to identify the unit. To ensure each unit is assigned the correct meter, the inside main panel of each unit must be clearly marked with its designated unit number.
4. A minimum vertical clearance of at least 48-inches from the center of the lowest meter to the final grade is required. However, in installations of three or more ganged meters, a minimum vertical clearance of 36-inches to the center of the lowest meter is acceptable if a minimum 36-inches wide, flat, concrete pad below the meter is provided at the final grade and extends at least 18-inches on either side of the meter cabinet.

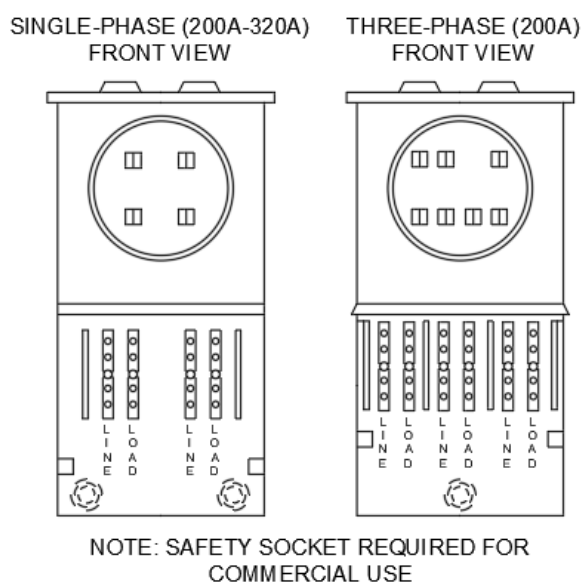
Meter Location

Meters must comply with accessibility and location requirements in “[Meter Location Criteria and Clearances](#).” Where meter equipment is installed in a location subject to vehicle traffic, the customer is required to install and maintain a CRPUD-approved barrier post

Single-Phase and Three-Phase Self-Contained Metering Installations

CRPUD requires a self-contained meter base when the ampacity of a single-phase service entrance less than or equal to 320 A continuous and when the ampacity of a three-phase service is 200 continuous amps or lower. Wires installed in the meter socket by the customer must have clear space for CRPUD to install conductors. Meter bases are illustrated in the [Figure 26](#).

Figure 26: Single-Phase and Three –Phase Self-Contained Meter Base (Safety Socket)



Self-Contained Meter Safety Socket

Please contact your CRPUD Field Engineer for more information on the following requirements. No safety socket is required for service equipment rated 200A or lower for these uses:

- Temporary construction.
- Residential pumps, gates, outdoor lighting, barns, and outbuildings.

Non-Residential Underground and Overhead Service Free-Standing Meter Base

For more information and requirements on non-residential underground and overhead service free-standing meter bases, please see the following figures:

- Meter Pole: [Figure 21](#)
- Underground Stand-Alone Residential Service: [Figure 20](#)

Self-Contained Metering: Multiple Installations

This section describes the additional requirements for self-contained, non-residential, single-phase, and three-phase multi-meter installations. [Figure 22](#) is an example of multi-metering services for three-phase and single-phase configurations. The following requirements shall be met:

- Metering conductors shall not pass through adjacent metering compartments except in enclosed wireways.
- A test bypass facility with rigid insulating barriers shall be furnished, installed, and wired or bussed to the meter bases. All test bypass facility cover panels shall be sealable and fitted with a lifting handle.
- Metering installations and service equipment shall be readily accessible to the CRPUD.

CT Metering (0-800A)

This section describes metering requirements for services rated up to 480V and 800A. CRPUD will provide and install the meter, a meter test switch, current transformers, and secondary metering wiring. Please see the following figures for more information:

- [Figure 27](#): Single-Phase Current Transformer Metering Cabinet Installation
- [Figure 28](#): Three-Phase Current Transformer Metering Cabinet Installation

Figure 27: Single-Phase Current Transformer Metering Cabinet Installation

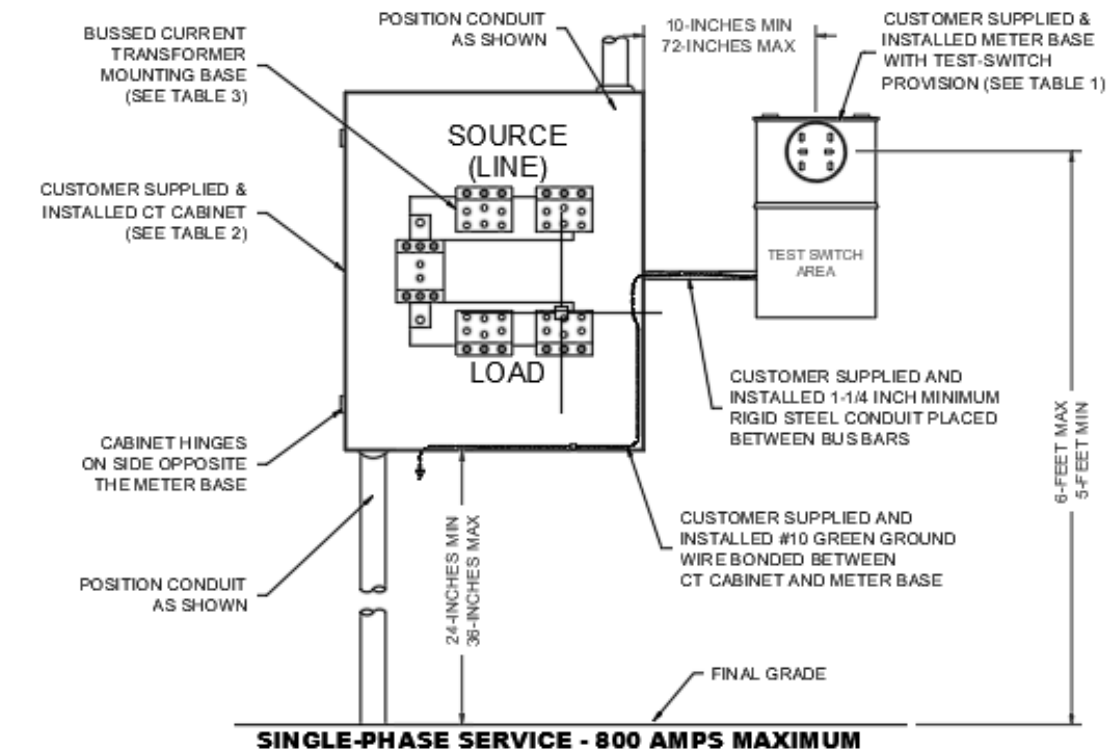


TABLE 1 - 6-JAW METER SOCKET

SERVICE VOLTAGE	MINIMUM SIZE (W x H x D)	COOPER B-LINE (OR EQUIVALENT)
1Ø, 3W 120/240	12" X 20" X 4-5/8"	# 12148

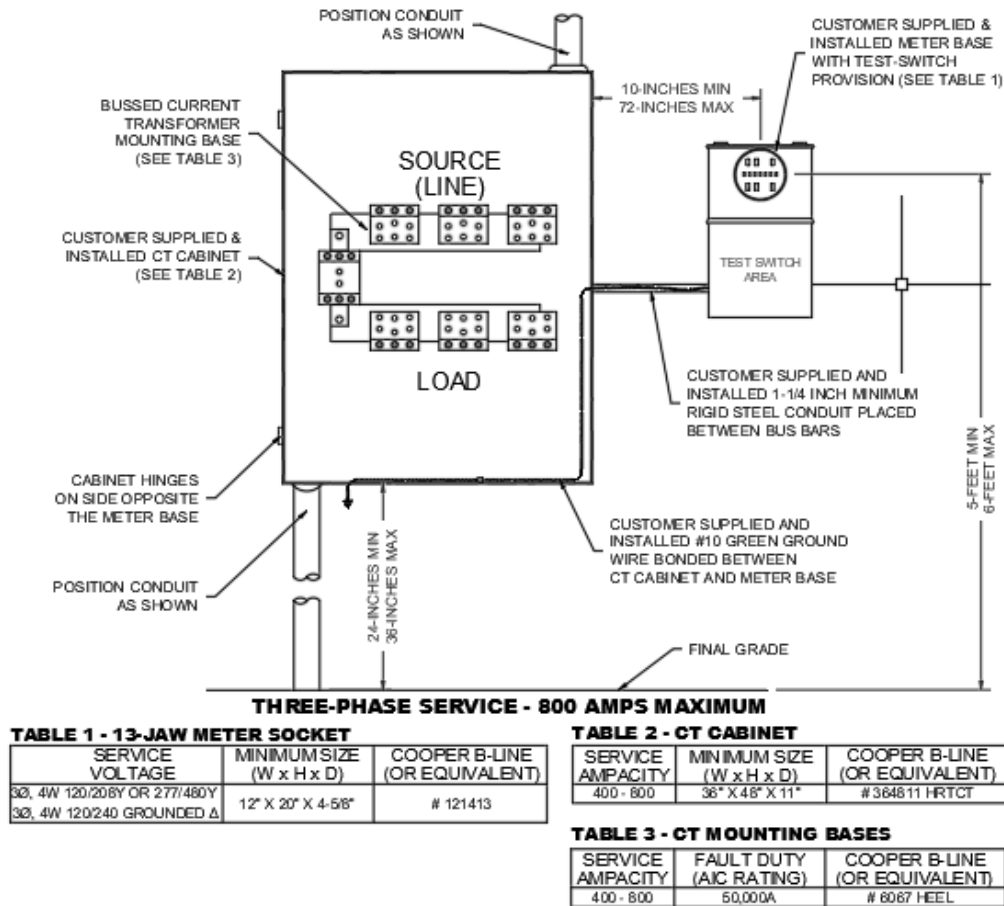
TABLE 2 - CT CABINET

SERVICE AMPACITY	MINIMUM SIZE (W x H x D)	COOPER B-LINE (OR EQUIVALENT)
400 - 800	30" X 36" X 11"	# 303611HRTCT

TABLE 3 - CT MOUNTING BASES

SERVICE AMPACITY	FAULT DUTY (AIC RATING)	COOPER B-LINE (OR EQUIVALENT)
400 - 800	50,000A	# 6019 HEL

Figure 28: Three-Phase Current Transformer Metering Cabinet Installation



CT Mounting Base

The following list are CRPUD requirements for a CT mounting base:

- Customer supplied and installed service cable.
- Customer supplied and CRPUD installed long-barrel connector lugs with two 9/16-inch holes spaced 1 3/4-inch on center for transformer termination.
- Customer supplies and installed current transformer (CT) cabinet and meter base to be securely mounted on a ridged surface and plumb in all directions.
- CT cabinet must have removable door with factory installed hinges on the opposite side of the meter base.
- Customer supplied and installed CT mounting base. 1 1/4-inch minimum rigid steel conduit and #10AWG green ground wire as shown and in accordance with latest issue of NEC article 250 (Grounding).
- CRPUD supplied and installed CT's, electric meter, metering wire, and test switch.
- CT cabinets to be mounted on outside of building with adjacent meter base as shown above.
- CT cabinet must have clear working space of at least 4 feet in front of enclosure.
- Line, source side, conductors always terminate on top bus and lead conductors always terminate on the bottom of the bus, regardless of whether service is overhead or underground.

CT Metering (Free-Standing)

For underground fed services, CRPUD allows free-standing installations on corrosion-resistant steel structures, similar to a single-phase “stand-alone” meter base installation. Consult your Field Engineer for more information. The free-standing structure shall be owned and maintained by the customer.

Switchboard Metering up to 4000A

A switchboard is required when the service entrance rating is greater than 800 A. The requirements for switchboard metering installations are as follows:

- The above requirements for the CT mounting bases shall be met.
- The customer must provide a concrete pad, per [Figure 25](#).

Primary Metering

For overhead primary metering, the pole with the primary metering equipment is the service point. If an agreement for primary voltage delivery is reached, CRPUD will provide and connect one span of overhead primary conductors to the customer’s pole. Underground fed primary metering services will require a primary metering cabinet, which the CRPUD will supply. Please consult your Field Engineer for more information.

Meter Rooms

All metering shall be mounted to the exterior of buildings when possible. Metering rooms must be accepted by CRPUD in writing and are not typically allowed. In the case where they are allowed, they should meet the requirements listed below:

- The door to the meter room shall open outward to the exterior of the building and shall have a panic bar.
- Access to meter rooms is shared by the customer and CRPUD. The customer shall provide CRPUD with an access key, and lockbox with hasp dedicated to CRPUD padlock.
- Only metering, service entrance, communications, and electronic equipment that supports the electrical service shall be installed in the meter room.
- The meter room shall not be used for storage.
- The meter room shall have adequate lighting in all work spaces.
- Not provide any access to the rest of the building.

Marinas

Due to conditions unique to each site containing floating homes, docks and marinas, requirements for electric service will be determined on a case by case basis. Ultimately, the authority jurisdiction may dictate the location of electrical equipment such as transformers, meters, breakers/disconnects, etc. Please consult with the appropriate electrical inspector and involve your Field Engineer early on in the design process.

RESIDENTIAL SERVICE LOAD DATA SHEET

General Information

Service Address* _____
Customer Name* _____
Customer Phone* _____ Customer Email* _____
Mailing Address* _____
Electrical Contractor _____ Phone _____ Email _____
Mailing Address _____
General Contractor _____ Phone _____ Email _____
Mailing Address _____

Service Information

Service Voltage* ☐ 120/240V ☐ Other _____ **Service Size*** ☐ 200A ☐ 320A ☐ Other _____ A
☐ Stick-Built Home ☐ Manufactured Home Size: _____ ft² ☐ Shop Size: _____ ft²
Type of Service* ☐ New ☐ Upgrade ☐ Relocation
☐ Overhead ☐ Underground Temporary Service Requested? ☐ Yes ☐ No

Connected Electrical Loads

HVAC

Type* ☐ Electric ☐ Gas ☐ None
Heat Pump / AC Unit _____ Tons Soft Start? ☐ Yes ☐ No
of Units _____ Starting Current (LRA) _____ Amps
☐ Ductless (Mini-Split) _____ Watts _____ Total Units
Furnace _____ Watts
Wall Units _____ Watts (per unit) _____ Total Units
Other _____ Watts _____ Description _____

Appliances

Clothes Dryer ☐ Gas ☐ Electric
Oven/Range ☐ Gas ☐ Electric Quantity: _____
Water Heater ☐ Gas ☐ Electric Quantity: _____
Tankless Water Heater (Electric) _____ Watts
Electric Vehicle Charging Level _____ Watts

Miscellaneous Loads

RV Plug-in _____ Watts
Hot Tub/Spa _____ Watts
Pool/Spa _____ Watts
Grow Lights _____ Watts
Air Compressor _____ Horsepower
Additional Motor _____ Horsepower

Comments or Additional Load Information

Acknowledgement

The PUD will design their facilities to accommodate the electrical loads listed on this form. Revisions of the electrical load or other information as supplied or requested on this form may change the scope of the project and/or project design and associated costs.

Customer Signature* _____

Date* _____



64001 Columbia River Hwy
P.O. Box 1193
St. Helens, Oregon 97051

Field Engineers

Karl Webster 503-397-8154
Brooke Sisco 503-366-3261
Ken Parris 503-366-3255

Fax (503) 397-5215
kwebster@crpud.org
bsisco@crpud.org
kparris@crpud.org

*Indicates fields required for CRPUD to accept this form

COMMERCIAL SERVICE LOAD DATA SHEET

General Information

Service Address* _____

Customer Name* _____ Phone* _____ Email* _____

Mailing Address* _____

Electrical Contractor _____ Phone _____ Email _____

Mailing Address _____

General Contractor _____ Phone _____ Email _____

Mailing Address _____

Type of Business _____ Hours of Operation _____ Days/Week _____

Service Information

Service Details Size of Main Service: _____ Amps # of Meters Requested: _____

☐ Single-Phase ☐ 120/240V ☐ 7,200V ☐ Other _____ V

☐ Three-Phase ☐ 120/208V Wye ☐ 277/480V Wye ☐ 120/240V 4W Delta ☐ 12,470V

☐ New ☐ Upgrade ☐ Relocation

☐ Overhead ☐ Underground Temporary Service Requested? ☐ Yes ☐ No

Connected Electrical Loads

HVAC

Type* ☐ Electric ☐ Gas ☐ None

Heat Pump / AC Unit _____ Tons Soft Start? ☐ Yes ☐ No

of Units _____ Starting Current (LRA) _____ Amps

☐ Ductless (Mini-Split) _____ KW

Furnace _____ Watts

Wall Units _____ Watts (per unit) Total Units _____

Other _____ Watts

Lighting _____ Watts

Refrigeration _____ Watts Units _____

_____ Watts Units _____

_____ Watts Units _____

Water Heater ☐ Gas ☐ Electric _____ Watts Type _____ ☐ N/A

Cooking ☐ Gas ☐ Electric _____ Watts Type _____ ☐ N/A

Miscellaneous Loads

Electric Vehicle Charging Level _____ Watts Air Compressor _____ Horsepower

Other _____ Watts Other _____ Watts

(DESCRIPTION) (DESCRIPTION)

Largest Motor Information _____ HP Variable Speed Drive? ☐ Yes ☐ No Soft Start? ☐ Yes ☐ No

☐ Three-Phase ☐ Single-Phase Locked Rotor Amps _____ Full Load Amps _____

Cannabis Cultivation

Grow Lights: _____ Watts per Light Total # of Lights: _____ Max # of Lights on at once: _____

Fans _____ Watts Other _____ Watts

(DESCRIPTION)

Dehumidifiers _____ Watts Other _____ Watts

(DESCRIPTION)

Acknowledgement

The PUD will design their facilities to accommodate the electrical loads listed on this form. Revisions of the electrical load or other information as supplied or requested on this form may change the scope of the project and/or project design and associated costs.

Customer Signature* _____ Date* _____



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*Indicates fields required for CRPUD to accept this form