

# COMMERCIAL & INDUSTRIAL

## Electrical Service Connection Handbook



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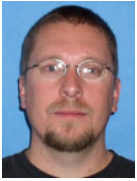
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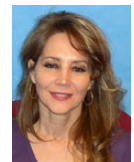
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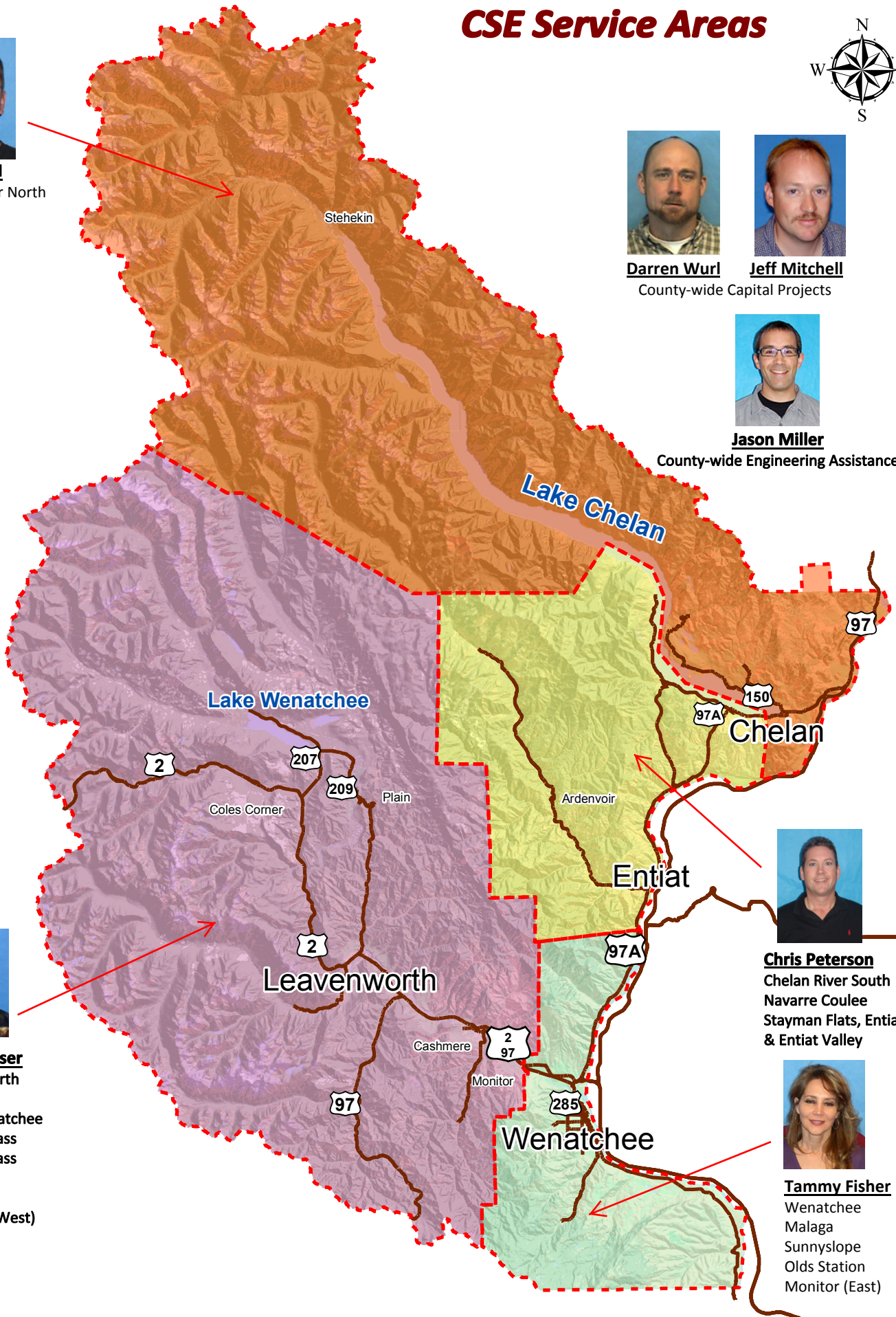
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## INTRODUCTION

This handbook is your guide to Chelan County PUDs (CCPUD) requirements **for new electric service installations of less than 600 volts for commercial, industrial, multifamily, and nonresidential applications.**

This handbook provides most, but not all, of the information and requirements that you will need. It does not include all possible standards and specifications required by CCPUD, state, federal, or local code requirements. If you need additional information, please call CCPUD Customer Service Engineering at **509-663-8121**.

Chelan County PUD is pleased to serve your electrical needs. Installing electrical service to your business or project is a joint effort between you and Chelan County PUD. A PUD Customer Service Engineer will need the following information to assist you with providing electrical service to your project

The Customer Service Engineer may provide you with additional information depending on the type of service you will be installing, and the proximity of your electrical service to PUD facilities. This packet is a general overview of the installation process.

Customer Service Engineers are located at PUD Office in Wenatchee. Please contact the Engineer in the area where your project will take place.

- Where the building or service point will be located
- What the service will be used for (business, irrigation, frost protection, etc)
- Type of service – overhead or underground
- Service Type and Size (Single Phase, Three Phase - Required Voltage)

## NEW AND ALTERED SERVICE - CUSTOMER RESPONSIBILITIES CHECKLIST

- ☐ Contact a Customer Service Engineer to determine a PUD connection point and approve meter location as much in advance as possible to determine the availability of electric service facilities.
- ☐ Familiarize yourself with the applicable contents of this manual pertaining to your new or altered service
- ☐ Set up an account for billing and pay fees at the Chelan County PUD Customer Accounting Department in Wenatchee, Chelan or Leavenworth.
- ☐ Obtain electrical permit, inspection and approval from the Washington State Department of Labor and Industries (Electrical Inspection (509) 886-6500).
- ☐ Provide and install appropriate meter base, conduit and conductor to PUD connection point. Call the 'One-Call Center' (**1-800-424-5555**) for utility locations prior to digging. *Washington Law requires you to locate all utilities on your site before you begin digging.*
- ☐ Contact local phone and cable service providers for utility installation information

**Chelan County PUD cannot connect your service until these items are completed.**

GENERAL INFORMATION AND REQUIREMENTS

TABLE 1  
Available Service Voltages

<u>Single Phase</u>	<u>Three Phase</u>
120/240 V, 3 wire*	120/208 V, 4 wire
120/208 V, 3 wire†	277/480 V, 4 wire

\*Available for loads up to a maximum of 1000 amperes

†Available only if 120/208 secondary voltage exists

TABLE 2  
Maximum  
Horsepower per  
Voltage

Voltage	Horsepower
240 Volts – Single Phase	Maximum 7 ½ HP
208 Volts – Three Phase	Minimum 7 ½ HP
480 Volts – Three Phase	Minimum 40 HP

ALL SERVICES – GENERAL INFORMATION

- Self-contained three-phase meter bases can be used for commercial services up to 200 amps. All single-phase commercial, or 3-phase services over 200 amps must have current transformer metering – See section IV, Meters and Service Entrance Equipment, for further information.
- All services 801 amps and over require approved switchgear. Switchgear specifications and drawings must be submitted to the District prior to purchase. **Failure to get District approval may result in rejection of all or part of the switchgear equipment.** Further information regarding switchgear is located on page 39.

**The District's primary distribution voltages may differ at various locations.** Consult the Chelan PUD Transmission & Distribution Engineering Department for the high voltage classification. The District will endeavor to maintain the voltage level within plus or minus 5% of the nominal voltage.

### THREE-PHASE SERVICES – GENERAL INFORMATION:

- The availability of service for three-phase equipment to be used shall first be determined at any District office before proceeding with the wiring.
- All three-phase secondary services shall be four (4) wire three-phase configurations.
- The three-phase service equipment or entrance head shall be installed at a location designated by or approved by the District.
- Any wiring installed without first contacting the District to determine the service entrance location is done at the risk of having to change the service location to conform with these requirements. (WAC 296-46-23001)
- The District reserves the right to refuse three-phase service for small loads if single-phase service will service adequately. However, variances may be granted if an existing facilities can be used without transformer changes.

### COST OF SERVICE:

- The cost of providing electrical service to all customers is governed by the District's Electric Rate Schedule currently in effect.
- The customer will be responsible for providing and installing service entrance equipment and wiring to conform with all applicable codes and these requirements.

### UPGRADING OR CONVERSION OF SERVICES

The customer shall advise the District of upgrading or conversion in the customer's facilities, whether it is a voltage, phase or load requirement, or service entrance location change.

- All upgrading, rewiring or conversion shall be in compliance with District policies and procedures in effect at the time of the upgrading, rewiring, or conversion.
- It is the customer's responsibility to have all inspections performed by the State of Washington Department of Labor and Industries.
- Any wiring performed without first checking with the District is done so at the risk of having to change either the service entrance equipment or location of same or both.
- Service will not be reconnected/energized until approved by the State Electrical Inspector and is acceptable to the District.

### TEMPORARY SERVICES

Temporary service, either overhead or underground, shall be limited to a maximum of twelve (12) months.

### PRIMARY LINE EXTENSIONS:

A usable PUD transformer or secondary connection point on or near your property will be necessary to provide electrical service to your project. If a PUD connection point or proper voltage is not available **WITHIN 150 FEET** of your project, a **PRIMARY LINE EXTENSION** may be necessary. Contact a PUD Customer Service Engineer to determine the nearest PUD facility and to design a primary line extension. The Customer Service Engineer will provide you with estimated costs and detailed plans for the primary line extension.

Customers requiring extension of the District's primary system shall provide the District with accurate load data and accurate plot plans showing the location of necessary property corners. The customer shall complete any surveying necessary for the location of property corners.

## ELECTRICAL WORK PERMIT & INSPECTIONS:

All parties doing electrical wiring are required to secure an Electrical Work Permit. This permit is available from the State of Washington Department of Labor and Industries office at **519 Grant Road, East Wenatchee**. The inspection of the electrical wiring must be performed and approved by the state inspector and the District prior to receiving electrical service.

- It is the customer's responsibility to have all inspections performed by the State of Washington Department of Labor and Industries.
- The District's inspecting representative is authorized by the District to make sure the customer's service entrance equipment is in compliance with these requirements and the District's policies.
- Once approval has been received from the state electrical inspector the District will endeavor to have service connected within ten (10) working days from date of receipt.

## POSSIBLE DELAYS :

- The District may or may not have a sufficient stock of materials to complete a job once the service application has been completed.
- The District will not order any equipment or materials to complete any particular job until certain requirements have been met. The purchase of special materials such as transformers and conductors can require many weeks to obtain. Contact engineering for requirements.
- In many cases, easements may be required for facilities located on private property and line construction will not begin until the necessary easements have been obtained.

## VOLTAGE DROP CALCULATIONS

You are responsible for calculating the overall voltage drop to your facility and determining what is an acceptable level for your facility. If you determine that the voltage drop is unacceptable, **you must determine a solution. Some possible solutions** are:

- Run separate services from CCPUD's transformer for motor loads.
- Modify or upgrade your equipment or service conductors.
- Contact CCPUD to inquire about increasing the size of the transformer.
- Contact CCPUD for costs associated with installing a second transformer

## FAULT CURRENT LEVELS:

It is the responsibility of the customer or customers electrician to calculate the fault current level for a new or upgraded service. Your Customer Service Engineer can provide the approximate impedance rating of the transformer for use in calculating the fault current, however, it is possible that the size of the transformer may change in the future, and this factor should be considered when calculating fault current.

## MINIMUM POWER FACTOR LIMITATIONS

Unless otherwise specifically agreed, the District shall not be obligated to deliver electric energy to the Customer at any time at a power factor below 75% (refers to average overall power factor for each individually metered service).



# **LARGE SERVICE INFORMATION**

## **PROTECTIVE DEVICES**

It shall be the responsibility of the customer to provide suitable protective apparatus on all motor installations including adequate protection against single phasing (loss of one single phase with two still energized), on three phase motors.

## **STARTING LIMITATION (MOTORS)**

The customer's use of electricity shall not interfere with the quality of his own service or that supplied neighboring customers.

- The District may require Customers to install reduced-voltage starting equipment in cases where across-the-line starting would result in excessive or undesirable voltage disturbances on the District's system. The District may specify the particular type of reduced-voltage starting equipment required and, in some cases, may not allow certain types of loads to be installed or may require that certain loads be disconnected from the District's system to prevent excessive voltage disturbances that may degrade electrical service to the District's Customers.

## **SPECIAL LOAD LIMITATION (COMMERCIAL AND INDUSTRIAL)**

Where non-inducting loads are energized from the District's secondary system and are to be switched on and off more frequently than once each hour, the maximum increased load shall not be greater than:

- 100 kilowatts, three-phase
- 30 kilowatts, 240 volts, single phase

Loads in excess of these amounts may require the customer to furnish and install special switching equipment to reduce the magnitude of the unit load to be cycled on and off. Inquiries as to the necessity of special equipment should be directed to Transmission & Distribution Engineering.

## **WELDING EQUIPMENT**

Welding equipment shall conform to the standards of the National Electrical Manufacturers Association (NEMA).

## **PRIMARY METERED SERVICES (.4 – 5 MEGAWATTS)**

To be considered for a primary metered service, customers must provide an engineering estimate of average loads, which supports the customer's annual load from 0.4 MW up to and including 5 MW. Please see the Chelan PUD's Electric Rates Schedule or contact Chelan PUD's Transmission & Distribution Department for more information.

## **LOADS OVER 5 MEGAWATTS**

Service to customers with electrical demands above 5 annual average megawatts will require a power sales contract between the customer and the District prior to connection of service that will identify special circumstances and conditions applicable to the customer's energy needs. Please see the Chelan PUD's Electric Rates Schedule or contact Chelan PUD's Transmission & Distribution Department for more information. regarding loads over 5 megawatts.

## POWER QUALITY – CUSTOMER RESPONSIBILITIES

The characteristics of the customer's electrical equipment and devices must allow the District's distribution system to operate efficiently without undue interference to the District's service or to other customers.

- **Prior to purchase, the customer shall submit information to the District regarding any equipment that might cause interference with service to other customers and/or require additional District facilities for its satisfactory operation** The District reserves the right to inspect and test any equipment connected to its lines and to obtain any information necessary to determine the operational characteristics of the equipment.
- **The customer must provide any power conditioning devices needed to obtain the quality of power necessary for optimum performance of voltage-sensitive equipment.** Electric service supplied by the District may be subjected to voltage disturbances which will not normally affect the performance of typical electrical equipment. However, these disturbances may result in the improper operation of voltage-sensitive equipment such as computers or microprocessors. Voltage-sensitive equipment is defined as equipment which is adversely affected by power disturbances (i.e., sags, spikes, or interruptions) of less than 0.5 seconds in duration.
- **The customer's use of the District's electrical facilities shall not result in an interference with the quality of his own service or that of other customers.** In the case of devices in which large blocks of load are recurrently switched on and off such as electric boilers, welders, heaters or motors, or where the customer desires voltage control within unusually close limits, the utility may require the customer to provide, at his own expense, special or additional equipment. This may apply to cases of unbalanced three phase loads.
- **Whenever a customer's equipment has characteristics which cause undue interference with District service to other customers, the customer must make changes in such equipment or provide, at customer expense, additional equipment to eliminate the interference.**
- **The customer may use additional facilities** (such as separate District transformers and a separate service) **to minimize voltage fluctuations on secondary voltage circuits for devices such as welders, induction heating equipment, and X-ray machines.** Where the operation of these types of equipment causes undue voltage fluctuations on primary voltage lines, the additional equipment required may include a separate primary voltage line.
- **The effects of the design and operation of high-frequency equipment** (such as electronic heating systems, spark discharge devices, radio transmitting equipment, etc., and equipment that generates harmonics, such as an induction furnace) **must not create disturbances on the District's electrical system which interferes with any other customer's proper operation of communication, radio, television, remote control, or other equipment.**
- **Devices which can produce harmonic distortion** (such as adjustable speed drives, electronic ballasts for fluorescent lighting, and switching power supplies for computers and electric vehicles) **shall be filtered in order that the harmonic distortion resulting from these devices are kept within the limits specified in IEEE 519-1992, Section 10.**

# CUSTOMER GENERATION INFORMATION

## PRIVATE GENERATORS

- Customer owned stand-by generators are defined by the District as those units which are installed on wiring that is not owned by the District and is intended for occasional use to supply emergency or back-up power when District supplied power is unavailable.
- Customer owned stand-by generators will be allowed on the customer's side of the meter. All facilities on the customer side of the meter, including generators and transfer switches, must meet or exceed the requirements of the current National Electric Code, Washington Administrative Code, and the Washington State Department of Labor and Industries. It shall be the customer's responsibility to obtain the necessary size and type of equipment and to obtain the necessary approvals from the appropriate agencies.
- A customer owned and installed generators must be electrically isolated from the District's lines to prevent back feeding into the District's System. To accomplish this, a transfer or double throw switch **MUST** be installed so that the customer's load will be transferred from the District's service to the customer's generator upon operation of the switch. The switch must be equipped with interlocks so that simultaneous feed from both the District's service and the customer's generator is prevented.
- The District reserves the right to disconnect any service that can or does feed simultaneously from both the District's service and the customer's generator.
- The customer should consult an electrician and the Washington State Department of Labor and Industries prior to initiating any plan for stand-by generators.

**Customer systems designed for continual operation or operated with the intent of providing the owner/operator with an income derived from the operation of the system shall be classified as Co-generation facilities and shall be subject to the District's Co-generation and Small Power Producer Policies.**



## OVERHEAD SERVICES

### GENERAL:

Contact the Chelan County PUD's Customer Service Engineering Department prior to construction. Availability and location of PUD facilities for providing overhead service shall be determined by a PUD Customer Service Engineer prior to the installation of service. If necessary, the District will determine the route and cost of extending its overhead distribution facilities to serve permanent commercial customers. The Customer Service Engineer will also communicate the service connection fees required for the project.

### Chelan County PUD Responsibilities:

Chelan County PUD is responsible for furnishing, installing, and maintaining the primary system equipment, overhead service wire, current transformers, meter(s), and meter wiring.

### Customer Responsibilities Checklist:

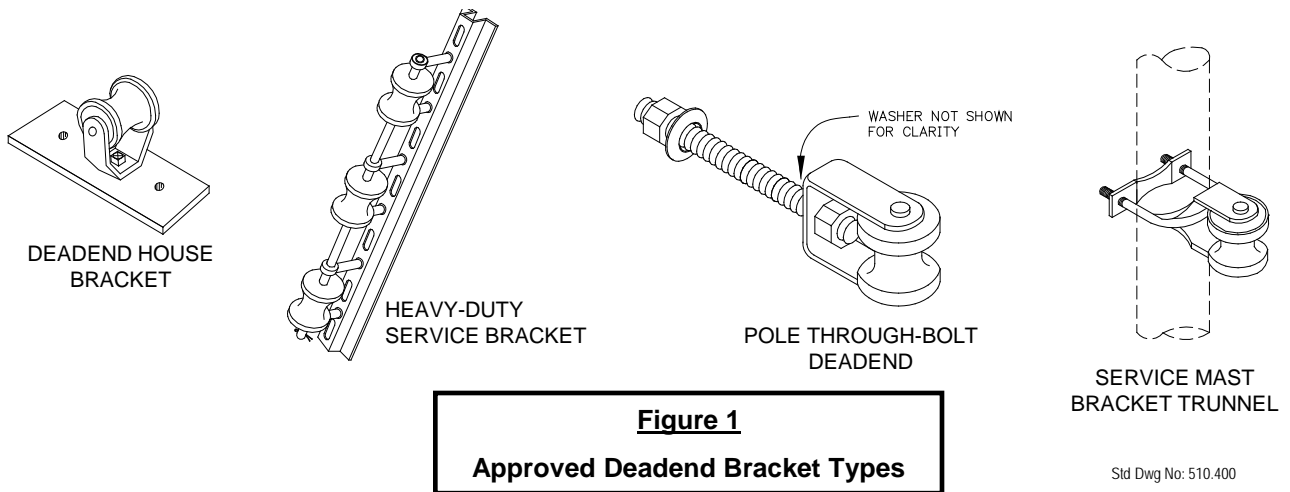
- ☐ Check for any local ordinances/covenants that may prevent you from obtaining an overhead service.
- ☐ Complete *a New Service Application* and a *Commercial Load Application*. Supply these forms and site drawings to your CCPUD Customer Service Engineer.
- ☐ Contact a Chelan PUD Customer Service Engineer to determine where your overhead will originate.
- ☐ Determine an approved meter location
- ☐ If required, provide an easement for any permanently installed CCPUD equipment located on your property.
- ☐ Provide payment for construction costs determined by your Customer Service Engineer.
- ☐ Furnish, install, and maintain all required *service entrance equipment, including the service entrance conductors from the meter socket* or current transformer enclosure to CCPUD's designated *point of delivery*. (*The point of delivery for overhead service is at the connectors on the weatherhead.*)
- ☐ Run conduit from the current transformer enclosure to the meter base for services where current transformers (CTs) are required. See Section IV, Meters and Service Entrance Equipment, for more information.
- ☐ Connect the meter sockets and permanently label them to indicate the part of the premises they serve, such as unit number.
- ☐ Obtain an approved electrical inspection from the Washington State Department of Labor and Industries.
- ☐ Call CCPUD at **663-8121** to initiate connection and energize your new service.



## OVERHEAD SERVICE – GENERAL GUIDELINES:

- All requirements for the installation of the service are located in the National Electric Code (NEC) and the Washington Administrative Code (WAC) 296-46B.
- The service entrance shall be located so that only one set of service wire attachments (of like voltage) will be required.
- Service drop conductors shall maintain the clearance requirements illustrated in Figure 2, page 10.
- The customer shall furnish and install a substantial point of attachment for wall or mast mounting that meets NEC requirements. See Figure 1 for approved deadend bracket types.
- For buildings where only one strike to the building is permitted by state law, but more than one weatherhead is desired, these weather heads must terminate within eighteen (18) inches of each other.
- Not more than fifteen (15) feet of service conductor shall extend inside the building lines.
- All service entrance masts in the area west of Monitor to the top of Stevens Pass, and the Entiat Valley shall be mounted on the gable end of the building.
- Service drop conductors will not be installed until all electrical inspections have been completed and approved.

See Section IV – Meters and Service Entrance Equipment Section for information regarding metering requirements.



## SERVICE ENTRANCE WIRES AND CABLES:

- The size of service entrance conductors shall be determined from the connected load and must not be less than the minimum size conductors as determined by the National Electrical Code.
- A service ground (fourth) wire must be provided at the weatherhead on all individual three phase services for connection at the weatherhead to a conductor from the supply transformer bank ground.
- The customer shall install this service ground conductor in the service conduit. It must meet the minimum size as set out in the National Electrical Code, and be color coded "WHITE" or natural grey.

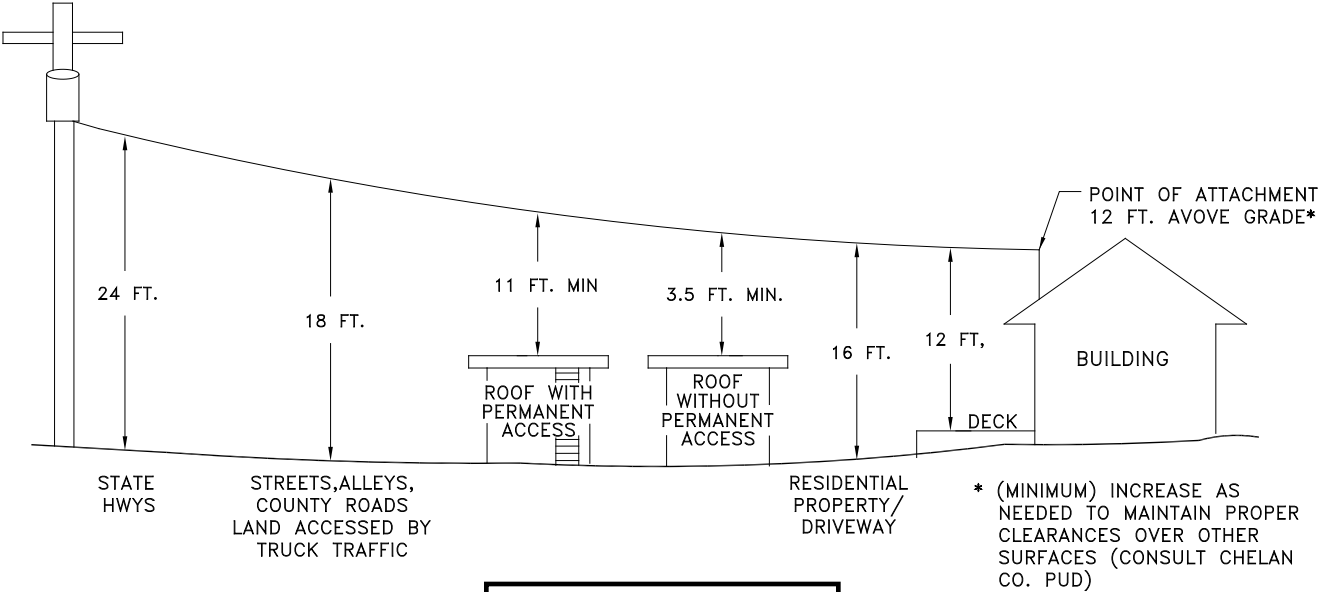
**GROUNDING SERVICE EQUIPMENT:**

The grounding of three phase service equipment shall meet the national, state and local utility rules.

**OVERHEAD SERVICE CLEARANCE REQUIREMENTS**

The National Electric Code (NEC) and the National Electric Safety Code (NESC) establish minimum clearance requirements to maintain safe height distances for electrical conductors over various terrain. The service drop from a Chelan County PUD pole to a temporary service pole must meet clearances as illustrated in Figure 2.

It is not the customer’s responsibility to supply or install the overhead wire, but you are required to provide a point of attachment at your service post that will allow Chelan PUD to meet the clearance requirements.

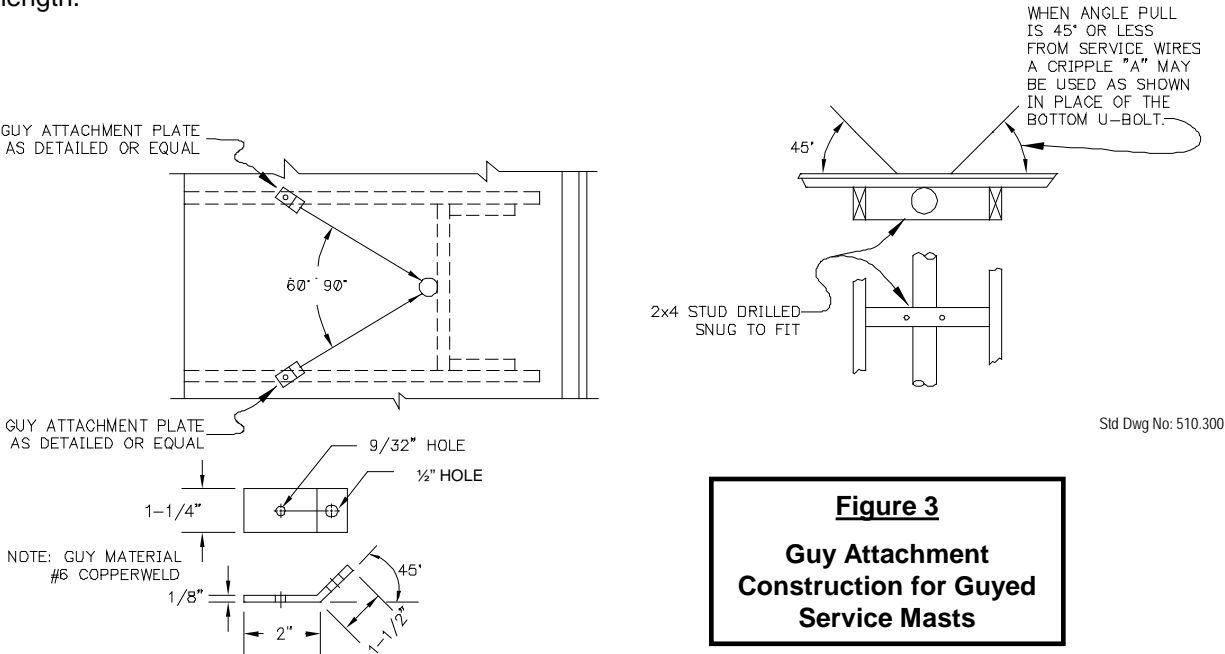


**Figure 2**  
**Clearance Requirements**

Std Dwg No: 510.110

**MAST SUPPORTS**

Additional mast supports, typically a **guy or a brace**, are required for any service line over 50 feet in length.

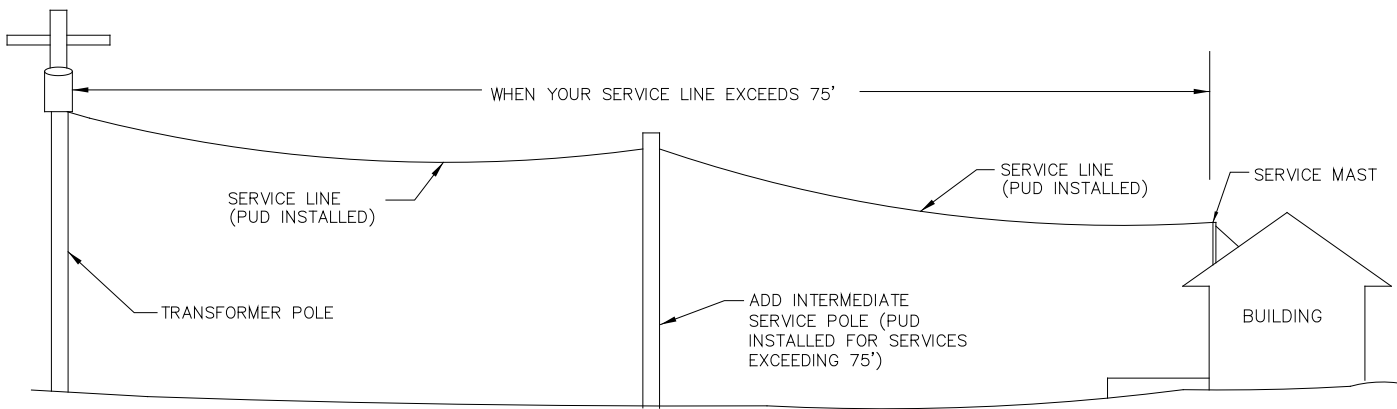


Std Dwg No: 510.300

**Figure 3**  
**Guy Attachment Construction for Guyed Service Masts**

## SECONDARY WIRE SUPPORTS

- If overhead service length is 75 feet or more from the Chelan County PUD point of connection, a customer meter pole shall be guyed. Service masts extending higher than 26 inches above the roof or with overhead services longer than 50 feet must be guyed.
- If overhead service is over 75 feet from Chelan County PUD point of connection or crosses a road, a PUD installed service pole may be required to maintain clearances (See Figure 4, below). A Customer Service Engineer will determine if a service pole is necessary. Costs associated with PUD installed service poles are paid for by the customer.
- The path that the service will take should not cross property belonging to other individuals.
- If the service will pass through trees or brush, a three-foot path must be cleared and maintained to allow service personnel to access the line, and to allow lines to hang without contacting trees or limbs. Maintaining this clear path is your responsibility.



Std Dwg No: 510.100

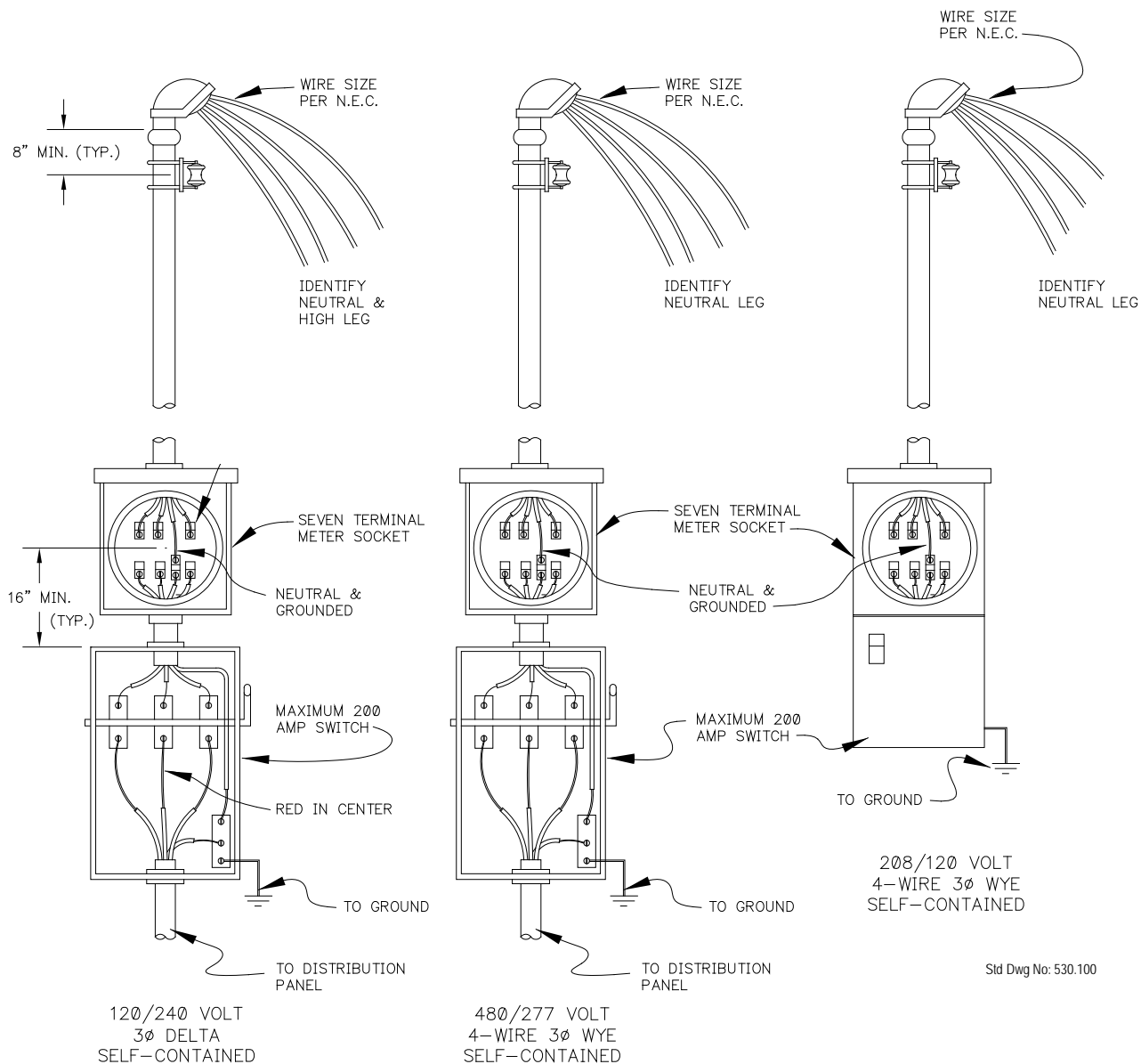
**Figure 4**  
**Intermediate Service Pole**

## SWITCHBOXES

Service switches and allied equipment exposed to the weather shall be of a rain tight type and shall be factory built for the purpose. The practice of building a small enclosure on the exterior of buildings to house service equipment will not be permitted in lieu of rain tight equipment.

When aluminum conductors are used, the switchbox must be listed or approved and clearly marked by the manufacturer that it is acceptable for aluminum conductors. Aluminum conductors must have oxide inhibitor applied.

**Figure 5**  
**Three Phase Overhead Service**  
**200A or Less**  
**Equipment Arrangement**



Std Dwg No: 530.100

**These figures provide general information and CCPUD requirements for 3-phase, 200A services. For these services and for three phase services over 200A, please refer to National Electric Code requirements.**

**General information for single phase 200A overhead services can be found in the CCPUD manual "Residential Electrical Services"**



# UNDERGROUND SERVICES

## GENERAL:

Contact the Chelan County PUD's Customer Service Engineering Department prior to construction. Availability and location of PUD facilities for providing underground service shall be determined by a PUD Customer Service Engineer prior to the installation of service. If necessary, the District will determine the route and cost of extending its underground distribution facilities to serve permanent commercial customers. The Customer Service Engineer will also determine the service connection fees required for the project.

## Chelan County PUD Responsibilities:

Chelan County PUD is responsible for furnishing, installing, and maintaining the primary system equipment, current transformers, meter(s), and meter wiring.

## Customer Responsibilities Checklist:

- ☐ Check for any local ordinances/covenants that may prevent you from obtaining an underground service.
- ☐ Complete a ***New Service Application*** and a ***Commercial Load Application***. Supply these forms and site drawings to your CCPUD Customer Service Engineer.
- ☐ Contact a Chelan PUD Customer Service Engineer to determine where your underground service will originate.
- ☐ Determine an approved meter location.
- ☐ If required, provide an easement for any permanently installed CCPUD equipment located on your property.
- ☐ Provide payment for construction costs determined by your Customer Service Engineer.
- ☐ Provide all trenching, backfilling and site restoration for all underground facilities and get approval for proper vault entrance location of your conduit and conductors.
- ☐ Provide and install service conduit and conductor, and conduit for primary power service when necessary.
- ☐ Furnish, install, and maintain all required *service entrance equipment, including the service entrance conductors* from the meter socket or current transformer enclosure, or switchgear to CCPUD's transformer or secondary handhole.
- ☐ Run conduit from the CT enclosure to the meter base for services where current transformers (CTs) are required. See the Meters and Service Entrance Equipment section for more information.
- ☐ Provide and install service conductors.
- ☐ Install required service entrance equipment.
- ☐ Connect the meter sockets and permanently label them to indicate the part of the premises they serve, such as unit number.
- ☐ Obtain an approved electrical inspection from a governmental agency.
- ☐ Call CCPUD at **663-8121 to initiate connection and energize your new service.**

## UNDERGROUND SERVICE – GENERAL GUIDELINES:

- All requirements for the installation of the service are located in the National Electric Code (NEC) and the Washington Administrative Code (WAC) 296-46B.
- Trenching, conduit and vault installations shall adhere to the standards and requirements shown in this manual. Contact the CCPUD inspector or a Customer Service Engineer to obtain further information and/or standards for installation of equipment that is not shown in this manual.
- Not more than fifteen (15) feet of service conductor shall extend inside the building lines.
- Call the 'One-Call Center' (**1-800-424-5555**) for utility locations prior to digging. *Washington Law requires you to locate all utilities on your site before you begin digging*

## CUSTOMER WIRING TO ENERGIZED TRANSFORMERS

The electrician who is installing commercial service wire and conduits into energized transformers shall coordinate such work with CCPUD to ensure a safe installation before the work begins. Depending upon the type of work being done, CCPUD will either de-energize the transformer or provide a journeyman lineman to assist with the installation. It is the responsibility of the electrician to contact the CCPUD Service Department to coordinate an outage or journeyman to stand by well in advance of the anticipated wire pull date.

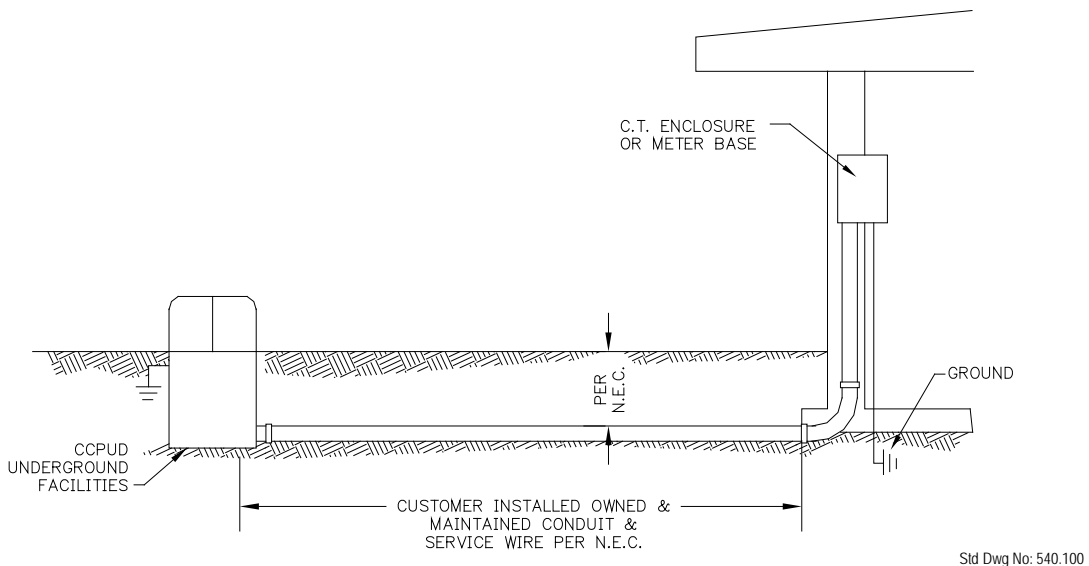
### Single-phase and Three-phase transformers:

Work that involves installing conduit and inserting wire or pulling wire into a transformer shall be done only:

- After the transformer has been de-energized; or,
- With the on-site assistance of a CCPUD journeyman.

To train the cable and mark the runs:

- Label the cables and group them together.
- Label each cable's phase and the neutrals for three phase services
- Leave no more than 8 feet of wire coiled in the vault, neatly installed and taped together.



**Figure 6**  
**Secondary Service Installation to**  
**CCPUD Transformer**

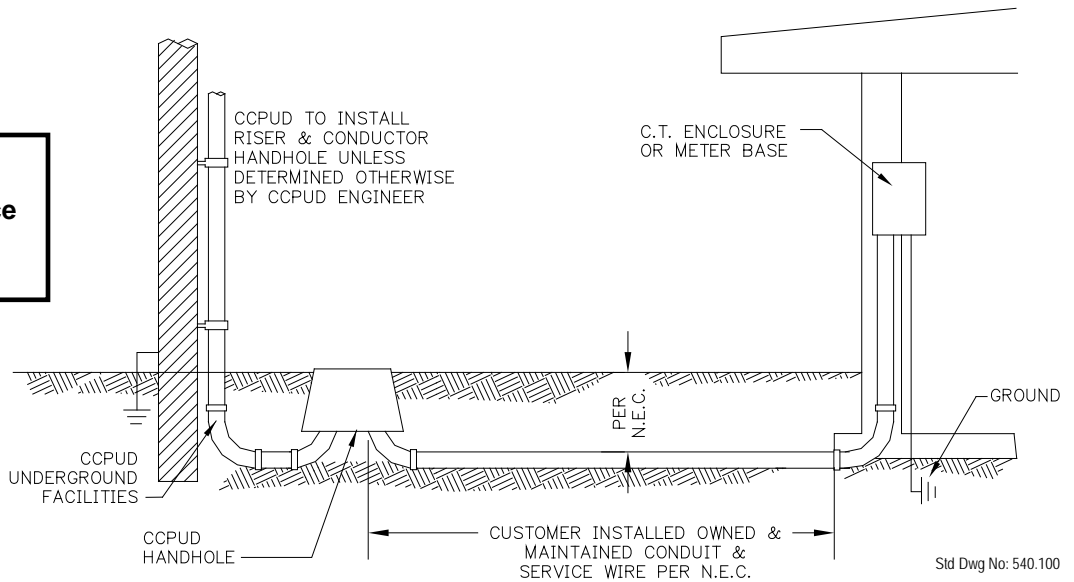
## INSTALLING UNDERGROUND SERVICES TO POWER POLES (OVERHEAD TRANSFORMER):

In most cases, where secondary service originates from an overhead transformer bank, the District will install and maintain secondary service wires from the transformer to a secondary handhole which will be designated at the customers point of connection.

It is the Customers responsibility to provide and install conduits and conductor from this point of connection to the meter base.

When connecting services in existing handholes, contact CCPUDs Customer Service Engineering Dept to ensure that the existing equipment is appropriate for the new or altered service

**Figure 7**  
**Secondary Service**  
**Installation to**  
**CCPUD Pole**



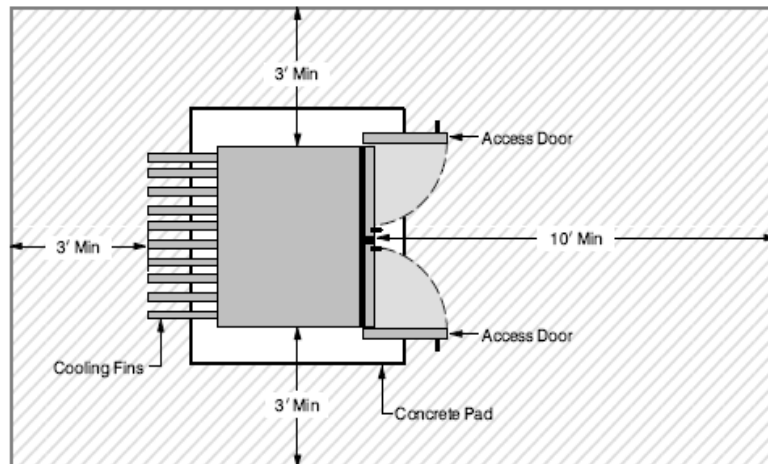
### ACCESS & WORKING SPACE REQUIREMENTS FOR PADMOUNTED EQUIPMENT:

The customer is responsible for providing safe access at all times for District personnel and equipment necessary for the installation, maintenance, and removal of all District facilities.

**Padmounted equipment must NOT have shrubs or structures within 10 feet of the front-side and 3 feet from other sides.**

If the transformer on a customer's property is located so that special hoisting or transporting facilities are necessary to remove or install the District's equipment, it shall be the customer's responsibility to provide and maintain these special facilities.

For clearance information from other types of CCPUD equipment, contact Customer Service Engineering.



**Figure 8 – Transformer Clearances**

### VAULT ROOMS:

- Any vault(s) and/or switchroom shall be provided with adequate ventilation, sumps, ground rods, or conductors, and lighting and power outlets.
- Doors must be installed with locksets capable of accepting a "Best Universal Lock Company" cylinder and core, which will be furnished by the customer.
- The vault floor shall be sloped to drain into a sump. (Consult the District for minimum vault dimensions.) The vault wall shall be solid concrete.
- It is the customer's responsibility to isolate transformer vault rooms so that sounds of transmitted vibration to other areas of the building are minimal. Transformer vault rooms must meet or exceed requirements of the applicable laws and noise ordinances of W.A.C. Foreign pipes and ducts shall not enter or pass through transformer vaults, see National Electric Code 450-47.

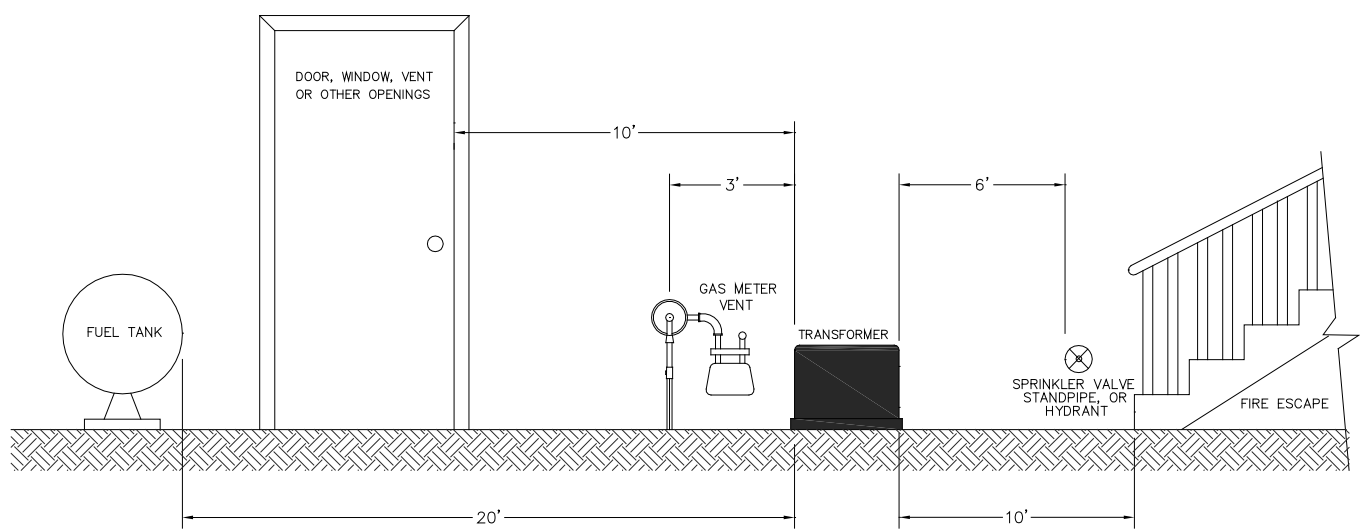


PADMUNTED TRANSFORMER LOCATIONS:

CCPUD will install padmount transformers based on the clearances listed in Table 3. Clearances between padmount transformers and structures must be measured from the metal portion of the transformer closest to the building or structure, including any building overhangs.

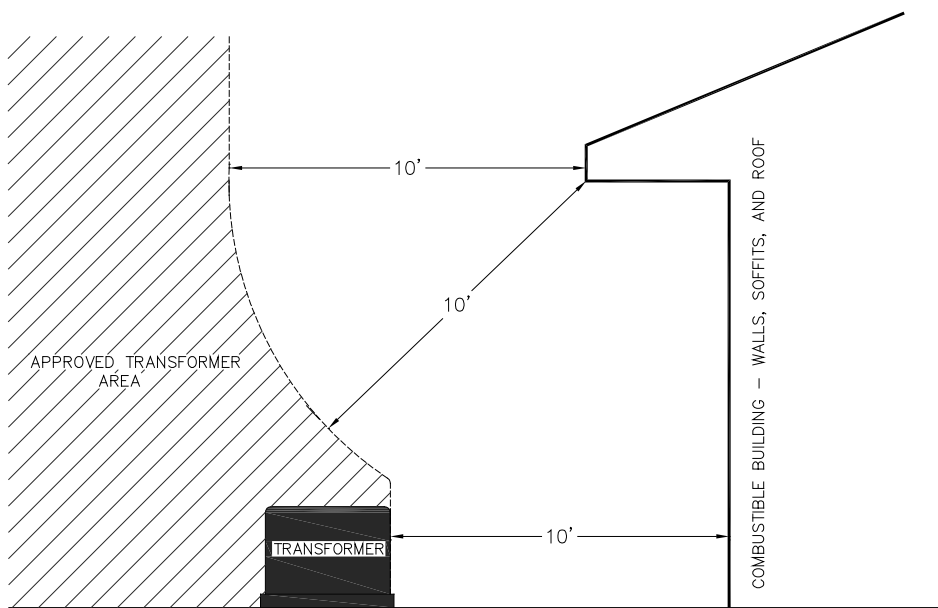
TABLE 3 – Padmounted Transformer Clearances

Feature	Min. Clearance Distance from Transformer
Combustible walls (including stucco)	10 ft.
Non-Combustible walls (brick, concrete, steel & stone) Transformer doors shall NOT face wall	3 ft
Fire sprinkler valves, standpipes, and fire hydrants	6 ft
Doors, windows, vents, fire escapes, and other building openings	10 ft
Waters edge of a swimming pool or other body of water	15 ft
Individual domestic & irrigation wells	100 ft
Facilities used to store hazardous liquids or gases (service station fuel tanks, fueling points)	10 ft
Facilities used to dispense or store hazardous liquids or gases (service station pumps, propane tanks)	20 ft
Natural gas meter pressure relief valve opening	3 ft.



Std Dwg No: 540.300

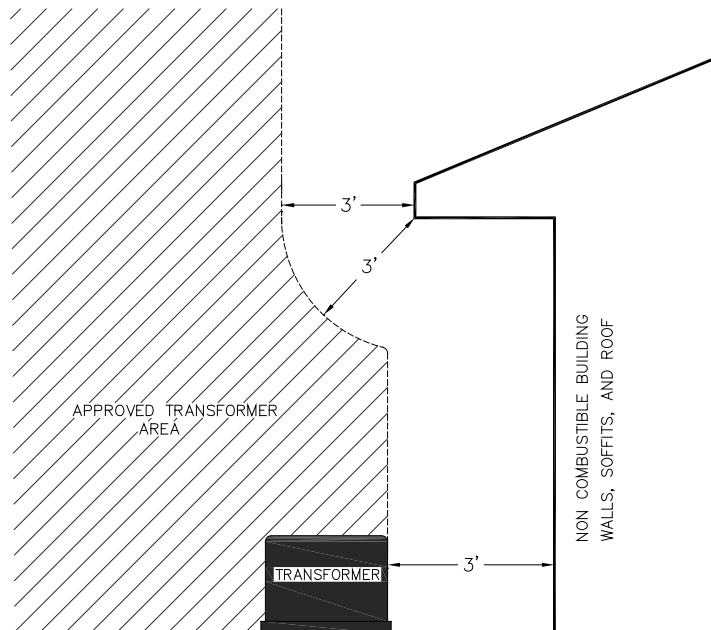
**Figure 9**  
**Transformer Clearance Requirements**



**Figure 10**  
**Transformer Clearance**  
**Requirements – Combustible**  
**Building**

Std Dwg No: 540.300

**Figure 11**  
**Transformer Clearance**  
**Requirements Non-Combustible**  
**Building**



## SECONDARY TERMINAL LIMITS FOR TRANSFORMERS

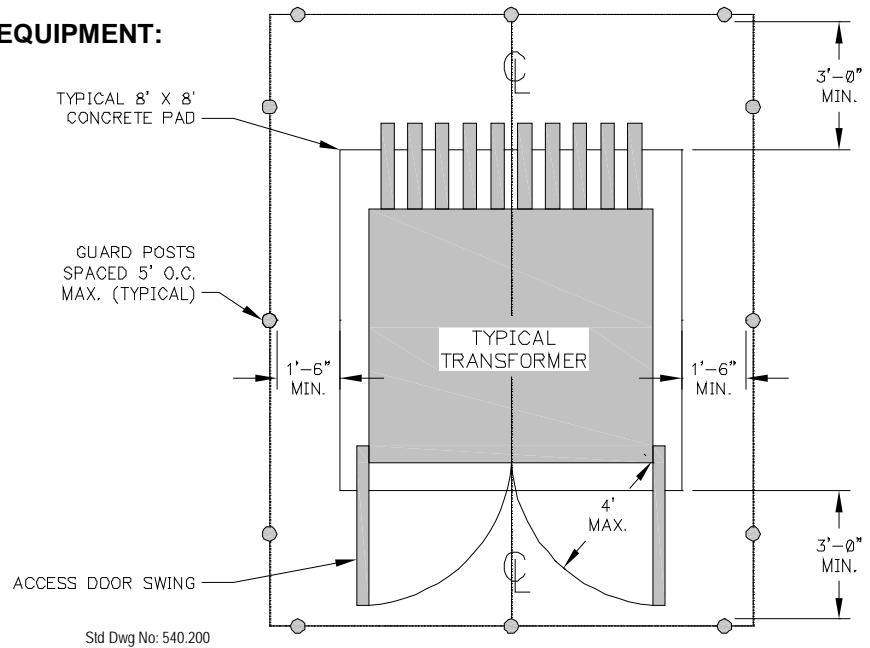
Std Dwg No: 540.300

The maximum number of secondary conductors allowed for specific transformer sizes is outlined in CCPUD Construction Standard 780.200 “Padmount Transformer Secondary Terminal Requirements” which is available from a Customer Service Engineer.

## GUARD POSTS FOR PADMOUNTED EQUIPMENT:

Washington Administrative Code (WAC) requires guard posts around padmounted equipment that is exposed to vehicular traffic. CCPUD guard post location requirements are shown in Figure 12.

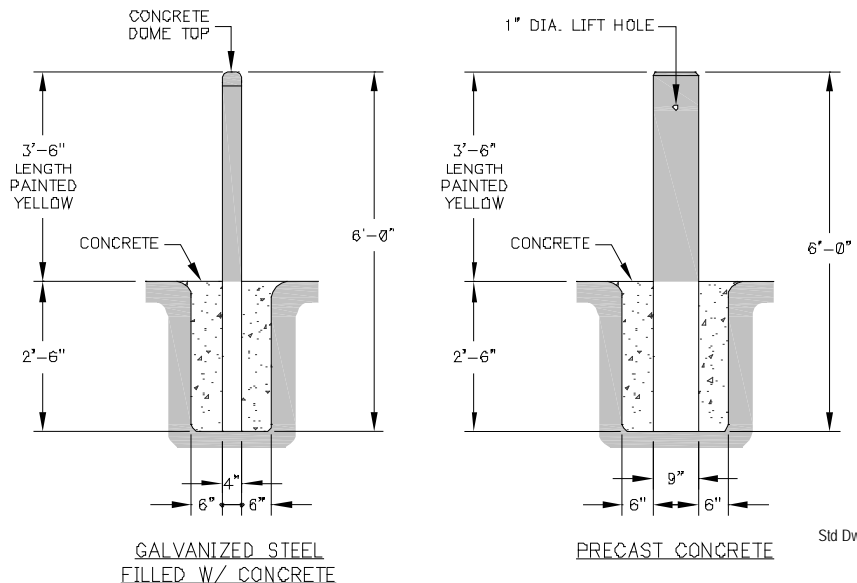
CCPUD shall determine the minimum required number of guard posts and either assist in determining the location of the guard posts, or approve locations determined by the Customer.



**Figure 12 - Guard Post Locations**

The customer is required to supply and install guard posts or pay CCPUD to supply and install them. The following styles of guard posts are approved for CCPUD transformers:

1. Schedule 40 or better galvanized steel pipe filled with concrete, 6 feet x 4 inches diameter. The concrete shall have a minimum compressive strength of 3,000 psi after 28 days. The exposed section of the post shall be painted traffic yellow.
2. Precast steel-reinforced concrete post, 6 feet x 9 inches diameter. Available from Utility Vault Company, Auburn, WA. The exposed portion of the post shall be painted traffic yellow.
  - Set post 30 inches deep in undisturbed soil. If soil has been disturbed, use concrete to stabilize the post.
  - Backfill the holes with concrete.



**Figure 13 -  
Guard Post  
Approved Types**

# UNDERGROUND PRIMARY POWER AND SERVICE CONDUIT INSTALLATION

*Adopted from CCPUD Standard Practice 760.000*

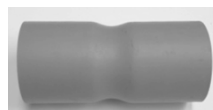
## CUSTOMER RESPONSIBILITIES

Provide electrical conduit, and installation of electrical and fiber optic conduit in accordance with Chelan County PUD standards.

## MATERIALS

All PVC conduits shall meet the following requirements:

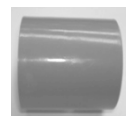
- PVC Electrical Grade Schedule 40 (EPC-40) meeting NEMA Standard TC-2
- All conduit pipe, sweeps and fittings shall be grey in color
- Do not mix fiber optic conduit with electrical or other conduit
- Fiber optic conduit shall be used only for CCPUD Fiber Optic installation
- Conduit shall be in diameters of 2", 3", or 4" or as specified by the PUD
- All conduit shall be in either 10' or 20' sections with one extended coupling
- Conduit bends shall be 2" 90deg, 45deg, or 22 1/2deg long radius factory bends of 36", or 60" for horizontal bends with one bell end – For 2" and 3" VERTICAL sweeps UP into transformers and handholes, short radius sweeps of 24" may be used as typically this makes installation easier.
- Install bell end (pulling collar) on all conduit ends.
- Heated and bent conduit is not acceptable
- All couplings shall be the "extended" type
- Flexible conduit is not acceptable



*Extended Coupling*



*Bell End  
(Pulling Collar)*



*Short Coupling  
(not acceptable)*

## CONDUIT ASSEMBLY PROCEDURE

- Apply a liberal and uniform coat of PVC cement to the conduit and bell end. Assemble the pieces while the surfaces are wet and fluid. Slip the conduit straight into the coupling, while lightly twisting, until it bottoms. Hold the joint for 15 seconds so the conduit will not "push out"
- Let conduit joints cure completely before placing conduit in permanent position
- Plug all exposed conduit ends during work breaks and upon completion with tape or conduit plug to keep dirt, mud and water out of the conduits
- When joining schedule 40 & schedule 80 conduits, bevel the inside edge of the thicker conduit (schedule 80) to prevent scraping of the cable during installation

## CONDUIT PLACEMENT AND INSTALLATION

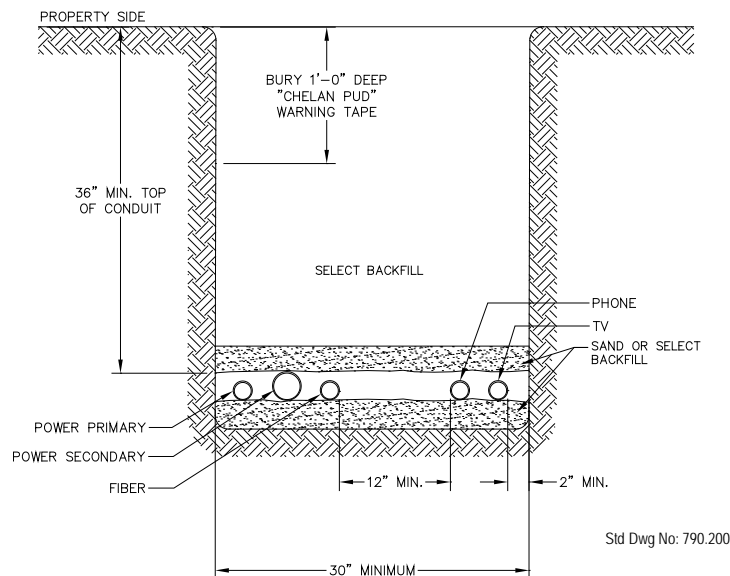
- All conduits (primary power, secondary service power & communications) shall be placed at the same depth in a common trench
- All power conduits shall be placed on the field side of the trench
- A minimum of 12" separation is required between any Chelan PUD conduit and other utility conduits occupying the same trench.
- A minimum of 2" separation is required between all adjacent conduits. A 2" separation is also required between any conduit and trench wall
- Keep the number of 90-degree bends in a primary conduit run to a minimum. **No more than (4) four bends will be allowed in any single run**

- All conduit bends will be made with manufactured 90 or 45 degree, 36" or 60" radius elbows
- For conduit stubs in transformer sleeves, termination cabinets and handholes, 90 or 45 degree, 36" or 60" radius elbows.
- A mandrel or missile of suitable diameter with respect to pipe size shall be pulled or blown through conduit to ensure pipe is clean of debris and has not been crushed.
- A nylon pull string or tape shall be installed in all conduits and destinations and phasing marked. Conduit shall be plugged with a standard conduit plug of the appropriate size.

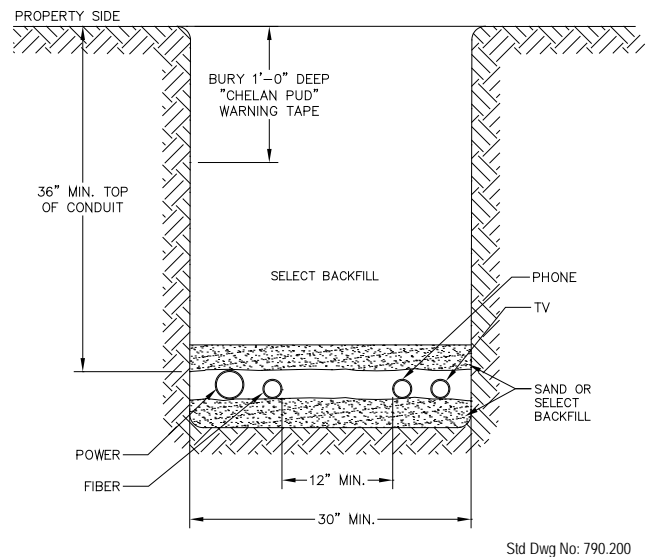
## CONDUIT BANKS

- When conduit banks are required, check with Chelan PUD engineering for conduit size and bank configuration
- Place conduit banks directly on sand-bedded trench bottom
- Use conduit base spacers for the bottom row of conduit. Place spacers at 5-foot intervals
- Use conduit "intermediate" spacers for additional layers of conduit. Place spacers at 5-foot intervals.
- Stagger bell ends between layers to facilitate bank assembly
- If a slurry mix is required for backfill, the bank must be tied down to prevent "floating" during the backfilling process. The Chelan PUD representative, prior to backfilling, must approve the method used to secure the bank

**Figure 14**  
**JOINT TRENCH SECONDARY SERVICE & COMMUNICATION CONDUITS**



**Figure 15**  
**JOINT TRENCH PRIMARY POWER & COMMUNICATION CONDUITS**



## MINIMUM CLEARANCES TO OTHER UTILITIES:

Water Lines	2' horizontal AND 6" vertical
Irrigation	12" horizontal OR vertical
Telephone & Cable TV	12" horizontal
Gas	24" horizontal
Sewer	12" vertical at crossings/as per jurisdiction
Storm Drain	12" vertical at crossings/as per jurisdiction

## **PRE-CAST CONCRETE VAULT INSTALLATION**

*Adopted from CCPUD Standard Practice 750.000*

***Installation Standard Drawings (construction standards) for your project are available from a Chelan PUD Inspector or Customer Service Engineer.***

### **EXCAVATION**

- All vault locations shall be identified and approved prior to excavating.
- No vaults shall be placed on an existing utility.
- The excavation bottom shall be level and free from rock.
- The Customer shall abide by all state safety regulations whenever excavation depths exceed four feet.
- All excavation boundaries shall be as required to allow the vault to be square with the adjacent roads, property lines, sidewalks or structures.

### **SUBGRADE PREPARATION**

- Each vault shall be placed on a six inch base of  $\frac{3}{4}$ " minus crushed rock. A drain field composed of 1-1/2" -3" washed drain rock, a minimum of 2' wide by 1' deep and extending the width of the vault, shall be located directly under the vaults sump.

### **INSTALLATION:**

- Vaults shall be set square with adjacent roads, property lines, sidewalks or structures unless otherwise directed by the Districts representative.
- All vaults shall be rigged and hoisted with approved lifting devices. Slings shall be of adequate length to minimize stresses on the vault walls.
- Vault shall be aligned with the conduit trenches so that all conduits can be brought straight into the vault.
- Lid shall be plumbed and set prior to backfilling. Should lids require shimming to match the slope of the vault lid with the existing surface, all voids between the lid and vault body shall be filled with a quick setting, non-shrinking, nonmetallic grout.
- All conduits shall enter the vault through the fabricated knockouts. Two inches of separation shall exist between conduits of multiple-conduit entrances. Knockouts shall not be made larger than necessary to accommodate conduits entering the vault.
- Knockout voids shall be sealed with a quick setting, non-shrinking, non-metallic grout, approved by the District. All grout finishes, inside and out shall be smooth and flush with the vault's surfaces.
- The interior of the vault shall be swept clean of concrete and grout debris.

### **SYSTEM GROUNDING:**

- Vault shall be ordered with pre-grounded unless otherwise specified by District Engineer.

### **BACKFILL:**

- Prior to initiating the backfill the customer shall receive approval from Districts representative of all pad installations.
- Select backfill (sand) will be used as bedding and cover for all conduits and around all conduit entrances. Do not use backfill with rocks, vegetation, trash, and scrap conduit or other non-native debris
- Materials mixed with snow or excessive moisture will not be allowed.
- Mechanical compactors shall not be used within two feet of conduit runs.



# **PRE-CAST FIBERGLASS VAULT SLEEVE INSTALLATION**

*Adopted from CCPUD Standard Practice 784.000*

***Installation Standard Drawings (construction standards) for your project are available from a Chelan PUD Inspector or Customer Service Engineer.***

## **EXCAVATION**

- All pad locations shall be identified and approved prior to excavating.
- Sleeve shall be placed in an outward position and with minimum of 10' of clearance for PUD crews to conduct work.
- No sleeve shall be placed on an existing utility.
- The excavation bottom shall be level and free from rock.
- All excavation boundaries shall be as required to allow the sleeve to be square with the adjacent roads, property lines, sidewalks or structures.

## **SUBGRADE PREPARATION**

- Each sleeve shall be placed on a minimum three inch base of sand

## **INSTALLATION:**

- All sleeves shall be placed according to District standards.
- They shall be square with adjacent roads, property lines, sidewalks or structures unless otherwise directed by the Districts representative.
- The tops of all sleeves shall be level with surrounding finish grade with 3-6" inches extending above the finished grade.
- Conduit placement inside the sleeve shall be as shown on the attached drawings. The top of the duct 4-8" above grade inside the sleeve.
- For Safety, all openings shall be covered with 5/8" plywood secured to the top of the sleeve.

## **SYSTEM GROUNDING:**

- A grounding mat shall be installed around the base of the sleeve in accordance with the Districts standard grounding practices (see page 7) Two separate ground wire tails shall enter the sleeve with a minimum of 8 feet of wire on each tail extending into the vault.

## **BACKFILL:**

- Prior to initiating the backfill process, the customer shall receive approval from Districts representative of all sleeve installations.
- Select backfill (sand) will be used as bedding and cover for all conduits. Excavated materials free from rocks, vegetation and foreign objects may be used as backfill.
- Care shall be taken during the backfill procedure in not "overloading" the side wall pressures of the fiberglass sleeves, causing them to bow inward.
- Backfill shall be placed around the tops of each unit and sloped away for drainage purposes.



# METERS AND SERVICE ENTRANCE EQUIPMENT

## GENERAL:

This section provides information on Chelan County PUD's metering requirements including requirements that pertain to all meter installations such as meter location, clearances, and multiple meter installations and information on Self-Contained Metering 200 amps or less, and Current Transformer Metering for services 201-800 amps. **Services of 400 amps or greater require the approval of CCPUDs Meter Department - A** Customer Service Engineer will coordinate this process. Please follow these requirements to avoid a delay in your service hookup.

## Chelan County PUD Responsibilities:

Chelan County PUD is responsible for furnishing, installing, and maintaining revenue meters, Current Transformers (CTs), CT meter wiring, and the connectors where service lines connect to CCPUD equipment.

## Customer Responsibilities Checklist:

- ☐ The customer shall be required to supply, install, and maintain meter mounting equipment acceptable to the District including:
  - Meter socket
  - All necessary wiring and connections
  - Switches
  - Current Transformer Enclosures & Landing Pads
  - Switchboards
  - Conduit
  - Protection equipment
- ☐ The customer shall provide sufficient space and exercise proper care to protect District property on his premises.
- ☐ In the event of loss or damage to the District's property on the customer's premises arising from neglect, carelessness, or misuse, the cost of necessary repairs or replacement will be billed to the customer.
- ☐ The customer or his contractor shall connect his equipment to keep the load, under normal operating conditions, balanced within plus or minus 10% of the average load across the phase wires.

## **GENERAL METERING REQUIREMENTS:**

### **METER LOCATION REQUIREMENTS:**

- **The District must approve all meter locations prior to installation (WAC 296-46-23001).** The customer shall furnish a location acceptable to the District, readily accessible without risk of bodily harm to District employees, free from vibration, corrosive atmosphere, and abnormal temperatures, in which to install the metering equipment, and the equipment shall be protected from damage.
- **Meters shall not be in carports, breezeways, porches, fenced in areas, or such locations where subsequent addition, rewiring or remodeling could enclose the meter.**
- **Meters shall not be closed in by paneling, or siding, etc.** Meter and face of meter base must be exposed and visible.
- **Metering shall not be mounted on or in the District's padmount transformer, transclosure, or pole.**
- **All meters shall be readily removable, i.e., not plastered in or built in.** If installed in a recessed opening, the socket shall be arranged so that the minimum vertical distance between socket centers is ten (10) inches and the minimum horizontal distance is eight (8) inches. Preferred minimum vertical distance between socket centers is sixteen (16) inches and ten (10) inches horizontal.
- **A meter installed in an alley or driveway must be protected adequately to prevent damage from vehicular traffic.**
- **In heavy snow areas, the meter must be protected from damage by snow and ice loading**
- **The District reserves the right of ingress and egress from the premises of the customer** for purposes of meter reading, inspection and testing, or for the installation, removal or replacement of its property.

## METER SOCKET ARRANGEMENT & REQUIREMENTS

- Meter socket and socket enclosures shall meet the standards of the Electric Utility Service Equipment Requirements Committee (EUSERC).
- Socket forms or arrangements to provide correct metering for the various systems used in the District are illustrated on page 29.
- Socket terminal jaws shall be 9/16 inch below cover or edge of sockets.
- Sockets must be mounted plumb and be securely fastened to the structure to withstand forces of the installation or removal of the meter.
- Unused threaded socket openings and openings in trough type sockets must be provided with an approved plug locked in place from the inside.
- On approved surface mounted meter sockets, with lower portion without hub or with solidly closed hub, a drain hole of approximately 1/8 inch diameter is required.
- The District prohibits the use of meter sockets with automatic circuit closing devices. Manual block bypass devices may be installed on self-contained meter bases only. These sockets must be clearly marked. (No lever bypass)
- Terminals shall be marked with a conductor range for aluminum or copper conductors. When aluminum conductors are used, the socket must be approved and clearly marked by the manufacturer that it is acceptable for aluminum conductor.
- **CAUTION** Strands shall not be removed to make conductors fit undersized terminals. Meter sockets shall not be jumped to provide power.
- Taps are not allowed in meter sockets - Potential taps, including the neutral potential tap, shall be located behind a sealed panel.
- The line supply conductors to a socket shall be connected to the top terminals and the load supply conductors shall be connected to the bottom terminals.
- The neutral service conductor shall be bonded to the meter base using the grounding screw or bonding terminal. The neutral service conductor may be continuous from the weatherhead to the switchbox.
- All parts used in the assembly of a meter socket shall be held together by bolts and nuts or pre-threaded housing.

## METER RETAINING RINGS:

Meter retaining rings will be provided and installed by the District.

## SEQUENCE OF SERVICE ENTRANCE EQUIPMENT

**The sequence of service equipment shall be meter-switch-fuse or meter-circuit breaker-load unless not allowed by Code.** Prior CCPUD authorization is required. For requirements, contact CCPUD. When code requires sequence of service equipment to disconnect-meter-load, CCPUD approved locking provisions must be provided on all access to conductors that are ahead of the meter.

## METER SOCKETS – CLASSIFICATION & LIMITATIONS

### Classification of meter sockets by NEMA Standards:

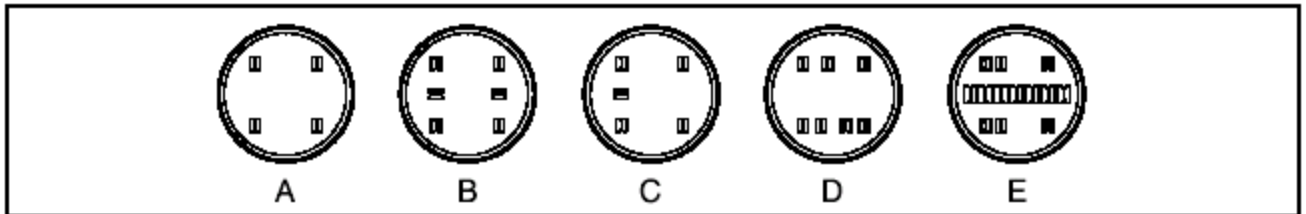
- **Style 1** - A meter of the round die cast or pressed type (listed or approved).
- **Style 2** - A 100 ampere socket rectangular shaped and generally constructed of sheet steel, known as "can" or "trough" type (listed or approved).
- **Style 3** - A 200 ampere socket (160 ampere continuous duty and/or special socket UL approved for 200 ampere continuous duty).
- **Style 4** - Limited to "grouped", "stacked" or on-the-job assembled meter sockets and switch assemblies at multi-meter installations rated at 150 amperes (listed or approved).

### Limitations of meter sockets by Style:

- Use of the **Style 1** socket is limited to temporary installations where the size of the service entrance conductors, as rated by the National Electric Code, does not exceed 100 amperes (#2 TW copper or #1 THW aluminum)
- Use of the **Style 2** socket is limited to installations where the size of service entrance conductors does not exceed #2 AWG copper or #1/0 aluminum.
- Use of the **Style 3** socket is limited to installation where the size of the service entrance conductors does not exceed 2/0 copper or 4/0 aluminum.
- **Style 4** sockets may be used in multi-meter installations of two (2) or more meters if the sockets are approved for 150 amperes and conductors and breakers do not exceed code requirements for 150 amperes.

**TABLE 4 – Meter Socket Requirements**

Voltage	Wires	Service Capacity Amps	No. of Terminals	Meter Socket Config.*	Manual Block Bypass Acceptable?	Accessible Disconnect Required?	Socket
<b>SINGLE-PHASE RESIDENTIAL</b>							
120/240	3	up to 200	4	A	Yes	No	Self-contained socket
120/240	3	201 to 320	4	A	Yes	No	Self-contained 320 Amp Socket
120/240	3	above 320	6	B	n/a	n/a	Instrument transformer rated with provision for test switch
<b>SINGLE-PHASE NONRESIDENTIAL</b>							
120/240	3	above 200	6	B	n/a	n/a	Instrument transformer rated with provision for test switch
120/208	3	up to 200	5	C	Yes	No	Preferred arrangement
<b>ALL THREE-PHASE</b>							
120/208	4	up to 200	7	D	Yes	No	Self-contained socket
120/208	4	above 200	13	E	n/a	n/a	Instrument transformer rated with provision for test switch
120/240	4	up to 200	7	D	Yes	No	Self-contained socket (RESTRICTED APPLICATION) -- High leg on right terminals
120/240	4	above 200	13	E	n/a	n/a	Instrument transformer rated with provision for test switch (RESTRICTED APPLICATION)
277/480	4	up to 200	7	D	Yes	Yes	Self-contained socket
277/480	4	above 200	13	E	n/a	n/a	Instrument transformer rated with provision for test switch



Three wire services taken from any 208/120 volt system require a #10 wire from the neutral grounded conductor shall be connected to the fifth terminal

Three phase four-wire services require the neutral tap to be connected to the terminal second from the right on the bottom or load side. In the case of four-wire delta services, the high voltage-to-ground phase conductor shall always be connected to the right hand terminal, top and bottom, and be properly color coded.

**Meter List**

Amp	Brand	Model Number
100	Midwest	M038CB1033
100	Square-D	SC1624M100S
100	Cooper	U011
100	Cooper	011
125	Eaton	CHM7N7N5GS
200	Square-D	SC816D200C
200	Eaton	CMBE88B200BTS
200	Cooper	204 MS68
200	Cooper	MSM200PPD
200	Cooper	U204
400	Cooper	324 N
400	Eaton	HP816P400BS

**NOTE:** Equipment other than those units listed here shall be submitted for approval prior to installation. Approval will be made through the office Distribution Engineering and Operations Department. All metering equipment must be approved by EUSERC.



## CLEARANCES AND METER HEIGHT:

- A level standing and working surface shall be provided and maintained in front of each metering installation. A clear and unobstructed working space shall be provided above this surface.
- Should the metering installation be on a working platform then the platform must be accessible by a permanent stairway that conforms to OSHA/WISHA regulations.

See Table 5, for detailed meter clearance information.

**TABLE 5 - Metering Clearance Requirements**

*NOTE: The center of the meter socket is the point of reference unless otherwise noted.*

For:	Clearance
Socket Height	5 feet minimum to 7 feet maximum above finished grade or floor (WAC 296-46-180)  In metering rooms 7 feet maximum and 3 feet minimum
Current Transformer rated test switches & Phase shifting transformers and recorders	Bottom of device shall be no less than 12" above finished grade, floor or working platform. Top of enclosure no more than 8' from finished grade, floor or working platform
Working Space	<ul style="list-style-type: none"><li>▪ Minimum 3 feet wide and 3 feet deep measured from the front of the current transformer enclosure or meter face.</li><li>▪ Plants, shrubs and trees shall not be planted in this area</li><li>▪ The center of all meter socket enclosures shall be a minimum of 10" from adjacent VERTICAL obstructions and a minimum 10" from adjacent HORIZONTAL obstructions</li><li>▪ Minimum distance between socket centers is 16" VERTICAL and 10" HORIZONTAL</li></ul>
Recessed Meters	Minimum 12" VERTICAL and 12" HORIZONTAL clearance and 3" clearance around the meter on all sides..
Meter Pedestals (RV, Manufactured Home)	Minimum 44 inches and Maximum 7 feet

## OUTDOOR METERING REQUIREMENTS:

- Meter sockets containing energized equipment shall be covered and sealed with a transparent cover plate if a meter is not installed
- Meters shall be installed only in sockets that are level, plumb and securely fastened to the structure
- Installation of three (3) meters or less shall be on the outside lines of the building and shall be grouped in such a manner that a single service drop may serve all meters.
- All unused openings of the meter socket enclosure shall be closed with plugs (rain-tight, if outside) that are secured tightly in place from inside the enclosures before a meter is installed.
- All meter equipment exposed to weather shall be rain-tight according to the National Electrical Manufacturer's Association (NEMA) 3R minimum.

## METER ROOMS:

Where a multiple installation is four (4) meters or more, the location may be on the inside lines of the structure, provided the location is a metering room accessible to the District. The customer shall install a suitable key box provided by the District on the outside of the building in close proximity to the meter room that is keyed to accept the District key. If the "key in the knob", "lock set", or "mortise lock set" is used the lock must accept a removable core that can be keyed to the District key.

- The number of meter rooms in apartment buildings shall not exceed one (1) without the District approval.
- When a metering room is to be used, a floor plan shall be submitted to the District for approval prior to any wiring thereof.
- Meter rooms shall be properly illuminated with a switch located immediately next to the access door. The District has the right to refuse to enter inadequately illuminated or unsafe spaces.
- Meters shall not be installed in commercial buildings above the first level or below the first basement level without District approval.

## METER SOCKET LABELING:

- **Before a meter can be installed, the customer must obtain a valid service address from the proper agency.** When the meter is installed and sealed, it is designated in the District's official record as the meter serving that premise. Apartment unit or space numbers are considered part of the valid address.
- **It is the responsibility of the owner or manager of multi-unit complexes to notify the District of any changes in numbering so that the District's Meter Department may verify metering circuits.** Such notice must be given in writing immediately to Customer Service and Engineering to permit re-designation of meters serving the premise. The customer shall be responsible for renumbering both the premises and meter sockets prior to dispatch of the Meter Department.
- **Meters will not be installed nor service energized until marking is complete.** Each meter position and each service switch or breaker shall be clearly and permanently identified by the customer to indicate the particular location supplied by it. The relation of the meter socket, breaker, and location served must be easy to identify.

Examples of permanent marking are:

1. An identification plate attached by screws, rivets or a secure adhesive.
2. Non-removable paint (by usual solvents) applied with stencil or careful lettering.
3. Commercially available decals.

Clear identification means a legible apartment or street number.

The store name or number may be included but does not constitute a clear designation in itself.

## MULTIPLE METER INSTALLATIONS

On **residential** multimeter panels, the minimum spacing between socket centers shall be 7-1/2 inches horizontally, 8-1/2 inches vertically leaving not less than 1 inch clearance on the top and sides of the meters, and 2" clearance on the bottom. The center line shall be a minimum of 3 feet and a maximum of 7 feet above the floor or finished grade. All meters shall be identified per the requirements in the Meter Labeling section. See Figure 17.

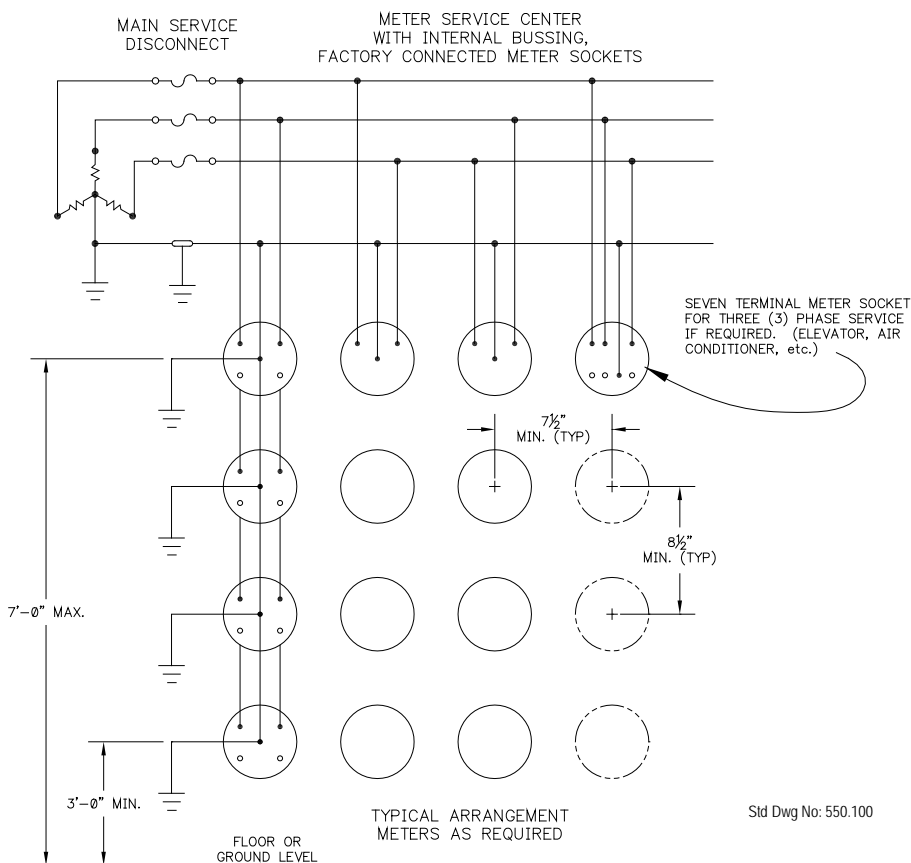
Meter socket jumpers shall not be used to serve house meters. CCPUD requires house meters to have manual block bypasses. House meters shall be served in the following ways:

- A dedicated set of service entrance conductors.
- A tap on the bussing of residential multimeter panels on the line side.
- All-in-one factory assembled multimeter panels.

On **nonresidential** multiple meter panels, the minimum spacing between socket centers shall be 12 inches horizontally, 12 inches vertically, and the meter shall be a minimum of 3 feet and a maximum of 7 feet above the floor or finished grade. All meters shall be identified per the requirements in the Meter Labeling section. Meters shall be adequately protected from mechanical damage. Factory-built multiple meter equipment shall be approved by the CCPUD Meter Department.

- All load shall be balanced between phases (+/- 10% of nominal voltage)
- The load center may be top or bottom connected, but must be approved by the District before being installed.
- Individual disconnects shall be on the load side of each socket on services 600 volts or under
- All unmetered compartments shall be sealed with padlock-type seals

**Figure 17**  
**Typical Multiple**  
**Occupancy Service**  
**(208v, 3-Phase, 4 Wire)**



**CT METERING INSTALLATIONS**  
**Single phase services over 400A or Three phase services over 200A**

**GENERAL INFORMATION**

- All current transformer installations shall be in acceptable enclosures (CT cans).
- All current transformer enclosures in residential services will be mounted on the outside of the building or flush mounted on an outside wall so that access to the enclosure is from outside of the building only..
- The customer must provide a 50,000 Amp fault current rated "Landing Pad" for mounting of C.T.'s.
- Indoor and outdoor current transformers (CT's) are furnished by the District for services over 200 amperes except single phase residential 400 amp self-contained type services and shall remain the property of the District. Either type shall be installed by the customer and may be obtained directly from the District's Meter Department in Wenatchee between 8:00 AM and 9:30 AM, weekdays, or from any local office by advance request.
- On all metering utilizing current transformers, the meter socket shall be a **Style 2 socket**.
- Transformer enclosures must contain only the line wires and transformers. The enclosure must not be used as a junction box for other wires or conduits.
- Enclosures shall not be mounted in or under floor crawl spaces. See Table 5, page 32 for further clearance requirements.
- Space requirements for meter socket and associated equipment shall be adequate for mounting, access and safe working of all equipment. All doors must be able to be completely removed or opened to 180° if hinged.
- Meters shall not be mounted on panels covering compartments which contain fuses, switches, or any other devices that will require servicing, changing, or adjusting, necessitating the breaking of seals on meter panels

The minimum size of metal instrument transformer cabinets or enclosures (C.T. Can) shall be as follows:

REQUIRED CT's		CABINET DIMENSIONS		
Service Size	Number Of CT's	Width	Height	Depth
Single Phase, 201 – 800 Amps	2	24"	36"	11"
Three Phase, 200 – 800 Amps	3	36"	48"	11"
801 Amps +	Requires Switchgear			

**TABLE 6**  
**CT Metering**  
**Cabinet Size**  
**Requirements**

*The three phase cabinet cover must be hinged*

**The Meter Department personnel will make up all termination of metering points on all current transformer installations.**

**TABLE 7 – Approved CT Cabinets**

<b>CT Cabinet – Approved Manufacturer Stock Numbers (or provide approved equivalent)</b>				
	<b>Cabinet Stock #</b>			
<b>Service Size</b>	<b>Circle AW</b>	<b>Milbank</b>	<b>Hoffman</b>	<b>Cooper</b>
Single Phase, 201 – 800 Amps	RTCT	CT-243611-SC CT-303611-SC CT363611-SC	A303011CT A363011CT A363611CT	243611 RTCT 303011 RTCT 363611 RTCT
Three Phase, 200 – 800 Amps	HRTCT	CT364811-HC	A483611HCT	364811 HRTCT
801 Amps +	Requires Switchgear	Requires Switchgear	Requires Switchgear	Requires Switchgear

**TABLE 8 – Approved CT Landing Pads**

<b>CT Landing Pad (Mounting Rack)– Approved Manufacturer Stock Numbers (or provide approved equivalent)</b>				
	<b>Cabinet Stock #</b>			
<b>Service Size</b>	<b>Circle AW</b>	<b>Milbank</b>		
Single Phase, 201 – 800 Amps	6019-HEL 6019-HELS	A4-K4797 (400A Max) A-K4797 G-K4729 J-K4903 (400A Max)		
Three Phase, 201-400 Amps	6067-HAL 6067-HALS	B4-K4798 J-K4903		
Three Phase, 400-800 Amps	6067-HEEL 6067-HEELS	B-K4798 H-K4722		

**FIGURE 18 – Typical CT Cabinets**

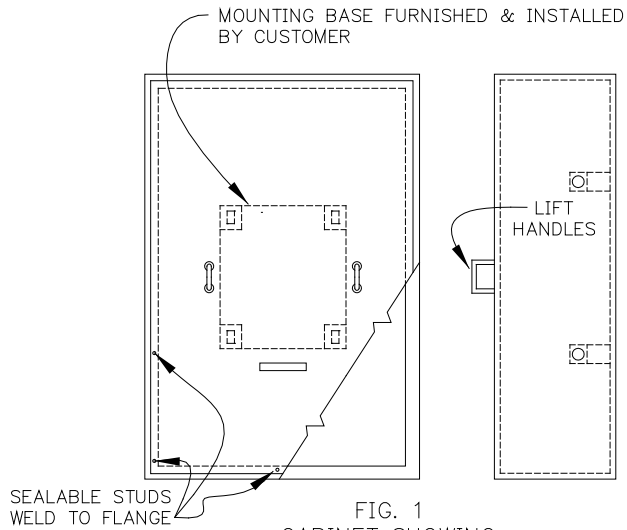


FIG. 1  
CABINET SHOWING  
STUD MOUNTED COVER

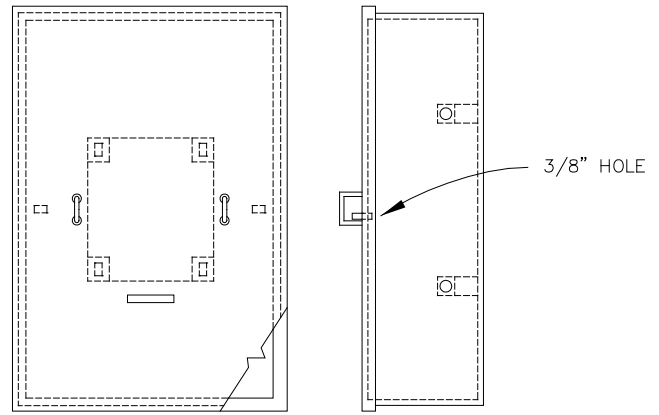


FIG. 2  
CABINET SHOWING FLANGED COVER  
FASTENED BY SEALABLE RIVET LATCHES

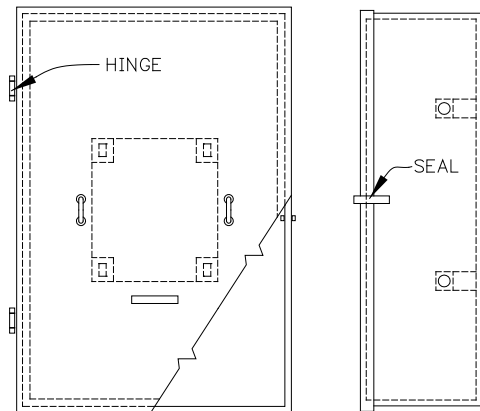


FIG. 3  
HINGED, FLANGED COVER

Std Dwg No: 550.200

INDOOR CT METERING

- Transformer enclosures shall not be installed on ceilings. If the enclosure is installed on a balcony or platform, it must be available by a permanent stairway that conforms to OSHA/WISHA. A minimum of 3 feet of clearance in front of enclosure is required.
- Adequate lighting shall be permanently provided with a switch located immediately next to the access door. The District has the right to refuse to enter inadequately illuminated spaces.

CT SECONDARY METERING REQUIREMENTS

- Current transformer enclosures must be connected to the meter socket or meter enclosure with conduit and shall be bonded by approved methods. A minimum of one (1) inch conduit is required. The length of conduit run and number of bends shall be kept to a minimum, preferably no more than fifteen (15) feet in length and not more than three (3) 90° bends.
- The customer shall supply and pull in the secondary metering conductors in accordance with the coded wire schedule shown Table 9. The District will complete the terminal connections from the secondary side of the current transformers to the metering equipment.
- The customer shall provide minimum 1" conduit and copper secondary metering conductors between the meter socket and the current transformers. Flexible conduit shall not be used.

The size of conduit and conductors shall be as follows:

Distance Between CT Enclosure and Meter Socket *50 feet or less 1" conduit required		Wire Size and Color	
		VOLTAGE	CURRENT
1-Phase	Six Terminal	(2) #12 Different Colors	(2) #10 Different Colors (1) #8 Any Color**
3-Phase	Thirteen Terminal	(3) #12 Different Colors (1) #12 White	(3) #10 Different Colors (1) #8 Any Color**
3-Phase	Eight Terminal	(3) #12 Different Colors	(2) #10 Different Colors (1) #8 Any Color**
* For greater length, contact the District			
** #8 conductor must be stranded			

TABLE 9  
CT Secondary  
Metering  
Conduit &  
Conductor Size  
Requirements

NOTE: THW wire or better insulation is required. TW wire is not acceptable.  
No conduit bodies will be allowed in the conduit between the C.T. can and the meterbase

SWITCHBOARD METERING – Services over 801 Amps

The customer shall consult the District and submit equipment drawings prior to the manufacture of the switchgear to determine the type of meter or meters that will be used, type and size of instrument transformers, and arrangements for mounting. Switchboards shall conform to EUSERC Standards.

When the customer's factory-built switchgear is manufactured, current transformers may be obtained by the customer directly from the District's Meter Department in Wenatchee between 8:00 AM and 9:30 AM, weekdays, or from any local office by advance request. Current transformers shall remain the property of the District. Either type shall be installed by the customer after the District approval of the switchboard drawings.

On switchboards, the current transformers shall be installed in such a manner as to be readily accessible after all bussing is in place. Installation plans regarding size of cubicle and placement of equipment shall be approved by the District before switchboard manufacturing. Neutral connections for metering shall be readily accessible and sealable.

Working spaces in back of a freestanding switchboard shall not be less than thirty-six (36) inches from the panel to the rear wall with provisions for safe exit.

The cover of the current transformer enclosure on switchgear shall be free of meters or equipment; however, the meter connected to the current transformer may be mounted on the cover provided said cover is hinged, sealable, and removable.

METERING ON SWITCHBOARDS OR PANELS - Multiple Self-contained Metering

- The clearance space around each meter socket shall not be less than one (1) inch at the top and sides nor less than two (2) inches at the bottom.
- Individual disconnects shall be on the load side of each socket on services 600 volts or under.
- All unmetered compartments shall be sealable with padlock-type seals.

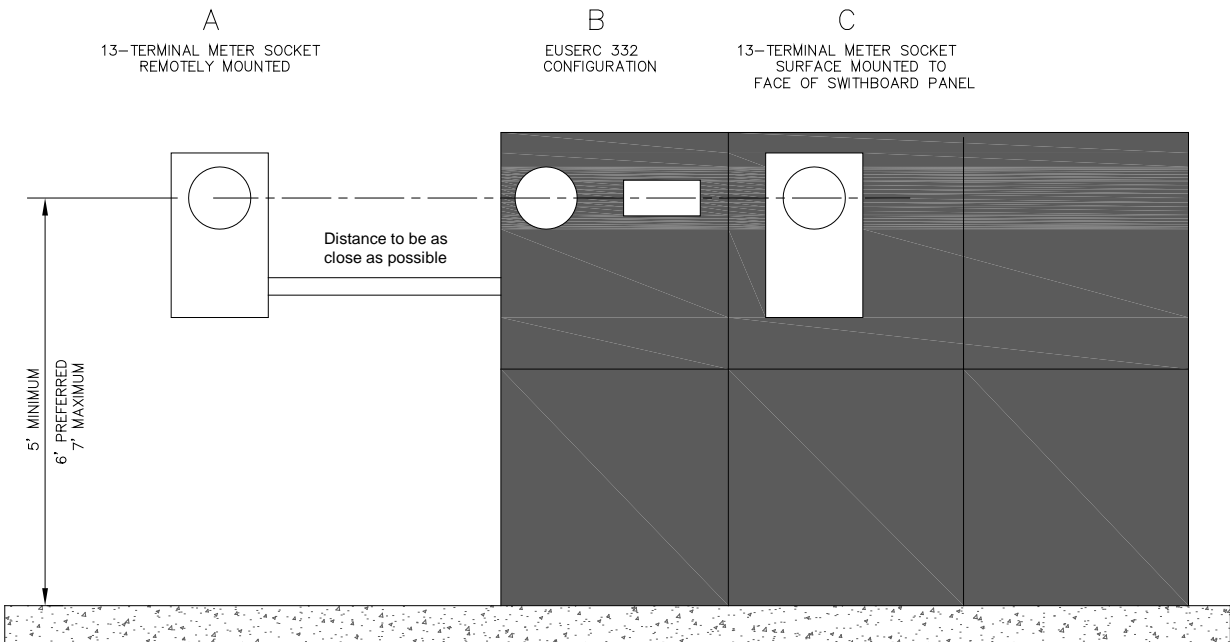


Figure 19  
Switchgear Metering Arrangement  
Diagram

Std Dwg No: 550.300