



## Customer Requirements Transformer Vault Installation

**C-UG-1700**

### Application

Installation requirements of precast concrete transformer vaults and associated conduit and cables. All excavation work required by this standard shall conform to the safety requirements of WAC 296-155 Part N (Excavation, Trenching, and Shoring) and any other applicable regulations.

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### Terms

Term	Definition
Construction Inspector	Representative from Tacoma Power T&D Construction Staff. <b>A pre-construction meeting with the Construction Inspector must happen prior to any construction. Call 253-381-3023.</b>
Electrical Inspector	Tacoma Power electrical inspection staff that inspect for compliance to the Tacoma Power standards, Tacoma Electrical Code, NEC, WAC and Electric Service Handbook requirements.
Electrical Primary	Conduit and cables (7.2 kV to 15 kV) that connect from the Tacoma Power electrical system to the transformer vault.
Electrical Secondary	<b>If there is an SSB</b> , conduit and cables (less than 600 volts) that connect from the transformer vault <b>to the SSB</b> . Utility owned.
Electrical Service	Conduit and cables <b>from the transformer vault or the SSB (if there is one)</b> to the service entrance. Customer owned.
New Services Engineer	Tacoma Power engineering staff that provide design, cost estimates, and coordination of the commercial service project.
Secondary Service Box (SSB)	<b>If there is an SSB</b> it will be a plastic or concrete vault designed to contain the point of connection for the electrical service which connects the electrical secondary cables to the electrical service cables. See C-SV-3200 “Customer Requirements Commercial Secondary Service” for SSB installations.

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**Responsibilities and Inspections**

<b>Construction Area</b>	<b>Responsibility</b>	<b>Inspection by</b>
Location of Transformer Vault	The <b><i>New Services Engineer</i></b> will work with the <b><i>customer's electrical contractor</i></b> to determine the location of the transformer vault <b>on the customer's property.</b>	Construction Inspector
Installation of Transformer Vault	The <b><i>customer's electrical contractor</i></b> will install the transformer vault per this standard under the direction of the <b><i>New Services Engineer.</i></b>	Construction Inspector
Work in Road Right-of-Way	The <b><i>customer's electrical contractor</i></b> will be responsible for installing conduit in the road right-of-way per the requirements of the permitting agency. Permits to cut and restore the road and any other work in the road right-of-way <u>must</u> be obtained before work in the right-of-way can begin. A copy of the approved permit must be on site while the road work is being done.	Construction Inspector
Installation of Primary Conduit	The <b><i>customer's electrical contractor</i></b> will install the primary conduit to the transformer vault.	Construction Inspector
Installation of Electrical Secondary (if any)	The <b><i>customer's electrical contractor</i></b> will install conduit from the transformer vault to the SSB (if any). <b>Tacoma Power T&amp;D Construction Staff</b> will install the electrical secondary cables from the transformer vault to the SSB (if any).	Construction Inspector
Electrical Service	The <b><i>customer's electrical contractor</i></b> will install the electrical service.	Electrical Inspector
Length of Electrical Service Cables in Transformer Vault	The <b><i>customer's electrical contractor</i></b> will pull in enough electrical service cable length to satisfy the Tacoma Power requirements of cable wrap in the transformer vault per the vault and transformer size (see page 8).	Construction Inspector
Installation of Primary Cables	The <b>Tacoma Power T&amp;D Construction Staff</b> will install the primary cables to the transformer vault.	Not Needed
Cable Connections Inside the Transformer	The <b>Tacoma Power T&amp;D Construction Staff</b> will make all primary, secondary and/or service connections inside the transformer.	Not Needed



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### Vault and Cover Requirements

**Vault & Cover Materials**

The tables below list the precast concrete single phase (1Φ) and three phase (3Φ) transformer vaults and covers.

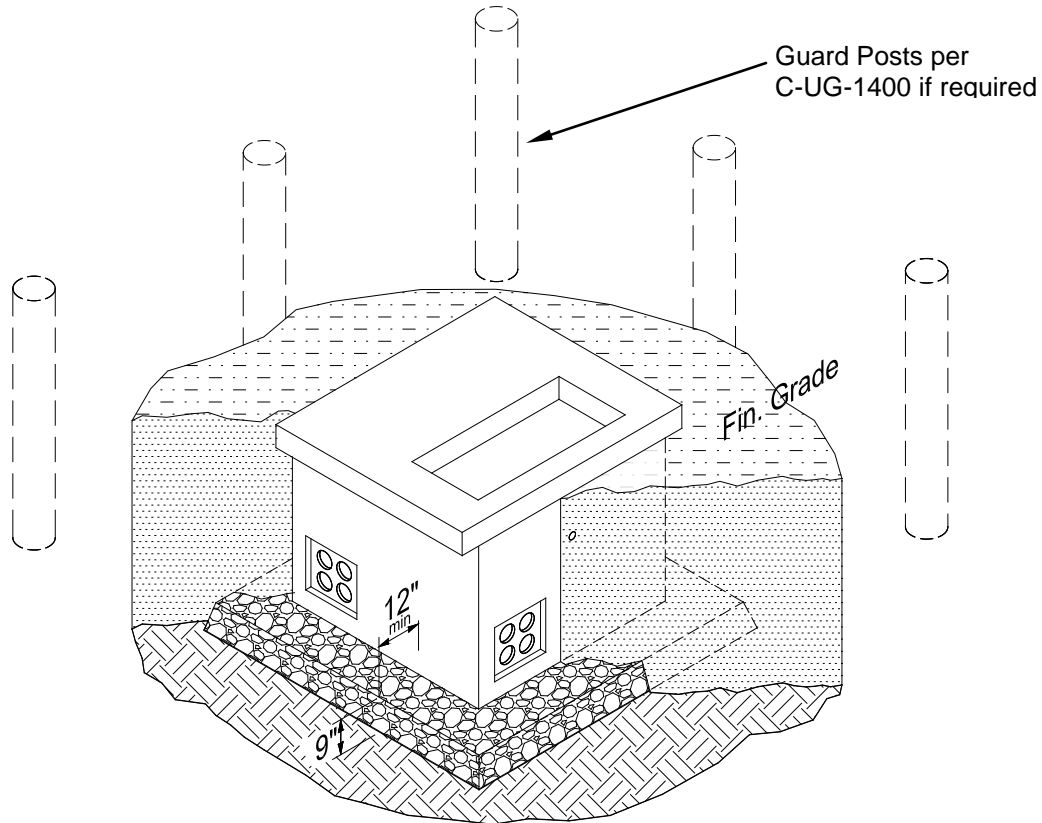
1Φ Transformers	Precast Concrete Vault and Cover				
<b>25 to 75 kVA</b>	Tacoma Power Vault 444 with Transformer Cover #1 <table border="1" style="margin-left: auto; margin-right: auto;"> <tr> <td style="text-align: center;">Vault</td> <td style="text-align: center;">4'-0" x 4'-0" x 3'-6"</td> </tr> <tr> <td style="text-align: center;">Cover</td> <td style="text-align: center;">4'-0" x 4'-0" x 6"</td> </tr> </table>	Vault	4'-0" x 4'-0" x 3'-6"	Cover	4'-0" x 4'-0" x 6"
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<b>100 to 167 kVA</b>	Tacoma Power Vault 554 with Transformer Cover #1 <table border="1" style="margin-left: auto; margin-right: auto;"> <tr> <td style="text-align: center;">Vault</td> <td style="text-align: center;">4'-8" x 4'-8" x 3'-6"</td> </tr> <tr> <td style="text-align: center;">Cover</td> <td style="text-align: center;">4'-8" x 4'-8" x 6"</td> </tr> </table>	Vault	4'-8" x 4'-8" x 3'-6"	Cover	4'-8" x 4'-8" x 6"
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3Φ Transformers	Precast Concrete Vault and Cover				
<b>45 to 300 kVA</b>	Tacoma Power Vault 554 with Transformer Cover #2 <table border="1" style="margin-left: auto; margin-right: auto;"> <tr> <td style="text-align: center;">Vault</td> <td style="text-align: center;">4'-8" x 4'-8" x 3'-6"</td> </tr> <tr> <td style="text-align: center;">Cover</td> <td style="text-align: center;">5'-6" x 4'-8" x 6"</td> </tr> </table>	Vault	4'-8" x 4'-8" x 3'-6"	Cover	5'-6" x 4'-8" x 6"
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<b>500 to 1500 kVA</b>	Tacoma Power Vault 774 with Transformer Cover #1 <table border="1" style="margin-left: auto; margin-right: auto;"> <tr> <td style="text-align: center;">Vault</td> <td style="text-align: center;">7'-0" x 7'-0" x 3'-6"</td> </tr> <tr> <td style="text-align: center;">Cover</td> <td style="text-align: center;">8'-0" x 8'-0" x 8"</td> </tr> </table>	Vault	7'-0" x 7'-0" x 3'-6"	Cover	8'-0" x 8'-0" x 8"
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<b>2000 to 2500 kVA</b>	Tacoma Power Vault 774 with Transformer Cover #2 <table border="1" style="margin-left: auto; margin-right: auto;"> <tr> <td style="text-align: center;">Vault</td> <td style="text-align: center;">7'-0" x 7'-0" x 3'-6"</td> </tr> <tr> <td style="text-align: center;">Cover</td> <td style="text-align: center;">8'-0" x 10'-0" x 8"</td> </tr> </table>	Vault	7'-0" x 7'-0" x 3'-6"	Cover	8'-0" x 10'-0" x 8"
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**Installation of Vault and Cover**

**Figure 1** Vault Foundation and Backfill



**Foundation and Backfill for Vault**

The foundation shall be prepared as follows as directed by the **Construction Inspector**. See Figure 1.

Issue	Action
Excavation for Vault	The <b>Construction Inspector</b> will direct the excavation requirements.
Vault Foundation	Vault foundation shall be minimum of 9 inches of 5/8" minus crushed rock, well compacted, extending a minimum of 12 inches beyond the edge of the vault in all directions.
Backfill Material	Clean fill or better as directed by the <b>Construction Inspector</b> .
Compaction at Subgrade	Compaction requirements will be determined by the <b>Construction Inspector</b> .
Final Grade	Surrounding final grade shall be to the <u>bottom</u> of the vault lid.

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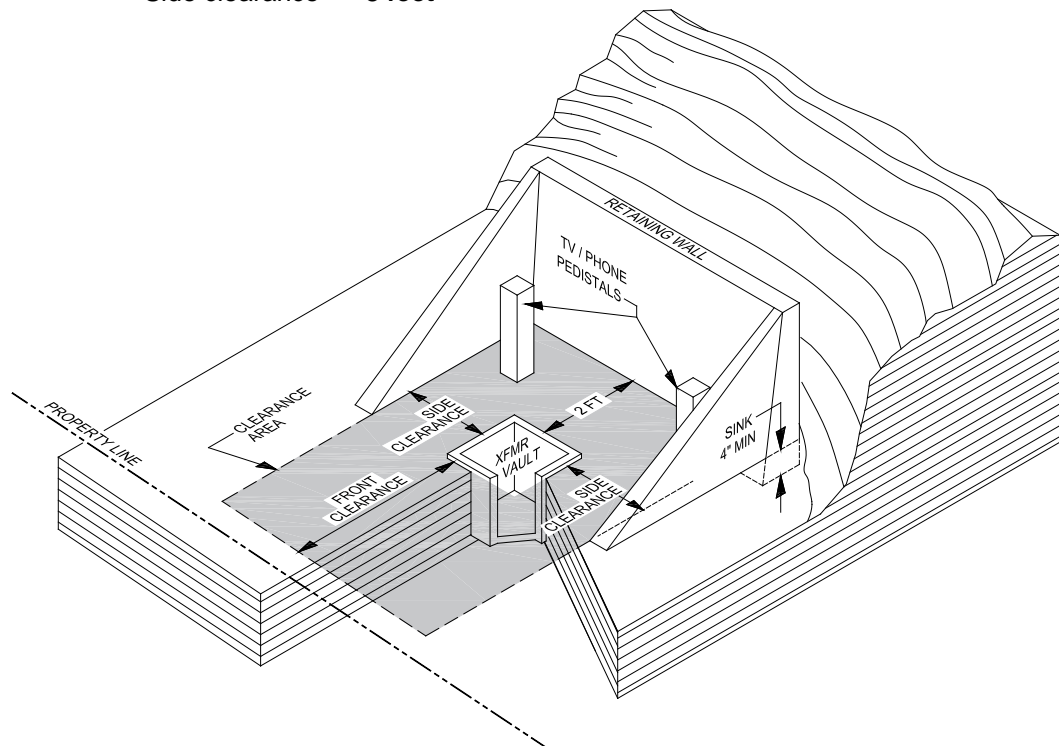
### Installation of Vault and Cover *(continued)*

**Guard Posts** Guard posts may be required by the **New Services Engineer** to protect vaults against damage due to vehicular traffic. See C-UG-1400 "Customer Requirements, Padmount Equipment Guard Posts Installation" for guard post construction and placement.

**Figure 2** Sloping Installations

For transformer vaults installed on a slope, the **minimum** dimensions for clearances are:

- Front clearance = **8 feet**
- Side clearance = **8 feet**



**Construction Notes**

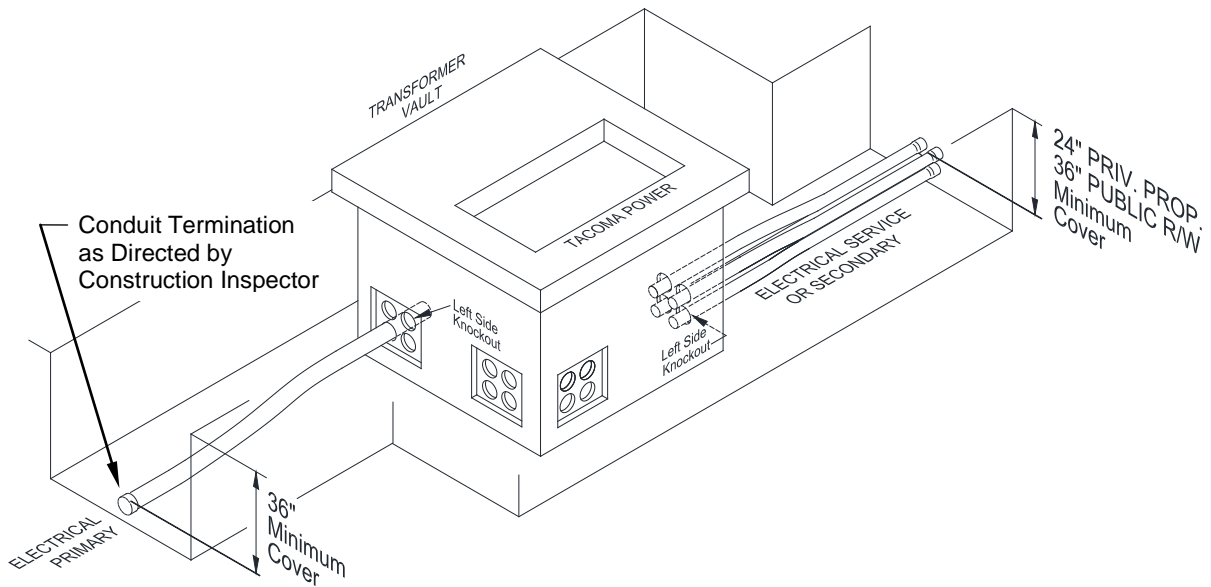
- The transformer vault must be kept clear of any **obstructions**, such as:
  - fences, mail boxes, rockeries, berms, and vegetation.
  - bark, sod, ground cover mulch, and rocks, etc., on any part of the structure.
  - trees and bushes extending into the clearance area.
- Phone and TV pedestals must be installed behind the vault on back corners as shown above.
- The clearance area grade shall be level and a retaining wall shall be provided when required by the **New Services Engineer**.
  - A wooden, concrete or rockery wall shall have 1 to 4 maximum allowable slope to the property line.

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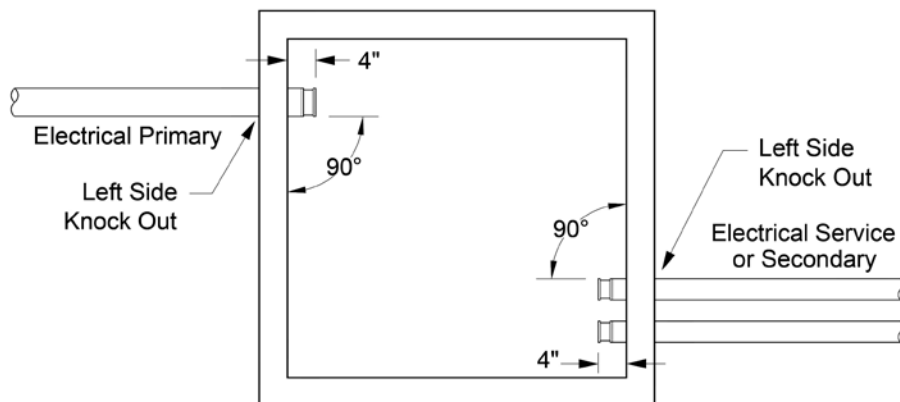
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### Installation of Conduit

**Figure 3** General Conduit Layout into Vault



### TOP VIEW



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**Installation of Conduit** *(continued)*

**Electrical  
Primary  
Trench**

Issue	Action
Depth	A minimum of 36 inches of cover is required over the primary conduit. With prior approval, exceptions may be granted by the <b>New Services Engineer</b> .
Backfill	The trench shall be backfilled with clean fill or better as directed by the <b>Construction Inspector</b> .

**Electrical  
Secondary  
Trench –  
Utility Owned  
(if any)**

Issue	Action
Depth	As directed by the <b>Construction Inspector</b> . Generally, a minimum of 24 inches of cover is required over the conduit.
Backfill	The trench shall be backfilled with clean fill or better as directed by the <b>Construction Inspector</b> .

**Electrical  
Service  
Trench –  
Customer  
Owned**

Issue	Action
Depth	Generally, a minimum of 24 inches of cover is required over the conduit.
Backfill	The trench shall be backfilled with clean fill or better and inspected by the <b>Electrical Inspector</b> .

**Electrical  
Primary and  
Secondary (if  
any) Conduit  
Size & Type**

Primary and secondary (if any) conduit shall be installed per the requirements listed below unless otherwise directed by the **New Services Engineer**:

Issue	Action	
Size of Conduit	Single Phase	2.5 inch
	Three Phase	4 inch
Color and Minimum Grade of Acceptable Conduit	Gray, Sch. 40 PVC	

**Electrical  
Service  
Conduit Size  
& Type**

Color and minimum grade of service conduit shall be gray, sch. 40 PVC.

**Conduit Entry**

All conduit entering the vault shall consistently enter the left side knockouts on all sides. This is for the training of cable in the vault to be in the same direction (see Figure 3).

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### Installation of Conduit *(continued)*

**Conduit Terminations**

Conduit shall be terminated as detailed below:

Issue	Action
Termination of Conduit <b><i>Inside</i></b> the Vault	<p>The conduit into the transformer vault shall:</p> <ul style="list-style-type: none"> <li>• be perpendicular to the vault wall.</li> <li>• extend 4 inches into the vault.</li> <li>• have bell ends on the conduit ends. Do not glue bell ends.</li> <li>• be sealed into the vault with grout around the knockouts.</li> </ul>
Termination of Conduit "stubs" <b><i>Beyond</i></b> the Vault (when required)	<p>The conduit ends shall:</p> <ul style="list-style-type: none"> <li>• be terminated 5 feet minimum beyond the vault.</li> <li>• install conduit coupling and cap prior to backfill in order to prevent the backfill material from entering the conduit.</li> <li>• be marked with a length of 2.5" Sch. 40 PVC conduit extending vertically a minimum of 4 feet above grade with a "Call Before You Dig" sticker.</li> </ul>

### Electrical Service Cable Requirements

**Maximum Quantity and Size**

The maximum quantity and size of electrical service cables that can be pulled into a transformer vault shall be 10 cables of up to 750 kcmil per phase.

**Lengths inside the Vault**

Minimum electrical service cable lengths per vault/transformer size to be pulled into the vault for termination on the transformer are listed below:

Vault Type	Transformer Size	Service Cable Length per Run Required in Vault *
444	1Φ, 25 to 75 kVA	20 feet
554	1Φ, 100 to 167 kVA	25 feet
554	3Φ, 45 to 300 kVA	25 feet
774	3Φ, 500 to 2500 kVA	30 feet

***\* The Construction Inspector may adjust electrical service cable lengths for certain vault/conduit configurations. Contact the Construction Inspector to coordinate a meeting to discuss adjusting the electrical service cable lengths.***