CHAPTER 7

Primary Services in Non-Network Areas

The non-network system comprises most of the majority of City Light's distribution system, which is an overhead system. This distribution system may have underground services or even underground areas, but the primary source wires that feed these customers are from overhead distribution poles. We refer to this system as "non-network" in this chapter.

Services to larger buildings, commercial office buildings and apartment buildings often have larger electrical services which are served with primary voltages. This means owners provide space and structures for SCL's transformers on their property.

Vaults, pads and handholes shall be furnished by the customer in accordance with SCL requirements and specifications. The customer shall contact SCL well in advance of vault design in order to receive the necessary requirements. These specifications will be provided by SCL in a service letter after reviewing the customer's plans. The following chapter includes general guidelines only and is not to be used for design instead of the SCL construction service letter.

Where the aggregate service entrance capacity exceeds 1,000 amperes at 208Y/120 volts; 600 amperes at 480Y/277 volts; or 600 amperes at 120/240 volts; the customer must provide a vault or other suitable facilities on private property for Utility transformer(s) and associated service equipment. Such vault or other facility for Utility transformer(s) must be located on the site being served.

SERVICE VOLTAGES AVAILABLE Transformers connected to SCL's primary distribution system will be furnished, installed and maintained by the Utility. Metering will be at the service voltage, unless otherwise agreed to in writing. SCL transformation will be to a standard voltage; i.e., 208Y/120 volts, 480Y/277 volts, 4160Y/2400 volts, or 13,800Y/7960 volts.

ADVANCE NOTICE It is essential the contractor notify SCL well in advance of designing their buildings, as the requirements for a primary service may alter the building design. For instance, SCL may require space not only for the vault but for a primary switchgear room.

INSPECTIONS Specific requirements given in the service letter will be part of Seattle City Light's vault inspection, both during and after installation. The customer is also required to be aware of and satisfy all applicable building codes for the City of Seattle as well as other cities and county jurisdictions served by SCL.

Vault Construction Non-Network Areas

DIMENSIONS

The dimension of the transformer vault is determined by SCL's engineering group.
The size of the vault is contingent on:

- The size of transformer(s) to be installed. Transformer size is determined by the customer's total electrical load.
- The type of devices used for the secondary connection to the customer's NEC-sized cables or bus bars.
- The working clearance needed around the equipment.

DRY SPACE

Vault interior must remain dry. The customer must prevent water from entering the vault.

Vault Access

The customer must provide properly supported, unobstructed access from the right-of-way to the vault for SCL equipment-handling machinery. SCL must be able to move electrical equipment in and out of the vault using SCL equipment. In-building vaults shall not be located more than one floor below the building's exterior finished grade. The customer is also responsible for providing sufficient building interior height so that SCL can move tall transformers into and out of the vault with the Utility's machinery.

If SCL cannot reach the vault with equipment to install the transformer, the customer may be granted the option of moving the transformers. If this option is allowed, the customer must sign an Equipment Transportation Agreement.

An Equipment Transportation Agreement is a legal document in which the building owner(s) take sole responsibility for moving the transformer(s) into and out of the transformer vault, to a mutually agreed upon location. At that point SCL will be able to deliver or pick up the transformer(s) using our normal transportation methods and equipment. Any damage that occurs to the transformer during transportation by the building owner(s) and any additional expense incurred as a result of said damage shall be paid by the building owner(s).

A copy of the transportation agreement must be kept in the vault. The customer must provide and install a weatherproof enclosure large enough to hold a paper copy of document. The document shall be permanently installed in an enclosure on the vault wall beneath the light switch.

Vault Structure Requirements

Six-inch concrete or concrete-filled concrete masonry units are required. Autoclaved cellular concrete or multiple layers of gypsum board will not be accepted for vault construction.

Pre-tensioned or post-tensioned concrete: the location of the tension cables must be permanently marked on the concrete's surface. Embedded insets may be required for the following:

— Seismic transformer anchoring in vault floor
— Steel support channel in vault ceiling

Equipment hatches are not allowed in the vault's ceiling. Equipment may be lowered through an adjacent shaft. See SCL Construction Standard 0751.60 "Concurrent Customer Requirements, In-Building Transformer Vaults, Looped Radial System".

Fire Rating

Walls, ceilings, and floors must have 3-hour fire protection. All penetrations through and joints in the vault floor, walls and ceiling must be sealed to meet a 3-hour fire rating.

Fire Clearance

All vaults and pad-mounted transformers must be located to provide safe access and code clearances from fire escapes, combustible materials, and other hazards. This is necessary to comply with requirements of SCL and the appropriate City, County, or State inspecting authorities. Building owners must make provisions to prevent unwanted debris from accumulating in vaults.

Vault Doors

Must be Class A, 3-hour, fire-rated. Size will be determined by SCL.

Vault doors shall swing out 180 degrees and be equipped with panic bars, pressure plates, or other devices that are normally latched but open under simple pressure. (2006 NESC, Rule 113C). The exit devices must always be locked (storeroom function) and equipped with a cylinder which accepts a Best Universal Lock Company core. The core will be provided and installed by SCL.

Lighting

Customer will provide and install surface mounted PVC conduit, wire, outlets, switches and fixtures per SCL Construction Guideline NTP-60 "Lighting and Sump Pump Installation for Single Transformer Vaults". SCL will supply power for the lighting system and outlets.

Oil Containment

Install a removable oil containment sill behind the vault door after the transformers installed.

Sill height shall be a minimum of 8 inches.

Install a 18"x18"x12" dry sump, with steel grate, near the vault door but not directly behind the door. The vault floor shall slope 1 inch in 10 feet toward the sump.

Vault Grounding

Vault grounding impedance must be 25 ohms or less.

FOR VAULTS IN CONTACT WITH THE SOIL:

— Install four 5/8 inch x 8 foot copper clad steel rods.

— Locate rods in vault corners as directed by SCL.

— Distance between any two rods shall be a minimum of 8 feet.

— Rods shall not extend into the public right-of-way or into a SCL easement over another property.

— Use driving head and coupling to drive rods. Drive rods into compacted earth. Do not drive into controlled density fill (CDF).

— Rods must extend 6 inches above vault floor.

FOR VAULTS ON UPPER FLOORS:

— Four 5/8 inch x 8 foot copper clad steel ground rods shall be driven into compacted soil within the property to be served. The rods shall be a minimum of 8 feet apart.

— Install a single bare-copper, soft-drawn, concentric-stranded cable between two of the four rods and run the single cable into a corner wall of the transformer vault. The other two rods shall be similarly connected with a second, single cable run into the opposite corner of the vault. Run the ground cables into the vault no more than 18 inches above the floor. The cables shall penetrate the vault walls through a protective sleeve. Extend at least 36 in of cable into the vault.

— The copper ground cables shall be connected to the ground rods with an exothermic weld (CADWELD) or approved SCL connector. The size of the copper ground cables shall be adequate size to carry the available fault current.

— Between the rods and the vault, the vault ground cables shall remain 8 feet apart from any other electrical ground cable, unless protected by non-metallic electrical conduit. The ground cables shall be protected by non-metallic electrical conduit where not in contact with earth.

Vault Ventilation

Forced air ventilation is required. Fan capacity, in cubic feet per minute (CFM), will be based on transformer size.

Intake and exhaust vents shall be located in opposite corners.

Intake Vent Must Be:

— 18 inches above interior and exterior floor surfaces. Locate so air flows along the transformer cooling fins.

— Installed with a damper to block air when vault temperature reaches 140 F.
Cover with a screen or louver to exclude rodents and birds.

Exhaust Vent Must Be:

— 6 inches below vault ceiling, or in ceiling.
— Located so air flows along the transformer cooling fins.
— 10 feet from building doors, windows, or flammable surfaces.
— 3-hour fire rated outside of vault, inside building.
— Installed without a damper.
— Covered at exterior opening with a screen or louver to exclude rodents and birds.
— Exhausted to the outside of the building.

Ventilation Fan Must Be:

— Mounted outside of the vault.
— Maintained by the customer.
— Powered from the customer's service panel.
— Installed with a fan controller located outside of the vault which operates as follows:
  – when vault temperature > 70° the fan turns on.
  – when vault temperature >140° the fan turns off and an alarms goes off.

THERMOSTAT AND VENTILATION CONTROLS

Transformer vaults shall have independent ventilation controls separate from the rest of the building. The thermostat must be located inside the vault. After initial setting by the customer, the thermostat shall be operated by SCL personnel only. The building's HVAC control system may monitor the vault temperature and fan alarm signal, but shall not control the vault fan or alarm.

Vibration and Noise Levels

The customer is responsible for isolating the transformer vault or pad. This will ensure sound and vibration levels satisfy the applicable laws and ordinances of the Washington Administrative Code, the City of Seattle or other applicable jurisdictions, including the customer's own requirements.

Unrelated Systems

No pipe or duct system unrelated to the electrical installation can enter or pass through a transformer vault or pad enclosure. No customer-owned equipment for the customer's use will be allowed in the vault or pad enclosure, with the exception of air ducts for vault ventilation.

Fire sprinklers are not allowed in the vault

Hoist Systems for Heavy Equipment

If special hoisting or transporting facilities are necessary to remove, install, or maintain SCL equipment on customer property, the customer is responsible for moving the equipment. The customer will transport the equipment to and from the point where SCL can use its normal equipment-handling methods. The customer will maintain the hoisting and transport facilities in a manner approved by SCL with advisory assistance from the Utility.

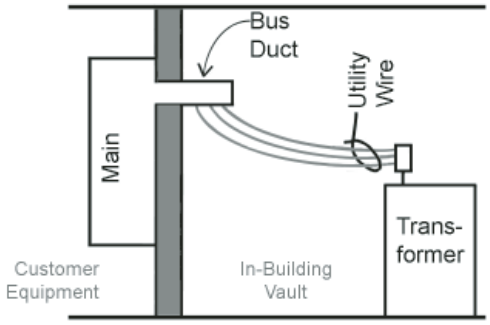
Elevators

Elevator service must be provided to any building level where a transformer vault is located.

NEC-sized Service Entrance Outside Network Areas

- The maximum size of NEC cable allowed to enter the vault is 750 kcmil.
- Depending on transformer size SCL may terminate a maximum of six (6) sets of NEC-sized cables directly on the transformer secondary terminals.
- SCL can terminate up to six (6) sets of NEC-sized cable on one set of multiple connectors. Seattle City Light may install two separate sets of multiple connectors in a vault, for a total of 12 sets of NEC-sized cable that are allowed to enter the vault.
- If multiple connectors are used, all NEC-sized cables entering the vault shall terminate on the multiple connectors.
- If the customer has more than 12 sets of NEC-sized cable entering the vault, or if the cable size is greater than 750 kcmil, then the customer must install NEC-sized bus bars in the transformer. See SCL Construction Standard 0474.08 "Looped Radial and Network Dry Valut Service Entrance Bus Duct See Diagrams 7-1 below.
- NEC-sized service-entrance conduits shall be 3-hour fire sealed, per the NEC, after the conductors are installed in the conduits.
- Visibly identify each conductor by phase and by the service panel, building address or building that it serves.

Diagram 7-1:
Bus Extension



All standards described in this chapter are general guidelines only; for design and construction specifications for projects, see your Seattle City Light Electric Service Representative or Electric Service Engineer for a service construction letter.