

In-Building Vault Equipment Clearances



1. Scope

This standard covers the requirements for minimum working spaces around electrical equipment to be installed in Seattle City Light (SCL) Network and Looped Radial (URD) in-building vaults. This standard should be used to evaluate the site-specific equipment layout and size of in-building vaults.

2. Application

The intended audience for this standard is SCL engineers, electrical service engineers and representatives, and customer engineering consultants who are involved with the planning and construction of in-building vaults.

3. Discussion

SCL in-building vaults present arc flash and exposed live parts hazards to the crews that construct and maintain them. The purpose of this standard is to define working spaces for crews to perform work during three distinct phases of operation:

1. Initial vault construction
2. Periodic electrical equipment maintenance while the vault is energized
3. Major equipment maintenance or removal when the vault may or may not be energized

Acronyms used in this section include:

Acronym	Definition
CSB	Customer Service Bus (or bus duct)
WMB	Wall Mounted Bus
BTS	Bus Tie Switch
XFMR	Transformer (acronym used in tables but not in text)
IWCB	Integral Web Channel (or Collector) Bus
NP	Network Protector
HVAC	Heating Ventilation and Air Conditioning

3.1 Width of Working Space

Working space widths are summarized in Table 3.1. Distances are horizontal (regardless of elevation) and are given from the nearest edge of the equipment. This is because the CSB and WMB have exposed live parts on all sides.

If there are elevation changes within the vault that require stairs or landings, additional working space will be required.

Table 3.1. Working Space Width (ft)

	See Figure	CSB	WMB	Adjacent Wall	Column	HVAC Grille	Door	BTS	IWCB	Cables in Conduit	XFMR
CSB	3.3b, 3.3c	3	6	3	3	3	3	6	N/A	3	6
WMB	3.4b	6	N/A	6	6	3	6	6	N/A	4	6

3.2 Depth of Working Space

Working space depths are summarized in Table 3.2. Distances are horizontal (regardless of elevation) and are given from the nearest edge of the equipment because the CSB and WMB have exposed live parts on all sides. Transformers have exposed live parts at their ends where primary and secondary connections are made.

If there are elevation changes within the vault that require stairs or landings, additional working space will be required.

Table 3.2. Working Space Depth (ft)

	See Figure	CSB	WMB	Opposite Wall	Column	HVAC Grille	Door	BTS	IWCB	Cables in Conduit	XFMR
CSB	3.3b	6	6	6	6	3	1.5	6	6	6	6
IWCB	3.5b	6	6	6	6	6	6	6	N/A	6	6
XFMR	3.6b, 3.7b	6	6	4	4	4	4	6	6	4	3

3.3 Customer Service Bus (CSB) Working Space

The CSB connects SCL's in-building vault bus to the customer's main switchboard for service. See Figure 3.3a.

The CSB connects to the Integral Web Channel (or Collector) Bus (IWCB) using heavy cables overhead and requires a lift to train and connect the cables.

The CSB requires side access to make connections, so working space is required in Table 3.1 to enable a worker to stand next to the CSB. See Figures 3.3b and 3.3c.

Figure 3.3a. CSB

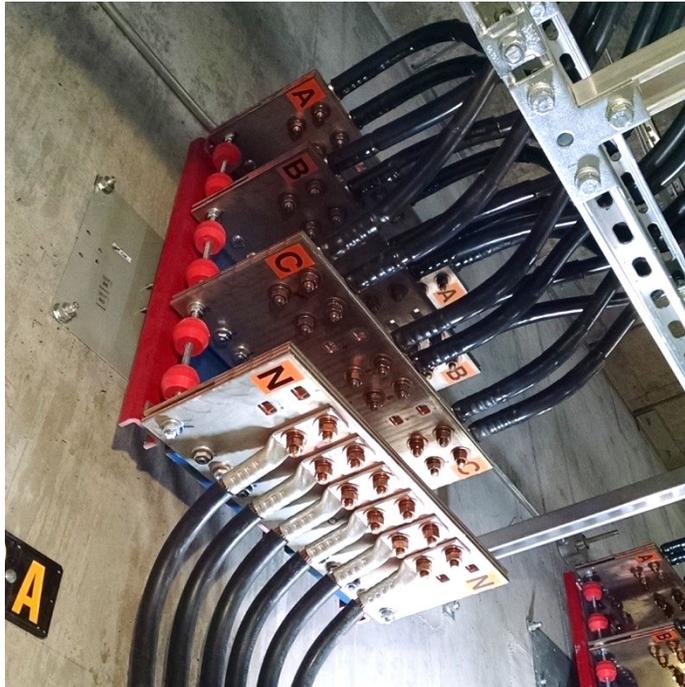


Figure 3.3b. CSB Working Space, Plan View

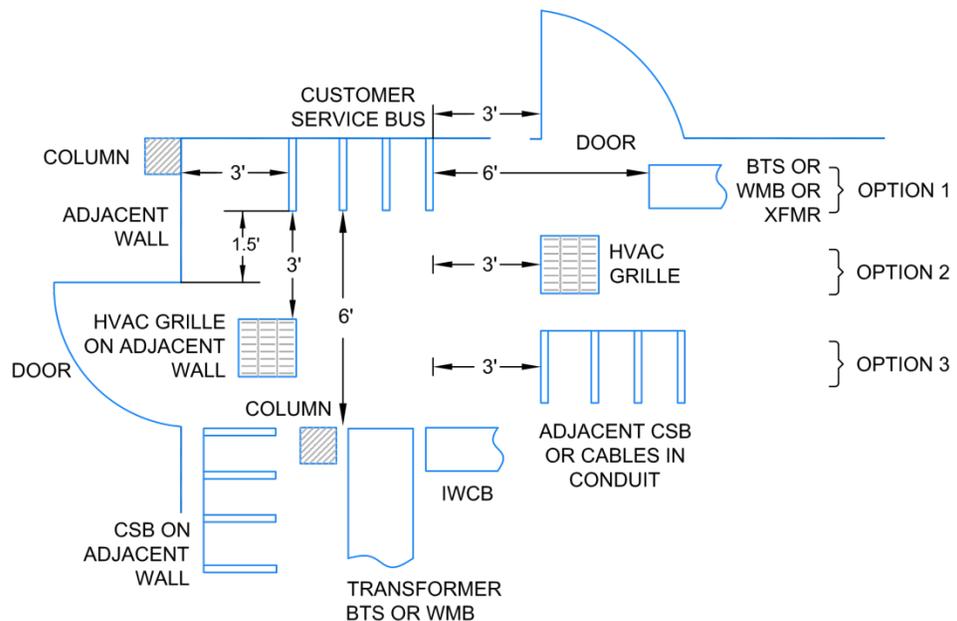
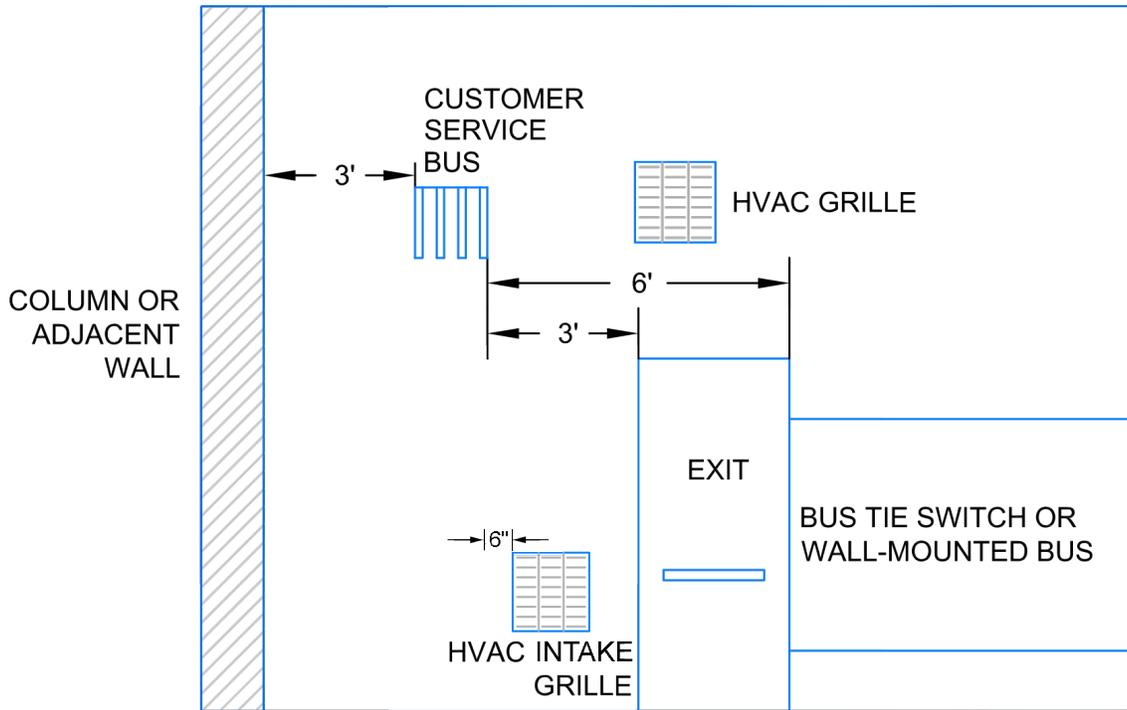


Figure 3.3c. CSB Working Space, Elevation



Note: HVAC grille clearance can be reduced for intake grilles per the figure above. See additional requirements in SCL 0751.00.

3.4 Wall Mounted Bus (WMB) Working Space

When only a small service is required, a WMB might be installed instead of an IWCB. The WMB connects SCL's in-building vault transformers to the customer service bus using cables. See Figure 3.4a.

The WMB connects to the transformers and CSB using heavy cables overhead and requires a lift to train and connect the cables.

The WMB requires side access to make connections. Therefore, working space as defined in Table 3.1 is required to enable a worker to stand next to the WMB. See Figure 3.4b.

Figure 3.4a. WMB

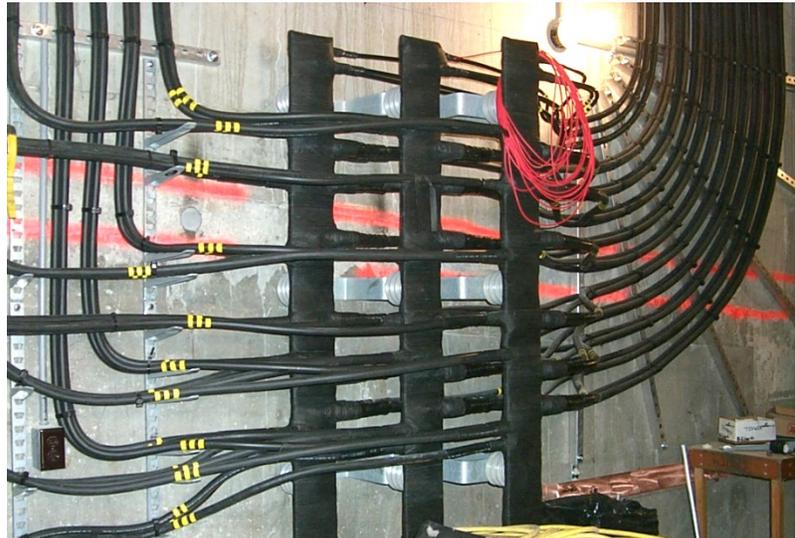
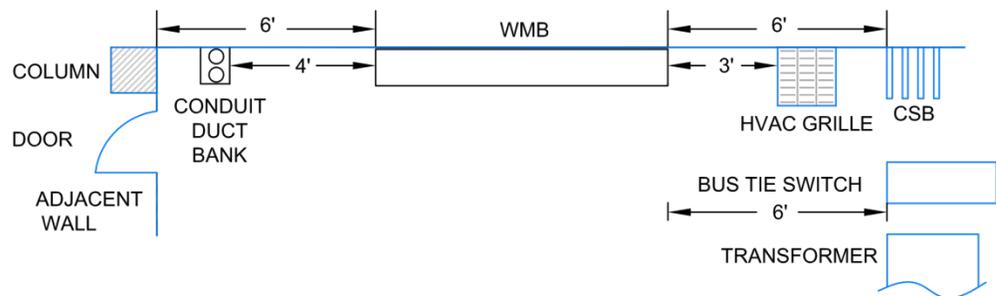


Figure 3.4b. WMB Working Space, Plan View



3.5 Integral Web Channel Bus (IWCB) Working Space

The IWCB connects SCL's in-building vault transformers to the customer service bus using cables. See Figure 3.5a.

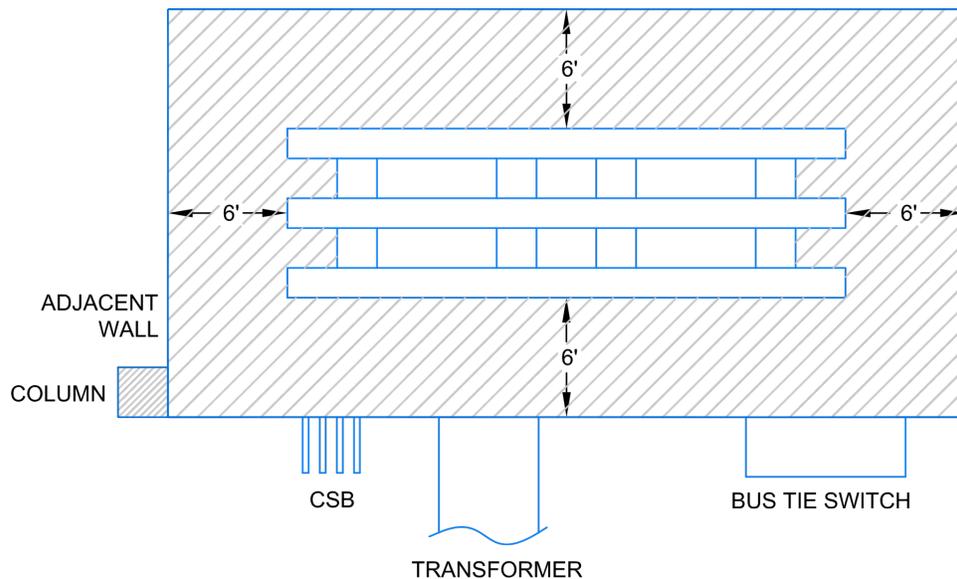
The IWCB connects to the transformers and CSB using heavy cables overhead and requires a lift to train and connect the cables.

The IWCB requires side access in each direction to make connections. Therefore, working space as defined in Table 3.1 is required to enable a worker to stand next to the IWCB. See Figure 3.5b.

Figure 3.5a. IWCB



Figure 3.5b. IWCB Working Space, Plan View



3.6 Network Transformer Working Space

The Network transformer connects SCL's in-building vault primary service to the customer 480 V or 208 V service bus using cables, WMB, or IWCB. See Figure 3.6a.

The transformer connects to the primary service and IWCB using heavy cables overhead and requires a lift to train and connect the cables. The primary side of the transformer contains a switch to disconnect the unit when it is de-energized. Therefore, workers need space in front of the switch to operate it.

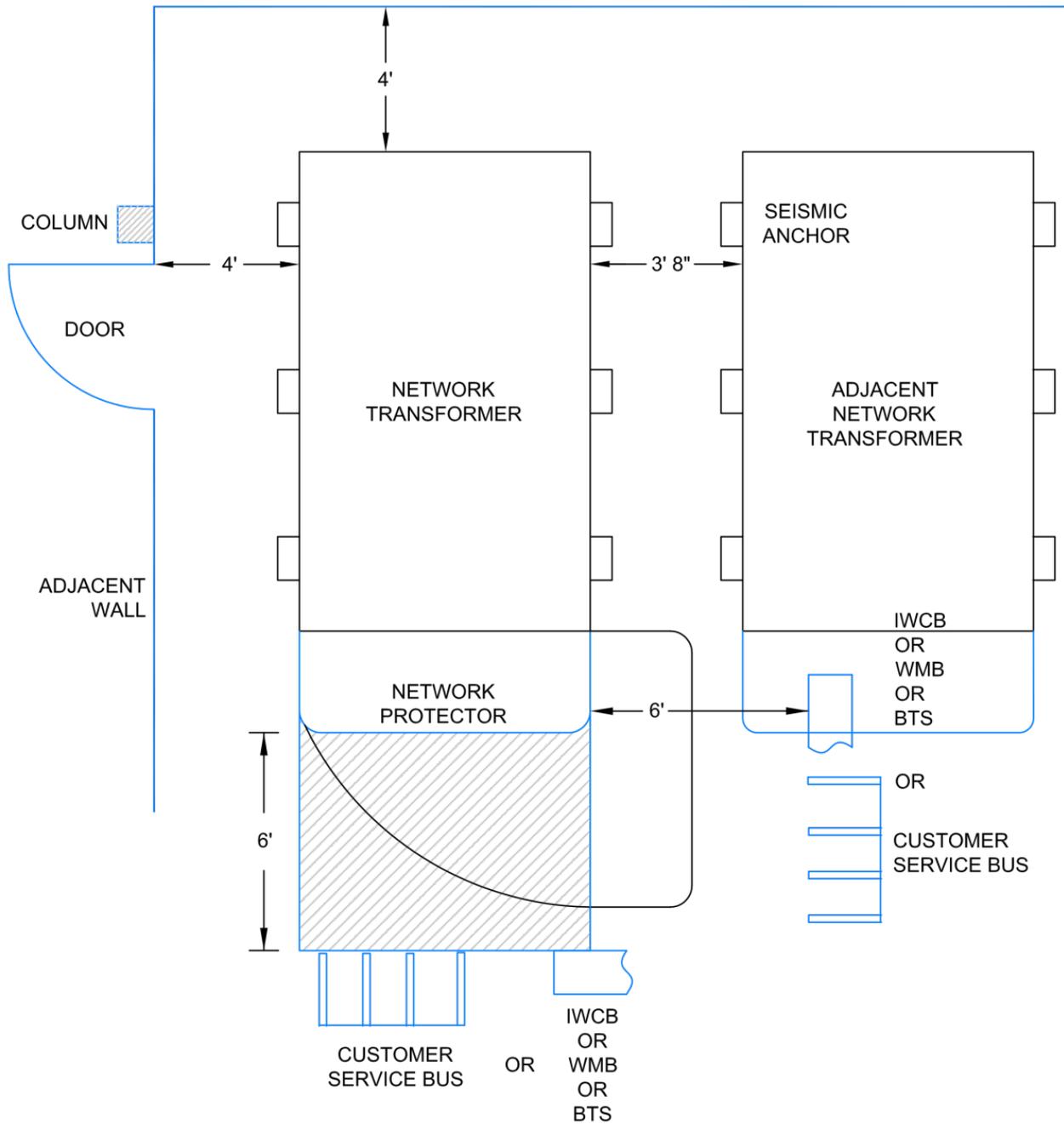
The secondary side of a Network transformer has a Network Protector (NP) mounted to it. The NP is a three-phase breaker intended to disconnect power when a fault is detected. The NP has a door that swings out 90 degrees and components that rack out for periodic maintenance. Therefore, working space is required in front of it. See Table 3.2.

Each transformer is mounted to seismic rails which are anchored or welded to the floor in the vault to prevent movement or damage during a seismic event. These rails extend 4 inches past the case or radiator fins of the transformer. Three feet of clearance between transformers is required from anchor to anchor so that a lift can be moved between transformers. See Figure 3.6b.

Figure 3.6a. Network Transformer



Figure 3.6b. Network Transformer Working Space, Plan View



3.7 Looped Radial Transformer Working Space

Transformers connect the SCL in-building vault primary service to the customer 480 V or 208 V service bus using cables. See Figure 3.7a.

The transformer connects to the primary service and customer gear using heavy cables overhead and requires a lift to train and connect the cables.

Each three-phase transformer is mounted to seismic rails, which are anchored or welded to the floor in the vault to prevent movement or damage during a seismic event. These rails extend 4 inches past the case or radiator fins of the transformer. Three feet of clearance between transformers is required from anchor to anchor so that a lift can be moved between transformers. See Figure 3.7b.

For single-phase (cylindrical type) transformer installations, see figures 3.7c and 3.7d.

Figure 3.7a. Looped Radial Three-Phase Transformer



Figure 3.7b. Looped Radial Three-Phase Transformer Working Space, Plan View

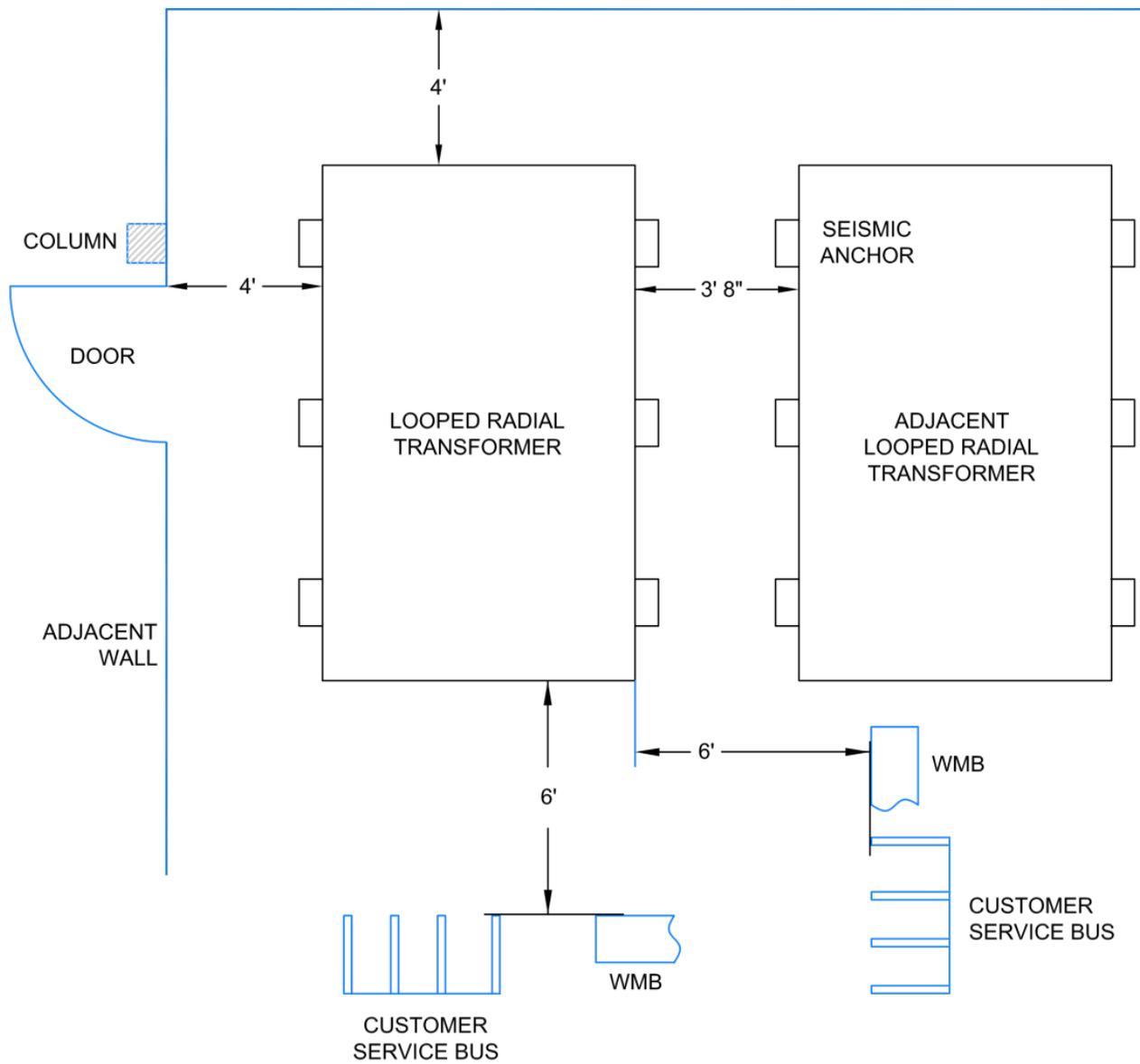


Figure 3.7c. Looped Radial Single-Phase Transformer Working Space, Plan View

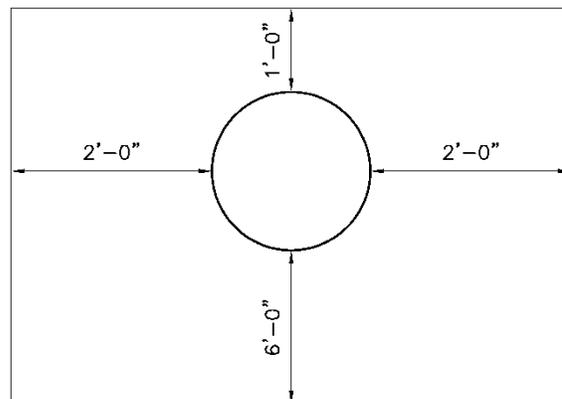
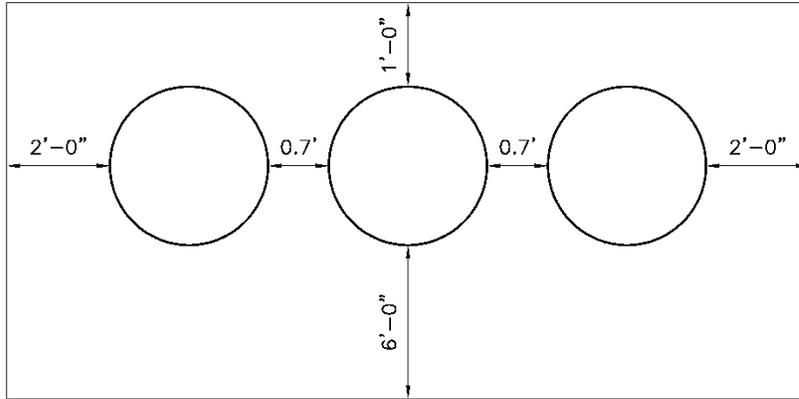


Figure 3.7d. Looped Radial Multiple Single-Phase Transformer Working Space, Plan View



4. References

SCL Construction Standard 0751.00; "Customer Requirements, In-Building Transformer Vaults, Network and Looped Radial Systems"

5. Sources

Arya, Shayan; SCL Network Engineer and subject matter expert for 0751.77

Edwards, Tommy; SCL Inspector, originator and subject matter expert for 0751.77

Hanson, Brett; SCL Standards Engineer, subject matter expert for 0751.77

Kuhnly, Steve; SCL Network Crew Chief and subject matter expert for 0751.77

Legall, Gerard; SCL Electrical Service Engineer and subject matter expert for 0751.77