

Overhead Three-Phase Transformer Bank Installation

1. Scope

This standard covers the information necessary to install overhead three-phase transformer banks on the 26 kV primary distribution system. Installation instructions to connect the equipment to the wood pole are included, along with requirements for vertical spacing and hardware.

2. Application

This standard provides direction to Seattle City Light (SCL) engineers, crews, and contractors for the installation of overhead three-phase transformer banks on 26 kV wood distribution poles.

3. Requirements

3.1 General

An overhead three-phase transformer bank shall be installed as shown in Figures 3.1a and 3.1b.

For a secondary voltage of 120/208 V, the transformer's secondary bushings shall be connected as shown in Figure 3.1d using the copper wire specified in Table 3.1.

For a secondary voltage of 277/480 V, the transformer's secondary bushings shall be connected as shown in Figure 3.1e using the copper wire specified in Table 3.1.

If the neutral wire is 4/0 AWG aluminum, install and connect a neutral stirrup as shown in Figure 3.1c.

The center phase limiter shall be installed using a connector bar and be aligned to point toward the center phase primary transformer bushing.

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Figure 3.1a. Three-Phase Transformer Installation, Top View

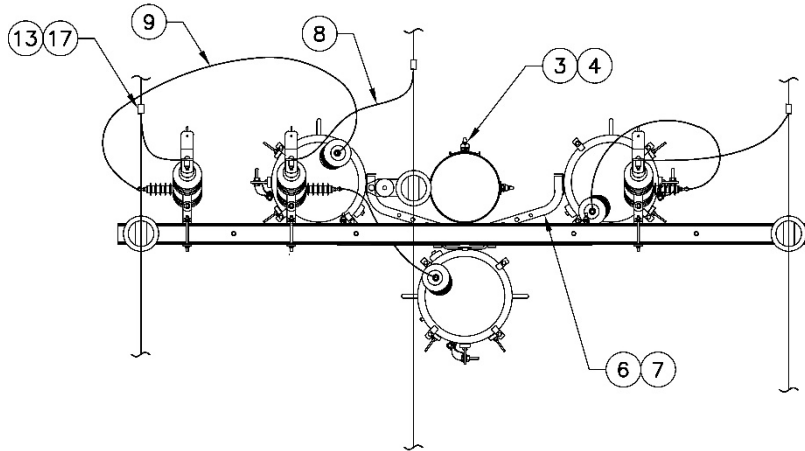


Figure 3.1b. Three-Phase Transformer Installation, Side View

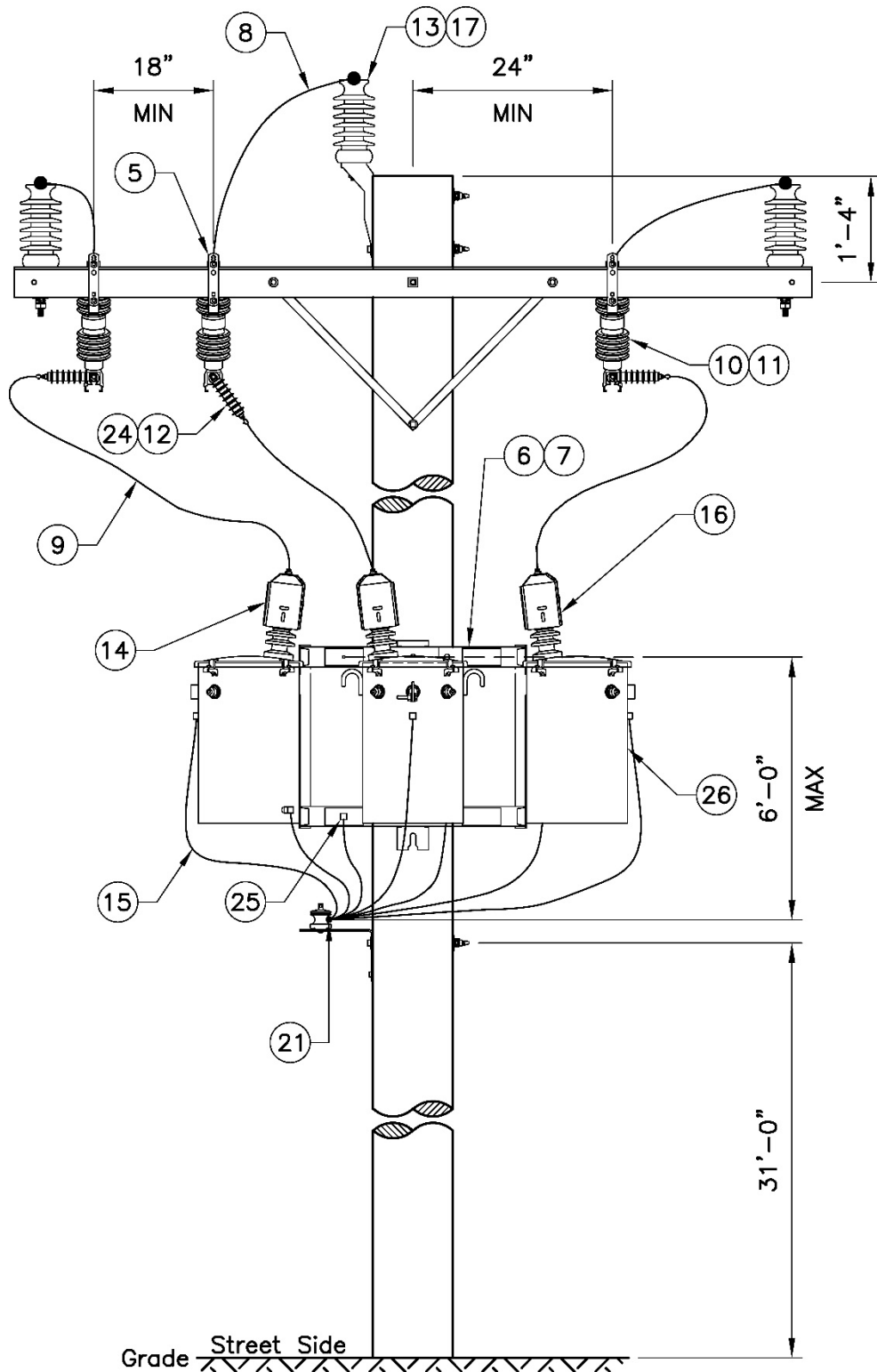


Figure 3.1c. Neutral Stirrup

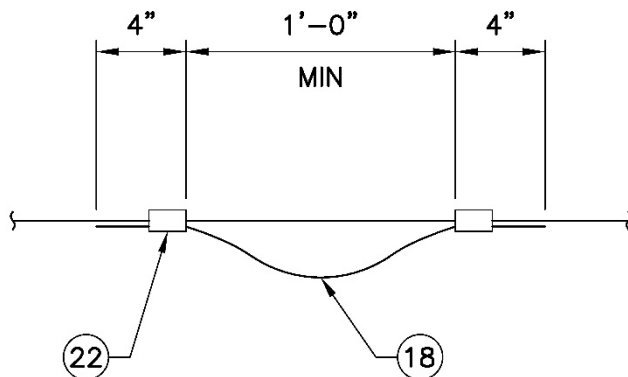


Figure 3.1d. 120/208 V Transformer Secondary Connection

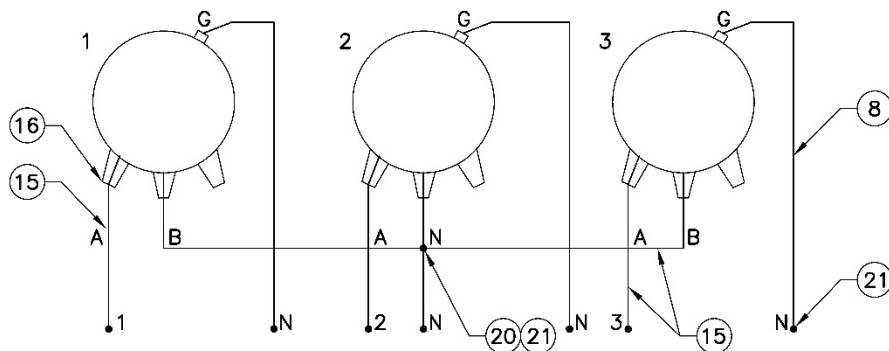


Figure 3.1e. 277/480 V Transformer Secondary Connection

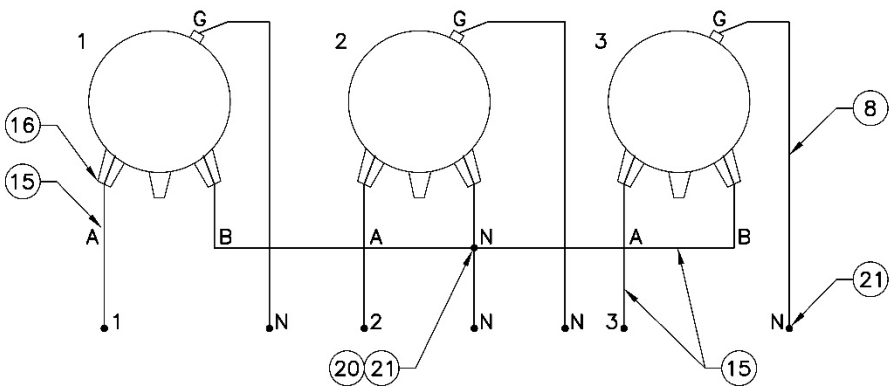


Table 3.1. Three-Phase Transformer Secondary Wire Sizes (AWG/kcmil)

kVA	208/120 - 240/138 V		480/277 V	
	A, B	N	A, B	N
3-25	4/0	2/0	#2	#4
3-50	350	4/0	2/0	#2
3-75	500	350	4/0	2/0
3-100	2-350	350	350	4/0
3-167	2-500	2-350	500	350

3.2 Avian Protection

A bird guard shall be installed as shown in SCL D15-1 on all transformers.

Additional avian protection shall be installed for all poles located in avian-sensitive areas as instructed in SCL 0072.01.

4. Construction Notes

If there are avian and wildlife concerns, contact the SCL Design Engineer.

If there are salt spray concerns, contact the SCL Design Engineer.

If there is no pole ground, install one as shown in SCL 0451.01.

For three-phase output voltage 120/208 V, use three 120/240 V transformers as shown in Table 5b.

For three-phase output voltage 277/480 V, use three 138/277 V transformers as shown in Table 5d.

Transformer banks should not be installed on poles located in areas with no truck access.

5. Material Lists

Table 5a. Three-Phase 120/208 V Transformer Assemblies

Fig	Compatible Unit	ID	Quantity				
3.1a, 3.1b	Three-phase transformer bank 25 kVA - 120/208 V	XY3-25-208BW					
3.1a, 3.1b	Three-phase transformer bank 50 kVA - 120/208 V	XY3-50-208BW					
3.1a, 3.1b	Three-phase transformer bank 75 kVA - 120/208 V	XY3-75-208BW					
3.1a, 3.1b	Three-phase transformer bank 100 kVA - 120/208 V	XY3-100-208BW					
3.1a, 3.1b	Three-phase transformer bank 167kVA - 120/208 V	XY3-167-208BW					
#	Material Description	ID					
1	Bolt, machine, galvanized, 5/8" x 14"	780846	2	2	2	2	2
2	Washer, flat, round, 5/8"	585030	2	2	2	2	2
3	Washer, square, flat, 2-1/4" x 2-1/4"	585135	2	2	2	2	2
4	Washer, coil spring lock, 5/8"	584261	2	2	2	2	2
5	Bracket, cutout mounting, crossarm	682097	3	3	3	3	3
6	Bracket, transformer cluster, 7500 lb rated	563294	1	1	1	1	1
7	Braces, stabilizing	563291	4	4	4	4	4
8	Wire, #4 AWG Cu, bare	610208	100	100	100	100	100
9	Wire, #4 AWG Cu, soft drawn, poly	611442	45	45	45	45	45
10	Cutout, 27 kV, polymer	013739	3	3	3	3	3
11	Fuse link, 3T rated	683706	-	-	-	-	3
11	Fuse link, 6K rated	683708	-	-	-	3	-
11	Fuse link, 10K rated	683710	-	3	3	-	-
11	Fuse link, 15K rated	683711	3	-	-	-	-
12	Fuse, fault limiter, size 12K	684920	-	3	3	3	3
12	Fuse, fault limiter, size B, K	014417	3	-	-	-	-
13	Clamp, hot line tap, 2/0 - #8	580725	3	3	3	3	3
14	Bird guard	580776	3	3	3	3	3
15	Wire, #2/0 AWG Cu, soft drawn, poly insul., ft	613733	-	-	-	-	25
15	Wire, #4/0 AWG Cu, soft drawn, poly insul., ft	613735	-	-	-	25	30
15	Wire, 350 kcmil Cu, soft drawn, poly insul., ft	613738	35	85	25	30	-
15	Wire, 500 kcmil Cu, soft drawn, poly insul., ft	613740	60	-	30	-	-
16	Bolted terminal, #1/0 solid to 500 AWG	676120	12	11	-	-	-
17	Stirrup, bolted 397.5 to 954 kcmil ACSR	580678	3	3	3	3	3

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18	#2 Cu bare	610434	2	2	2	2	2
20	Vise connector, bronze	012171	3	3	3	3	3
21	2 bolt tap 2/0	669379	-	-	-	-	1
21	2 bolt tap 4/0	669380	1	1	1	2	1
21	2 bolt tap 350	669381	3	2	2	1	1
22	Wedge connector 2/0 - 2/0	013610	2	2	2	2	2
23	Tape, electrical, vinyl	736655	1	1	1	1	1
24	Connector bar 2/0	684912	1	1	1	1	1
25	Tap lug, #8 - 2/0	676102	1	1	1	1	1
27	Cartridge, Burndy, blue shell	013629	2	2	2	2	2

Table 5b. Three-Phase 120/208 V Transformer List

Fig	Compatible Unit	ID	Quantity				
3.1b	Three-phase transformer 25 kVA - 120/208 V	XY3-25-208					
3.1b	Three-phase transformer 50 kVA - 120/208 V	XY3-50-208					
3.1b	Three-phase transformer 75 kVA - 120/208 V	XY3-75-208					
3.1b	Three-phase transformer 100 kVA - 120/208 V	XY3-100-208					
3.1b	Three-phase transformer 167 kVA - 120/208 V	XY3-167-208					

#	Material Description	ID					
26	25 kVA transformer, cut 120 V	355822	-	-	-	-	3
26	50 kVA transformer, cut 120 V	355832	-	-	-	3	-
26	75 kVA transformer, cut 120 V	355834	-	-	3	-	-
26	100 kVA transformer, cut 120 V	355836	-	3	-	-	-
26	167 kVA transformer, cut 120 V	355842	3	-	-	-	-

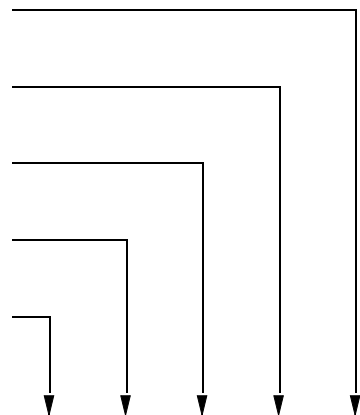


Table 5c. Three-Phase 277/480 V Transformer Assemblies

Fig	Compatible Unit	ID	Quantity				
3.1a, 3.1b	Three-phase transformer bank 25 kVA - 277/480 V	XY3-25-480BW					
3.1a, 3.1b	Three-phase transformer bank 50 kVA - 277/480 V	XY3-50-480BW					
3.1a, 3.1b	Three-phase transformer bank 75 kVA - 277/480 V	XY3-75-480BW					
3.1a, 3.1b	Three-phase transformer bank 100 kVA - 277/480 V	XY3-100-480BW					
3.1a, 3.1b	Three-phase transformer bank 167 kVA - 277/480 V	XY3-167-480BW					
#	Material Description	ID					
1	Bolt, machine, galvanized - 5/8" x 14"	780846	2	2	2	2	2
2	Washer, flat, round, 5/8"	585030	2	2	2	2	2
3	Washer, square, flat, 2-1/4" x 2-1/4"	585135	2	2	2	2	2
4	Washer, coil spring lock, 5/8"	584261	2	2	2	2	2
5	Bracket, cutout mounting, crossarm	682097	3	3	3	3	3
6	Bracket, transformer cluster, 7500 lb rated	563294	1	1	1	1	1
7	Braces, stabilizing	563291	4	4	4	4	4
8	Wire, #4 AWG Cu, bare	610208	100	100	100	100	100
9	Wire, #4 AWG Cu, soft drawn, poly insul, ft	611442	45	45	45	45	70
10	Cutout, 27 kV, polymer	013739	3	3	3	3	3
11	Fuse link, 3T rated	683706	-	-	-	-	3
11	Fuse link, 6K rated	683708	-	-	-	3	-
11	Fuse link, 10K rated	683710	-	3	3	-	-
11	Fuse link, 15K rated	683711	3	-	-	-	-
12	Fuse, fault limiter, size 12K	684920	-	3	3	3	3
12	Fuse, fault limiter, size B, K	014417	3	-	-	-	-
13	Clamp, hot line tap, 2/0 - #8	580725	3	3	3	3	3
14	Bird guard	580776	3	3	3	3	3
15	Wire, #2 AWG Cu, SD, poly insulated, ft	613730	-	-	-	25	30
15	Wire, #2/0 AWG Cu, SD, poly insulated, ft	613733	-	-	25	30	-
15	Wire, #4/0 AWG Cu, SD, poly insulated, ft	613735	-	25	30	-	-
15	Wire, 350 kcmil Cu, SD, poly insulated, ft	613738	25	30	-	-	-
15	Wire, 500 kcmil Cu, SD, poly insulated, ft	613740	30	-	-	-	-
16	Bolted terminal, #1/0 Solid to 500 AWG	676120	6	6	-	-	-
17	Stirrup, bolted 397.5 to 954 kcmil ACSR	580678	3	3	3	3	3
18	#2 Cu bare	610434	2	2	2	2	2

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#	Material Description	ID					
20	Vise connector, bronze	012171	3	3	3	4	5
21	2 bolt tap 2/0	669379	–	1	2	1	–
21	2 bolt tap 4/0	669380	2	1	–	–	–
21	2 bolt tap 350	669381	1	1	1	1	1
22	Wedge connector 2/0 - 2/0	013610	2	2	2	2	2
23	Tape, electrical, vinyl	736655	1	1	1	1	1
24	Connector bar 2/0	684912	1	1	1	1	1
25	Tap lug, #8 – 2/0	676102	1	1	1	1	1
27	Cartridge, Burndy, blue shell	013629	2	2	2	2	2

Table 5d. Three-Phase 277/480 V Transformer List

Fig	Compatible Unit	ID	Quantity				
3.1b	Three-phase transformer 25 kVA – 277/480 V	XY3-25-480					
3.1b	Three-phase transformer 50 kVA – 277/480 V	XY3-50-480					
3.1b	Three-phase transformer 75 kVA - 277/480 V	XY3-75-480					
3.1b	Three-phase transformer 100 kVA - 277/480 V	XY3-100-480					
3.1b	Three-phase transformer 167 kVA - 277/480 V	XY3-167-480					
#	Material Description	ID					
26	25 kVA transformer, 138/277 V	355622	–	–	–	–	3
26	50 kVA transformer, 138/277 V	355632	–	–	–	3	–
26	75 kVA transformer, 138/277 V	355634	–	–	3	–	–
26	100 kVA transformer, 138/277 V	355636	–	3	–	–	–
26	167 kVA transformer, 138/277 V	355642	3	–	–	–	–

6. References

- SCL Construction Standard 0072.01**; “Wildlife Protection, Small Birds and Animals”
- SCL Construction Standard 0451.01**; “Grounding Electrodes for Distribution Poles”

7. Sources

- Hall, Alan**; SCL Electrical Engineer and subject matter expert for 0125.03
- Lu, Curtis**; SCL Standards Engineer and originator of 0125.03
- Hanson, Brett**; SCL Standards Engineer and subject matter expert for 0125.03
- SCL Construction Standard D10-5** (canceled); “15/26 kV Distribution Three-Phase Transformer Installation, Cluster Mounted”
- SCL Construction Standard D15-1** (canceled); “Bird Guard Installation”