

Overhead Open-Delta Transformer Bank Installation

1. Scope

This standard covers the information necessary to install overhead open-delta 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 open-delta transformer banks on 26 kV wood distribution poles.

3. Requirements

3.1 General

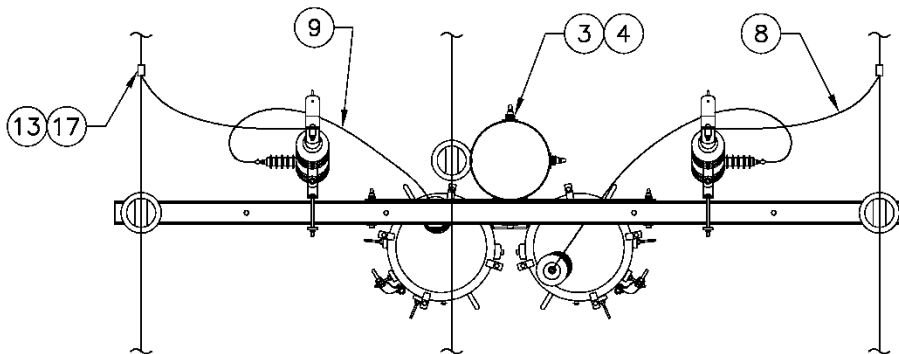
An overhead open-delta transformer bank shall be installed as shown in Figures 3.1a and 3.1b.

For a secondary voltage of single-phase 120 V or 240 V and three-phase 240 V, install two 120/240 V transformers and connect the secondary bushing as shown in Figure 3.1d using the copper wire specified in Table 3.1.

For a secondary voltage of single-phase 240 V or 480 V and three-phase 480 V, install two 240/480 V transformers and connect the secondary bushings as shown in Figure 3.1d 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.

Figure 3.1a. Open-Delta Transformer Installation, Top View



Standard Coordinator
Curtis Lu

Standards Engineering Supervisor
John Shipek

Division Director
Tamara Jenkins

Figure 3.1b. Open-Delta Transformer Installation, Side View

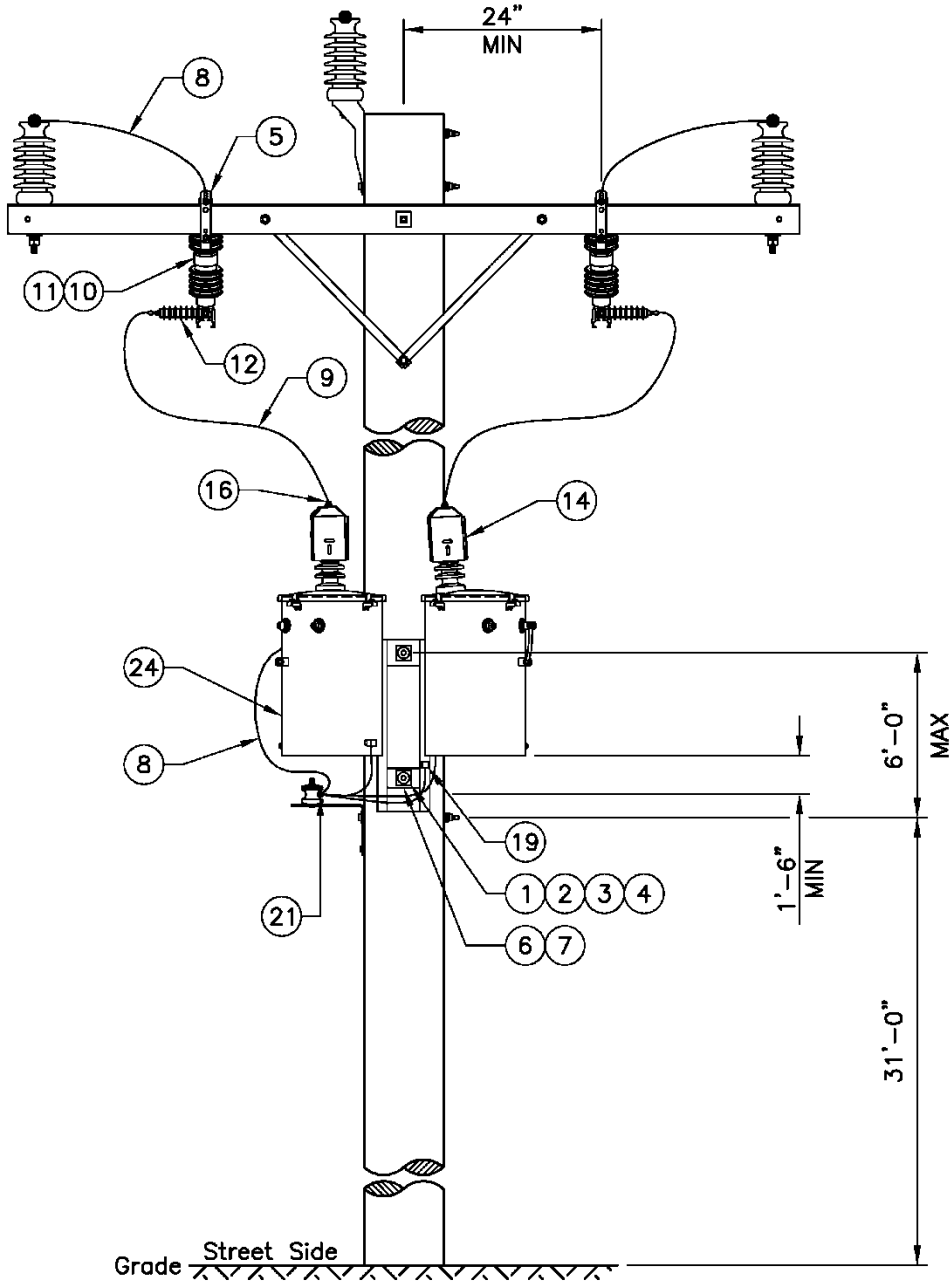


Figure 3.1c. Neutral Stirrup

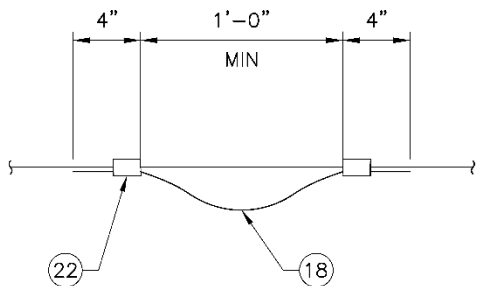


Figure 3.1d. Open-Delta Transformer Secondary Connection

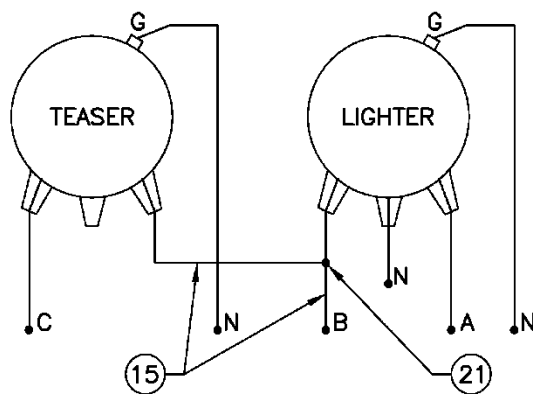


Table 3.1. Open-Delta Transformer Secondary Wire Sizes (AWG/kcmil)

kVA	120/240 V			240/480 V		
	A	B, C	N	A	B, C	N
25 - 25	2	2	4	-	-	-
50 - 25	4/0	2	2/0	-	-	-
50 - 50	4/0	4/0	2/0	2	2	2
75 - 25	350	2	4/0	-	-	-
75 - 50	350	4/0	4/0	2/0	2	2
75 - 75	350	350	4/0	2/0	2/0	2
100 - 25	350	2	4/0	-	-	-
100 - 50	350	4/0	4/0	4/0	2	2/0
100 - 75	350	350	4/0	4/0	2/0	2/0
100 - 100	350	350	4/0	4/0	4/0	2/0
167 - 25	2-350	2	350	-	-	-
167 - 50	2-350	4/0	350	-	-	-
167 - 75	2-350	350	350	-	-	-
167 - 100	2-350	350	350	-	-	-
167 - 167	2-350	2-350	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.

Where possible, install the lighter on the leading phase with the high-leg on the adjacent phase, i.e., Lighter W2, High-Leg W1.

5. Material Lists

Table 5a. Open-Delta Pole Mounted Transformer Assemblies 25-75 kVA 120/240 V

Fig	Compatible Unit	ID	Quantity					
3.1b	Open-delta transformer bank 25/25 kVA 120/240 V	XY2-25-25-240BW						
3.1b	Open-delta transformer bank 25/50 kVA 120/240 V	XY2-25-50-240BW						
3.1b	Open-delta transformer bank 25/75 kVA 120/240 V	XY2-25-75-240BW						
3.1b	Open-delta transformer bank 50/50 kVA 120/240 V	XY2-50-50-240BW						
3.1b	Open-delta transformer bank 50/75 kVA 120/240 V	XY2-50-75-240BW						
3.1b	Open-delta transformer bank 75/75 kVA 120/240 V	XY2-75-75-240BW						
#	Material Description	ID	▼	▼	▼	▼	▼	▼
1	Bolt, machine, galvanized, 5/8" x 14"	780846	2	2	2	2	2	2
2	Washer, flat, round, 5/8"	585030	2	2	2	2	2	2
3	Washer, square, flat, 2-1/4" x 2-1/4"	585135	2	2	2	2	2	2
4	Washer, coil spring lock, 5/8"	584261	2	2	2	2	2	2
5	Bracket, cutout mounting, crossarm	682097	2	2	2	2	2	2
6	Bracket, transformer cluster, 7500 lb rated	563294	2	2	1	1	1	1
7	Braces, stabilizing	563291	2	2	2	2	2	2
8	Wire, #4 AWG Cu, bare	610208	80	80	80	80	80	80
9	Wire, #4 AWG Cu, soft drawn, poly	611442	20	20	20	20	20	35
10	Cutout, 27 kV, polymer	013739	2	2	2	2	2	2
11	Fuse link, 3T rated	683706	-	-	-	1	1	2
11	Fuse link, 6K rated	683708	-	1	2	-	1	-
11	Fuse link, 10K rated	683710	2	1	-	1	-	-
11	Fuse link, 15K rated	683711	-	-	-	-	-	-
12	Fuse, fault limiter, size 12K	684920	2	2	2	2	2	2
13	Clamp, hot line tap, 2/0 - #8	580725	2	2	2	2	2	2
14	Bird guard	580776	2	2	2	2	2	2
15	Wire, #2 AWG Cu, soft drawn, poly insulated, ft	613730	-	-	-	30	30	60
15	Wire, #2/0 AWG Cu, soft drawn, poly insulated, ft	613733	-	-	30	-	30	-
15	Wire, #4/0 AWG Cu, soft drawn, poly insulated, ft	613735	30	60	45	30	15	-
15	Wire, 350 kcmil Cu, soft drawn, poly insulated, ft	613738	45	15	-	15	-	-
16	Bolted terminal, #1/0 solid to 500 AWG	676120	2	2	2	2	2	2

Continued on the next page.

Continued from the previous page.

#	Material Description	ID						
17	Stirrup, bolted 397.5 to 954 kcmil ACSR	580678	2	2	2	1	1	1
18	#2 Cu bare	610434	2	2	2	2	2	2
19	Tap lug, #8-2/0	676102	1	1	1	1	1	1
20	Vise connector, bronze	012171	-	-	2	1	2	3
21	2-bolt tap 2/0	669379	-	-	1	-	1	-
21	2-bolt tap 4/0	669380	2	3	1	2	1	1
21	2-bolt tap 350	669381	2	1	-	1	-	-
22	Wedge connector 2/0-2/0	013610	2	2	2	2	2	2
23	Tape, electrical, vinyl	736655	1	1	1	1	1	1
25	Blue shell	013625	2	2	2	2	2	2

Table 5b. Open-Delta Pole Mounted Transformer 25-75 kVA 120/240 V

Fig	Compatible Unit	ID	Quantity					
3.1b	Open-delta transformer bank 25/25 kVA 120/240 V	XY2-25-25-240						
3.1b	Open-delta transformer bank 25/50 kVA 120/240 V	XY2-25-50-240						
3.1b	Open-delta transformer bank 25/75 kVA 120/240 V	XY2-25-75-240						
3.1b	Open-delta transformer bank 50/50 kVA 120/240 V	XY2-50-50-240						
3.1b	Open-delta transformer bank 50/75 kVA 120/240 V	XY2-50-75-240						
3.1b	Open-delta transformer bank 75/75 kVA 120/240 V	XY2-75-75-240						
#	Material Description	ID						
24	25 kVA Transformer, 120/240 V	355122	-	-	-	1	1	2
24	50 kVA Transformer, 120/240 V	355132	-	1	2	-	1	-
24	75 kVA Transformer, 120/240 V	355134	2	1	-	1	-	-

Table 5c. Open-Delta Pole Mounted Transformer Assemblies 100 kVA 120/240 V

Fig	Compatible Unit	ID	Quantity			
3.1b	Open-delta transformer bank 25/100 kVA 120/240 V	XY2-25-100240BW				
3.1b	Open-delta transformer bank 50/100 kVA 120/240 V	XY2-50-100240BW				
3.1b	Open-delta transformer bank 75/100 kVA 120/240 V	XY2-75-100240BW				
3.1b	Open-delta transformer bank 100/100 kVA 120/240 V	XY2-100100240BW				
#	Material Description	ID				
1	Bolt, machine, galvanized, 5/8" x14"	780846	2	2	2	2
2	Washer, flat, round, 5/8"	585030	2	2	2	2
3	Washer, square, flat, 2-1/4" x 2-1/4"	585135	2	2	2	2
4	Washer, coil spring lock, 5/8"	584261	2	2	2	2
5	Bracket, cutout mounting, crossarm	682097	2	2	2	2
6	Bracket, transformer cluster, 7500 lb rated	563294	1	1	1	1
7	Braces, stabilizing	563291	2	2	2	2
8	Wire, #4 AWG Cu, bare	610208	80	80	80	80
9	Wire, #4 AWG Cu, soft drawn, poly	611442	20	20	20	20
10	Cutout, 27 kV, polymer	013739	2	2	2	2
11	Fuse Link, 3T rated	683706	-	-	-	1
11	Fuse Link, 6K rated	683708	-	-	1	-
11	Fuse Link, 10K rated	683710	2	2	1	1
12	Fuse, fault limiter, size 12K	684920	2	2	2	2
13	Clamp, hot line tap, 2/0 - #8	580725	2	2	2	2
14	Bird guard	580776	2	2	2	2
15	Wire, #2 AWG Cu, soft drawn, poly insulated, ft	613730	2	2	2	30
15	Wire, #2/0 AWG Cu, soft drawn, poly insulated, ft	613733	-	-	-	30
15	Wire, #4/0 AWG Cu, soft drawn, poly insulated, ft	613735	15	30	45	30
15	Wire, 350 kcmil Cu, soft drawn, poly insulated, ft	613738	60	45	30	-
16	Bolted terminal, #1/0 solid to 500 AWG	676120	2	2	2	2
17	Stirrup, bolted 397.5 to 954 kcmil ACSR	580678	2	2	2	2
18	#2 Cu bare	610434	2	2	2	2
19	Tap lug, #8-2/0	676102	1	1	1	1
20	Vise connector, bronze	012171	2	2	2	2
21	2 bolt tap 4/0	669380	1	1	2	1
21	2 bolt tap 350	669381	-	2	1	-
22	Wedge connector 2/0 - 2/0	013610	2	2	2	2
23	Tape, electrical, vinyl	736655	1	1	1	1
25	Blue shell	013629	2	2	2	2

Table 5d. Open-Delta Pole Mounted Transformer 100kVA 120/240 V

Fig	Compatible Unit	ID	Quantity			
3.1b	Open-delta transformer bank 25/100 kVA 120/240 V	XY2-25-100-240				
3.1b	Open-delta transformer bank 50/100 kVA 120/240 V	XY2-50-100-240				
3.1b	Open-delta transformer bank 75/100 kVA 120/240 V	XY2-75-100-240				
3.1b	Open-delta transformer bank 100/100 kVA 120/240 V	XY2-100-100-240				
#	Material Description	ID	↓	↓	↓	↓
24	25 kVA transformer, 120/240 V	355122	-	-	-	1
24	50 kVA transformer, 120/240 V	355132	-	-	1	-
24	75 kVA transformer, 120/240 V	355134	-	1	-	-
24	100 kVA transformer, 120/240 V	355136	2	1	1	1

Table 5e. Open-Delta Pole Mounted Transformer Assemblies 167 kVA 120/240 V

Fig	Compatible Unit	ID	Quantity				
3.1b	Open-delta transformer bank 25/167 kVA 120/240 V	XY2-25- 167240BW					
3.1b	Open-delta transformer bank 50/167 kVA 120/240 V	XY2-50- 167240BW					
3.1b	Open-delta transformer bank 75/167 kVA 120/240 V	XY2-75- 167240BW					
3.1b	Open-delta transformer bank 100/167 kVA 120/240 V	XY2- 100167240BW					
3.1b	Open-delta transformer bank 167/167 kVA 120/240 V	XY2- 167167240BW					
#	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	2	2	2	2	2
6	Bracket, transformer cluster, 7500 lb rated	563294	1	1	1	1	1
7	Braces, stabilizing	563291	2	2	2	2	2
8	Wire, #4 AWG Cu, bare	610208	60	60	60	60	60
9	Wire, #4 AWG Cu, soft drawn, poly	611442	20	20	20	20	20
10	Cutout, 27 kV, polymer	013739	2	2	2	2	2
11	Fuse link, 3T rated	683706	-	-	-	-	1
11	Fuse link, 6K rated	683708	-	-	-	1	-
11	Fuse link, 10K rated	683710	-	1	1	-	-
11	Fuse link, 15K rated	683711	2	1	1	1	1
12	Fuse, fault limiter, Size 12K	684920	-	1	1	1	1
12	Fuse, fault limiter, Size B, K	014417	2	1	1	1	1
13	Clamp, hot line tap, 2/0 - #8	580725	2	2	2	2	2
14	Bird guard	580776	2	2	2	2	2
15	Wire, #2 AWG Cu, soft drawn, poly insulated, ft	613730	2	2	2	2	14
15	Wire, #2/0 AWG Cu, soft drawn, poly insulated, ft	613733	-	-	-	-	14
15	Wire, #4/0 AWG Cu, soft drawn, poly insulated, ft	613735	-	-	14	28	14
15	Wire, 350 kcmil Cu, soft drawn, poly insulated, ft	613738	63	56	28	14	-
16	Bolted terminal, #1/0 solid to 500 AWG	676120	2	2	2	2	2
17	Stirrup, bolted 397.5 to 954 kcmil ACSR	580678	2	2	2	2	2
18	#2 Cu bare	610434	2	2	2	2	2
19	Tap lug, #8-2/0	676102	1	1	1	1	1
20	Vise connector, bronze	012171	2	2	2	2	2

Continued on the next page.

Continued from the previous page.

#	Material Description	ID						
21	2-bolt tap 4/0	669380	-	-	1	2	1	
21	2-bolt tap 350	669381	1	3	2	1	-	
22	Wedge connector 2/0 - 2/0	013610	2	2	2	2	2	
23	Tape, electrical, vinyl	736655	1	1	1	1	1	
25	Blue shell	013629	2	2	2	2	2	

Table 5f. Open-Delta Pole Mounted Transformer 167kVA 120/240 V

Fig	Compatible Unit	ID	Quantity				
3.1b	Open-delta transformer bank 25/167 kVA 120/240 V	XY2-25-167-240					
3.1b	Open-delta transformer bank 50/167 kVA 120/240 V	XY2-50-167-240					
3.1b	Open-delta transformer bank 75/167 kVA 120/240 V	XY2-75-167-240					
3.1b	Open-delta transformer bank 100/167 kVA 120/240 V	XY2-100-167-240					
3.1b	Open-delta transformer bank 167/167 kVA 120/240 V	XY2-167-167-240					
#	Material Description	ID					
24	25 kVA transformer, 120/240 V	355122	-	-	-	-	1
24	50 kVA transformer, 120/240 V	355132	-	-	-	1	-
24	50 kVA transformer, 120/240 V	355134	-	-	1	-	-
24	100 kVA transformer, 120/240 V	355136	-	1	-	-	-
24	167 kVA transformer, 120/240 V	355142	2	1	1	1	1

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 0125.02
- Lu, Curtis**; SCL Standards Engineer and originator of 0125.02
- Hanson, Brett**; SCL Standards Engineer and subject matter expert for 0125.02
- SCL Construction Standard D10-4.5** (canceled); “15/26 kV Distribution 2 Transformer, 3 Phase Installation, Cluster Mounted”
- SCL Construction Standard D15-1** (canceled); “Bird Guard Installation”