

## Three-Phase Tangent and Angle Wing Arm Pole Top Assemblies

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### 1. Scope

This standard covers the information necessary to construct pole top assemblies for two- and three-phase tangent and angle wing arm poles supporting #4 AWG copper, 397.5 kcmil ACSR, and 954 kcmil ACSR primary conductors on the 26 kV primary distribution system. Installation instructions for connecting the primary conductor to the pole are included, along with requirements for vertical spacing and hardware.

Wing arms are not acceptable permanent construction. They may be used temporarily where a standard crossarm cannot provide adequate clearances to meet codes.

Criteria for pole top assemblies covered under this standard include the following:

<b>Grade of construction</b>	B or C
<b>Pole class</b>	1 or stronger
<b>Pole length</b>	50 ft
<b>Soil condition</b>	Average
<b>Allowable line angle</b>	0°–30°

Composite, steel, laminated, and other non-wood poles are outside the scope of this standard.

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### 2. Application

This standard provides direction to Seattle City Light (SCL) engineers, crews, and contractors for the installation of two- and three-phase tangent and angle wing arm pole top assemblies on 26 kV distribution poles with primary conductors.

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### 3. General Requirements

Wing arms are for temporary installation and maintenance only.

Wing arms are not part of regular construction and shall only be installed temporarily in locations where a standard crossarm cannot provide adequate clearance to meet code.

Two-phase wing arm tangent and angle poles shall be constructed as three-phase wing arm tangent or angle poles without the center phase.

All wing arms shall be guyed according to the requirements in SCL 0199.01.

The line post insulator (LPI) configurations shown in this standard are typical and can be customized. They can be installed in any configuration using any of the available holes on the wing arm as long as the LPIs meet the minimum required spacing shown in Tables 3a and 3b. The angle used for Tables 3a and 3b is the angle of the conductor in the relation to the wing arm.



**Table 3a. Minimum LPI Spacing for Three-Phase 0°–22.5° Wing Arms**

Conductor Size	Span Length (ft)		
	Less Than 150	150 to 225	225 to 250
#4 AWG	2	3	4
397.5 kcmil	2	3	3
954 kcmil	2	3	3

**Table 3b. Minimum LPI Spacing for Three-Phase 22.5°–30° Wing Arms**

Conductor Size	Span Length (ft)	
	Less Than 200	200 to 250
#4 AWG	3	4
397.5 kcmil	3	3
954 kcmil	3	3

Three-phase tangent and angle wing arm poles shall be constructed as shown in Table 3c.

**Table 3c. Three-Phase Tangent and Angle Wing Arm Pole Top Assemblies**

Conductor Size	Allowable Line Angle	Figure
#4 AWG	0°–30°	3a, 3b
397.5 kcmil	0°–30°	3c, 3e
954 kcmil	0°–15°	3d, 3e

**Figure 3a. Allowable Line Angle Range for 0°–30° #4 AWG Copper Single Wing Arm**

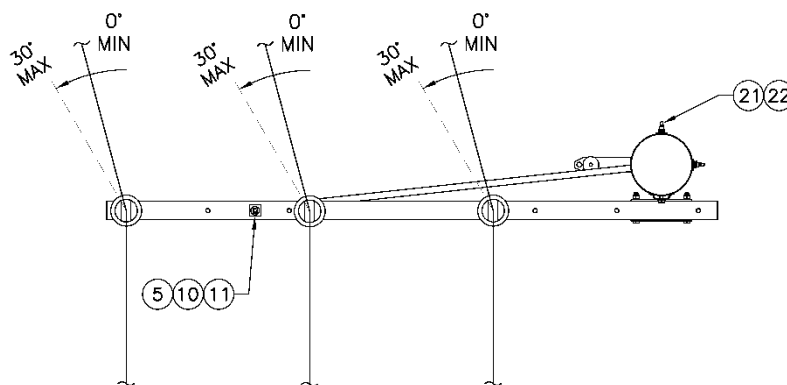
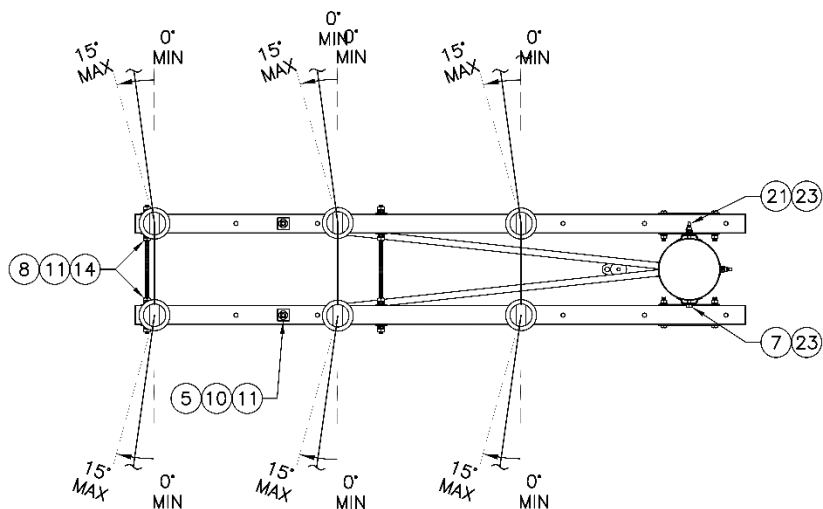
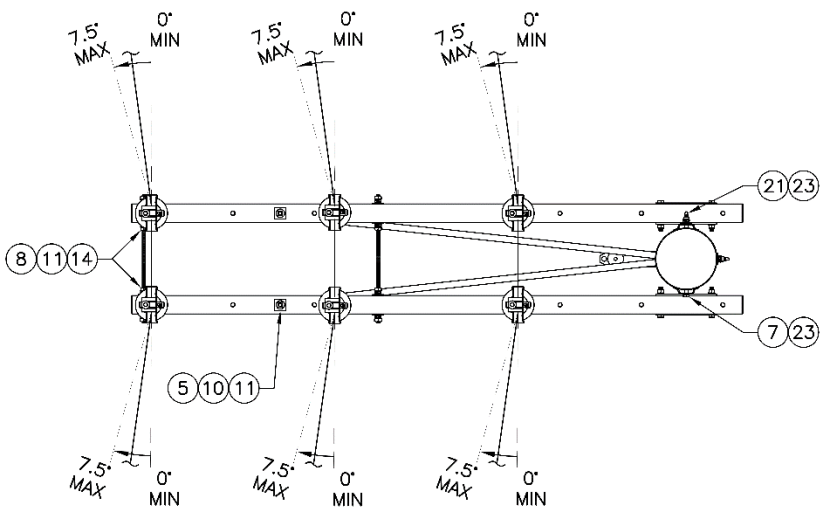


FIG. 1 is a schematic diagram of a vehicle suspension system. A horizontal beam (1) is supported by three springs (17, 20, 17) and is connected to a vertical member (2) via a diagonal link (2). The vertical member (2) is shown in three segments with break lines. It is connected to a lower beam (10) via a pivot (16). The lower beam (10) is supported by a spring (19) and is connected to a wheel (11) via a pivot (15). The wheel (11) is shown in three segments with break lines. The diagram includes dimension lines indicating heights: 1'-4" for the top section, 10'-8" for the middle section, and 31'-0" for the bottom section. The bottom section is labeled "Grade" and "Street Side".

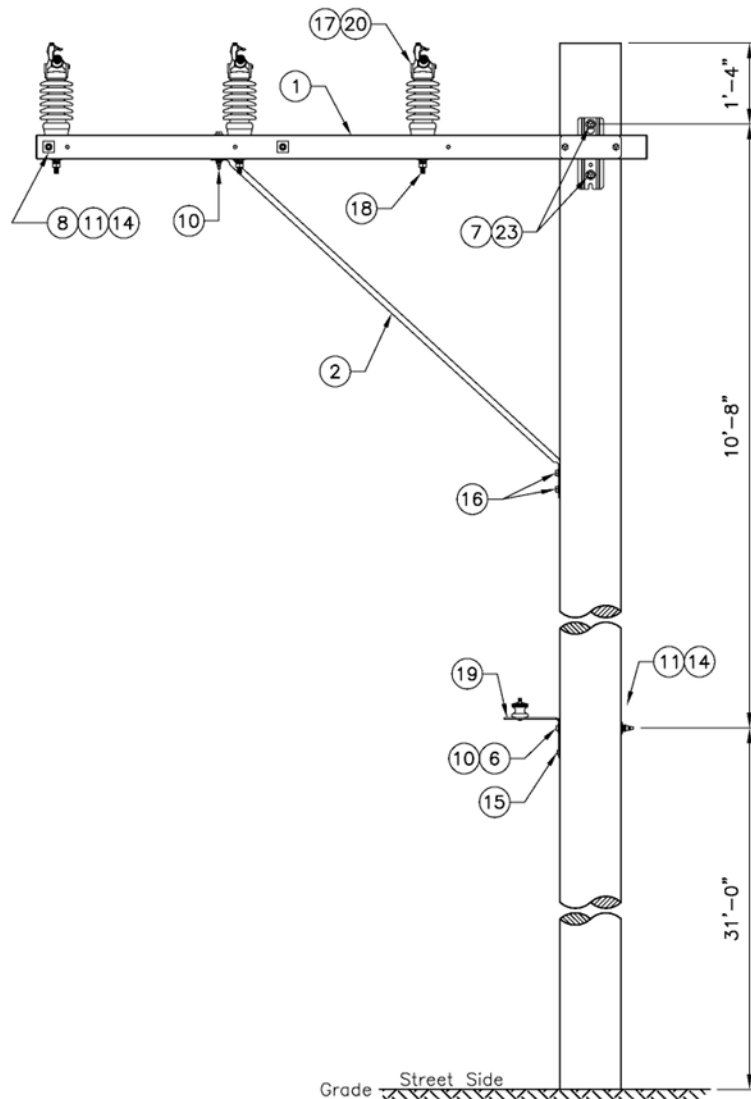
**Figure 3c. Allowable Line Angle Range for 0°-30° 397.5 kcmil ACSR Double Wing Arm**



**Figure 3d. Allowable Line Angle Range for 0°-15° 954 kcmil ACSR Double Wing Arm**



**Figure 3e. Three-Phase 397.5 and 954 kcmil ACSR Double Wing Arm Pole Top Assembly (0°–30° and 0°–15° respectively)**



#### 4. Construction Notes

The LR bracket is installed on the street side of the pole.

If two neutrals are required, mount the second neutral on the street side 1 ft below the top bolt hole of the original neutral.

If poor soil is found in the field, contact the SCL Design Engineer.

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

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

## 5. Material List

**Table 5a. Materials for Three-Phase Tangent and Angle Wing Arm Pole Top Assemblies**

Fig	Compatible Unit	ID	Quantity			
3b	Three-phase #4 AWG copper single wing arm (0°–30°)	PLT#4-3WING				
3e	Three-phase 397.5 kcmil ACSR double wing arm (0°–30°)	PLT397-WING				
3e	Three-phase 954 kcmil ACSR double wing arm (0°–15°)	PLT954-WING				
3b	Two-phase #4 AWG copper single wing arm (0°–30°)	PLT#4-2WING				
#	Material Description	ID	↓	↓	↓	↓
1	Crossarm, wing, fiberglass	014644	1	2	2	1
2	Brace, galvanized steel pipe, 1-1/4" x 9'-1"	563015	1	2	2	1
3	Bolt, machine, galvanized, 3/4" x 14"	780876	2	2	2	2
4	Bolt, machine, galvanized, 1/2" x 14"	780816	1	—	—	1
5	Bolt, machine, galvanized, 5/8" x 7"	780838	1	2	2	1
6	Bolt, machine, galvanized, 5/8" x 14"	780846	1	1	1	1
7	Bolt, machine, galvanized, 3/4" x 16"	780877	—	2	2	—
8	Bolt, double arming, galvanized, 5/8" x 22"	560522	—	2	2	—
9	Washer, round, flat, 1/2"	585025	1	—	—	1
10	Washer, round, flat, 5/8"	585030	3	5	5	3
11	Washer, square, flat, 2-1/4" x 2-1/4"	585135	4	9	9	4
13	Washer, coil spring lock, 1/2"	584257	1	—	—	1
14	Washer, coil spring lock, 5/8"	584261	1	9	9	1
15	Screw, galvanized lag, 1/2" x 4"	785261	1	1	1	1
16	Screw, galvanized lag, 1/2" x 6"	785265	1	4	4	1
17	Insulator, post top, 34.5 kV (tie-top)	014304	2	—	—	3
17	Insulator, post top, 34.5 kV (clamp-top)	014517	—	6	6	—
18	Stud, long, 3/4" x 7-1/2"	696828	2	6	6	3
19	Bracket, LR	690404	1	1	1	1
20	Wire, ties, insulator, #6 Cu solid, bare, SD, (ft)	610210	6	—	—	9
21	Washer, coil spring lock, 3/4"	584267	2	2	2	2
22	Washer, square, curved, 4" x 4"	584775	2	—	—	2
23	Washer, round, flat, 3/4"	585035	2	4	4	2

## 6. References

**SCL Construction Standard 0199.01**, "Requirements for Guying and Anchoring"

**SCL Construction Standard 0123.15**, "Three-Phase Dead End Wing Arm Pole Top Assemblies"

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## 7. Sources

**National Electrical Safety Code (NESC), C2-2012 Edition**; Institute of Electrical and Electronics Engineers (IEEE) Inc., New York, NY, 2011

**Hall, Alan**; SCL Senior Electrical Engineer and subject matter expert for 0123.13

**Lu, Curtis**; SCL Standards Engineer and originator of 0123.13