

06-JAN-2023
TM651.dgn

GENERAL NOTES

1. Signal supports shall be designed in accordance with the AASHTO Standard Specifications for Structural Supports for Highway Signs, Luminaires and Traffic Signals 4th edition, 2001, 2002, and 2003 interim revisions.

2. All traffic signal supports shall conform to the design criteria and details shown on these drawings except as approved by the Engineer.

3. The design basic wind speed (3 second gust) shall be 110 mph, gust factor $G = 1.14$, $I_r = 1.0$ (50 year recurrence interval), Fatigue Category II, no galloping, and truck speed = 55 mph.

4. Signal poles from this standard are not allowed over highways I-5, I-84, I-205, I-405, US 26 (Sunset Hwy.) between milepoints 64.3 – 73.0, I-105, and I-82. Signal poles on these highways require a Fatigue Category I.

5. Pole and arm shafts may be either round, hexdecagonal, dodecagonal, or octagonal but shapes shall not be mixed on a project. Dimensional tolerances of ASTM A595 shall apply to all tapered steel tubing members. Additionally, the diameter of round tapered steel tubing members or the dimensions across the flats of octagonal tapered steel tubing members shall not vary more than 2 percent from specified dimension. Two ply and fluted poles or arms are not permitted.

6. Pole taper shall be equal to .0117 in/in.

7. Anchor rods shall conform to ASTM Specification F1554 Gr. 55, Supplementary Requirement "S2" that include grade and manufacturer's identification.

8. High strength bolts shall conform to ASTM F3125 Grade A325 Type 1.

9. Nuts for high strength bolts shall be heavy hex and conform to ASTM A563 Grade DH with supplementary requirements "S1" and "S2".

10. Hardened steel washers shall conform to ASTM F436 Type 1.

11. Direct Tension Indicators (DTI) shall be the compressible washer type, mechanically galvanized, conforming to ASTM F959.

12. Steel sheet for poles and arm shall conform ASTM A595, Grades A or B, ASTM A572 Gr. 50, or approved equal. All other steel sheet and plate shall conform to AASHTO specification M223 (ASTM A572), or approved equal. Supplement S18 of ASTM A6 regarding maximum tensile strength shall apply.

13. All structural steel including fasteners shall be hot-dip galvanized after fabrication unless otherwise noted.

14. Galvanize-Control Silicon, typical. Silicon content of the base metal shall be in the range of 0 to 0.04 percent or 0.15 to 0.25 percent.

15. Footing concrete shall be Commercial Grade Concrete ($f_c=3000$ psi) per Specification Section 440. Grout in grout pad shall be non-shrink high early strength grout (non-ferrous) with a minimum strength of 5000 psi.

16. Reinforcing steel shall conform to AASHTO M31, Grade 60 (ASTM A615 or A706). A minimum lap splice length of 32 bar diameters shall be used unless shown otherwise.

17. Computed deflection of these poles at full design loading shall be limited to 5 percent of the pole length. Computed dead load deflection of the poles shall be limited to 1 percent of the pole length. Pole shall be raked to offset the computed dead load deflection. Computed deflection (ignoring pole bending and/or rotation) of signal arms shall not exceed that listed in the Signal Arm Deflection Table on TM650. Additionally, the amplitude (maximum up to maximum down as measured at the tip of the arm) of wind induced vertical oscillations shall not exceed 1.5 percent of the signal arm length. Luminaire arms and pole extensions to support luminaire arms shall meet requirements of standard drawing TM629.

18. Hubs for cabinets and/or other appurtenances shall be welded into the pole prior to galvanizing. Poles may be tapped for up to 1" galvanized bolts after pole has been galvanized.

19. Longitudinal seam welds within 6 inches of a circumferential weld shall be complete penetration welds. Weld inspection shall be in accordance with AWS D1.1 and the special provisions. Inspect seam welds using cyclically loaded criteria. Hubs shall be 3000# threaded forged carbon steel flat weld hubs by Anvil Products Inc., Phoenix Forging Co., Bonney Forge & Tool Works or approved equal.

20. Grounding terminal shall be 1/2" UNC x 1 1/2" Type 308, 309 or 310 threaded stainless steel weld studs.

21. Assemble support, tighten anchor bolts, tighten HS thru bolts and tighten HS bolts in tapped holes according to 00962.46(j)(2).

22. Round and smooth all edges along electrical way.

23. The minimum arm flange thickness shall be equal to the value where prying action is not included in the bolt calculation.

Standard Maximum Base Reactions (Unfactored)								
Signal Pole Type	Signal Arm Lengths	Wind Load Case II				Controlling Fatigue		
		Axial (Kips)	Shear (Kips)	Moment (Kip-ft)	Torque (Kip-ft)	Shear (Kips)	Moment Kip-ft)	Torque (Kip-ft)
SM1	15'	2.10	5.15	80.39	16.95	0.68	10.39	2.13
SM2	20', 25'	2.66	6.23	105.41	42.54	0.82	13.35	5.37
SM3	30', 35'	3.49	7.77	138.43	82.87	1.00	17.10	10.31
SM4	40', 45'	4.51	9.00	173.46	132.72	1.16	20.54	16.50
SM5	50', 55'	5.69	9.23	190.91	181.60	1.18	21.62	22.55
SM1L	15'	2.96	6.09	113.28	23.22	0.79	14.08	2.84
SM2L	20', 25'	3.69	7.23	139.41	48.81	0.94	17.17	6.08
SM3L	30', 35'	4.39	8.80	176.51	87.88	1.14	21.43	11.02
SM4L	40', 45'	5.94	10.14	215.11	136.97	1.31	25.27	17.21
SM5L	50', 55'	7.34	10.56	241.17	187.96	1.34	26.49	23.26

Standard Maximum Mast Arm Reactions						
Signal Pole Type	Signal Arm Lengths	Wind Load Case II			Controlling Fatigue	
		Axial (Kips)	Shear (Kips)	Moment (Kip-ft)	Shear (Kips)	Moment (Kip-ft)
SM1, SM1L	15'	0.06	1.98	18.44	0.23	2.18
SM2, SM2L	20', 25'	0.10	3.14	46.20	0.37	5.48
SM3, SM3L	30', 35'	0.15	4.51	89.42	0.53	10.51
SM4, SM4L	40', 45'	0.23	5.91	146.67	0.67	16.82
SM5, SM5L	50', 55'	0.34	6.78	211.94	0.70	22.99

Luminaire Arm Reactions					
Arm Lengths	Wind Load Case II			Controlling Fatigue	
	Axial (Kips)	Shear (Kips)	Moment (Kip-ft)	Shear (Kips)	Moment (Kip-ft)
6'	0.03	0.31	1.49	0.03	0.15
10'	0.06	0.38	2.85	0.04	0.29
15'	0.08	0.47	4.96	0.05	0.51
20'	0.05	0.55	7.24	0.06	0.74

Accompanied by drawings TM650, TM652, TM653, TM654

The selection and use of this Standard Drawing, while designed in accordance with generally accepted engineering principles and practices, is the sole responsibility of the user and should not be used without first consulting a Registered Professional Engineer.	All materials shall be in accordance with the current Oregon Standard Specifications.				
	OREGON STANDARD DRAWINGS				
	TRAFFIC SIGNAL SUPPORTS NOTES AND REACTIONS				
	2024				
	DATE	REVISION DESCRIPTION			
	07-2020	ADDED ACCOMPANIED BY STANDARD DRAWING TM654			
	07-2021	ADDED "(UNFACTORED)" TO THE TABLE HEADING			
	01-2023	CHANGED HIGH STRENGTH BOLT TIGHTENING TO 00962.46(j)(2)			
	CALC. BOOK NO.	5301	SDR DATE	06-JAN-2023	TM651

Effective Date: June 1, 2026 – November 30, 2026