

General Notes

1. Refer to roadway plans for the actual configuration and location of traffic signal heads and signs marked with a ■ .
2. All poles and arms shall be fabricated with ASTM A572 Grade 65 steel. Luminaire arms may be fabricated with ASTM A595 Grade A steel with a minimum yield point of 55 KSI.
3. All poles and arms shall comply with the dimensional tolerances specified in ASTM A500, A501, or A595.
4. All poles and arms shall be round or dodecagonal (12 sided) tubes with a 0.14 inch/foot taper.
5. Hardened washers shall conform to ASTM F436.
6. All poles and arms shall be galvanized inside and outside after fabrication in accordance with ASTM A123. Painting shall conform to Section 522, Duplex Coating System.
7. Pole and mast arm splices shall be mechanically forced together for a snug fit.
8. Blind bolts shall be A307 Grade A steel and are not required for multisided poles. Mechanical alternatives to blind bolts utilizing friction, keys, interlocking teeth or a combination thereof to prevent the built-up box from twisting on the pole may be used as approved by CDOT Staff Bridge.
9. All mast arms more than 40 feet in length shall be two piece construction to limit arm weights.
10. Galvanized ASTM A325 HS bolts shall be used for attaching luminaire and mast arms. A lubricated tightening torque of 178 foot-pounds for ¾ inch diameter bolts, 395 foot-pounds for 1 inch diameter bolts and 1300 foot-pounds for 1½ inch diameter bolts shall be used to tighten all HS bolts. Mast arms shall be temporarily supported to take load off of field connections while bolts are tightened in order to firmly seat the flange plate. Bolts shall be sequentially tightened. Assuming 12 bolts and a clock face, the tightening sequence would be 12, 6, 1, 7, etc. This process shall be continued until no loose bolts are found after all bolts have been initially tightened.
11. Cast pole end cap to be secured in place with 3 set screws.
12. All signal heads, signs, and hardware shall be field positioned.
13. Accessories to be hot dip galvanized in accordance with ASTM A153.
14. All plates and stiffeners shall be fabricated with AASHTO M270 (ASTM A709) Grade 36 steel and shall comply with the dimensional tolerances specified in ASTM A6. All handholes shall be fabricated with ASTM A572 Grade 42 steel.
15. Leveling concrete shall be 3000 psi air entrained concrete vibrated in place below the pole base plate.
16. Caissons shall be placed against undisturbed earth. Wet or caving holes shall be backfilled with flow-fill and redrilled after a three day curing period without the use of a casing.
17. Caissons shall be constructed with air entrained Class BZ concrete in accordance with Section 503 of the Standard Specifications. Reinforcing steel shall be Grade 60.
18. Caisson concrete must have a minimum compressive strength of 2,700 psi before installing the signal structure; verify concrete strength with maturity meter.
19. U-Bolts and anchor bolts shall be fabricated with AASHTO M314-90 Grade 55 steel.
20. Anchor bolts shall be fabricated with heavy hex nuts and flat washers, and extended a minimum of ¾ inches above the nut after completing the tightening process. Thread upper 12 inches and galvanize upper 13 inches of the anchor bolts. Field welding of anchor bolts to rebar during erection will not be allowed. Anchor bolts shall be set with a steel template until the concrete has cured at least two days. The anchor bolts shall be tightened using the turn-of-nut method. The bolts shall first be tightened to snug tight, which is defined as the tightness that exists when the upper and lower nuts are in firm contact with the base plate. With mast arms free to deflect, the upper and lower nuts shall then each be rotated an additional ½ turn (30° ± 5°) with a slugging, hydraulic or air impact wrench.
21. Welding of steel shall conform to the requirements of ANSI/AWS D1.1. All areas to be welded shall be ground to bright metal. All welding and required testing shall be complete before any material is galvanized. All circumferential and stiffener welds shall be non-destructively tested using the enhanced magnetic particle method in accordance with Subsection 509.18 (d) of the Standard Specifications. The acceptance criteria is stated in Table 8.1 of ANSI/AWS D1.1. All longitudinal welds within 6 inches of full penetration circumferential groove welds and full penetration groove welds shall be inspected as specified above. Maximum weld undercut shall be 0.01 inches.
22. All electrical connections to the signal shall be grounded in accordance with applicable Electrical Codes.
23. Certified Mill Test Reports Including Charpy V-notch Test Results, Weld Inspection Reports and Enhanced Magnetic Particle Test Reports Shall be submitted to CDOT Staff Bridge, 2829 W Howard Place, Denver Colorado, 80204 as soon as they become available. CVN Test Results for ASTM A572 Grades 42 and 65 steel shall have a minimum value of 15 feet-pounds at 40°F as per the H Frequency Test requirements in AASHTO T243 (ASTM A673).
24. Shop drawings shall be submitted to the Engineer for review in accordance with Subsection 105.02 of the Standard Specifications.
25. Standard Abbreviations: UNO = Unless Noted Otherwise
WP = Work Point
26. Traffic signals mounted on mast arms shall be furnished with Astro type mounting brackets.
27. End section diameters must be increased to accommodate out-of-roundness, galvanizing thickness and seam weld profiles to provide the minimum required arm slip splice lengths and pole member overlaps.
28. Use 35 feet of ¾ inch high strength chain (safe working load of 5,000 pound), two "S" shaped hooks properly forged from 1 inch square bar stock and two 4,000 pound capacity come-alongs to seat the pole end section on its base section by attaching the come-alongs to opposing access holes in the built-up box with the "S" shaped hooks and pulling against the chain which is strung underneath the pole base plate. Apply enough force to align the wire access holes and to seat the slip splice within 4 inch of the specified length.
29. Secure arm flange plate, pole base plate, and connection faceplate during welding to prevent distortion.
30. One drilled hole with a maximum diameter of ¾ inch is allowed at locations marked with a ▲ to accommodate electrical wiring.
31. See S-614-42 and S-614-43 for "Cabinet Foundation Details" and "Traffic Loop And Misc. Signal Details" respectively.
32. Signal faces shall be the same size within each signal head.
33. Traffic control devices on a Colorado State Highway that is being replaced or refurbished because it is damaged, missing, or no longer serviceable for any reason shall be replaced with a device compliant with all applicable CDOT Standards and Specifications.

Computer File Information		Sheet Revisions		 Colorado Department of Transportation Traffic Safety & Engineering Services 2829 West Howard Place Denver, CO 80204 EB/SNH	Typical Traffic Signal 15' - 75' Double Mast Arms 60' - 75' Single Mast Arm	Standard Plan No.
Creation Date: 07/04/12	<input type="checkbox"/>	Date:	Comments			S-614-40
Created By: SCL	<input type="checkbox"/>					Standard Sheet No. 1 of 6
Last Modification Date: 07/01/26	<input type="checkbox"/>				Issued by the Traffic Safety & Engineering Services: July 01, 2026	
Last Modified By: YSP	<input type="checkbox"/>					Project Sheet Number:
CAD Ver.: ORD 10.12 Scale: Not to Scale Units: English	<input type="checkbox"/>					

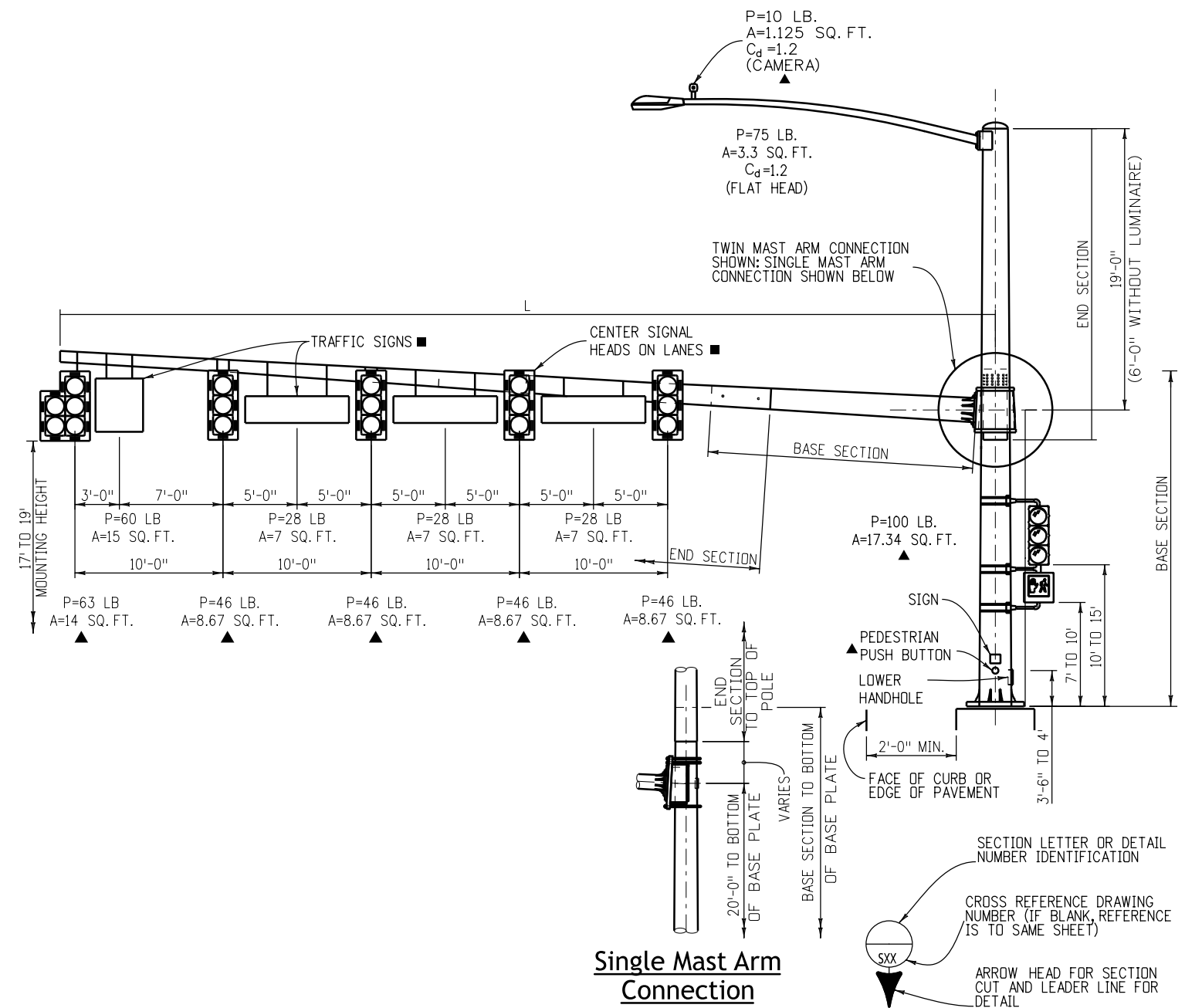
Design Data

- Drawing shown has 5 signal heads, shorter arm lengths may have fewer heads. This configuration is intended to represent a worst case loading condition.

70', (75')	55', 60', (65')	45', (50')	35', (40')	25', (30')
5 Signal Heads	5 Signal Heads	4 Signal Heads	3 Signal Heads	2 Signal Heads

The design length "L" for each series is shown in parentheses.

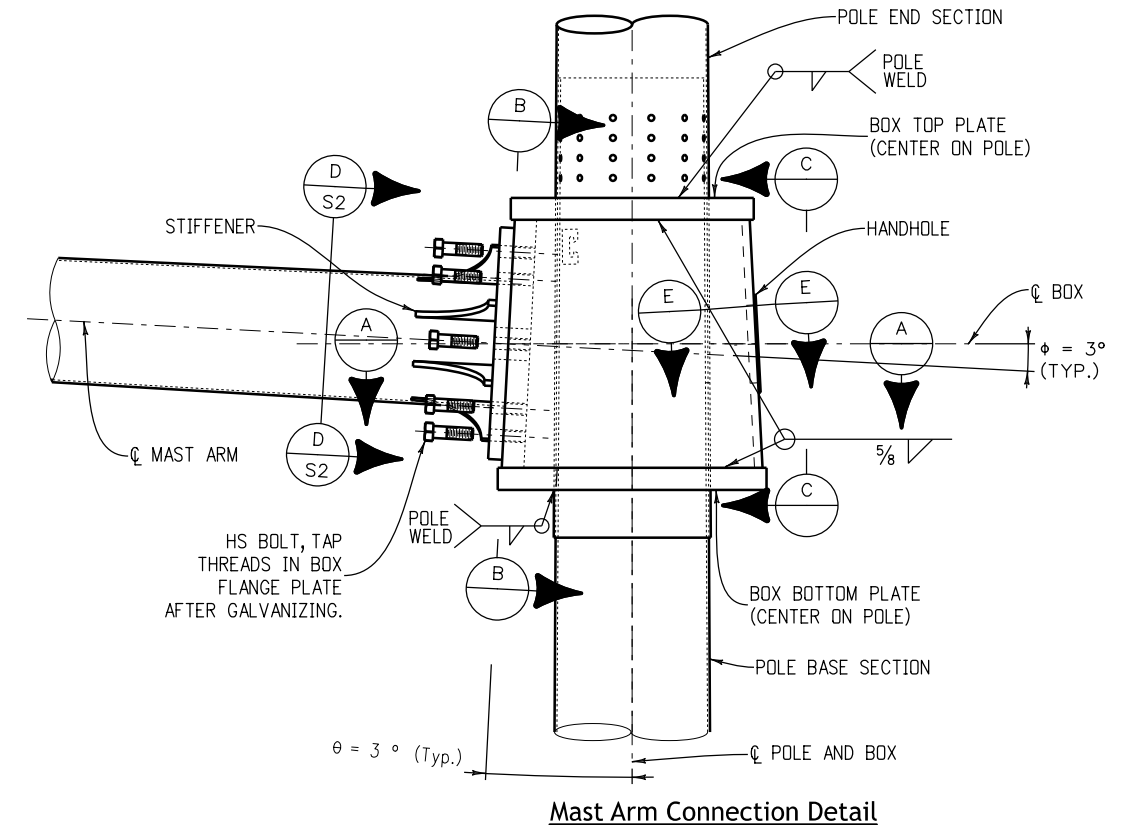
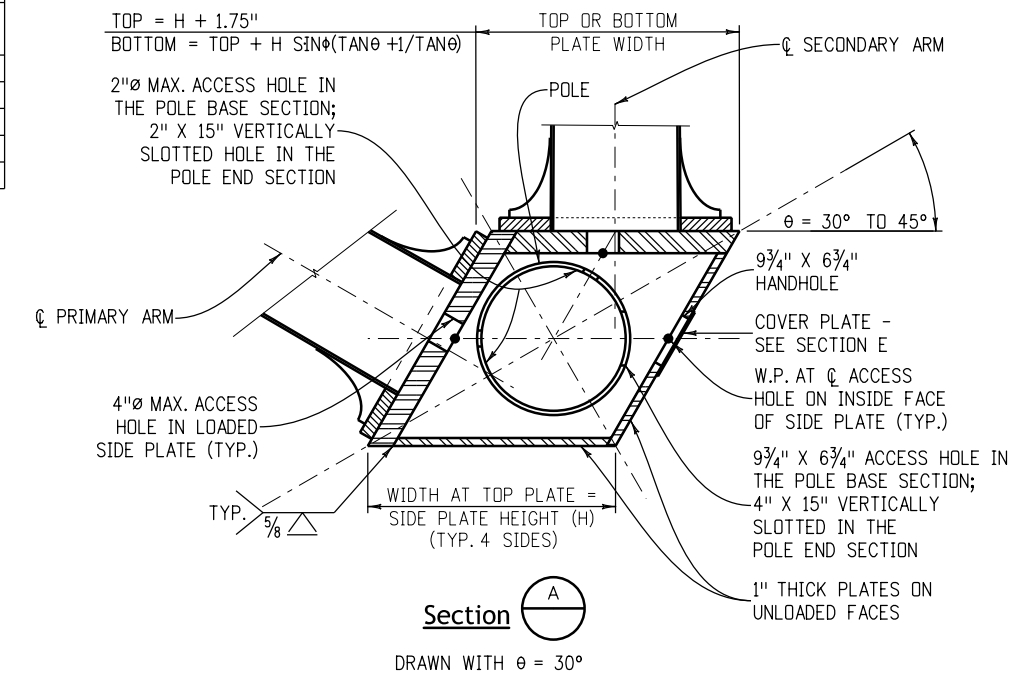
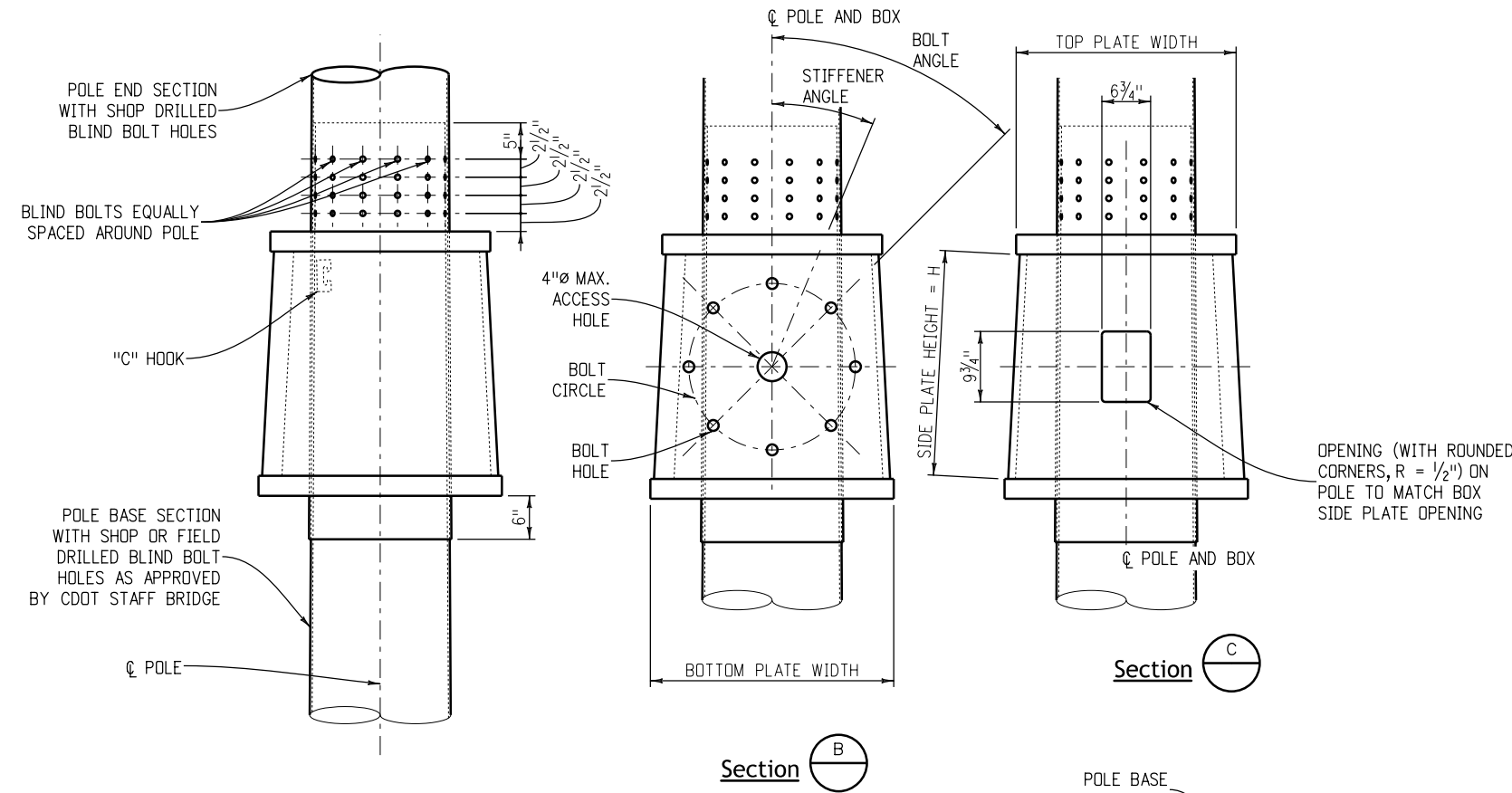
- For the twin mast arm connection, the second arm is assumed to be within 60° to 120° of the primary arm and is assumed to be loaded with the same loads as shown above. The secondary arm may be the same length as or shorter than the primary arm.
- The designs herein assume that signals are installed within the roadway earthwork prism with the following soil parameters:
Soil Density $\gamma = 110$ pound/cubic feet
Soil Cohesion = 750 pound/ square feet for medium stiff cohesive soil
Soil ϕ Angle = 30° for medium dense cohesionless soil
SF = 1.5 for torsional resistance and 3.0 for flexural resistance
- Contact the Engineer if any of the following soil conditions are encountered during drilling:
(A) Signals will not be installed within the roadway earthwork prism.
(B) The soil has a high organic content or consists of saturated silt and clay.
(C) The site won't support the weight of the drilling rig.
(D) The foundation soils are not homogenous.
(E) Firm bedrock is encountered.
- Traffic signal structures have been designed in accordance with the AASHTO Standard Specifications for Structural Supports for Highway Signs, Luminaires, and Traffic Signals, Fourth Edition, 2001.
- A design wind velocity of 100 mph and one 12 foot lane with a 65 mph truck induced gust loading have been used for the designs herein.



Computer File Information		Sheet Revisions		Colorado Department of Transportation	Traffic Safety & Engineering Services	Typical Traffic Signal	Standard Plan No.
Creation Date: 07/04/12		Date:	Comments				
Created By: SCL					2829 West Howard Place Denver, CO 80204	60' - 75' Single Mast Arm	Standard Sheet No. 2 of 6
Last Modification Date: 07/01/26							
Last Modified By: YSP							Project Sheet Number:
CAD Ver.: ORD 10.12 Scale: Not to Scale Units: English							

MAST ARM LENGTH (FT.)	BLIND BOLT DATA				BUILT-UP BOX DATA *						POLE DATA						
	NO. OF	DIA. (IN.)	BOLTS PER ROW	NO. OF ROWS	THICKNESS OF BOX PLATES UNO (IN.)	POLE WELD (IN.)	SIDE PLATE	TOP PLATE	BOTTOM PLATE	BASE SECTION			END SECTION WITH LUMINAIRE ♦				
							H (IN.)	WIDTH FOR $\theta = 45^\circ$ (IN.)	WIDTH FOR $\theta = 45^\circ$ (IN.)	LENGTH (FT.)	TOP ϕ (IN.)	BOTTOM ϕ (IN.)	THK. (IN.)	LENGTH (FT.)	TOP ϕ (IN.)	BOTTOM ϕ (IN.)	THK. (IN.)
30	24	0.75	6	4	1.50	0.1875	22	23.75	26.053	22.29	9.11	12.23	0.3125	20.54	7.25	10.13	0.2391
40	30	0.75	6	5	2.00	0.1875	25	26.75	29.367	22.67	11.81	14.98	0.3125	20.71	10.00	12.90	0.2391
50	36	0.75	12	3	2.50	0.1875	26	27.75	30.471	22.33	14.86	17.98	0.3125	20.79	13.00	15.91	0.2391
65	48	0.75	12	4	2.75	0.1875	31	32.75	35.995	22.77	18.54	21.73	0.3125	21.02	16.75	19.69	0.2391
75	60	0.75	12	5	3.00	0.1875	33	34.75	38.204	23.08	20.75	23.98	0.3125	21.12	19.00	21.96	0.2391

* Use larger arm in a double arm signal to determine plate thickness and dimensions.
 ♦ See general note 27 on sheet 1 of 6.



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Colorado Department of Transportation

Traffic Safety & Engineering Services
 2829 West Howard Place
 Denver, CO 80204 EB/SNH

Typical Traffic Signal
15' - 75' Double Mast Arms
60' - 75' Single Mast Arm

Issued by the Traffic Safety & Engineering Services: July 01, 2026

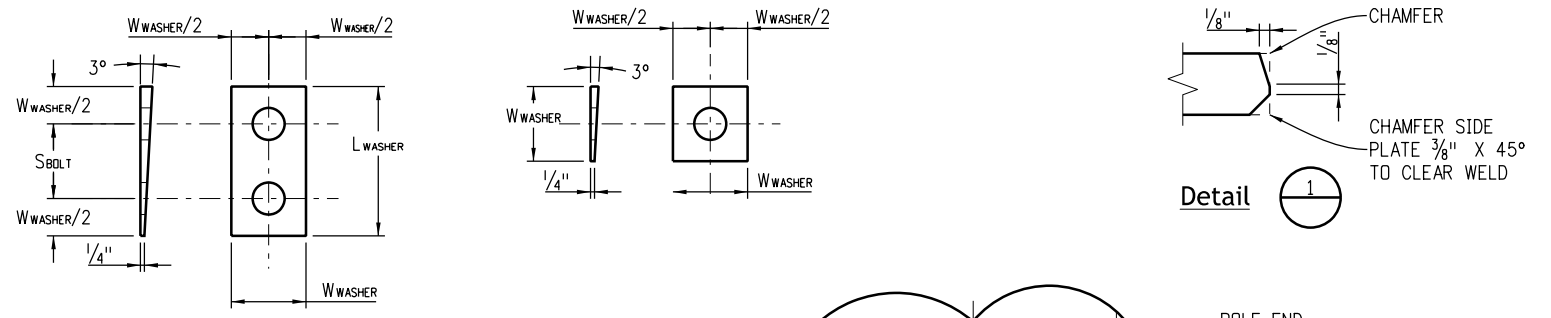
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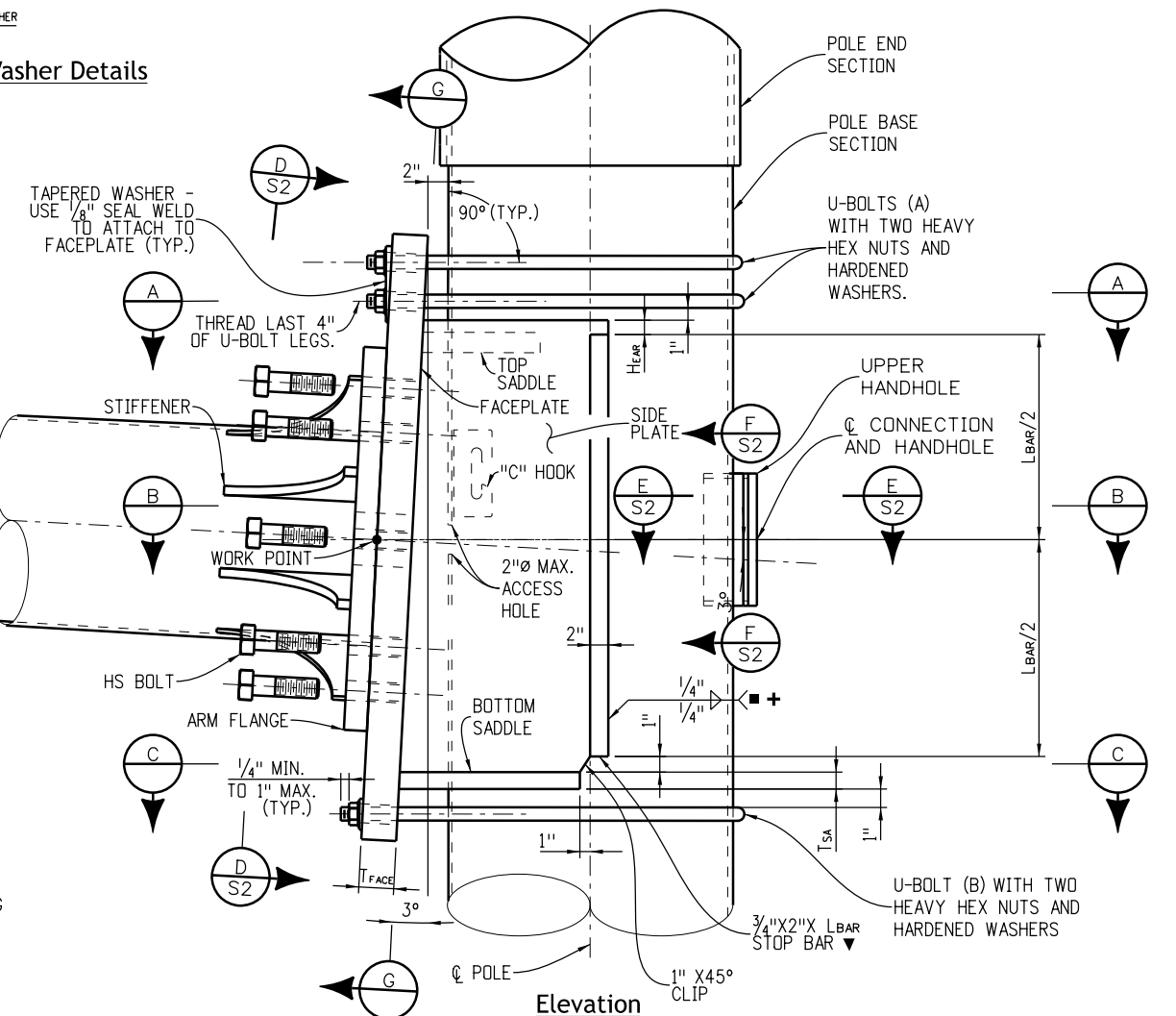
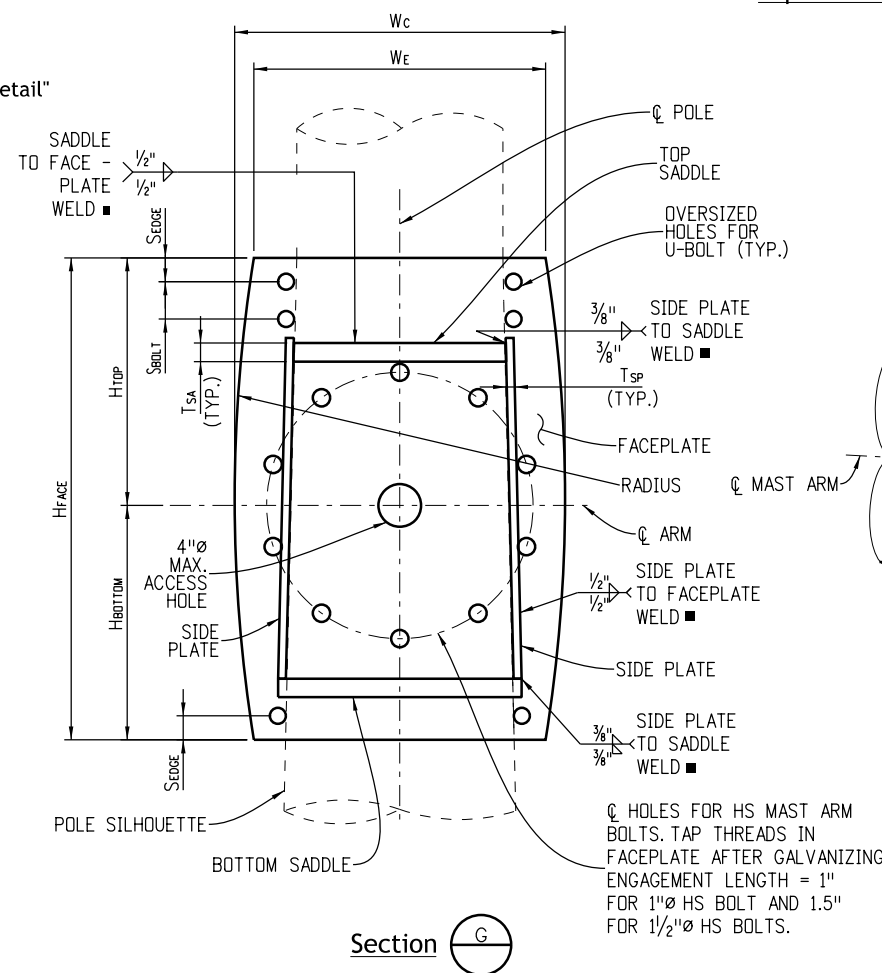
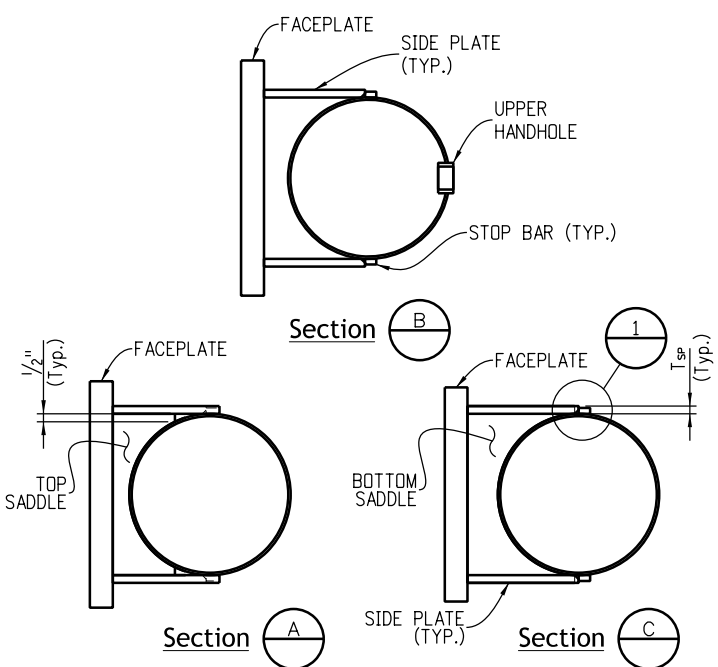
Project Sheet Number:

MAST ARM LENGTH (FT.)	FACEPLATE DATA								STOP BAR DATA BAR LENGTH (L _{BAR}) (IN.)	SIDE PLATE DATA		WASHER DATA			U-BOLT DATA			
	FACEPLATE HEIGHTS			THICKNESS OF FACEPLATE (T _{FACE}) (IN.)	WIDTH OF FACEPLATE		RADIUS (IN.)	EDGE DISTANCE (S _{EDGE}) (IN.)		THICKNESS OF SIDE PLATE (T _{SP}) (IN.)	EAR HEIGHT (H _{EAR}) (IN.)	LENGTH OF WASHER (L _{WASHER}) (IN.)	WIDTH OF WASHER (W _{WASHER}) (IN.)	BOLT SPACING (S _{BOLT}) (IN.)	DIAMETER OF U-BOLT (D _{U-BOLT}) (IN.)	BEND RADIUS U-BOLT (A) (IN.)	BEND RADIUS U-BOLT (B) (IN.)	DIAMETER OF OVERSIZED HOLE (IN.)
	TOP (H _{TOP}) (IN.)	BOTTOM (H _{BOTTOM}) (IN.)	TOTAL (H _{FACE}) (IN.)		ENDS (W _E) (IN.)	CENTER (W _C) (IN.)												
65	24.91	20.91	45.81	2.375	25.67	29.00	158.58	2.563	28.000	1.125	1.500	8.500	3.50	5.000	1.375	10.05	10.26	1.688
75	26.59	22.59	49.19	2.500	28.07	31.00	207.07	2.563	31.000	1.125	1.625	8.500	3.50	5.000	1.500	11.23	11.46	1.813

MAST ARM LENGTH (FT.)	POLE DATA								SADDLE DATA THICKNESS OF SADDLE PLATES (T _{SA}) (IN.)
	BASE SECTION *				END SECTION WITH LUMINAIRE ◆				
	LENGTH (FT.)	TOP Ø (IN.)	BOTTOM Ø (IN.)	THK. (IN.)	LENGTH (FT.)	TOP Ø (IN.)	BOTTOM Ø (IN.)	THK. (IN.)	
65	26.30	18.05	21.73	0.3125	14.99	16.75	18.85	0.2391	1.500
75	26.74	20.24	23.98	0.3125	14.83	19.00	21.07	0.2391	1.625

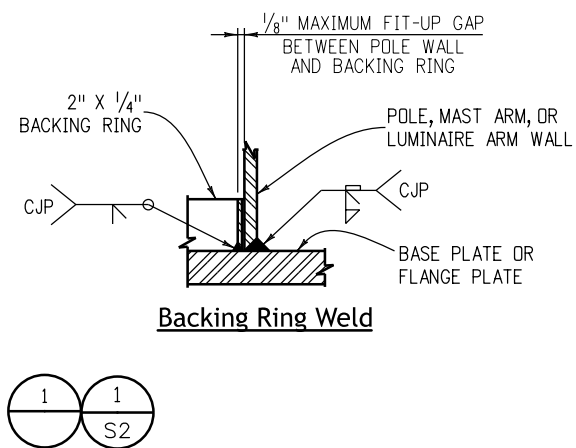
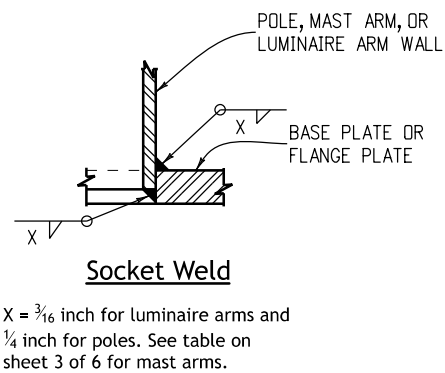
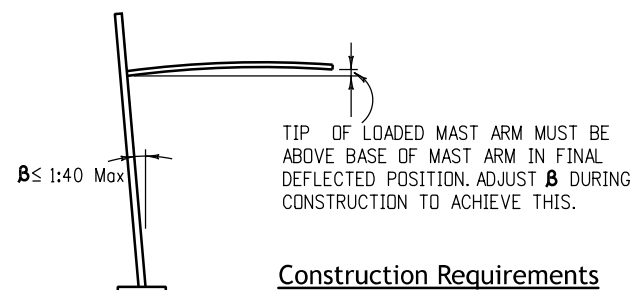
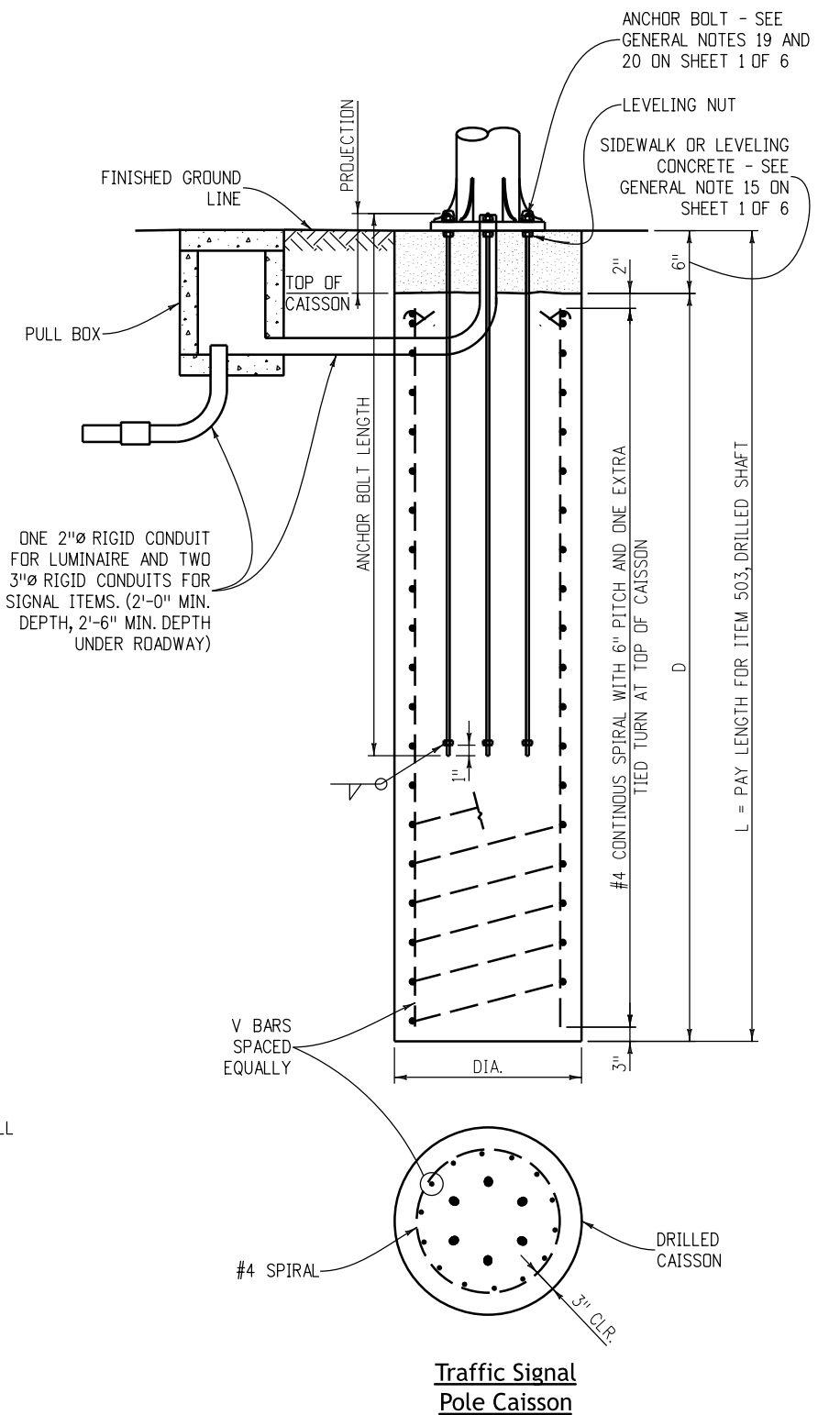
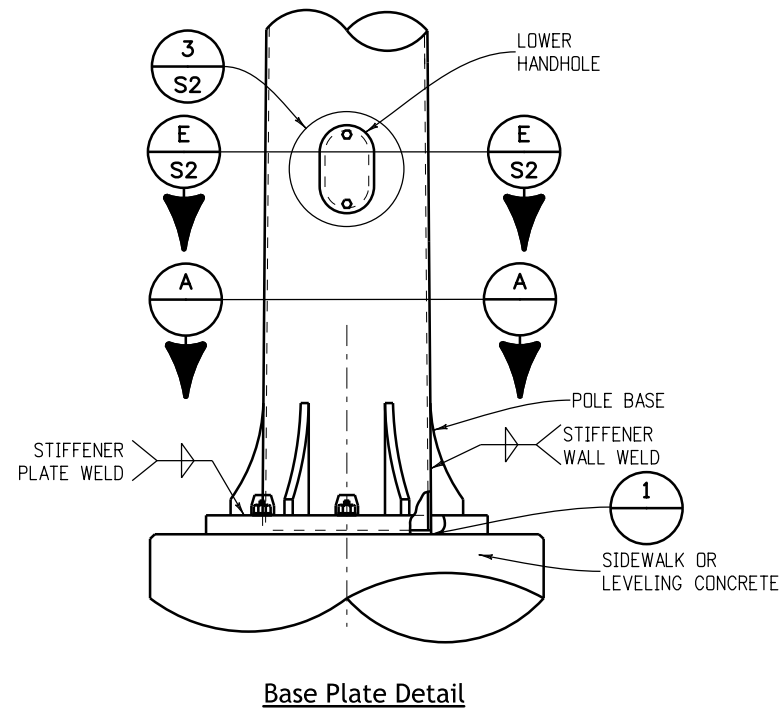
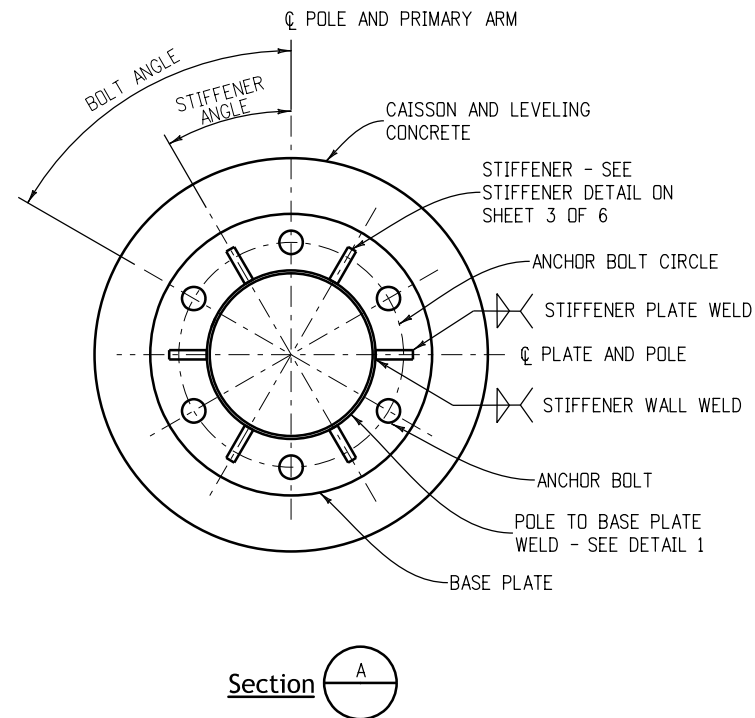


- Bend radius measured to the ϕ of each U-Bolt. Increase radii as needed to accommodate out-of-roundness, galvanizing thickness and seam weld profiles. U-Bolts shall be tightened $\frac{1}{2}$ turn ($30^\circ \pm 5^\circ$) past snug tight; peen threads after tightening. U-Bolts and faceplate shall be mounted on base section prior to shipment.
- ✚ Match fit stop bar to side plate using tack welds to ensure uniform bearing.
- ★ Base section lengths include the splice length as per the "Mast Arm Slip Splice Detail" on sheet 3 of 6.
- ◆ See general note 27 on sheet 1 of 6.
- End all welds $\frac{1}{2}$ inch short of bolt hole and plate edges.
- ▼ Bend stop bar to match pole curvature.



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MAST ARM LENGTH (FT.)	POLE BASE CONNECTION DATA																CAISSON DATA (FOR SINGLE AND DOUBLE ARM INSTALLATIONS)					
	STIFFENER						BASE PLATE		ANCHOR BOLT						V BARS							
	NO. OF	THK. (IN.)	WIDTH (IN.)	HEIGHT (IN.)	RADIUS (IN.)	ANGLE	WALL WELD (IN.)	PLATE WELD (IN.)	DIA. (IN.)	THK. (IN.)	NO. OF	DIA. (IN.)	LENGTH (IN.)	CIRCLE DIA. (IN.)	HOLE DIA. (IN.)	ANGLE	PROJECTION (IN.)	DIA. (IN.)	DEPTH (D) (FT.)	PAY LENGTH (L) (FT.)	SIZE	TOTAL
30	6	0.75	5.0	10	10.600	30.0°	0.25	0.625	24	2.25	6	2.0	63	17.75	2.25	60.0°	11.25	36	12.5	13	#9	11
40	6	0.75	5.5	11	11.841	30.0°	0.25	0.625	27	2.50	6	2.0	63	21.00	2.25	60.0°	11.50	36	14.5	15	#9	11
50	6	0.75	6.5	13	14.327	30.0°	0.25	0.625	32	2.75	6	2.0	63	25.00	2.25	60.0°	11.75	42	16.5	17	#9	14
65	6	0.75	8.0	16	18.063	30.0°	0.25	0.625	39	3.00	6	2.5	63	30.25	2.75	60.0°	12.50	48	20.5	21	#9	18
75	6	0.75	8.5	17	19.309	30.0°	0.25	0.625	42	3.25	6	2.5	63	33.00	2.75	60.0°	12.75	54	20.5	21	#9	23



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