GENERAL NOTES

1. ALL STRUCTURAL STEEL SHALL CONFORM TO THE REQUIREMENTS SHOWN IN THE MATERIALS TABLE ON SHEET 2.
2. SIGN STRUCTURES SHALL BE CONSTRUCTED TRUE TO THE SPECIFIED DIMENSIONS, SHALL BE FREE FROM KINKS, TWISTS OR BENDS, AND SHALL BE UNIFORM IN APPEARANCE. THE COMPLETED SECTIONS SHALL BE ASSEMBLED IN THE SHOP AND SHALL BE CHECKED FOR STRAIGHTNESS, ALIGNMENT, AND DIMENSIONAL ACCURACY. ANY VARIATIONS SHALL BE CORRECTED TO THE SATISFACTION OF THE ENGINEER.
3. MAST ARMS SHALL BE TEMPORARILY SUPPORTED TO TAKE ALL LOAD OFF OF THE FIELD SPLICES WHILE BOLTS ARE BEING TIGHTENED IN ORDER TO FIRMLY SEAT THE FLANGE PLATES.
4. POSTS FOR TUBULAR SIGN STRUCTURES SHALL BE FORMED TO THE RADII SHOWN ON THE PLANS BY HEAT TREATMENT OR BY FABRICATION TO SUCH RADII BY METHODS WHICH WILL NOT CRIMP OR BUCKLE THE INTERIOR RADIUS OF THE PIPE BEND.
5. CLIPS, EYES, OR REMOVABLE BRACKETS SHALL BE AFFIXED TO ALL POSTS AND MAST ARMS, AS NECESSARY, TO SECURE THE SIGN DURING SHIPPING AND FOR LIFTING AND MOVING DURING ERECTION. THIS IS TO PREVENT DAMAGE TO THE FINISHED GALVANIZED OR PAINTED SURFACES. BRACKETS ON TUBULAR SIGN STRUCTURES SHALL BE REMOVED AFTER ERECTION. DETAILS OF SUCH DEVICES SHALL BE SHOWN ON THE SHOP DRAWINGS.
6. HIGH-STRENGTH BOLTED CONNECTIONS SHALL CONFORM TO THE PROVISIONS IN SECTION 509.28 OF THE STANDARD SPECIFICATIONS. ASSEMBLY OF HIGH-STRENGTH BOLTED CONNECTIONS FOR SIGN STRUCTURES MAY BE MADE WITH GALVANIZING OR PAINT ON THE CONTACT (FAYING) SURFACES.
7. ALL SIGN STRUCTURES SHALL BE FABRICATED INTO THE LARGEST PRACTICAL SECTIONS PRIOR TO GALVANIZING. SPLICE LOCATIONS SHALL BE SUBMITTED TO THE ENGINEER FOR APPROVAL AND THE CONTRACTOR SHALL NOT COMMENCE FABRICATION UNTIL SUCH SPLICE LOCATIONS ARE APPROVED.
8. ALL PIPE MEMBERS SHALL BE HOT-DIP GALVANIZED INSIDE AND OUTSIDE AFTER FABRICATION AS PER ASTM A123, UNLESS PAINTING IS CALLED FOR ON THE PLANS. PAINTING SHALL CONFORM TO SECTION 522, DUPLEX COATING SYSTEM. WALKWAY GRATINGS, WALKWAY BRACKETS, SAFETY RAILINGS, ACCESS LADDER AND CAGE, STEEL MOUNTINGS FOR LIGHT FIXTURES AND ALL NUTS, BOLTS AND WASHERS FOR SIGN STRUCTURES SHALL BE GALVANIZED AFTER FABRICATION PER ASTM A123 OR ASTM A153, AS APPROPRIATE AND SHALL NOT BE PAINTED. BOLTS SHALL BE LUBRICATED PRIOR TO INSTALLATION. TENSION CONTROL BOLTS OR DIRECT TENSION INDICATING WASHERS USED IN HIGH-STRENGTH BOLTED CONNECTIONS SHALL BE MECHANICALLY GALVANIZED PER ASTM B695, COATING CLASS 55.
9. ALL CONCRETE SHALL BE CLASS BZ WITH AIR ENTRAINMENT; REINFORCING STEEL SHALL BE GRADE 60. CAISSON CONCRETE MUST HAVE A MINIMUM COMPRESSIVE STRENGTH OF 2,700 PSI BEFORE INSTALLING THE SIGN STRUCTURE; VERIFY CONCRETE STRENGTH WITH MATURITY METER.
10. STRUCTURES SHALL BE GROUNDED IN ACCORDANCE WITH APPLICABLE ELECTRICAL CODES.
11. SHEETS IN THE INDEX MARKED WITH A ■ PROVIDE INSTRUCTIONS TO DESIGNERS FOR THEIR USE IN THE PREPARATION OF THE SIGN X-SECTION SHEETS IN THE ROADWAY PLANS.
12. NPS = NOMINAL PIPE SIZE; O.D. = OUTSIDE DIAMETER.
13. SHOP DRAWINGS SHALL BE SUBMITTED TO THE ENGINEER FOR REVIEW IN ACCORDANCE WITH SUBSECTION 105.02 OF THE STANDARD SPECIFICATIONS.
14. INSTALL STRUCTURE IDENTIFICATION PANEL IN ACCORDANCE WITH M AND S STANDARD S-614-12 USING TWO 1#2" WIDE STAINLESS STEEL BANDS AND STAINLESS STEEL FLARED LEG BRACKETS WITH HEX HEAD BOLTS (BAND-IT D315 OR EQUIVALENT).
15. CAISSON, STEEL SUPPORTS AND SURVEY WORK SHALL BE PAID FOR IN ACCORDANCE WITH BID ITEMS 503, 614 AND 625 RESPECTIVELY.
16. CANTILEVER ARMS MARKED WITH A ▲ MUST BE LEVEL OR TILTED UPWARD NO MORE THAN 1° MAXIMUM AFTER INSTALLATION OF THE SIGN.
17. THERE SHALL BE NO PENETRATIONS OF THE TUBE MEMBERS OTHER THAN AS SHOWN IN THESE PLANS UNLESS APPROVED BY THE ENGINEER PRIOR TO FABRICATION.

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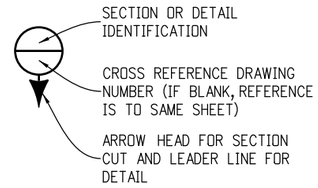
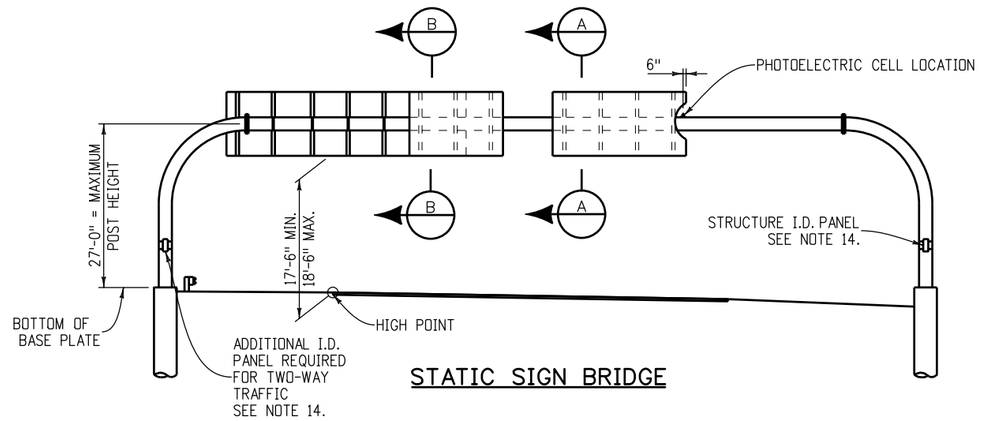
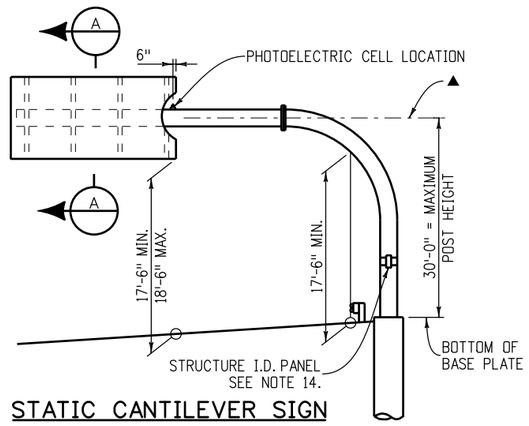
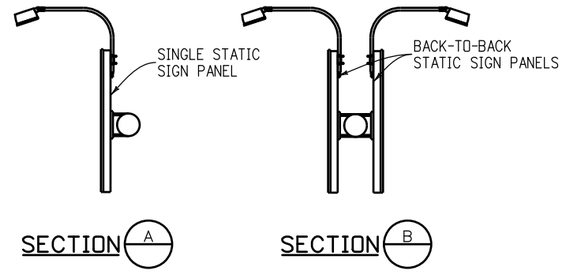




STATIC SIGN BRIDGE



STATIC CANTILEVER SIGN



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GENERAL NOTES (CONTINUED)

18. WELDING OF STEEL SHALL CONFORM TO THE REQUIREMENTS OF AWS D 1.1. ALL AREAS TO BE WELDED SHALL BE GROUND TO BRIGHT METAL. NO BUTT WELD SPLICES WILL BE PERMITTED. ALL WELDING AND REQUIRED TESTING SHALL BE COMPLETE BEFORE ANY MATERIAL IS GALVANIZED.

    ENHANCED MAGNETIC PARTICLE TESTING SHALL BE PERFORMED ON AREAS DEFINED IN AWS D1.1 AND HEREIN. ENHANCED MAGNETIC PARTICLE TESTING SHALL BE CONDUCTED IN ACCORDANCE WITH ASTM E 709 AND AWS D 1.1, EXCEPT AS AMENDED HEREIN. ALTERNATING CURRENT SHALL BE USED. THE YOKE SPACING SHALL BE BETWEEN 2 AND 4 INCHES. THE MINIMUM LIFTING POWER SHALL BE 10LBS. RED DRY PARTICLES SHALL BE USED. THE LIGHT INTENSITY SHALL MEET ASTM E 709, SECTION 7. PARTICLE APPLICATION AND SPECIMEN PREPARATION SHALL MEET THE REQUIREMENTS OF ASTM E 709 SECTIONS 9 AND 15, EXCEPT WHITE NON-AQUEOUS DEVELOPER MEETING ASTM E 165, TYPE 3, SHALL BE APPLIED TO THE TEST SURFACE PRIOR TO TESTING.

    THE YOKES SHALL BE SET IN TWO POSITIONS WHEN TESTING THE WELD OR BASE METAL. THEY SHALL BE POSITIONED BOTH NORMAL AND PARALLEL WITH RESPECT TO THE WELD AXIS AND ROLLING DIRECTION OF THE BASE METAL.

    ENHANCED MAGNETIC PARTICLE TESTS SHALL BE PERFORMED AT THE FOLLOWING LOCATIONS:

    (1) BASE METAL. ALL AREAS CONTACTED BY THE CARBON ARC GOUGE ELECTRODE, THE ELECTRODE CUP, AND THE WELDING ELECTRODE. ALL THREE CONDITIONS ARE ARC STRIKES.

    (2) FILLET WELDS. EACH DESIGN WELD SIZE ON MAIN MEMBER TO MAIN MEMBER AND SECONDARY MEMBER TO MAIN MEMBER WELDMENTS. ALL STOP-STARTS AND WELD TERMINI. ALL LINEAR INDICATIONS SHALL FURTHER BE EVALUATED WITH 10X OR 30X MAGNIFICATION. VERIFICATION SHALL BE RESOLVED BY EXCAVATION.

    (3) GROOVE WELDS. ALL THROUGH THICKNESS EDGES ON TRANSVERSE BUTT JOINT WELDMENTS IN TENSION AREAS.

    (4) REPAIRS. ALL REPAIR WELDS TO CORRECT DEFECTS IN GROOVE AND FILLET WELDS, PLATE CUT EDGES, CORRECTION OF FABRICATION ERRORS IN CUTTING, PUNCHING, DRILLING, OR FITTING, AND MEMBERS WHICH ARE TACKED OR WELDED AND SUBSEQUENTLY CUT APART AND REWELDED.

19. ALL CIRCUMFERENTIAL AND ALL LONGITUDINAL PIPE SEAM WELDS WITHIN 5" OF FULL PENETRATION CIRCUMFERENTIAL GROOVE WELDS SHALL BE FULL PENETRATION GROOVE WELDS AND SHALL BE INSPECTED AS SPECIFIED HEREIN. THE ACCEPTABLE MAXIMUM WELD UNDERCUT IS 0.01".

MATERIALS

ELEMENT	SPECIFICATION ASTM	AASHTO	CLARIFICATIONS
POSTS, MAST ARMS	A53		#1
BARS, PLATES AND SHAPES	A709	M-270	#2
HOLLOW STRUCTURAL SECTIONS (HSS)	A500		#3
HIGH-STRENGTH BOLTS (H.S. BOLTS)	A325	M-164	#4
HIGH-STRENGTH NUTS	A563	M-291	
HIGH-STRENGTH WASHERS	F436	M-292	#5
U-BOLTS (RODS)	F1554	M-314	GRADE 55 STEEL
ANCHOR BOLTS	F1554	M-314	GRADE 55 STEEL

#1 PIPESS SHALL BE WELDED OR SEAMLESS STEEL PIPE CONFORMING TO THE SPECIFICATIONS OF ASTM DESIGNATION: A53, GRADE B.

#2 GRADES 36 OR 50 STEEL. ASTM A992 SHAPES MAY BE SUBSTITUTED.

#3 HOLLOW STRUCTURAL SECTION SPECIFICATIONS APPLY TO THE STRUCTURAL TUBING SECTIONS (TS) USED AT HANDHOLES AND STATIC SIGN LIGHTING LOCATIONS.

#4 TENSION CONTROL (TC) BOLTS CONFORMING TO ASTM F1852 MAY BE SUBSTITUTED FOR ASTM A325 BOLTS. ALL OTHER BOLTS AND NUTS SHALL CONFORM TO THE SPECIFICATIONS OF ASTM DESIGNATION: A307. INSTALL A307 BOLTS WITH COMMERCIAL QUALITY WASHERS.

#5 ASTM F959, COMPRESSIBLE-WASHER-TYPE DIRECT TENSION INDICATORS MAY BE SUBSTITUTED FOR ASTM F436 WASHERS AT HIGH-STRENGTH BOLTED CONNECTIONS.

DESIGN DATA

SPECIFICATIONS:

DESIGN: "STANDARD SPECIFICATIONS FOR STRUCTURAL SUPPORTS FOR HIGHWAY SIGNS, LUMINAIRES AND TRAFFIC SIGNALS", AMERICAN ASSOCIATION OF STATE HIGHWAY AND TRANSPORTATION OFFICIALS (1994 AASHTO).

"FATIGUE-RESISTANT DESIGN OF CANTILEVERED SIGNAL, SIGN AND LIGHT SUPPORTS", NATIONAL COOPERATIVE HIGHWAY RESEARCH PROGRAM (NCHRP) REPORT 412, 1998.

SUBSECTION 17.4, SIGNS, IN THE STAFF BRIDGE BRANCH BRIDGE DESIGN MANUAL.

CONSTRUCTION: CDOT STANDARD SPECIFICATIONS, THESE STANDARD SHEETS AND THE PROJECT PLANS.

WIND LOADING: 80, 90 OR 100 MPH VELOCITY AS PER THE SELECTION TABLES.

OVERHEAD SIGN X-SECTION SHEET(S) SHALL SHOW:

1. SIGN STRUCTURE LOCATION (HIGHWAY, STATION AND DIRECTION)
2. LENGTH OF STRUCTURE SPAN
3. PANEL SIZE AND LOCATION ON STRUCTURE
4. OFFSET FROM SHOULDER
5. POST HEIGHT(S) FROM TOP OF CAISSON TO ℄ MAST ARM
6. CAISSON DIAMETER AND MINIMUM EMBEDMENT
7. TOP OF CAISSON ELEVATION
8. CAISSON PAY LENGTH
9. STATIONS AND OFFSETS TO CAISSON
10. GUARDRAIL PROTECTION LIMITS
11. LANE LINE LOCATION(S)
12. AS CONSTRUCTED BLOCK
13. PHOTOELECTRIC CELL LOCATION IF REQUIRED

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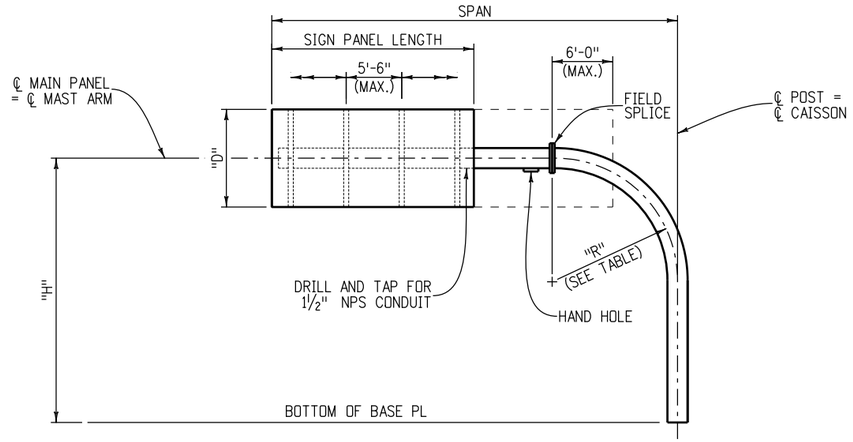

CANTILEVER

CANTILEVER NOTES

1. THE MAXIMUM SIGN PANEL OVERLAP ONTO ELBOW SHALL NOT EXCEED 6'-0" FROM THE FIELD SPLICE.
2. ALL POSTS BETWEEN BASE PLATE AND FIELD SPLICE SHALL HAVE A TUBE WALL THICKNESS OF ½". ALL MAST ARMS SHALL HAVE A TUBE WALL THICKNESS OF ⅜".
3. SEE SHEET 7 FOR FIELD SPLICE DETAILS.

PIPE POST	
PIPE OD (IN.)	"R" (FT.)
12.75	8
14	8
16	8
18	8
20	8
24	10

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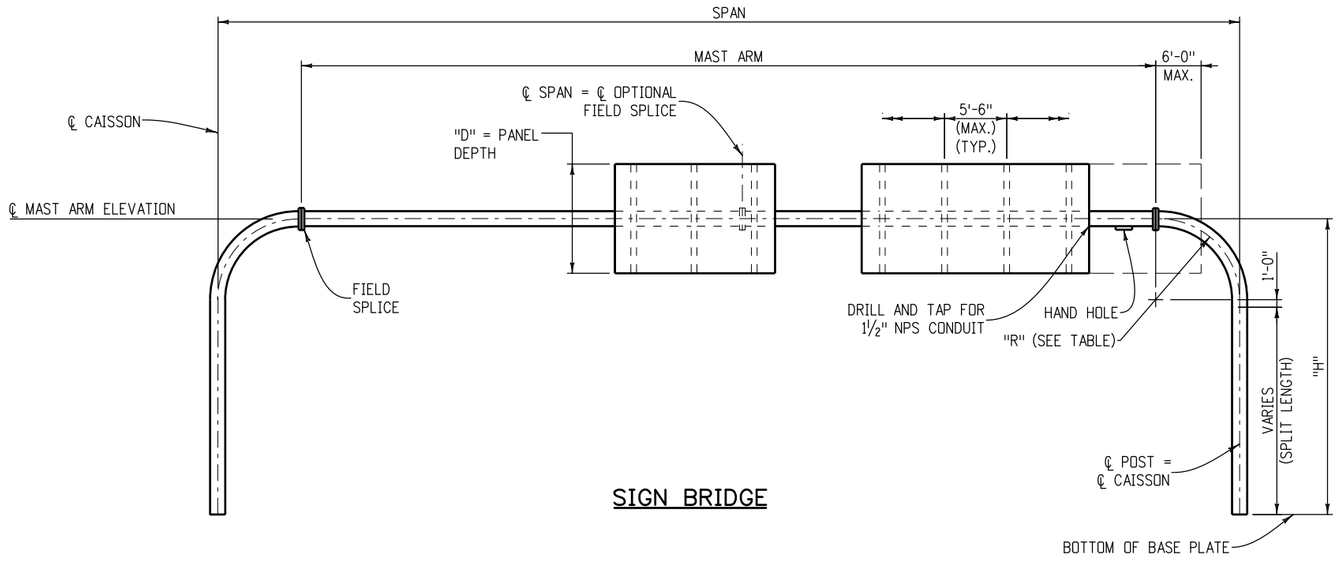
-SIGN BRIDGE INSTALLATION DETAILS-



SIGN BRIDGE

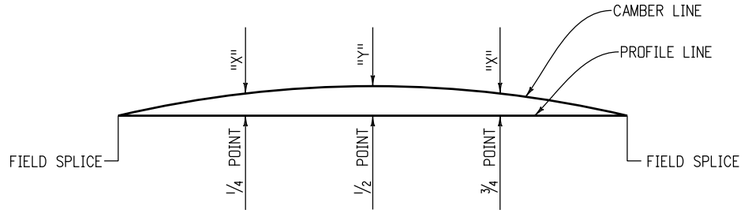
✳ PIPE POST

PIPE OD (IN.)	"R" (FT.)	CAMBER TYPE
12.75	8	Ⓐ
14	8	Ⓐ
16	8	Ⓑ
18	8	Ⓒ
20	10	Ⓒ
24	12	Ⓓ•

• USE CAMBER TYPE E FOR 130' - 140'.
✳ MAST ARM DIAMETER SAME AS POST.
◯ INDICATES CAMBER TYPE, SEE TABLE.

CAMBER

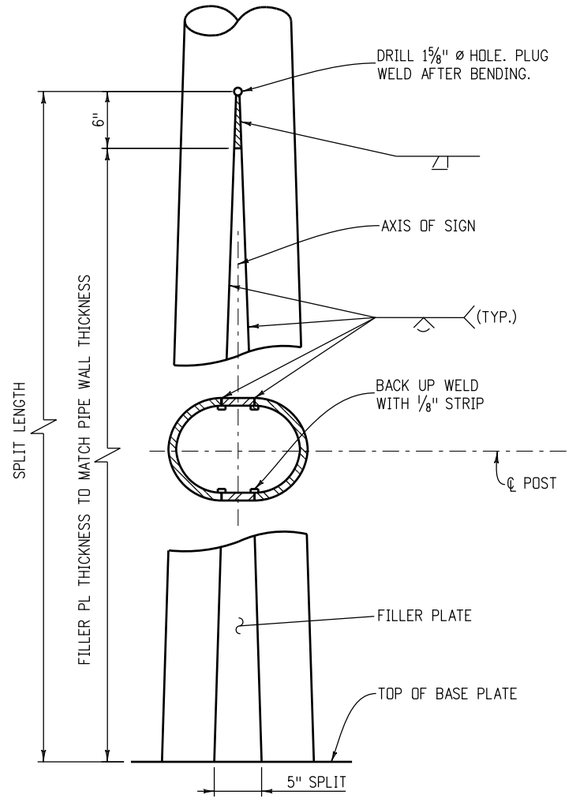
TYPE	"X"	"Y"
Ⓐ	1½"	2"
Ⓑ	2¼"	3"
Ⓒ	2¾"	4"
Ⓓ	3½"	5"
Ⓔ	4½"	6"



CAMBER DIAGRAM

NOTES

1. THE MAXIMUM SIGN PANEL OVERLAP ONTO ELBOW SHALL NOT EXCEED 6'-0" FROM THE FIELD SPLICE.
2. ALL POSTS BETWEEN BASE PLATE AND FIELD SPLICE SHALL HAVE A TUBE WALL THICKNESS OF ½". ALL MAST ARMS SHALL HAVE A TUBE WALL THICKNESS OF ⅜".
3. BEFORE ANY PORTION OF THE SIGN FRAMES ARE ASSEMBLED IN THEIR FINAL POSITIONS THE CONTRACTOR SHALL DEMONSTRATE TO THE ENGINEER BY PREASSEMBLY OR OTHER APPROVED METHODS THAT THE SPAN LENGTHS OF THE FRAMES IN THE NO LOAD CONDITION MATCH WITHIN ½" OF THE FIELD MEASURED SPAN LENGTHS BETWEEN FOUNDATIONS.
4. IF THE SIGN FRAMES ARE ERECTED AS ONE UNIT, THEY SHALL BE ADEQUATELY SUSPENDED TO AVOID DISTORTIONS OR CHANGES IN SPAN LENGTH BETWEEN BASE PLATES.
5. FOR MAST ARMS WITH LENGTHS BETWEEN 40'-0" AND 80'-0" A BOLTED FIELD SPLICE WILL BE PERMITTED AT ℄ OF THE ARM TO FACILITATE GALVANIZING AND HAULING OPERATIONS. FOR MAST ARMS WITH LENGTHS GREATER THAN 80'-0", TWO BOLTED FIELD SPLICES WILL BE PERMITTED AT THE ⅓ POINTS TO FACILITATE GALVANIZING AND HAULING OPERATIONS.
6. SEE SHEET 7 FOR FIELD SPLICE DETAILS.



POST SPLIT DETAILS

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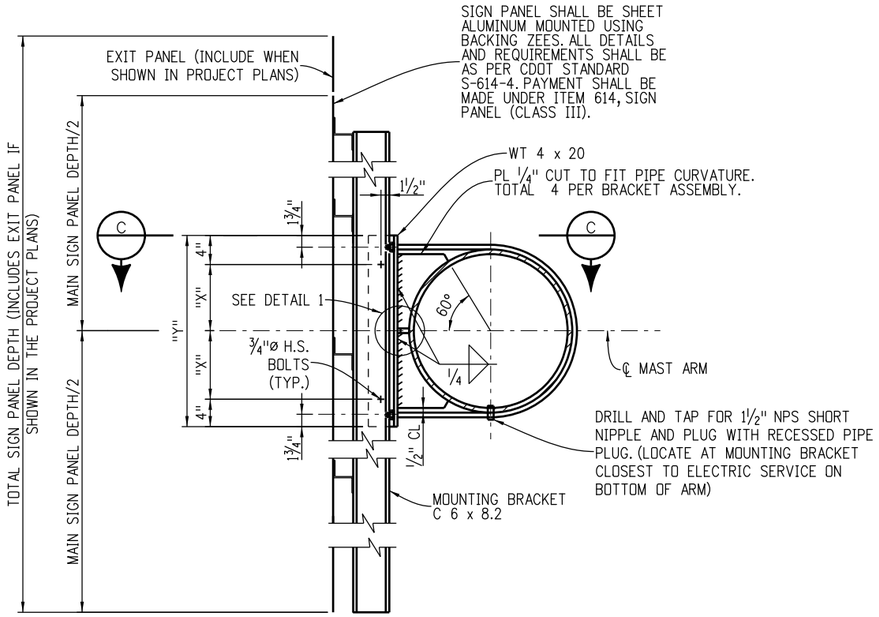
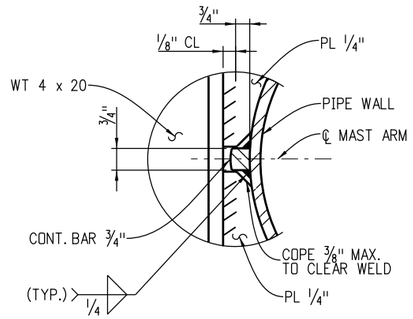
-SIGN MOUNTING BRACKET DETAILS-

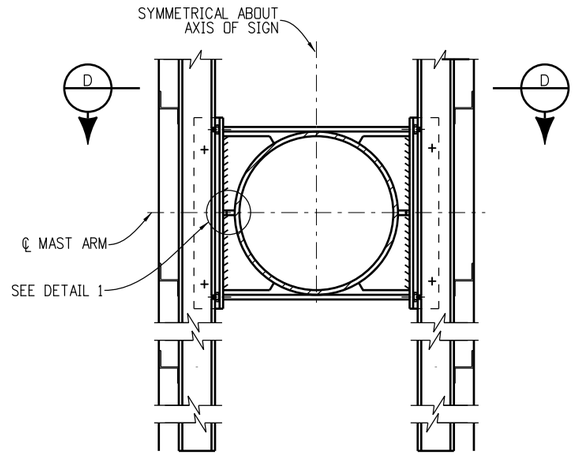


SINGLE SIGN PANEL



DETAIL 1

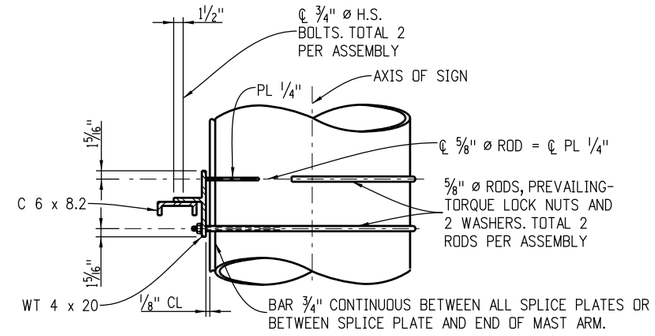
PIPE OUTSIDE DIAMETER (IN.)	DISTANCE "X" (IN.)	DISTANCE "Y" (IN.)
12.75	4 7/16	16 7/8
14	5 1/16	18 1/8
16	6 1/16	20 1/8
18	7 1/16	22 1/8
20	8 1/16	24 1/8
24	10 1/16	28 1/8



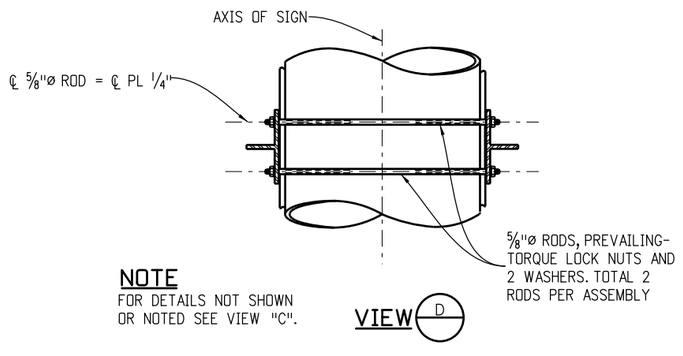
NOTES

FOR DETAILS NOT SHOWN OR NOTED SEE "SINGLE SIGN PANEL". ASSEMBLY DETAILS SHOWN APPLY TO TANGENT PORTION OF PIPE ONLY. FOR MOUNTING BRACKET ON ELBOW SEE DETAIL 2.

BACK-TO-BACK SIGN PANELS

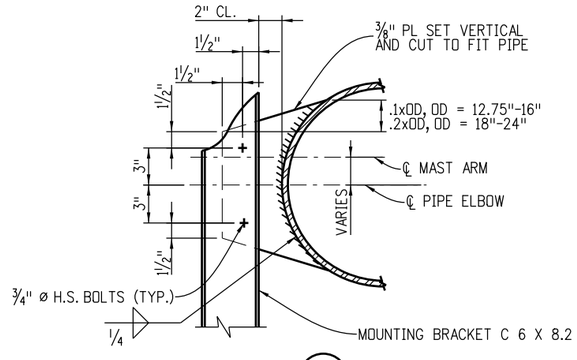


VIEW C



NOTE
FOR DETAILS NOT SHOWN OR NOTED SEE VIEW "C".

VIEW D



DETAIL 2

MOUNTING BRACKET ON ELBOW

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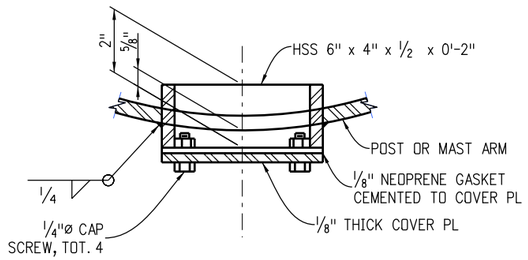
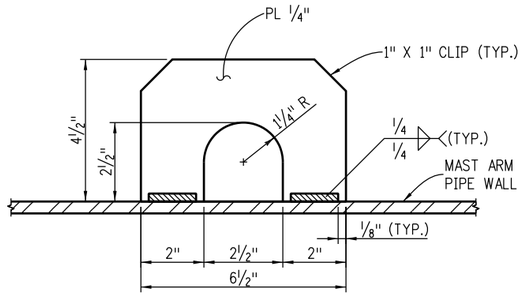
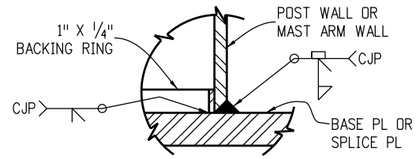
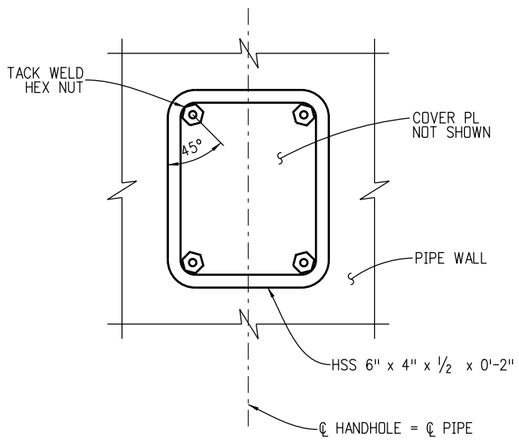




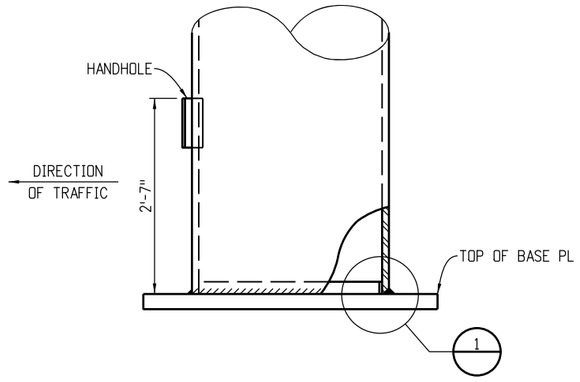
LIFTING EYE DETAIL



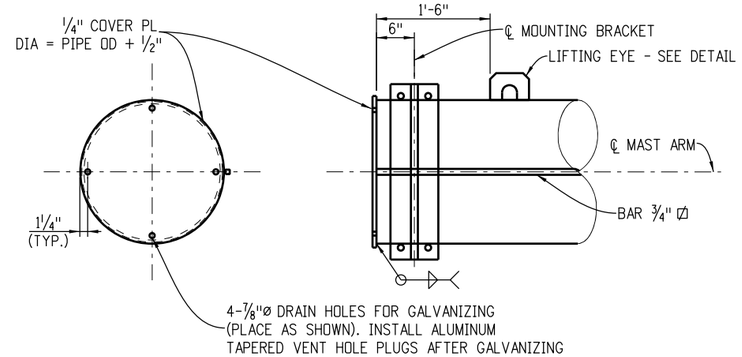
DETAIL 1



HANDHOLE AND COVER DETAILS



POST BASE ELEVATION
(FOR BASE PL DETAILS SEE SHEET 8)

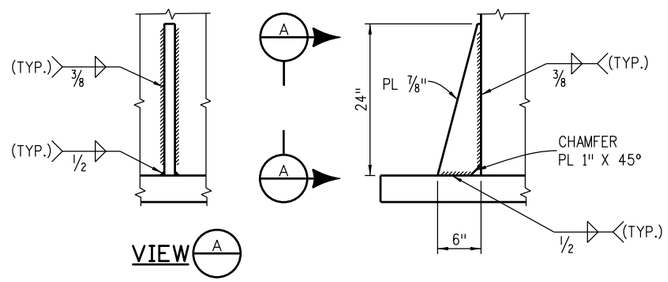


MAST ARM END DETAIL
(FOR CANTILEVER ARMS)

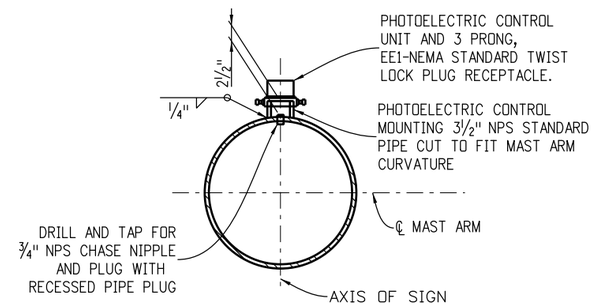
NOTES:

1. STIFFENERS ARE TO BE PLACED AT THE BASE OF ALL POSTS. SEE SHEET 8 FOR THE LOCATION OF STIFFENERS. STIFFENERS ARE NOT SHOWN ELSEWHERE IN THESE SHEETS FOR CLARITY.

2. TERMINATE WELD 1/2" SHORT OF THE TOP OF THE STIFFENER PLATE. AT THE OTHER 3 WELD TERMINATIONS ON THESE TWO TYPICAL WELDS STOP THE WELD 1/4" SHORT OF THE END OF THE PLATE.



STIFFENER DETAILS
(AT POLE BASE - SEE NOTES)



PHOTOELECTRIC CONTROL DETAILS
(SEE "LAYOUT" SHEET FOR LOCATION WHEN REQUIRED)

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STATIC SIGN MONOTUBE STRUCTURES

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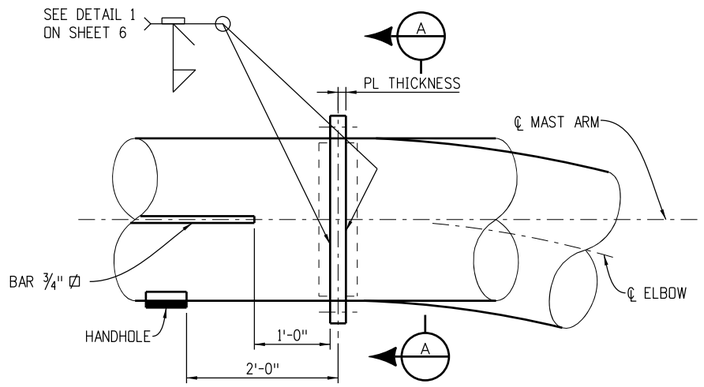
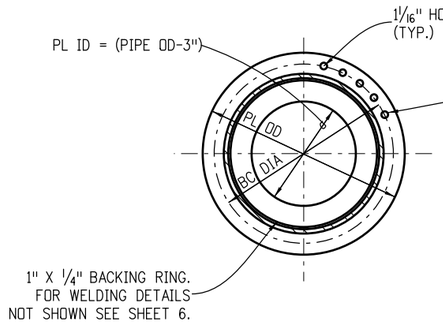


FIELD SPLICE



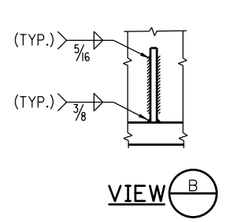
SECTION A

1" Ø H.S. BOLTS (GALVANIZED) EQUALLY SPACED. 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. SEE THE FIELD SPLICE TABLE FOR OTHER DETAILS

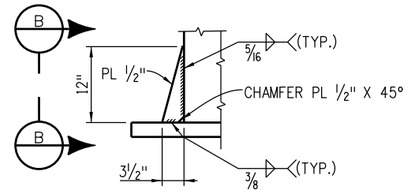
FIELD SPLICE

PIPE OUTSIDE DIAMETER (IN.)	PL THICKNESS (IN.) *	BC DIAMETER (IN.)	PL OD (IN.)	# OF STIFF.	# OF BOLTS
12.75	1¼	16	21	6	14
14	1¼	17	22	6	16
16	1¼	21	24	6	20
18	1⅜	23	26	10	22
20	1⅜	25	28	10	24
24	1½	29	32	12	28

* MINIMUM THICKNESS AFTER MACHINING AS CALLED FOR IN NOTE 4.



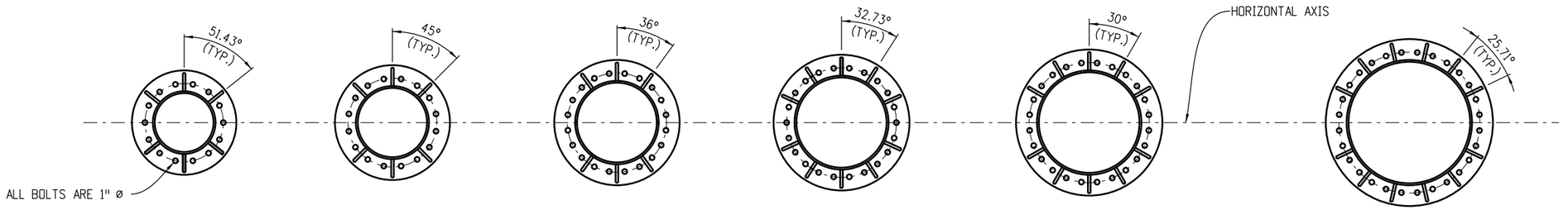
VIEW B



NOTES:

1. STIFFENERS ARE TO BE PLACED ON ALL FIELD SPLICES. STIFFENERS ARE NOT SHOWN ELSEWHERE IN THESE SHEETS FOR CLARITY.
2. TERMINATE WELD ½" SHORT OF THE TOP OF THE STIFFENER PLATE. AT THE OTHER 3 WELD TERMINATIONS ON THESE TWO TYPICAL WELDS, STOP THE WELD ¼" SHORT OF THE END OF THE PLATE.
3. SPLICE DESIGN BASED ON ARM CAPACITY.
4. THE MATING SURFACES OF THE FLANGE SPLICE PLATES SHALL BE MACHINED TO A COMMON PLANE WITHIN A TOLERANCE OF 1/64" USING A PORTABLE FLANGE FACER AFTER WELDING AND PRIOR TO GALVANIZING.

STIFFENER DETAILS
(AT FIELD SPLICE)



12.75" PIPE | 14" PIPE | 16" PIPE | 18" PIPE | 20" PIPE | 24" PIPE

FIELD SPLICE DETAILS

STIFFENERS SHALL BE LOCATED ON BOTH SIDES OF THE FIELD SPLICE.
CLIP WASHERS AS NEEDED TO AVOID INTERFERENCE WITH STIFFENER WELDS.

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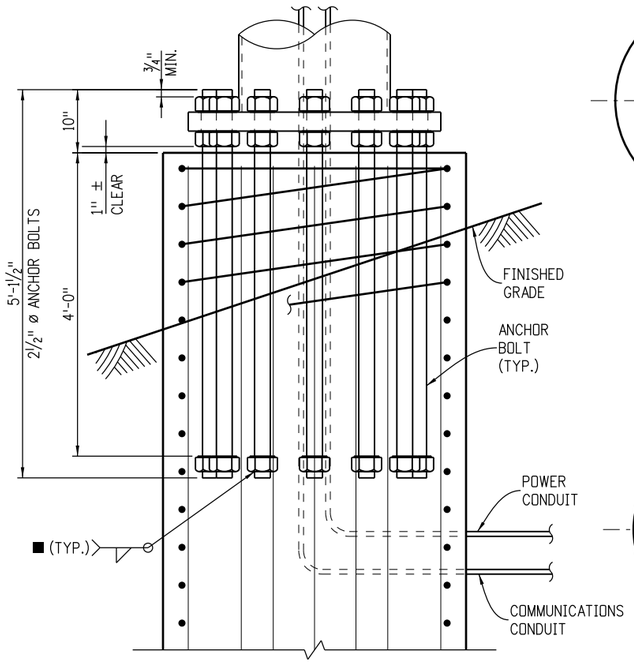
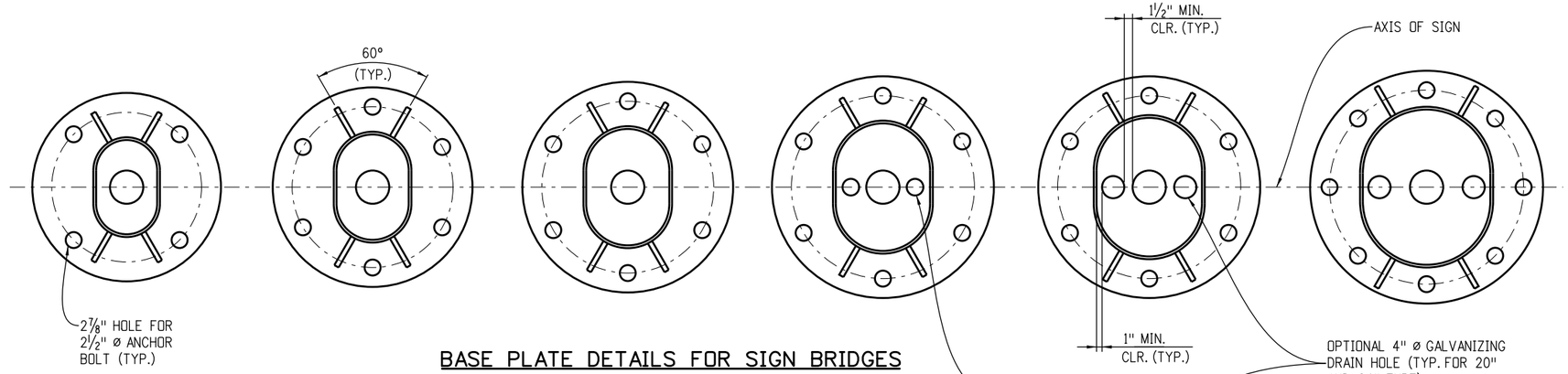
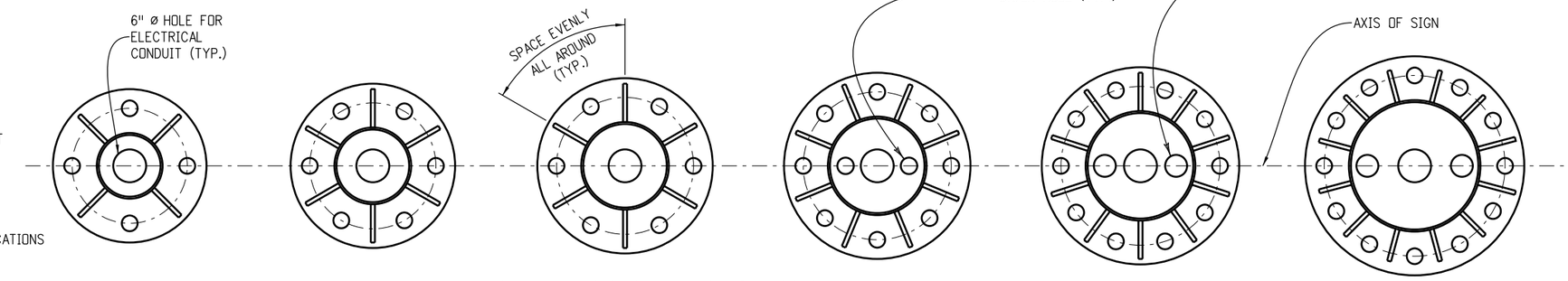


ANCHOR BOLT DETAIL

■ WELDING PROCEDURE IS NOT REQUIRED FOR THIS WELD



BASE PLATE DETAILS FOR SIGN BRIDGES



BASE PLATE DETAILS FOR CANTILEVERS

12.75" PIPE | 14" PIPE | 16" PIPE | 18" PIPE | 20" PIPE | 24" PIPE

CANTILEVERS

PIPE OD (IN.)	SPLIT (IN.)	BASE PL SIZE (DIAM. X THICK.) (IN.)	BOLT CIRCLE (IN.)	# OF ANCHOR BOLTS	# OF STIFF.
12.75	-	28" x 2.5"	21"	4	4
14	-	30" x 2.5"	23"	6	6
16	-	32" x 2.5"	25"	6	6
18	-	34" x 2.75"	27"	8	8
20	-	36" x 3.0"	29"	10	10
24	-	40" x 3.0"	33"	12	12

SIGN BRIDGES

PIPE OD (IN.)	SPLIT (IN.)	BASE PL SIZE (DIAM. X THICK.) (IN.)	BOLT CIRCLE (IN.)	# OF ANCHOR BOLTS	# OF STIFF.
12.75	5	34" x 2.5"	27"	4	4
14	5	36" x 2.5"	29"	6	4
16	5	38" x 2.5"	31"	6	4
18	5	40" x 2.75"	33"	6	4
20	5	40" x 3.0"	33"	6	4
24	5	42" x 3.0"	35"	8	4

NOTES

1. THREAD UPPER 10" AND GALVANIZE UPPER 1'-3" OF THE ANCHOR BOLTS.
2. ANCHOR BOLTS SHALL BE SET WITH A STEEL TEMPLATE UNTIL THE CONCRETE HAS CURED AT LEAST TWO DAYS.
3. THERE SHALL BE NO GROUT PAD INSTALLED ON TOP OF THE EXISTING FOUNDATIONS.
4. 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 THE MAST ARM FREE TO DEFLECT, THE UPPER AND LOWER NUTS SHALL EACH THEN BE ROTATED AN ADDITIONAL $^{1}/_{12}$ TURN (30° ± 5°) USING A SLUGGING WRENCH.
5. STIFFENERS ARE NOT SHOWN ELSEWHERE IN THESE SHEETS FOR CLARITY. ALL POST BASES ARE TO HAVE STIFFENERS.

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R-1	07-01-15	ANCHOR BOLTS EXTEND FROM NUT
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R-X		
R-X		

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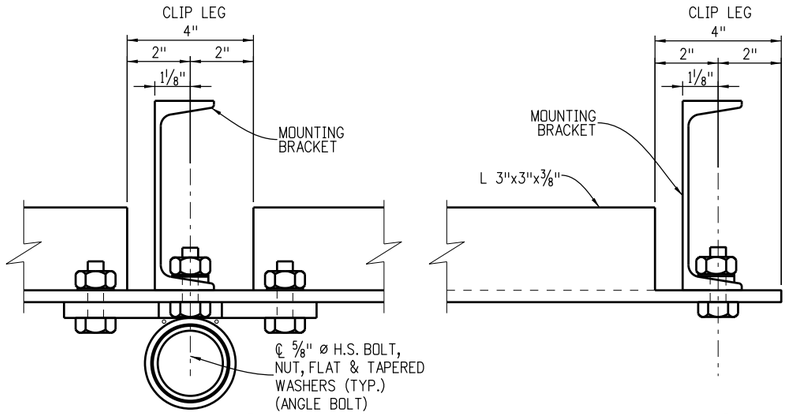
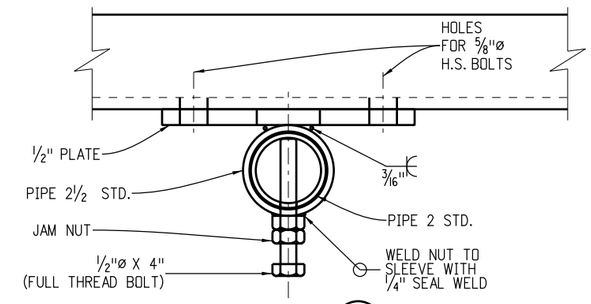
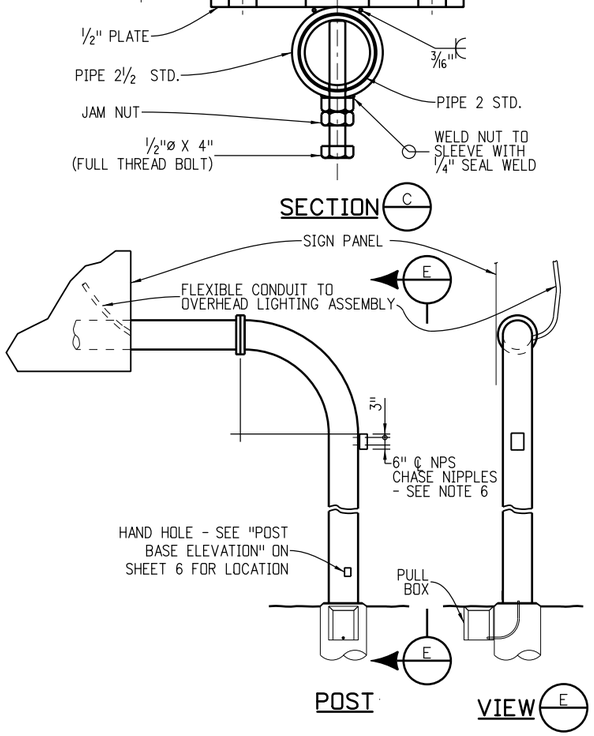
-SIGN LIGHTING DETAILS-

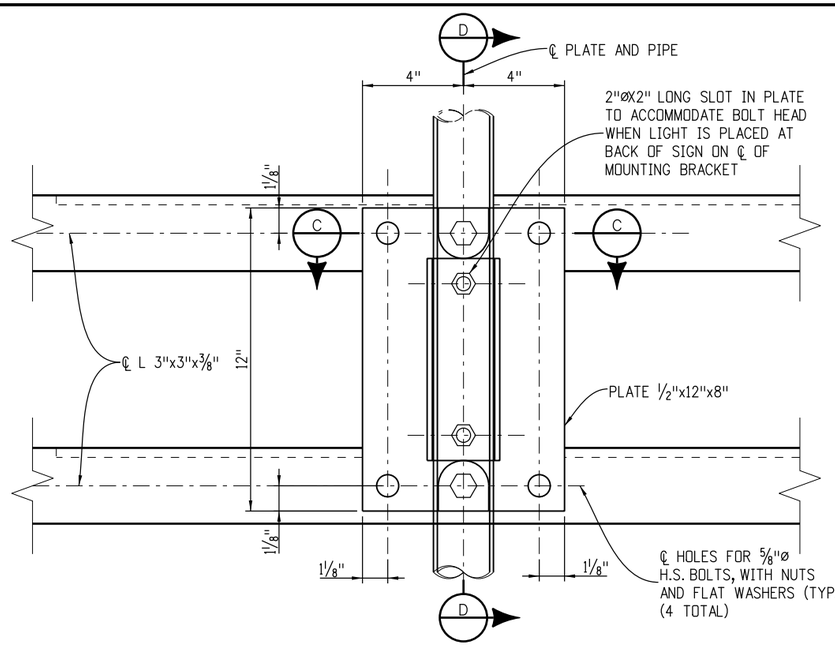
LIGHTING NOTES

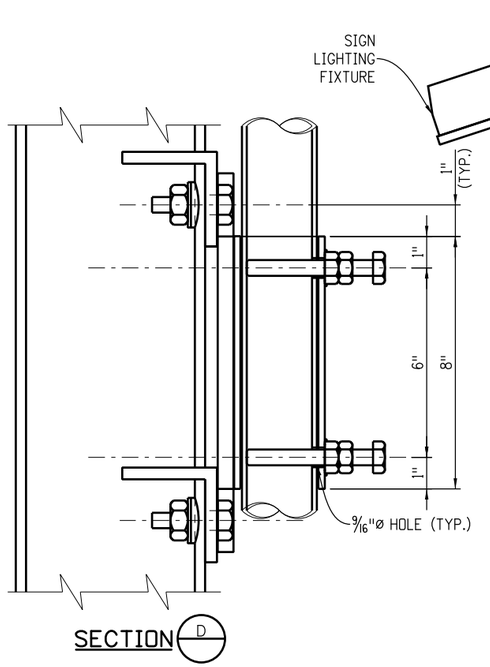
1. FIXTURES SHALL BE WATERTIGHT, DUSTPROOF AND DESIGNED FOR EASE OF LAMP AND BALLAST REPLACEMENT.
2. WHEN LIGHTS ARE REQUIRED, LAMP SHALL BE OF HIGH PRESSURE SODIUM TYPE (85 WATT OR 250 WATT AS DIRECTED BY THE ENGINEER). LAMPS AND BALLAST SHALL BE DESIGNED TO OPERATE OVER AN AMBIENT TEMPERATURE RANGE OF -20° F TO +120° F.
3. BALLASTS SHALL BE OF THE MAGNETIC REGULATOR TYPE SPECIFICALLY MANUFACTURED FOR USE WITH HIGH PRESSURE SODIUM LAMPS, AND SHALL OPERATE AT A MINIMUM OF 90% POWER FACTOR. OPERATION SHALL BE SUITABLE WITH A LINE VOLTAGE VARIATION OF ±10%.
4. THE TYPE, NUMBER AND SPACING OF FIXTURES SHALL BE PER MANUFACTURER'S SPECIFICATIONS TO MAINTAIN A MAXIMUM INITIAL ILLUMINATION OF THE SIGN FACE OF 30 FOOTCANDLES TO 60 FOOTCANDLES WITH A MAXIMUM UNIFORMITY RATIO (MAXIMUM ILLUMINATION / MINIMUM ILLUMINATION) OF 5:1.
5. FIXTURE AND MOUNTING DETAILS WILL BE SUBJECT TO APPROVAL BY THE ENGINEER.
6. DRILL AND TAP 1½" NPS CHASE NIPPLES AND PLUG WITH RECESSED PIPE PLUGS. PLACE PERPENDICULAR TO SIGN PANEL AXIS AND AWAY FROM APPROACHING TRAFFIC.

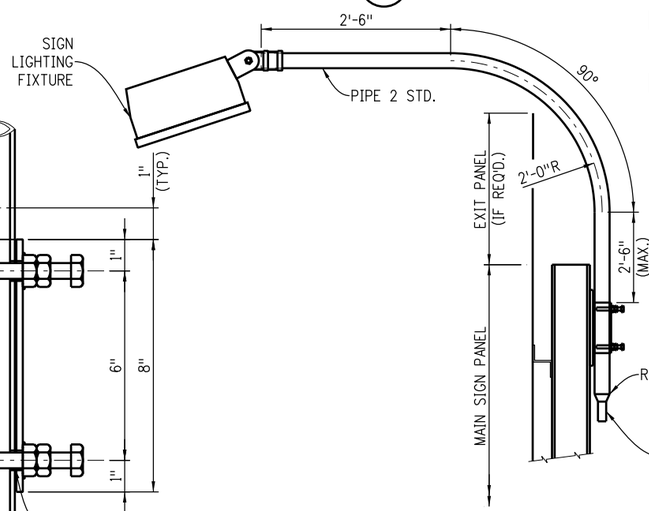


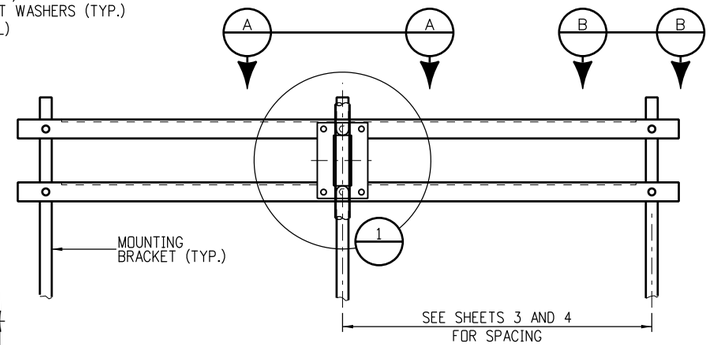


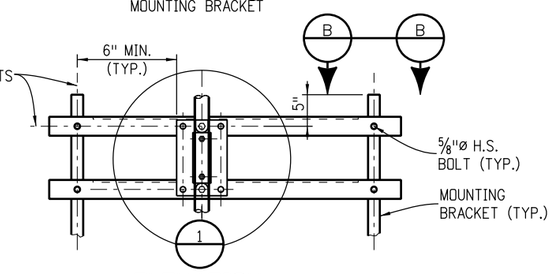












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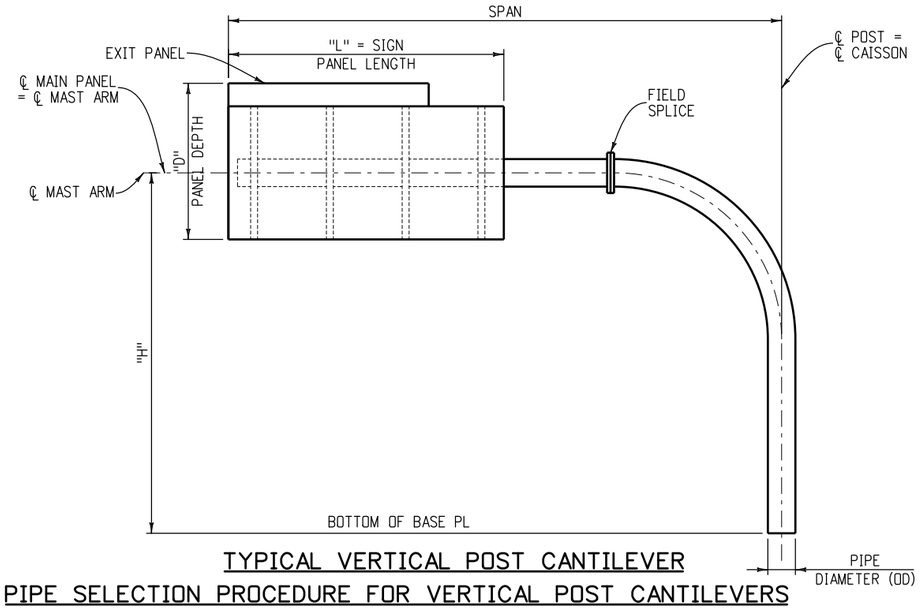

TYPICAL VERTICAL POST CANTILEVER

PIPE SELECTION PROCEDURE FOR VERTICAL POST CANTILEVERS

A. COVERAGE PERCENTAGE = $\frac{\text{SIGN PANEL LENGTH}}{\text{SPAN}}$ FOR THE SPAN LENGTH USE THE SPAN FROM ONE OF THE CHARTS (25', 35', ETC.), NOT THE ACTUAL SPAN

B. PICK THE PIPE OUTSIDE DIAMETER (OD) FROM THE 0-50% OR THE 51-80% CHART. THE COVERAGE PERCENTAGE CHOSEN SHOULD BE HIGH ENOUGH TO INCLUDE ANY SIGN PANELS WHICH MAY POTENTIALLY BE PLACED ON THIS SIGN IN THE FUTURE.

C. TO DETERMINE "D" FOR THE SELECTION CHARTS ADD THE AREA OF THE EXIT PANEL, IF PRESENT, TO THE MAIN SIGN PANEL AREA. DIVIDE BY THE MAIN PANEL LENGTH TO OBTAIN "D".

D. IF NO PIPE IS SHOWN FOR A CERTAIN SPAN THIS INDICATES THAT THIS SPAN/SIGN PANEL/HEIGHT COMBINATION EXCEEDS THE LIMITS OF THIS STANDARD.

E. ON THE OVERHEAD SIGN X-SECTION SHEET INDICATE THE DIAMETER OF THE PIPE, THE HEIGHT "H" AND THE SPAN.

F. OBTAIN THE DESIGN WIND SPEED FROM THE OVERHEAD SIGN X-SECTION SHEETS IN THE ROADWAY PLANS.

80 MPH WIND

"D" (FT.) →		10'		12'		14'	
"H" (FT.) →		H ≤ 25	25 < H ≤ 30	H ≤ 25	25 < H ≤ 30	H ≤ 25	25 < H ≤ 30
SPAN ≤ (FT.)	20	12.75	14	14	14	14	16
	25	14	16	16	16	16	18
	30	16	18	18	18	18	20
	35	18	20	20	20	24	24
	40	20	24	24	24	24	24
	45	24	24	24	24		

UP TO 50% COVERAGE CHART

"D" (FT.) →		10'		12'		14'	
"H" (FT.) →		H ≤ 25	25 < H ≤ 30	H ≤ 25	25 < H ≤ 30	H ≤ 25	25 < H ≤ 30
SPAN ≤ (FT.)	20	16	16	16	18	18	20
	25	18	18	18	20	20	24
	30	20	20	20	24	24	24
	35	24	24	24	24	24	
	40	24	24	24			
	45						

51-80% COVERAGE CHART

90 MPH WIND

"D" (FT.) →		10'		12'		14'	
"H" (FT.) →		H ≤ 25	25 < H ≤ 30	H ≤ 25	25 < H ≤ 30	H ≤ 25	25 < H ≤ 30
SPAN ≤ (FT.)	20	14	14	16	16	16	18
	25	16	18	18	18	18	20
	30	18	20	20	20	24	24
	35	20	24	24	24	24	24
	40	24	24	24			
	45						

UP TO 50% COVERAGE CHART

"D" (FT.) →		10'		12'		14'	
"H" (FT.) →		H ≤ 25	25 < H ≤ 30	H ≤ 25	25 < H ≤ 30	H ≤ 25	25 < H ≤ 30
SPAN ≤ (FT.)	20	16	18	18	20	20	20
	25	20	20	20	24	24	24
	30	24	24	24	24	24	
	35	24					
	40						
	45						

51 - 80% COVERAGE CHART

100 MPH WIND

"D" (FT.) →		10'		12'		14'	
"H" (FT.) →		H ≤ 25	25 < H ≤ 30	H ≤ 25	25 < H ≤ 30	H ≤ 25	25 < H ≤ 30
SPAN ≤ (FT.)	20	16	16	16	18	18	18
	25	18	18	20	20	20	24
	30	20	24	24	24	24	24
	35	24	24	24			
	40						

UP TO 50% COVERAGE CHART

"D" (FT.) →		10'		12'		14'	
"H" (FT.) →		H ≤ 25	25 < H ≤ 30	H ≤ 25	25 < H ≤ 30	H ≤ 25	25 < H ≤ 30
SPAN ≤ (FT.)	20	18	20	20	24	24	24
	25	20	24	24	24	24	
	30	24	24				
	35						

51 - 80% COVERAGE CHART

PROCEDURE TO DETERMINE THE DESIGN WIND SPEED

80 MPH IS THE STANDARD DESIGN WIND SPEED FOR THE STATE OF COLORADO. THE STANDARD DESIGN WIND SPEED OF 80 MPH IS TO BE USED AT ALL LOCATIONS EXCEPT THE FOLLOWING:

1. USE THE 90 MPH WIND SPEED FOR LOCATIONS WITHIN 4 MILES OF EITHER SIDE OF THE BASE OF THE FOOTHILLS ALONG THE FRONT RANGE OF THE EASTERN SLOPE.
2. USE THE 100 MPH WIND SPEED FOR LOCATIONS IN BOULDER COUNTY.

IF THERE ARE QUESTIONS CONCERNING THE PROPER DESIGN WIND SPEED CONTACT THE STAFF BRIDGE BRANCH.

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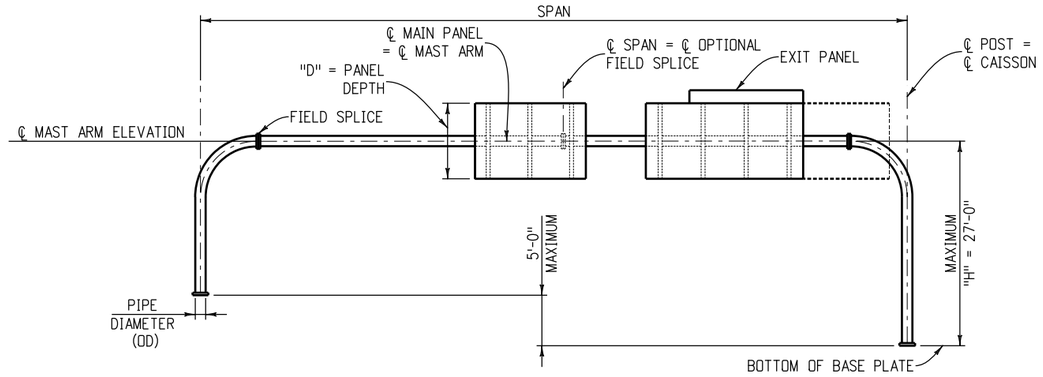
-SIGN BRIDGE PIPE SELECTION TABLES-



TYPICAL VERTICAL POST SIGN BRIDGE

STRUCTURE SELECTION PROCEDURE FOR SIGN BRIDGES

A. DESIGN IS BASED ON A SIGN HEIGHT OF 15' WITH 50% OF THE SPAN LENGTH COVERED UP UNTIL THE CAPACITY OF THE LARGEST POLE SHOWN IS REACHED. BEYOND THIS POINT THE COVERAGE PERCENTAGE DECREASES.

B. THE MAXIMUM PRIMARY PANEL HEIGHT IS 14'. ADD THE AREA OF ALL EXIT PANELS TO THE AREA OF ALL PRIMARY PANELS TO CHECK AGAINST MAXIMUM SIGN PANEL AREA.

C. OBTAIN THE DESIGN WIND SPEED FROM THE OVERHEAD SIGN X-SECTION SHEETS IN THE ROADWAY PLANS.

D. PICK PIPE OD AND SPLIT SIZE FROM THE APPROPRIATE CHART. INCLUDE THE AREA OF ALL SIGN PANELS SHOWN IN THE OVERHEAD SIGN X-SECTION SHEETS WHICH MAY POTENTIALLY BE PLACED ON THE SIGN IN THE FUTURE.

E. IF NO PIPE POST/ARM SIZE IS SHOWN FOR A CERTAIN SPAN THIS INDICATES THAT THIS SPAN/SIGN PANEL/HEIGHT COMBINATION EXCEEDS THE LIMITS OF THIS STANDARD.

F. THE OVERHEAD SIGN X-SECTION SHEETS INDICATE THE HEIGHT "H", THE SPAN AND THE SIGN PANEL SIZES.

80 MPH WIND

SPAN ≤	MAXIMUM SIGN PANEL AREA (SQ. FT.)	* PIPE POST	
		PIPE OD (IN.)	SPLIT (IN.)
50'	375	12.75	5
60'	450	14	5
70'	525	16	5
80'	600	18	5
90'	675	20	5
100'	750	20	5
110'	825	24	5
120'	900	24	5
130'	780	24	5
140'	700	24	5

90 MPH WIND

SPAN ≤	MAXIMUM SIGN PANEL AREA (SQ. FT.)	* PIPE POST	
		PIPE OD (IN.)	SPLIT (IN.)
50'	375	14	5
60'	450	16	5
70'	525	18	5
80'	600	20	5
90'	675	24	5
100'	750	24	5
110'	775	24	5
120'	650	24	5
130'	585	24	5
140'	525	24	5

100 MPH WIND

SPAN ≤	MAXIMUM SIGN PANEL AREA (SQ. FT.)	* PIPE POST	
		PIPE OD (IN.)	SPLIT (IN.)
50'	375	16	5
60'	450	18	5
70'	525	20	5
80'	600	24	5
90'	675	24	5
100'	660	24	5
110'	580	24	5
120'	500	24	5
130'	450	24	5
140'	400	24	5

PROCEDURE TO DETERMINE THE DESIGN WIND SPEED

80 MPH IS THE STANDARD DESIGN WIND SPEED FOR THE STATE OF COLORADO. THE STANDARD DESIGN WIND SPEED OF 80 MPH IS TO BE USED AT ALL LOCATIONS EXCEPT THE FOLLOWING:

1. USE THE 90 MPH WIND SPEED FOR LOCATIONS WITHIN 4 MILES OF EITHER SIDE OF THE BASE OF THE FOOTHILLS ALONG THE FRONT RANGE OF THE EASTERN SLOPE.
2. USE THE 100 MPH WIND SPEED FOR LOCATIONS IN BOULDER COUNTY.

IF THERE ARE QUESTIONS CONCERNING THE PROPER DESIGN WIND SPEED CONTACT THE STAFF BRIDGE BRANCH

* MAST ARM DIAMETER SAME AS POST.

Computer File Information		
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Sheet Revisions	
Date:	Comments

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STATIC SIGN MONOTUBE STRUCTURES

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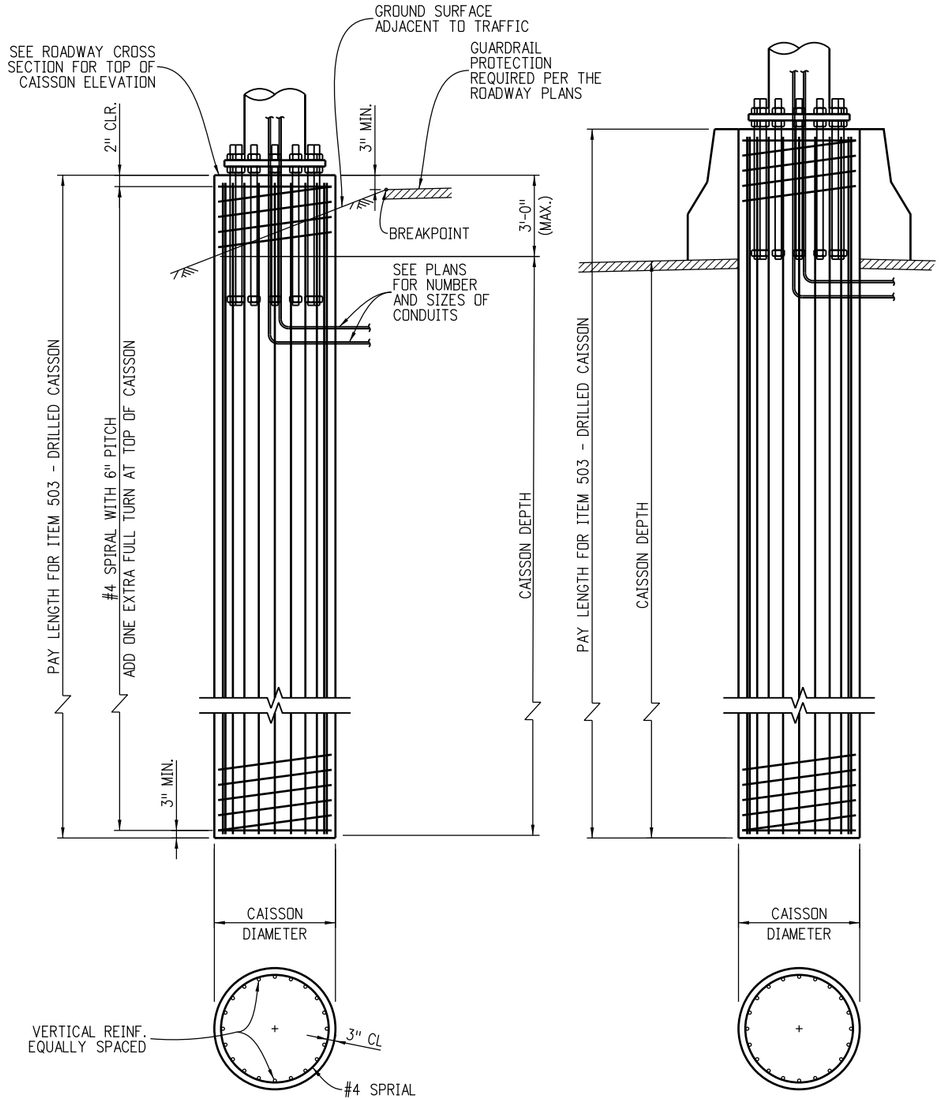

ROADSIDE SHOULDER INSTALLATION

MEDIAN RAIL INSTALLATION
(SEE ROADSIDE SHOULDER INSTALLATION FOR ADDITIONAL INFORMATION)

CAISSON FOUNDATION DETAILS

CAISSON DRILLING AND INSTALLATION NOTES

1. CONTACT THE ENGINEER IF ANY OF THE FOLLOWING SOIL CONDITIONS ARE ENCOUNTERED DURING DRILLING:
   - A) THE SOIL HAS A HIGH ORGANIC CONTENT OR CONSISTS OF SATURATED SILT AND CLAY.
   - B) THE SITE WON'T SUPPORT THE WEIGHT OF THE DRILLING RIG.
   - C) THE FOUNDATION SOILS ARE NOT HOMOGENOUS.
   - D) FIRM BEDROCK IS ENCOUNTERED.
2. 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.
3. THE FOLLOWING SOIL PARAMETERS WERE USED FOR DESIGN:
   - A) LOOSE GRANULAR SOIL WITH A UNIT WEIGHT OF 100 PCF AND A 28 DEGREE ANGLE OF INTERNAL FRICTION (PHI ANGLE).
   - B) SOFT COHESIVE SOIL WITH A UNIT WEIGHT OF 100 PCF AND A UNIT COHESION OF 500 PSF.
4. THE CONTRACTOR SHALL PROVIDE A SURVEY OF EACH OVERHEAD SIGN FOUNDATION TO VERIFY PLACEMENT SOON AFTER WORK ON THE FOUNDATION HAS BEEN COMPLETED. THE SURVEY SHALL CONFORM TO THE REQUIREMENTS OF SECTION 625, CONSTRUCTION SURVEYING. THE CONTRACTOR SHALL SUBMIT TO THE ENGINEER A COPY OF THE SURVEY NOTES DETAILING THE FOUNDATION LOCATION AND ELEVATION AND THE ANCHOR BOLT LOCATIONS, PROJECTIONS, AND ORIENTATIONS, AND IN THE CASE OF SIGN-BRIDGE TYPE OF OVERHEAD SIGNS, THE DISTANCE MEASURED BETWEEN THE CENTERLINE OF THE ANCHOR BOLT GROUPS. THE ELEVATION OF THE GROUND SURROUNDING EACH FOUNDATION SHALL ALSO BE PROVIDED. THE CONTRACTOR SHALL COMPARE THE SURVEY INFORMATION TO THE REVIEWED SHOP DRAWINGS AND RECONCILE ANY DIFFERENCES BETWEEN THEM. THE CONTRACTOR SHALL SUBMIT ALL PROPOSED ADJUSTMENTS OR MODIFICATIONS TO THE ENGINEER FOR APPROVAL.

BRIDGES

PIPE OUTSIDE DIAMETER (INCHES)	SPLIT (INCHES)	CAISSON DIAMETER (INCHES)	CAISSON DEPTH (FEET)	VERTICAL REINF.
12.75	5	48	17	18 - #8
14	5	48	19	24 - #8
16	5	48	20	24 - #8
18	5	54	21	24 - #9
20	5	54	22	24 - #9
24	5	54	24	24 - #9

CANTILEVERS

PIPE OUTSIDE DIAMETER (INCHES)	SPLIT (INCHES)	CAISSON DIAMETER (INCHES)	CAISSON DEPTH (FEET)	VERTICAL REINF.
12.75	-	36	13	13 - #8
14	-	42	15	18 - #8
16	-	42	16	18 - #8
18	-	42	17	18 - #8
20	-	48	18	24 - #8
24	-	48	20	24 - #8

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