

THE STATE OF DELAWARE DEPARTMENT OF TRANSPORTATION



CONSTRUCTION PLANS FOR:

CANTILEVER SIGN STRUCTURE MATERIALS SR 1 NORTHBOUND AUXILIARY LANE

CONTRACT NUMBER: T201611001

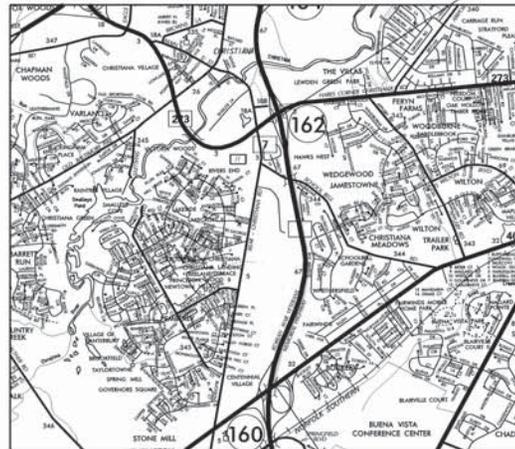
FEDERAL AID PROJECT NUMBER: NH-N067(28)

COUNTY: NEW CASTLE

M.R. #: 067

U.S. CUSTOMARY
UNITS

END CONTRACT
STATION a 337 + 83.00



BEGIN CONTRACT
STATION 248 + 15.00

DESIGN DESIGNATION

SR 1		YEAR 2025
FUNCTIONAL CLASS: FREEWAY/EXPRESSWAY	D.L.V. PROJECTED: 5,685	YEAR 2025
TYPE OF CONSTRUCTION: WIDENING	DESIGN SPEED: 60 MPH	
A.A.D.T. CURRENT: 44,550	YEAR 2014	TRUCKS: 10%
A.A.D.T. PROJECTED: 56,250	YEAR 2025	DIRECTION OF DISTRIBUTION: 100%

INDEX OF SHEETS

SHEET NO.	TITLE
1	TITLE
2	SIGN STRUCTURES GENERAL NOTES
3	CANTILEVER SIGN STRUCTURE - ELEVATION AND END VIEW
4	CANTILEVER SIGN STRUCTURE DETAILS - 1
5	CANTILEVER SIGN STRUCTURE DETAILS - 2

TOTAL SHEETS: 5

APPROVED DESIGN EXCEPTIONS

DESIGN PARAMETER	REQUIRED	PROVIDED	DATE

ADDENDA & REVISIONS

DESCRIPTION	NAME & DATE

ASSOCIATED CONTRACTS

CONTRACT NO.	CONTRACT NAME
83-101-02	DELAWARE ROUTE 7 PHASE I
83-101-03	DELAWARE ROUTE 7 PHASE II
93-101-01	SR 1, US 13 TO I-95 LIGHTING

PREPARED BY
THE CONSULTING FIRM OF
RUMMEL, KLEPPER & KAHL, LLP

Nancy R. Bergerson
RECOMMENDED 5/22/15
DATE

Bruce C. Baker
RECOMMENDED 05/29/2015
SQUAD MANAGER, CONSTRUCTION DATE

John F. Z...
RECOMMENDED 06/01/2015
GROUP ENGINEER, CONSTRUCTION DATE

John A. G...
RECOMMENDED 06/02/2015
ASSISTANT DIRECTOR, TRANSPORTATION SOLUTIONS (CONSTRUCTION) DATE



~~RECOMMENDED~~

~~STORMWATER ENGINEER~~

~~DATE~~

~~SEAL~~

RECOMMENDED

Anna Lynne Feys
SQUAD MANAGER, PROJECT DEVELOPMENT

DATE 06/08/2015

SEAL



RECOMMENDED

John F. Z...
BRIDGE DESIGN ENGINEER

DATE 05/29/2015

SEAL



RECOMMENDED

Dawn M. O'Neil
GROUP ENGINEER, PROJECT DEVELOPMENT

DATE 06/02/2015

SEAL

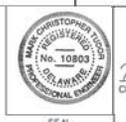


RECOMMENDED

Mark C. Juber
ASSISTANT DIRECTOR, PROJECT DEVELOPMENT

DATE 06/02/2015

SEAL



APPROVED

Robert Brian McCreary
CHIEF ENGINEER

DATE 06/02/2015

SEAL



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GENERAL NOTES

DESIGN SPECIFICATIONS:

1. AASHTO "STANDARD SPECIFICATIONS FOR STRUCTURAL SUPPORTS FOR HIGHWAY SIGNS, LUMINAIRES, AND TRAFFIC SIGNALS", 2013, 6TH EDITION, INCLUDING 2015 INTERIMS.
2. AASHTO/AWS D1.5 BRIDGE WELDING CODE.

DESIGN LOADS:

1. THE DESIGN WIND SPEED IS 90 MPH (3-SECOND GUST WIND SPEED), BASED ON A 50-YEAR MEAN RECURRENCE INTERVAL.
2. THE DESIGN ICE LOAD IS 3 PSF.
3. FATIGUE DESIGN FOR CANTILEVER SIGN STRUCTURES IS BASED ON FATIGUE CATEGORY I FOR GALLOPING, NATURAL WINDS GUSTS, AND TRUCK INDUCED GUSTS.
4. DESIGN SIGN AREA FOR CANTILEVER SIGN STRUCTURE SHALL BE APPROXIMATELY 25% MORE AREA THAN ACTUAL SIGN AREA (ADJUSTED IN SIGN HEIGHT ONLY).

MATERIALS:

1. ALL STRUCTURAL TUBES FOR MASTS AND MAST ARMS SHALL CONFORM TO API 5L GRADE B PSL-2.
2. ALL STEEL PLATES AND SHAPES SHALL CONFORM TO AASHTO M270, GRADE 36 OR BETTER. ALL STEEL MEMBERS GREATER THAN OR EQUAL TO ONE HALF (1/2) INCH SHALL MEET THE CHARPY V-NOTCH REQUIREMENTS FOR ZONE 2, NON-FRACTURE CRITICAL.
3. THE STRUCTURE SHALL BE GALVANIZED IN ACCORDANCE WITH AASHTO M111.
4. ALL CONNECTION BOLTS FOR SPLICE PLATES SHALL CONFORM TO AASHTO M164. WASHERS SHALL CONFORM TO AASHTO M293, AND NUTS SHALL CONFORM TO AASHTO M291, GRADE DH, OR AASHTO M292, GRADE 2H. U-BOLTS SHALL CONFORM TO ASTM A449.
5. ANCHOR BOLTS SHALL CONFORM TO AASHTO M314, GRADE 55. ANCHOR NUTS SHALL CONFORM TO AASHTO M291, GRADE DH, OR AASHTO M292, GRADE 2H. WASHERS SHALL CONFORM TO AASHTO M293.
6. ALL HARDWARE SHALL BE GALVANIZED IN ACCORDANCE WITH AASHTO M232.
7. PORTLAND CEMENT CONCRETE FOR PEDESTALS AND FOUNDATIONS SHALL BE DELDOT CLASS B ($f'c = 3,000$ PSI).
8. ALL EXPOSED EDGES OF CONCRETE SHALL BE CHAMFERED 3/4" UNLESS OTHERWISE NOTED.
9. REINFORCING STEEL SHALL CONFORM TO AASHTO M31, GRADE 60. ALL REINFORCING STEEL SHALL BE PROTECTED WITH FUSION BONDED EPOXY. EPOXY COATED REINFORCING STEEL SHALL CONFORM TO M284 (ASTM D3963).
10. ALL REINFORCING STEEL SHALL HAVE A CLEAR COVER OF 2" UNLESS OTHERWISE NOTED.

GENERAL:

1. ANY ALTERNATE DESIGNS SHALL BE STRUCTURALLY EQUIVALENT AND SUBJECT TO APPROVAL BY THE ENGINEER. AESTHETICS MAY BE A REASON FOR REJECTION OF AN ALTERNATE DESIGN.
2. FORM MASTS FOR SIGN STRUCTURES TO THE RADII SHOWN ON THE PLANS IN ACCORDANCE WITH THE TUBE AND PIPE ASSOCIATION INTERNATIONAL RECOMMENDED STANDARDS FOR INDUCTION BENDING OF PIPE AND TUBE (TPA-IBS-98).
3. STEEL TEMPLATES SHALL BE USED TO SET ANCHOR BOLTS PLUMB WHEN POURING THE FOUNDATION.
4. BASE PLATES SHALL BE IN FULL CONTACT WITH ALL FLAT WASHERS.
5. ALL ANCHOR BOLTS SHALL BE TIGHTENED USING TURN OF NUT METHOD (1/6 TURN AFTER SNUG TIGHT).
6. THREADS OF ANCHOR BOLTS SHALL BE BURRED OFF AT FACE OF NUT AFTER COLUMN IS INSTALLED.
7. LOCK WASHERS WITH FLAT WASHERS SHALL ONLY BE USED FOR U-BOLT CONNECTIONS AND NUT SHALL BE TURNED UNTIL THE LOCK WASHER IS FLAT.
8. MAST AND MAST ARM O.D. DIMENSIONS ARE ACTUAL.
9. FIELD VERIFY ALL DIMENSIONS BEFORE ORDERING ANY MATERIALS.
10. FABRICATE ALL SIGN STRUCTURES INTO THE LARGEST PRACTICAL SECTIONS PRIOR TO GALVANIZING. SUBMIT SPLICE LOCATIONS TO THE ENGINEER FOR APPROVAL. DO NOT COMMENCE FABRICATION UNTIL SUCH SPLICE LOCATIONS ARE APPROVED.
11. DO NOT USE GROUT BETWEEN BASE PLATE AND CONCRETE PEDESTAL.
12. SLOPE TOP OF PEDESTAL 4% FROM CENTER TO NEAR EDGES FOR DRAINAGE.
13. PROVIDE DOUBLE NUTS AND WASHERS FOR EACH ANCHOR BOLT.
14. PERMANENT CAMBER EQUAL TO L/1000 HAS BEEN PROVIDED IN ADDITION TO THE DEAD LOAD CAMBER.

FABRICATOR NOTE:

FABRICATOR IS TO SUPPLY AND DELIVER THE SIGN STRUCTURES AND ANCHOR BOLTS TO THE JOB SITE (SEE MAP ON TITLE SHEET) WHICH IS IN ZIP CODE 19701. THE FABRICATOR SHALL COORDINATE WITH THE CONTRACTOR OF CONTRACT T201511001 (ONCE CHOSEN BY THE DEPARTMENT) FOR DELIVERY. THE FABRICATOR SHOULD ANTICIPATE THAT EACH SIGN STRUCTURES WILL BE DELIVERED SEPARATELY. THE FABRICATOR MUST BE PREPARED TO DELIVER THE SIGN STRUCTURES TO THE SITE BY OCTOBER 15, 2015 AND THE ANCHOR BOLTS BY SEPTEMBER 15, 2015. THE EXACT DATE FOR DELIVERY OF EACH SIGN STRUCTURE AND THE ANCHOR BOLTS SHALL BE COORDIANATED WITH THE CONTRACTOR. THE CONTRACTOR SHALL BE RESPONSIBLE FOR OFFLOADING THE SIGN STRUCTURES FROM THE TRUCKS AT THE SITE. PAYMENT FOR DELIVERY AND COORDINATION SHALL BE INCLUDED IN ITEM 605500. SIGN STRUCTURES SHALL BE FABRICATED IN ACCORDANCE WITH ITEM 605500 (ATTACHED). IF THE FABRICATOR CAN NOT MEET THE DATES SHOWN ABOVE THEN HE/SHE SHALL PROVIDE THE EARLIEST DATE IN WHICH HE/SHE CAN PROVIDE THE SIGN STRUCTURES AND ANCHOR BOLTS. THE DEPARTMENT WILL EVALUATE ALL BIDS BASED ON BID PRICE AND TIME OF DELIVERY.

SIGN STRUCTURE LOCATION

SIGN STRUCTURE NUMBER	STRUCTURE TYPE	BASELINE	STATION	SUPPORT OFFSET
SC-1	CANTILEVER	SR-1	269+00.00	71' -6"
SC-2	CANTILEVER	SR-1	295+50.00	71' -6"
SC-3	CANTILEVER	SR-1	323+00.00	78' -9"

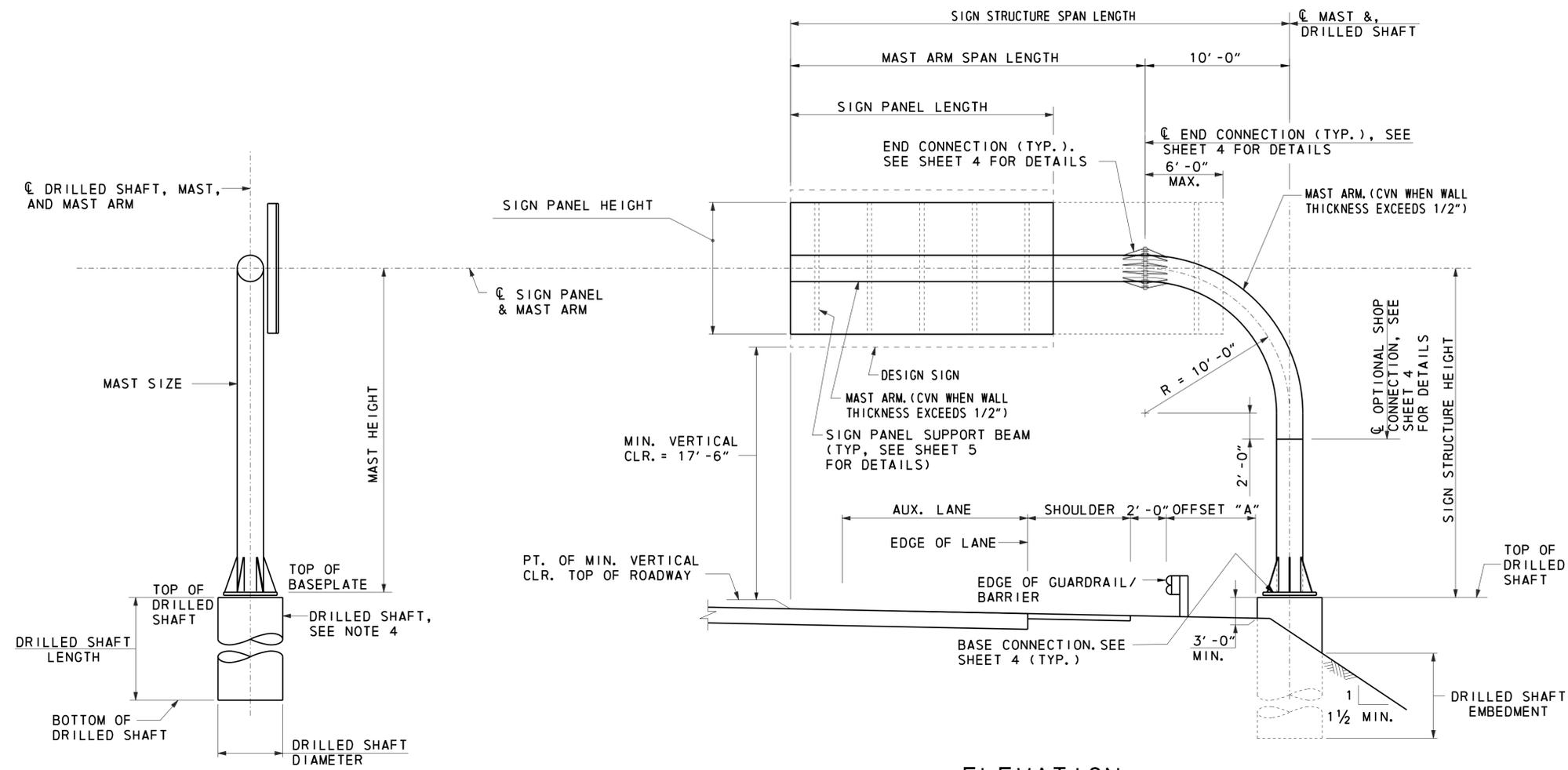
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5/18/2015

Steve_Lambert



DELAWARE DEPARTMENT OF TRANSPORTATION	ADDENDUMS / REVISIONS	NOT TO SCALE	CANTILEVER SIGN STRUCTURE MATERIALS, SR1 NORTHBOUND AUXILIARY	CONTRACT	BRIDGE NO.	1-319N	SIGN STRUCTURES GENERAL NOTES	SHEET NO.
	T201611001			DESIGNED BY:	D. W. HITCHKO	2		
	NEW CASTLE			CHECKED BY:	R. F. KIRCHNER	TOTAL SHTS.		
								5

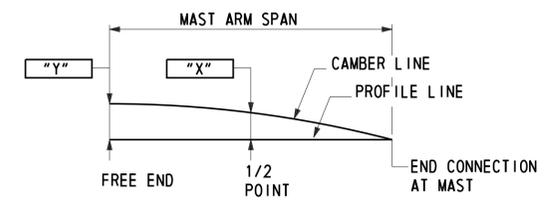


END VIEW

ELEVATION

GENERAL NOTES:

1. TERMINATE WELDS ONE HALF (1/2) INCH SHORT OF STIFFENER ENDS AND STIFFENER CHAMFER.
2. SEAL GAP BETWEEN BASE PLATE AND CONCRETE DRILLED SHAFT WITH GALVANIZED SCREEN, 1 1/4" TO 3/8" OPENING, TO PREVENT ENTRY OF RODENTS. SCREEN IS TO BE REMOVABLE AND ATTACHED TO BASE PLATE WITH STAINLESS STEEL HARDWARE. SCREEN IS TO BE OF SUFFICIENT STIFFNESS TO PREVENT ENTRY BETWEEN SCREEN AND FOUNDATION WHILE PERMITTING DRAINAGE.
3. SIGN PANEL SHALL BE CENTERED OVER AUXILIARY LANE.
4. DRILLED SHAFT DETAILS ARE NOT INCLUDED IN THIS CONTRACT.



CAMBER DIAGRAM

MAXIMUM CAMBER (AT FREE END) REPRESENTS MAXIMUM DEAD LOAD CAMBER PLUS L/1000 WHERE L = SIGN STRUCTURE SPAN.

CAMBER			
SIGN STRUCTURE NUMBER	SPAN	"X" (IN.)	"Y" (IN.)
SC-1	22'-9"	1 1/4	2
SC-2	22'-9"	1 1/8	1 7/8
SC-3	28'-1"	1 1/2	2 3/4

CANTILEVER SIGN SUPPORT STRUCTURE CHART

SIGN STRUCTURE NO.	SIGN STRUCTURE SPAN LENGTH	DESIGN PANEL AREA (SF)	MAST AND MAST ARM				ANCHOR BOLTS			BASE PLATE			H. S. (SPLICE) BOLTS			SPLICE PLATE		
			MAST ARM SPAN LENGTH	SIGN STRUCTURE HEIGHT	DIAMETER (INCHES)	THICKNESS (INCHES)	NO. OF BOLTS	DIAMETER (INCHES)	BOLT CIRCLE (INCHES)	DIAMETER (INCHES)	THICKNESS (INCHES)	NO. OF STIFFENERS	NO. OF BOLTS	DIAMETER (INCHES)	BOLT CIRCLE (INCHES)	DIAMETER (INCHES)	THICKNESS (INCHES)	NO. OF STIFFENERS
SC-1	32'-9"	498	22'-9"	28'-4"	34	0.500	16	2.00	41	48	3	8	24	1.25	40	46	3	8
SC-2	32'-9"	425	22'-9"	26'-5"	34	0.500	16	2.00	41	48	3	8	24	1.25	40	46	3	8
SC-3	38'-1"	425	28'-1"	26'-9 1/2"	34	0.500	16	2.25	41	48	3	8	24	1.50	40	46	3	8

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ADDENDUMS / REVISIONS

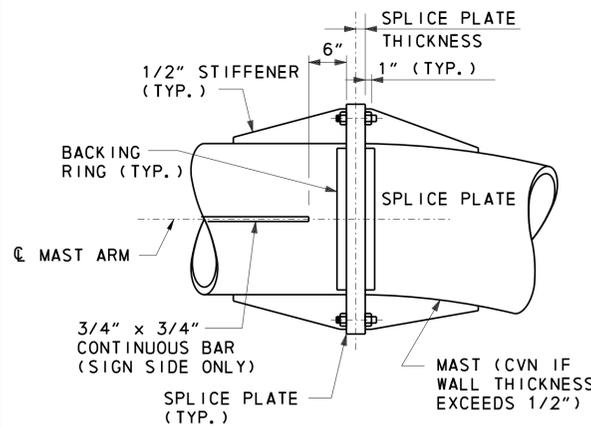
NOT TO SCALE

CANTILEVER SIGN STRUCTURE MATERIALS, SR1 NORTHBOUND AUXILIARY

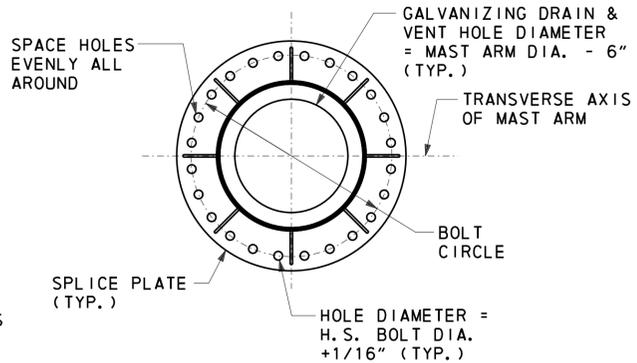
CONTRACT	BRIDGE NO.	1-319N
T201611001	DESIGNED BY:	D. W. HITCHKO
COUNTY	CHECKED BY:	R. F. KIRCHNER
NEW CASTLE		

CANTILEVER SIGN STRUCTURE - ELEVATION AND END VIEW

SHEET NO.	3
TOTAL SHTS.	5



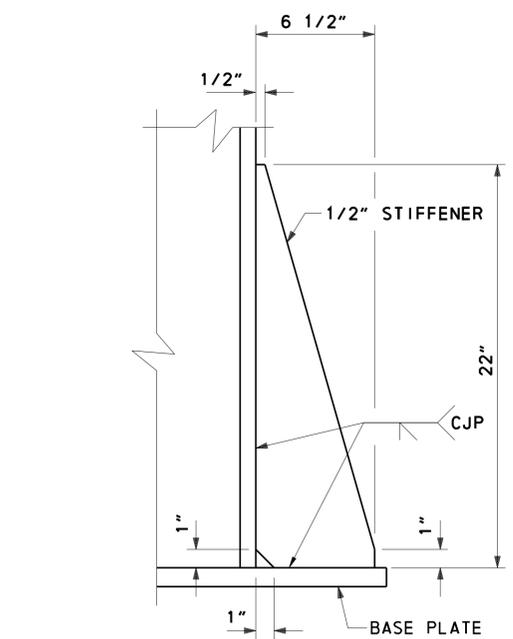
ELEVATION



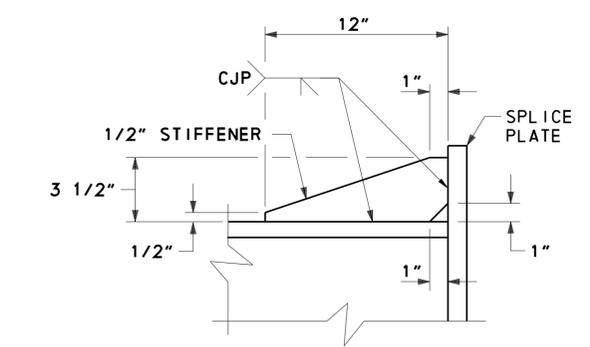
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**CANTILEVER STRUCTURE
END CONNECTION DETAILS**

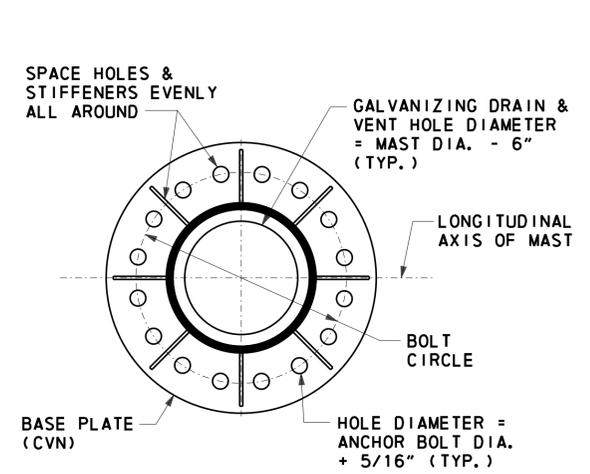
(MAST ARM SPLICE CONNECTION SIMILAR)
(24 BOLT CONFIGURATION SHOWN, OTHER CONFIGURATIONS SIMILAR)



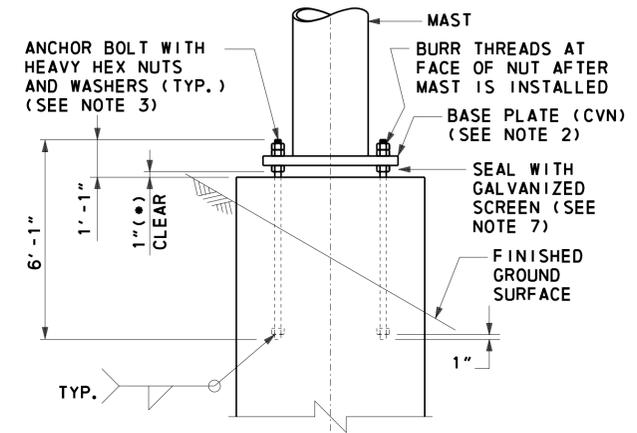
BASE PLATE STIFFENER DETAIL



SPLICE PLATE STIFFENER DETAIL



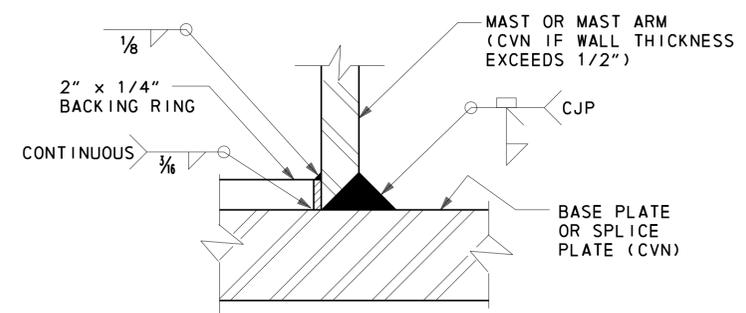
SECTION



NOTE: STIFFENERS NOT SHOWN FOR CLARITY
ELEVATION

**CANTILEVER STRUCTURE
BASE CONNECTION DETAILS**

(16 BOLT CONFIGURATION SHOWN, OTHER CONFIGURATIONS SIMILAR)



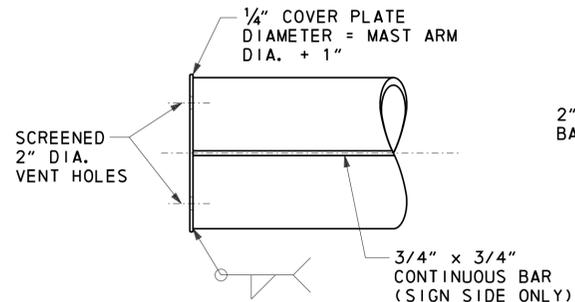
WELD DETAIL

WELD DETAIL NOTE:

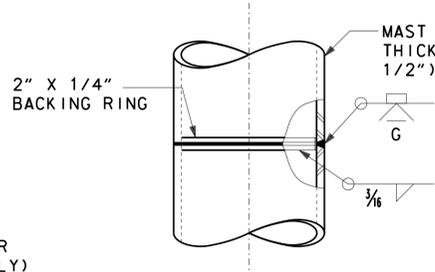
BACKING RING MUST BE FITTED/SIZED TO THE PIPE COLUMN AND CONTINUOUSLY FILLET WELDED TO THE BASE PLATE BEFORE THE FULL PENETRATION GROOVE WELD IS MADE. BACKING RING MUST BE FABRICATED AS A CONTINUOUS RING.

NOTES:

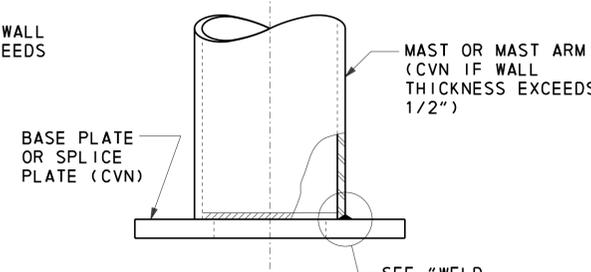
- FOR GENERAL NOTES, SEE SHEET 2.
- DO NOT GROUT BETWEEN BASE PLATE AND CONCRETE DRILLED SHAFT.
- TIGHTEN ANCHOR BOLTS USING TURN-OF-NUT METHOD (ADDITIONAL 1/6 TURN AFTER SNUG TIGHT) ONCE SIGN PANEL IS LEVELED.
- TERMINATE WELDS 1/2" SHORT OF STIFFENER ENDS AND STIFFENER CHAMFER.
- PROVIDE STIFFENERS AS INDICATED IN TABLES.
- FOR SIGN PANEL SUPPORT BEAM DETAILS, SEE SHEET 5.
- SEAL WITH GALVANIZED SCREEN, 1 1/4" TO 3/8" OPENING, TO PREVENT ENTRY OF RODENTS. SCREEN IS TO BE REMOVABLE AND ATTACHED TO BASE PLATE WITH STAINLESS STEEL HARDWARE. SCREEN IS TO BE OF SUFFICIENT STIFFNESS TO PREVENT ENTRY BETWEEN SCREEN AND FOUNDATION WHILE PERMITTING DRAINAGE.



MAST ARM END DETAIL
(CANTILEVER STRUCTURES)



OPTIONAL SHOP
CONNECTION DETAIL



PIPE TO PLATE
CONNECTION DETAIL

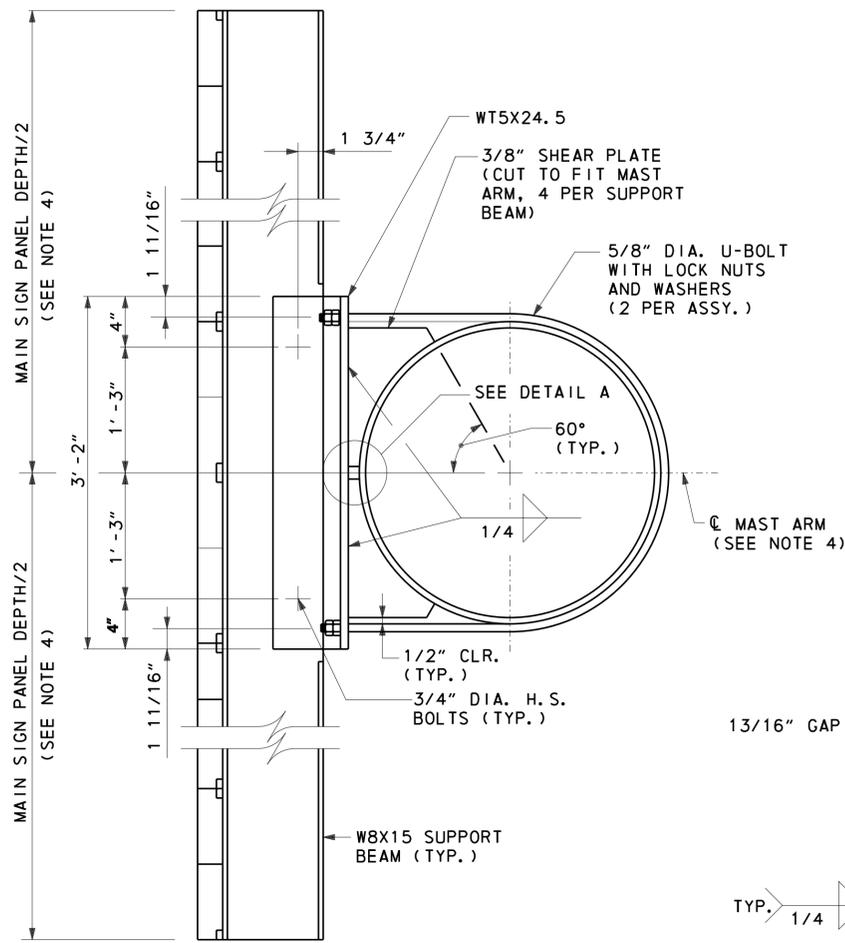


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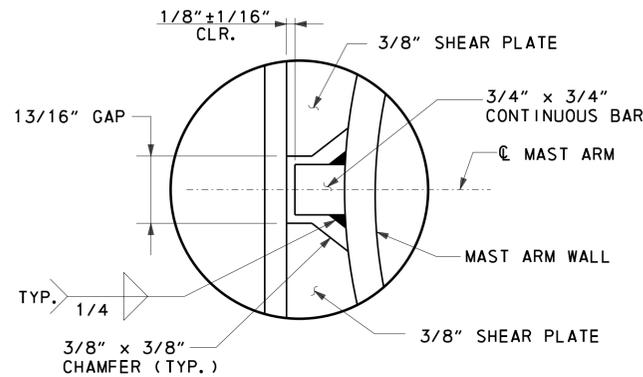
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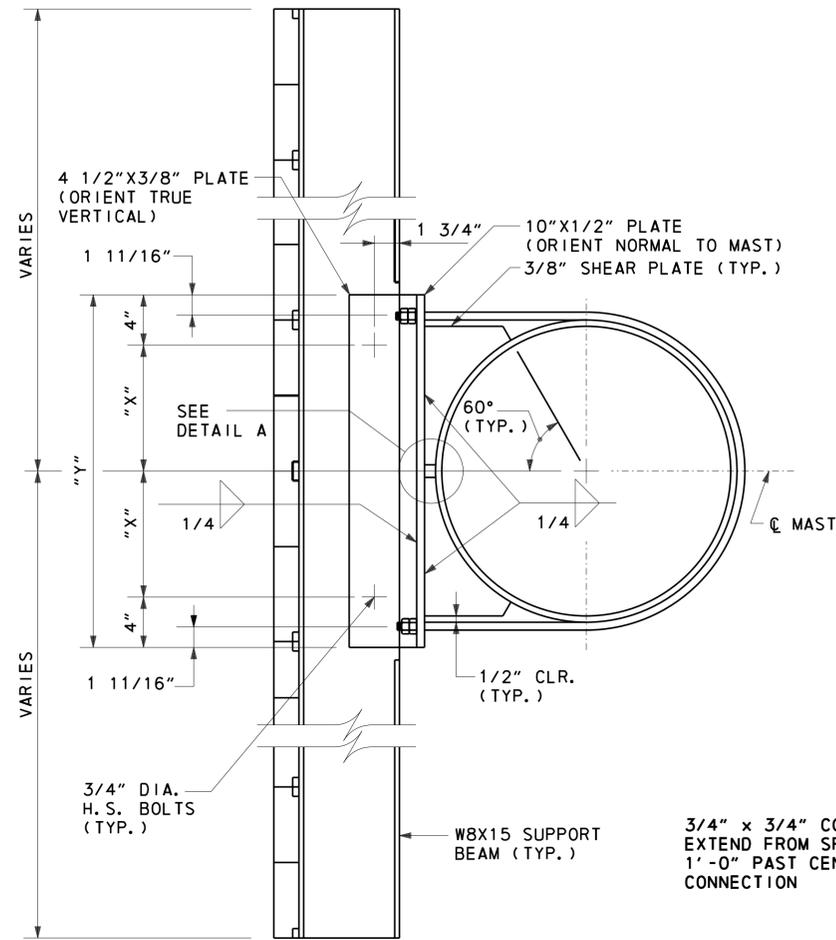
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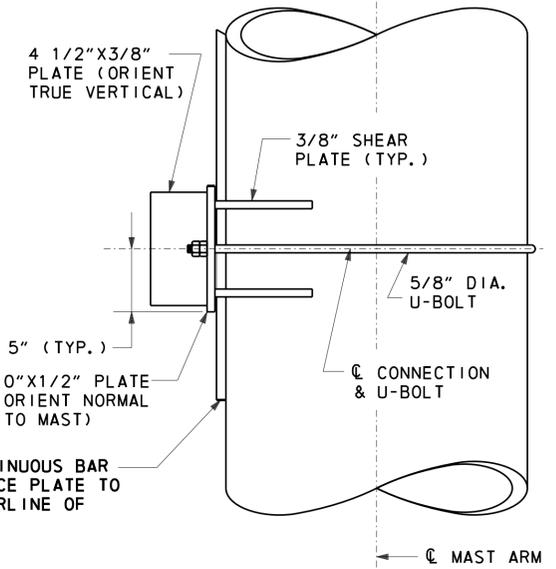
SINGLE SIGN PANEL SECTION



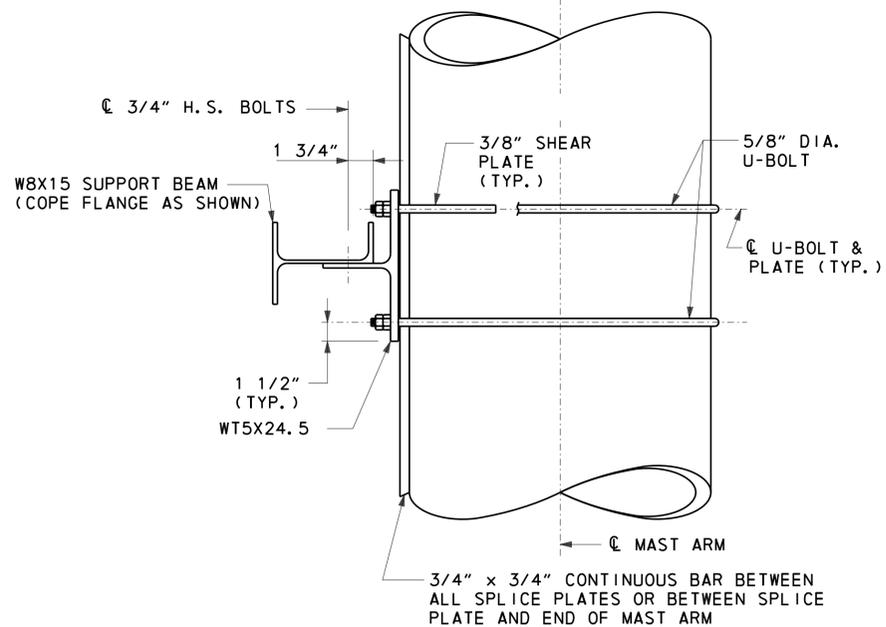
DETAIL A



SINGLE SIGN PANEL SECTION



SINGLE SIGN PANEL PLAN



SINGLE SIGN PANEL PLAN

SUPPORT BEAM TO MAST ARM CONNECTION DETAILS

SUPPORT BEAM TO MAST CONNECTION DETAILS
 (FOR DETAILS NOT SHOWN OR NOTED, SEE SUPPORT BEAM TO MAST ARM CONNECTION DETAILS)
 (SUPPORT BEAM NOT SHOWN IN PLAN AND ELEVATION VIEWS FOR CLARITY)

NOTES:

1. FOR DETAILS NOT SHOWN OR NOTED, SEE SINGLE SIGN PANEL DETAILS, THIS SHEET.
2. FOR SIGN PANEL DETAILS, SEE SIGN DETAIL SHEETS.
3. LOCATE SUPPORT BEAMS TO AVOID END AND SPLICE CONNECTIONS. MAXIMUM SPACING = 5'-0". MAXIMUM DISTANCE TO PANEL EDGE = 2'-6".
4. SIGN PANEL SUPPORT BEAM DETAILS GIVEN ON THIS SHEET ARE ONLY VALID FOR SIGNS WHERE THE HORIZONTAL CENTERLINE OF THE SIGN PANEL IS AT THE SAME LOCATION AS THE CENTERLINE OF MAST ARM.

