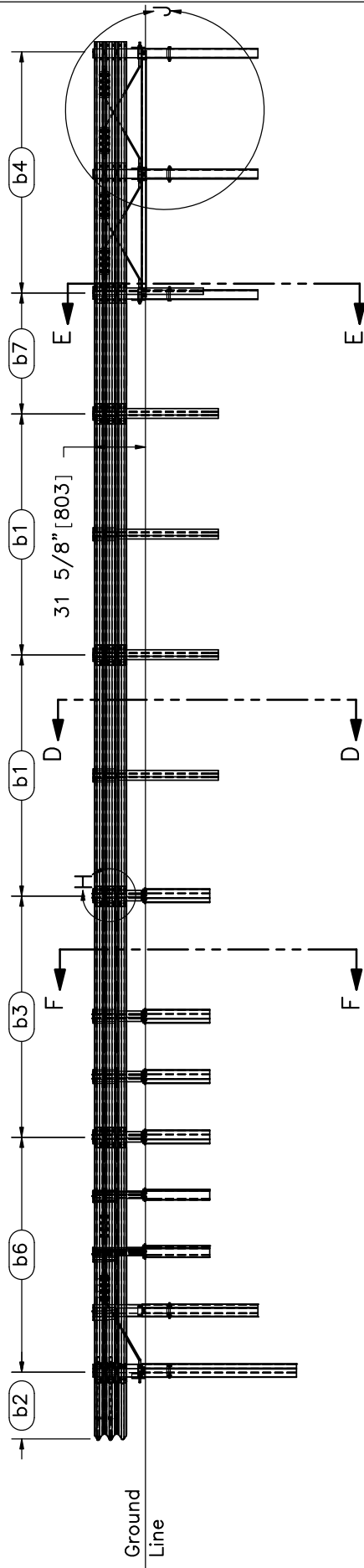
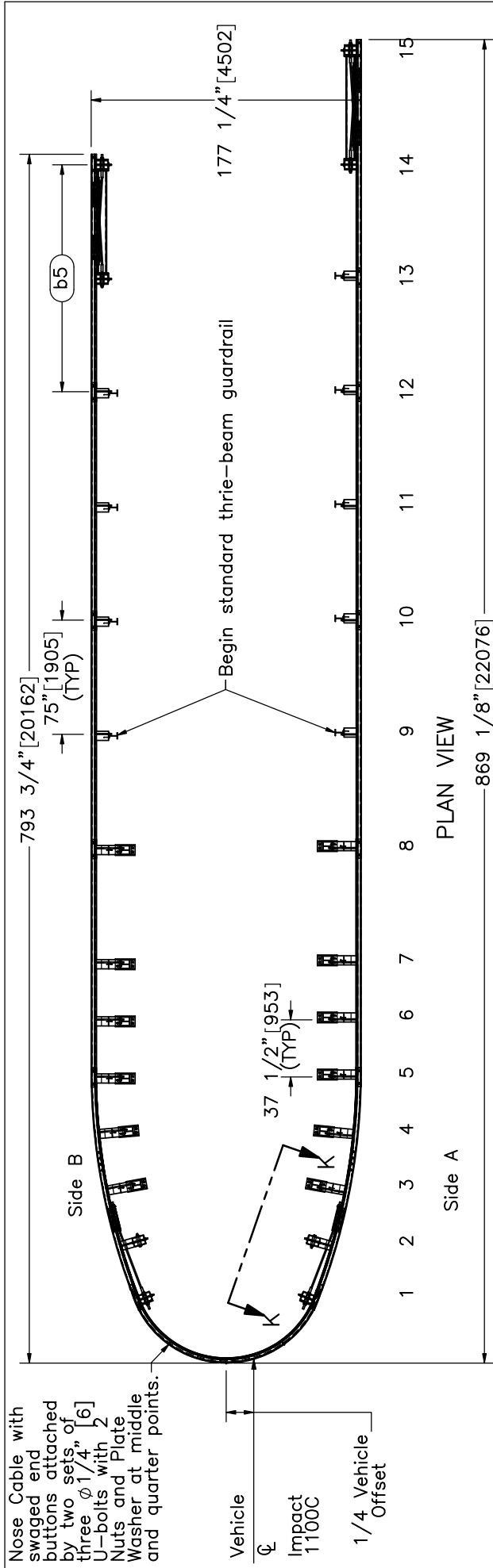


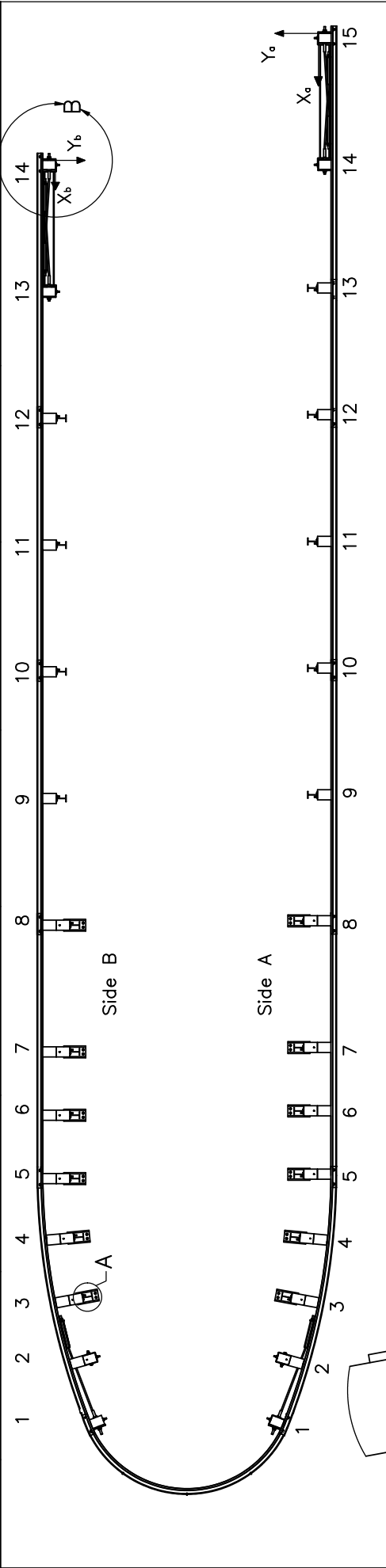


ELEVATION VIEW

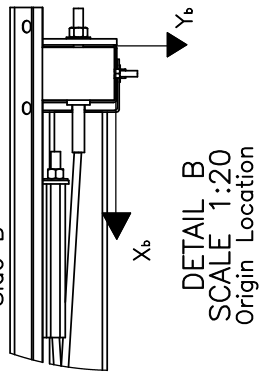
- Notes: (1) The test shall be performed to test designation no. 3-30 of MASH criteria.
 (2) The impact location is the center of the vehicle at a 1/4 vehicle offset from the bullnose center.
 (3) All posts are to be installed using $\phi 3'$ [914] augered holes with the HE8 compaction method.
 (4) BCT Anchors are to be placed in $\phi 3'$ [914] holes and backfilled with soil.
 (5) Dummy should be placed on the side of the vehicle toward the inside of the system.

	Bullnose with UBSP		SHEET: 1 of 24
	Test No. MSPBN-4		DATE: 4/17/2020
System Layout	DWG. NAME: Bullnose-4_R12		DRAWN BY: MES/JEK/M KB/JDY/JRF
	SCALE: 1:100		REV. BY: JEK/RWB/J CH/JEK

Post No.	Side A				Side B			
	Rear Face-DS Edge		Rear Face-US Edge		Rear Face-DS Edge		Rear Face-US Edge	
	X	Y	X	Y	X	Y	X	Y
1	68'-1 7/8"	2'-3 1/8"	68'-7"	2'-5 1/8"	61'-10 7/8"	2'-3 1/8"	62'-4"	2'-5 1/8"
2	65'-0 3/4"	1'-11 1/4"	65'-6 1/8"	2'-0 3/4"	58'-9 3/4"	1'-11 1/4"	59'-3 1/8"	2'-0 3/4"
3	62'-1 1/4"	1'-9 3/8"	62'-5 1/8"	1'-10 1/8"	55'-10 1/4"	1'-9 3/8"	56'-2 1/8"	1'-10 1/8"
4	59'-2 1/4"	1'-4 3/8"	59'-6 1/8"	1'-4 3/4"	52'-11 1/4"	1'-4 3/4"	53'-3 1/8"	1'-4 3/4"
5	56'-3 3/4"	1'-2 3/8"	56'-7 3/4"	1'-2 3/8"	50'-0 3/4"	1'-2 3/8"	50'-4 3/4"	1'-2 3/8"
6	53'-2 1/4"	1'-2 3/8"	53'-6 1/4"	1'-2 3/8"	46'-11 1/4"	1'-2 3/8"	47'-3 1/4"	1'-2 3/8"
7	50'-0 3/4"	1'-2 3/8"	50'-4 3/4"	1'-2 3/8"	43'-9 3/4"	1'-2 3/8"	44'-1 3/4"	1'-2 3/8"
8	43'-9 3/4"	1'-2 3/8"	44'-1 3/4"	1'-2 3/8"	37'-6 3/4"	1'-2 3/8"	37'-10 3/4"	1'-2 3/8"
9	37'-6 3/4"	6 3/8"	37'-10 3/4"	6 3/8"	31'-3 3/4"	6 3/8"	31'-7 3/4"	6 3/8"
10	31'-3 3/4"	6 3/8"	31'-7 3/4"	6 3/8"	25'-0 3/4"	6 3/8"	25'-4 3/4"	6 3/8"
11	25'-0 3/4"	6 3/8"	25'-4 3/4"	6 3/8"	18'-9 3/4"	6 3/8"	19'-1 3/4"	6 3/8"
12	18'-9 3/4"	6 3/8"	19'-1 3/4"	6 3/8"	12'-6 3/4"	6 3/8"	12'-10 3/4"	6 3/8"
13	12'-6 3/4"	6 3/8"	12'-10 3/4"	6 3/8"	6'-3"	0"	6'-8 1/2"	0"
14	6'-3"	0"	6'-8 1/2"	0"	0"	0"	5 1/2"	0"
15	0"	0"	5 1/2"	0"	-	-	-	-



Note: All dimensions measured from the rear face and downstream edge of post no. 14 on side B and post no. 15 on side A.



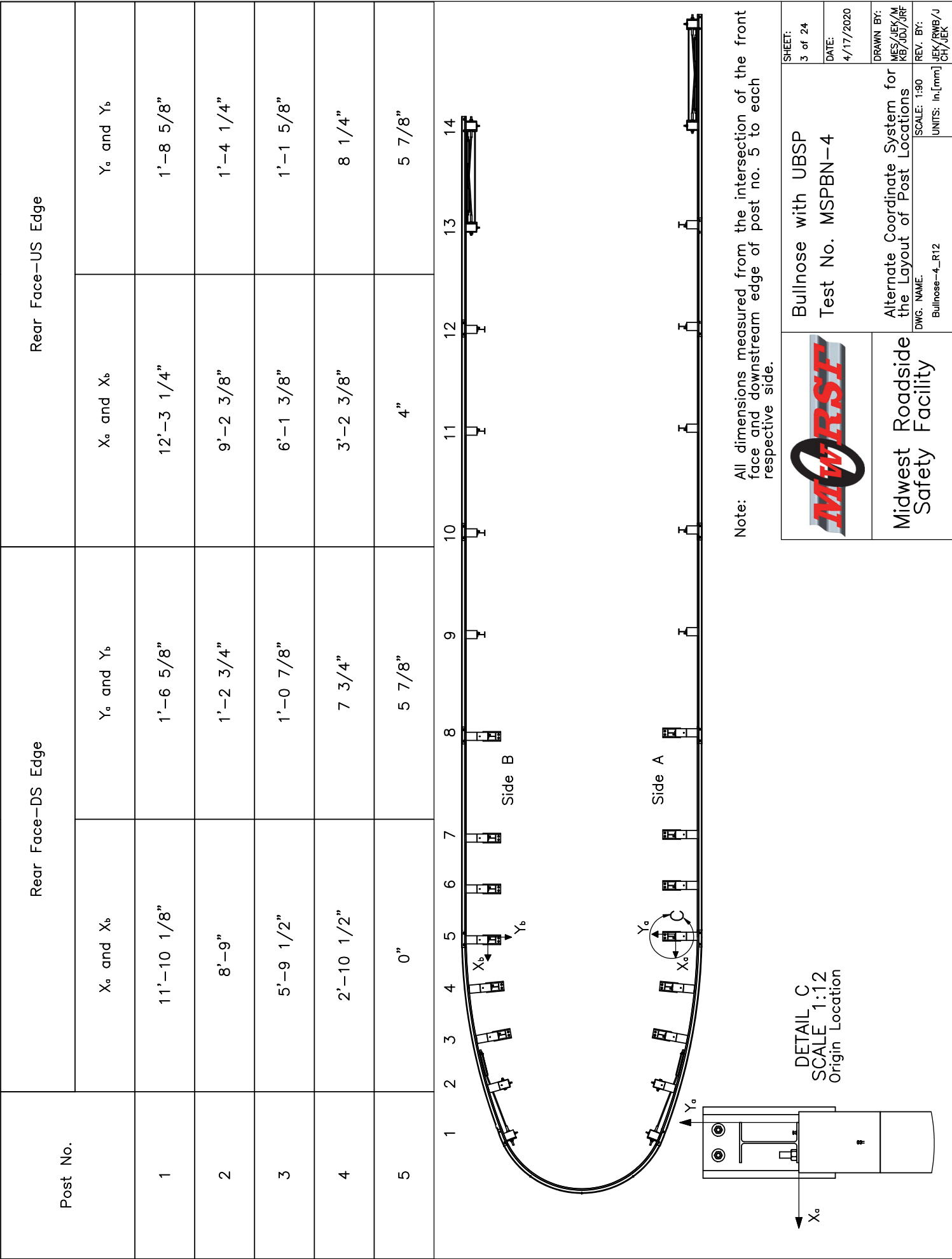
Bullnose with UBSP
Test No. MSPBN-4

Midwest Roadside
Safety Facility

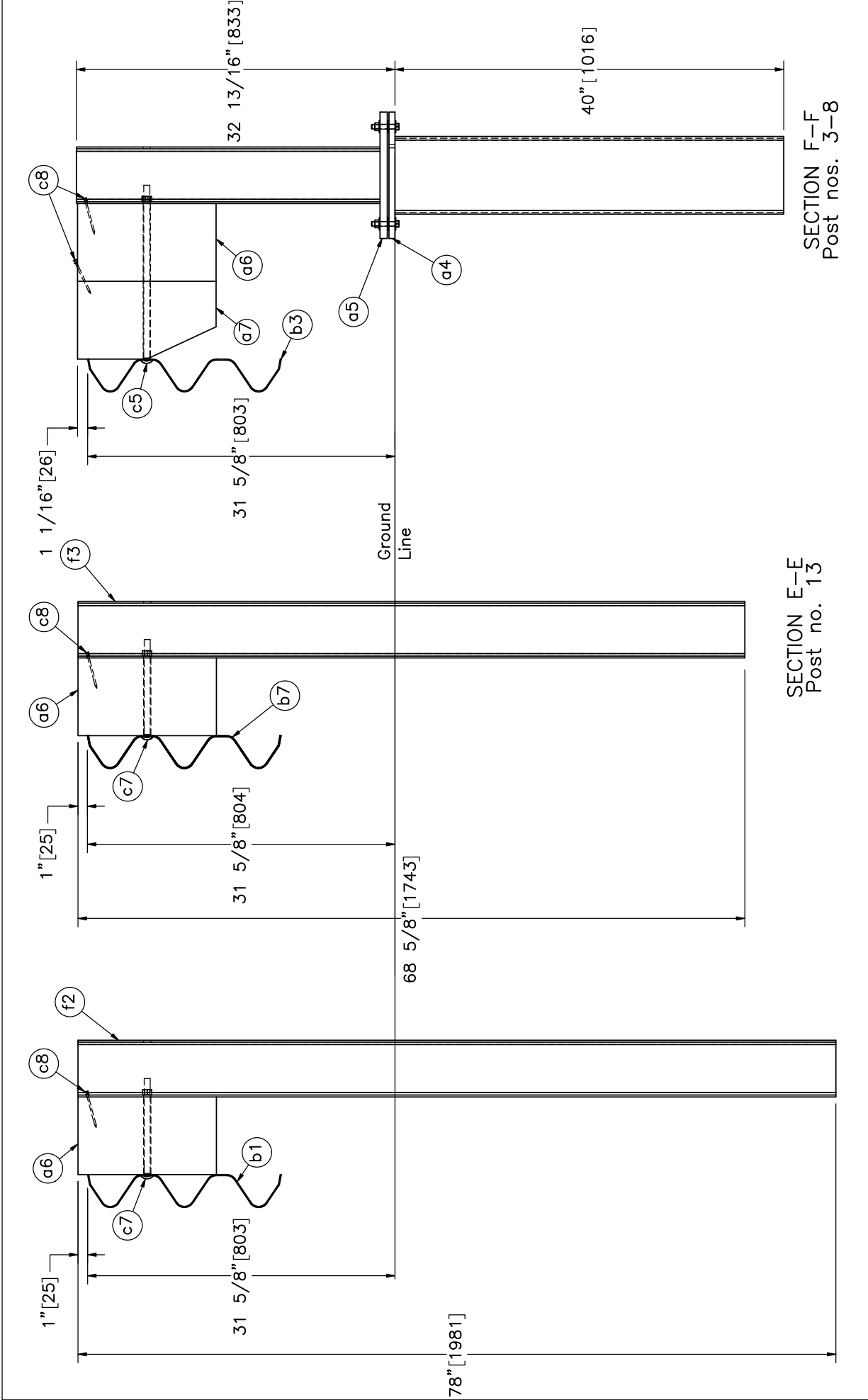
Layout for Post Locations

SHEET:	2 of 24
DATE:	4/17/2020
DRAWN BY:	MES/JEK/M KB/JDY/JRF
REV. BY:	JEK/RWB/J CH/JEK

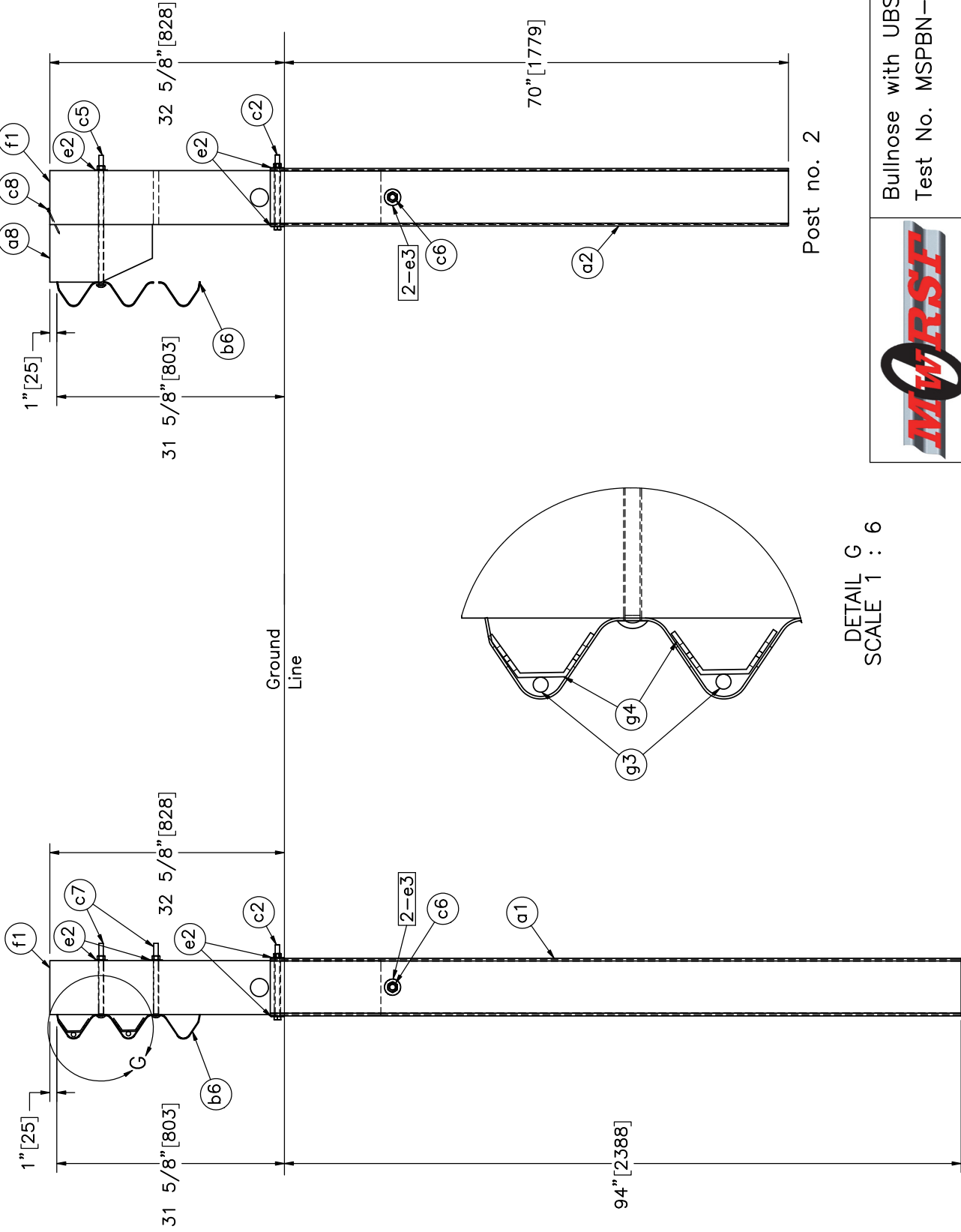
DWG. NAME:	Bullnose-4_R12
SCALE:	1:30
UNITS:	in, [mm]



	Bullnose with UBSP Test No. MSPBN-4	
	Alternate Coordinate System for the Layout of Post Locations	
Midwest Roadside Safety Facility	DWG. NAME: Bullnose-4_R12	SCALE: 1:90 UNITS: in, [mm]
SHEET: 3 of 24		DATE: 4/17/2020
DRAWN BY: MES/JEK/M KB/JD/JRF		REV. BY: JEK/RWB/J CH/JEK



	Bullnose with UBSP Test No. MSPBN-4		SHEET: 4 of 24
	Post Nos. 3-8, 9-12 and 13 Details DWG. NAME: Bullnose-4_R12		DATE: 4/17/2020
Midwest Roadside Safety Facility		DRAWN BY: MES/JEK/M KB/JD/JRF	REV. BY: JEK/RWB/J CH/JEK
		SCALE: 1:14 UNITS: in, [mm]	



DETAIL G
SCALE 1 : 6



Midwest Roadside
Safety Facility

Bullnose with UBSP
Test No. MSPBN-4

Post Nos. 1 and 2 Details

DWG. NAME:
Bullnose-4_R12

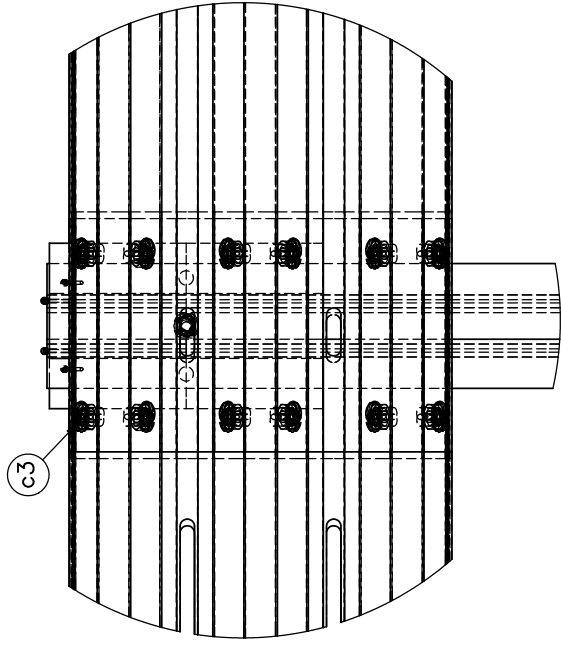
SCALE: 1:20
UNITS: in, [mm]

SHEET:
5 of 24

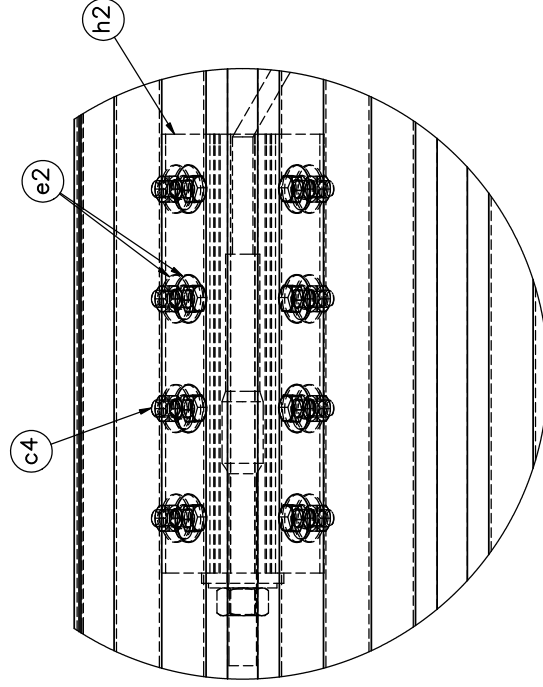
DATE:
4/17/2020

DRAWN BY:
MES/JEK/M
KB/JD/JRF

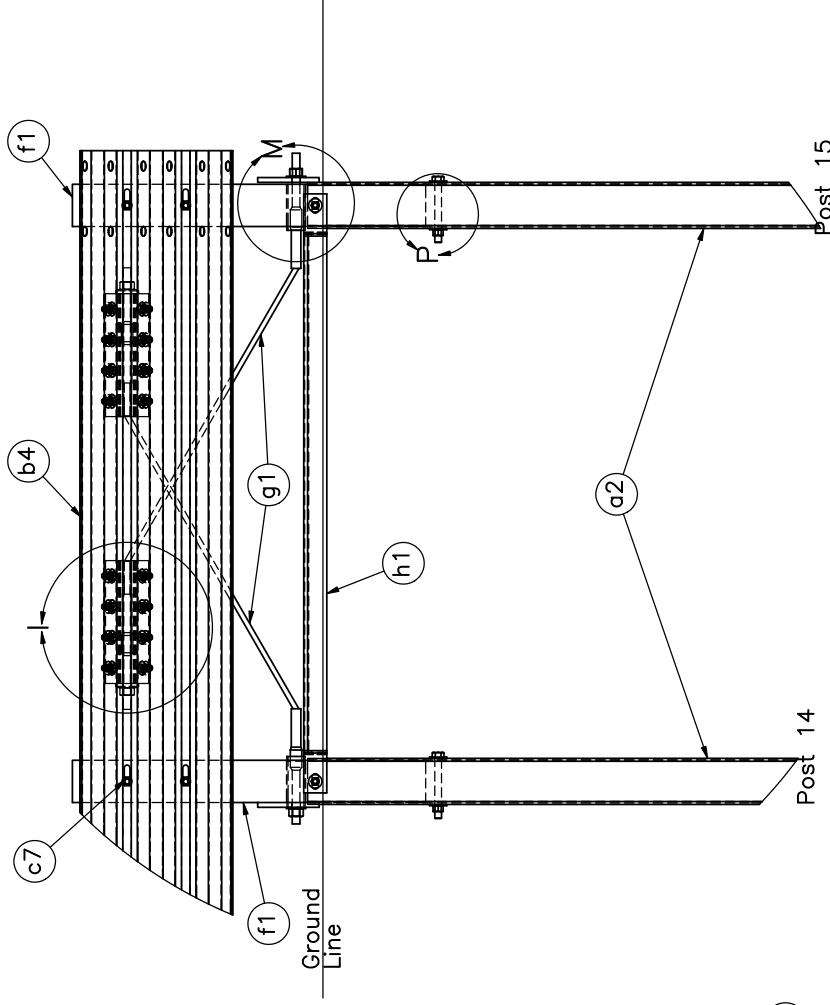
REV. BY:
JEK/RWB/J
CH/JEK



DETAIL H
SCALE 1 : 10



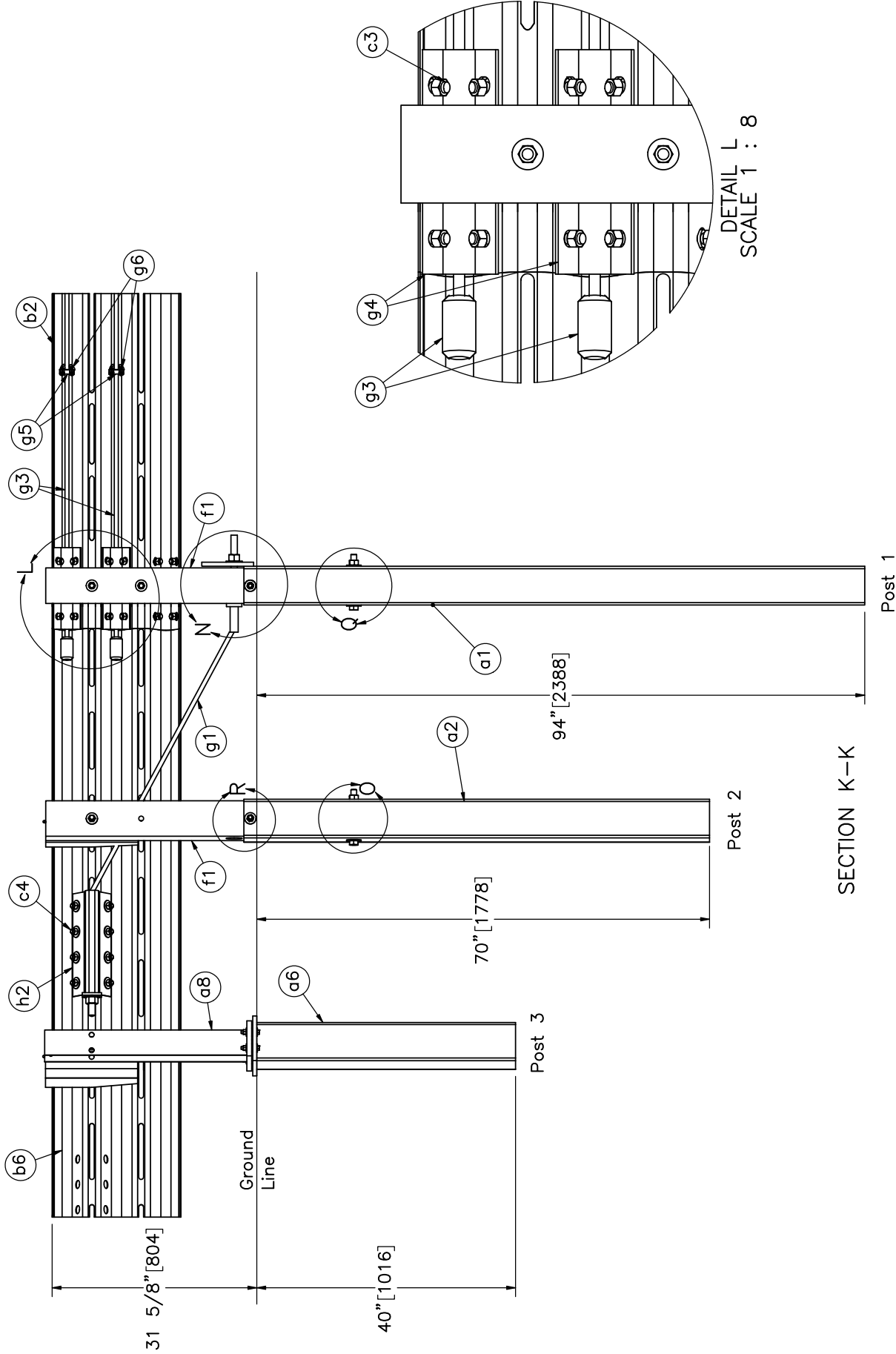
DETAIL I
SCALE 1 : 7



DETAIL J

Notes: (1) Two nails (Part c8) bent over bearing plate (Part a3) to prevent rotation.
(2) Components in Detail J on side B of system hidden for clarity.

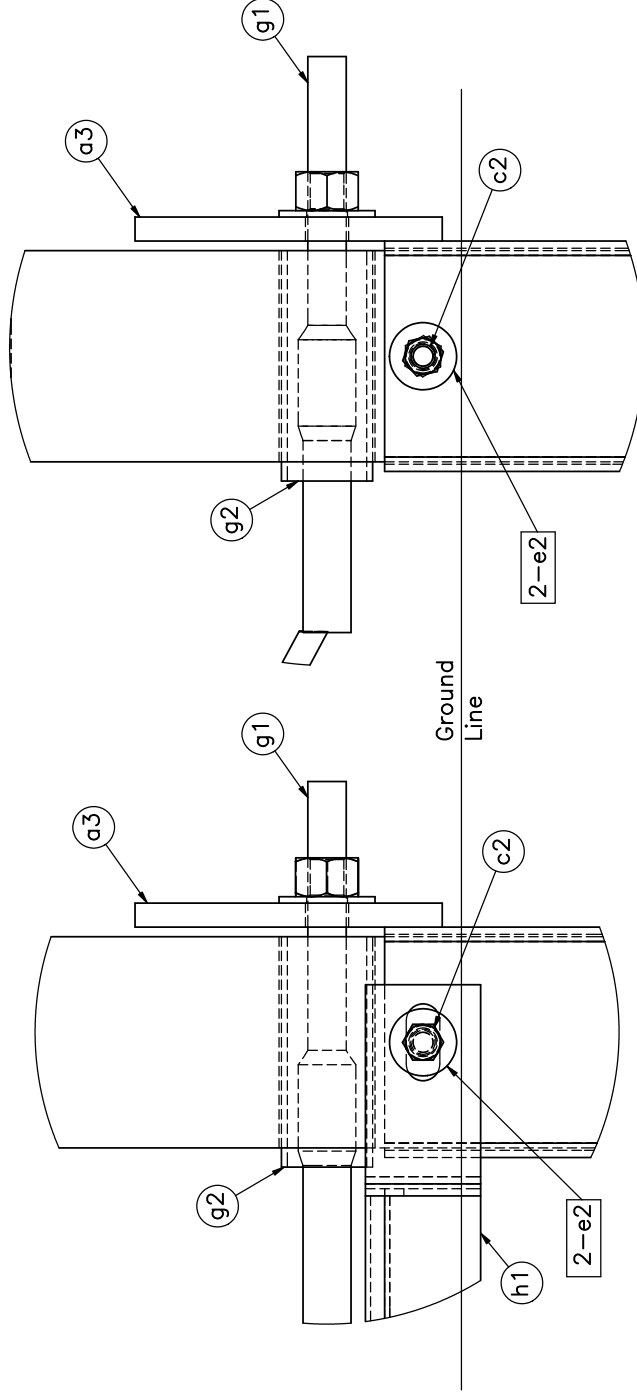
	Bullnose with UBSP		SHEET: 6 of 24
	Test No. MSPBN-4		DATE: 4/17/2020
Midwest Roadside Safety Facility	End Rail Splice Detail		DRAWN BY: MES/JEK/M KB/JD/JRF
	DWG. NAME: Bullnose-4_R12		REV. BY: JEK/RWB/J CH/JEK
		SCALE: 1:25	UNITS: in,[mm]



Midwest Roadside
Safety Facility

Bullnose with UBSP Test No. MSPBN-4	SHEET: 7 of 24
	DATE: 4/17/2020
Nose Section Detail	DRAWN BY: MES/JEK/M KB/JD/JRF
	REV. BY: JEK/RWB/J CH/JEK
DWG. NAME: Bullnose-4_R12	SCALE: 1:22 UNITS: in, [mm]

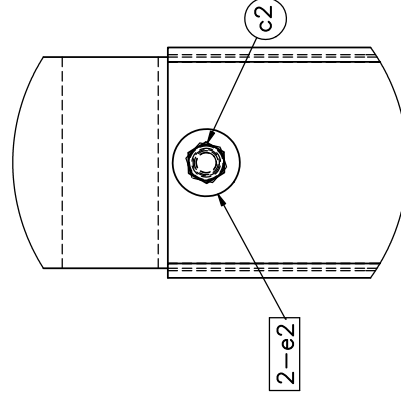
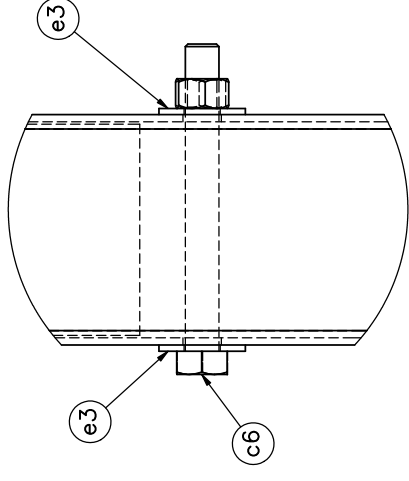
Note: (1) Two nails (Part c8) bent over bearing plate (Part a3) to prevent rotation.



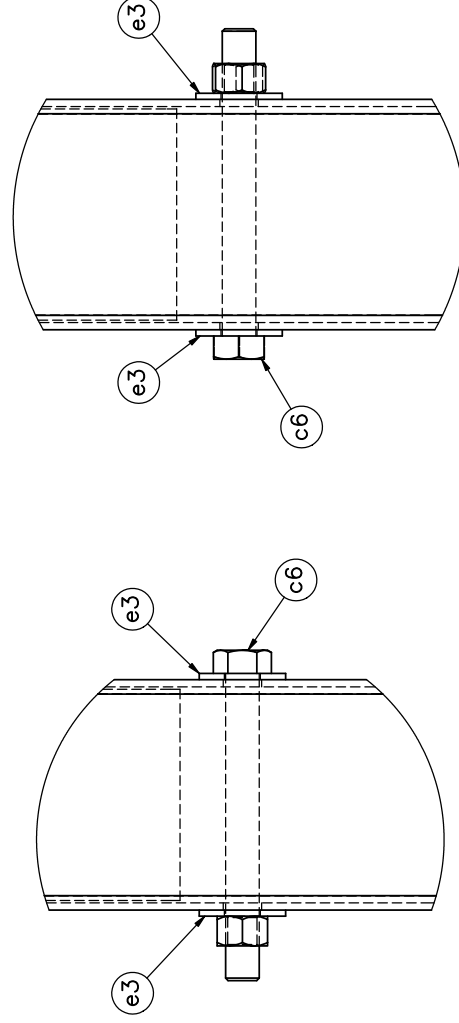
DETAIL M

DETAIL N

DETAIL O



DETAIL R



DETAIL P

DETAIL Q



Midwest Roadside
Safety Facility

Bullnose with UBSP
Test No. MSPBN-4

Anchor Post Details

Note: (1) Two nails (Part c8) bent over bearing plate (Part a3) to prevent rotation.

SHEET:
8 of 24

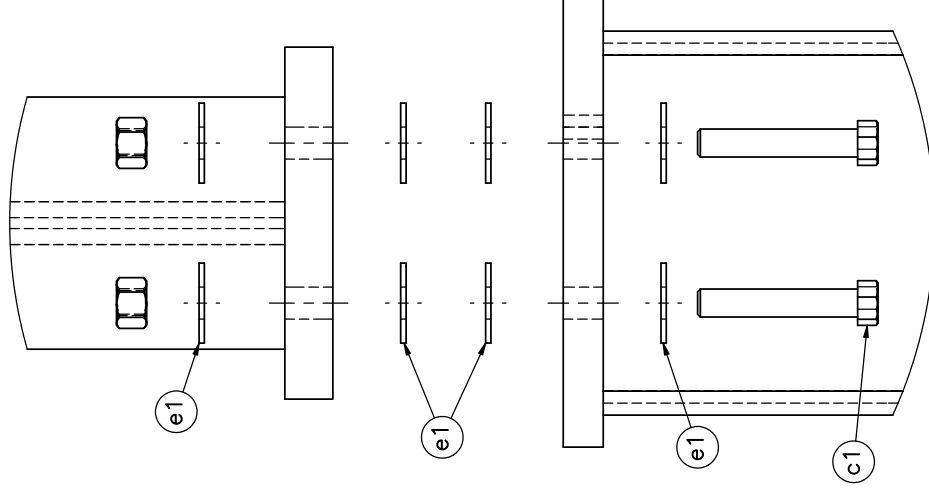
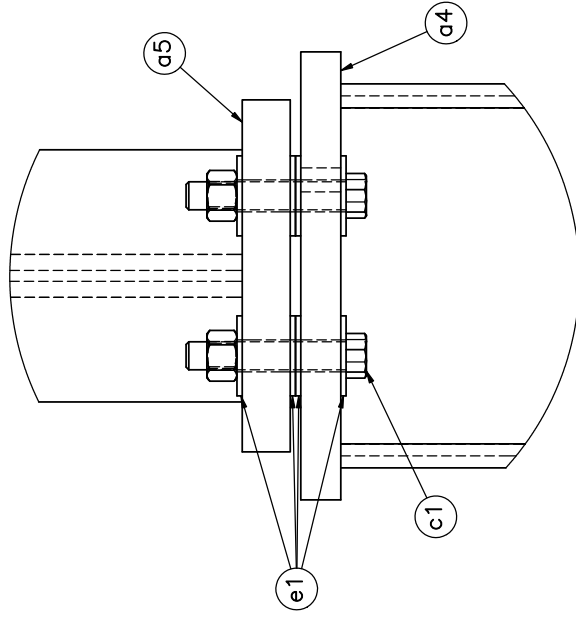
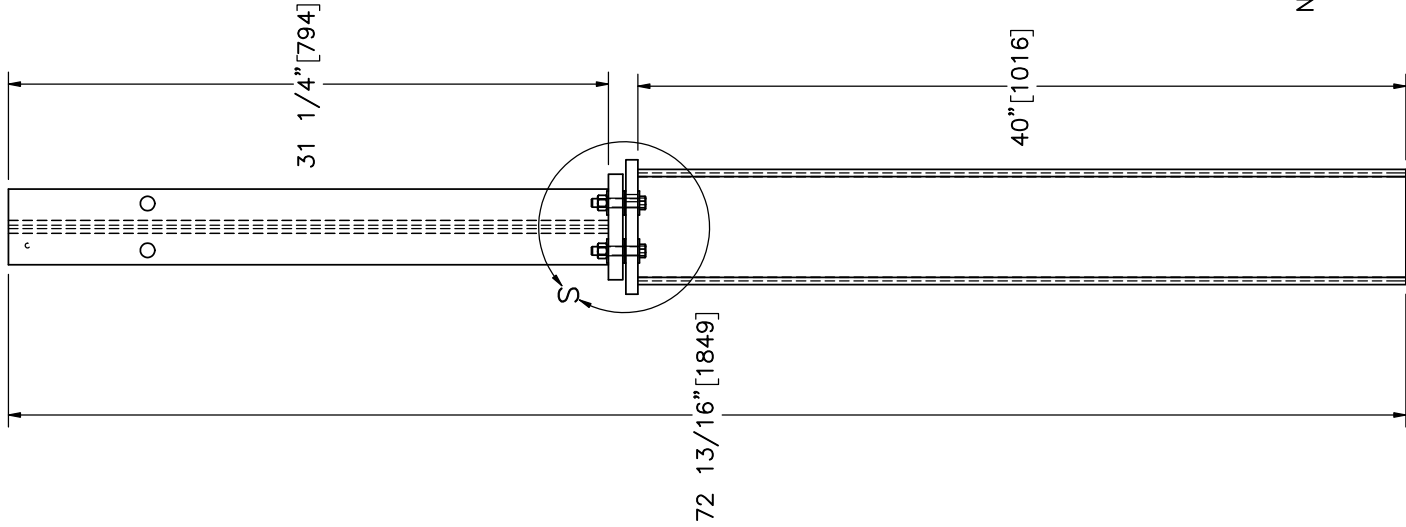
DATE:
4/17/2020

DRAWN BY:
MES/JEK/M
KB/JDY/JRF

REV. BY:
JEK/RWB/J
CH/JEK

DWG. NAME:
Bullnose-4_R12

SCALE: 1:5
UNITS: in, [mm]



DETAIL S
(EXPLODED)
SCALE 1:3



Midwest Roadside
Safety Facility

Bullnose with UBSP
Test No. MSPBN-4

UBSP Post and Component
Details

DWG. NAME:

Bullnose-4_R12

SCALE: 1:10

UNITS: in, [mm]

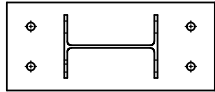
SHEET:
9 of 24

DATE:
4/17/2020

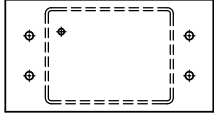
DRAWN BY:
MES/JEK/M
KB/JD/JRF

REV. BY:
JEK/RWB/J
CH/JEK

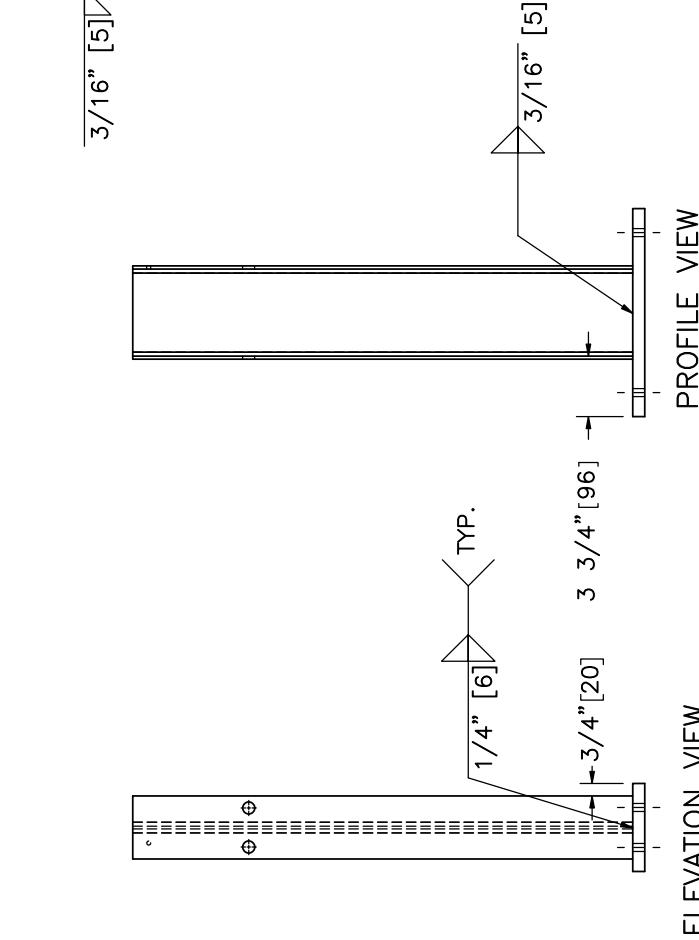
Note: Vertical through-bolts (part c1) are to
be torqued to approximately 60–75 ft–lb
[81.3–101.7 N–m].



PLAN VIEW

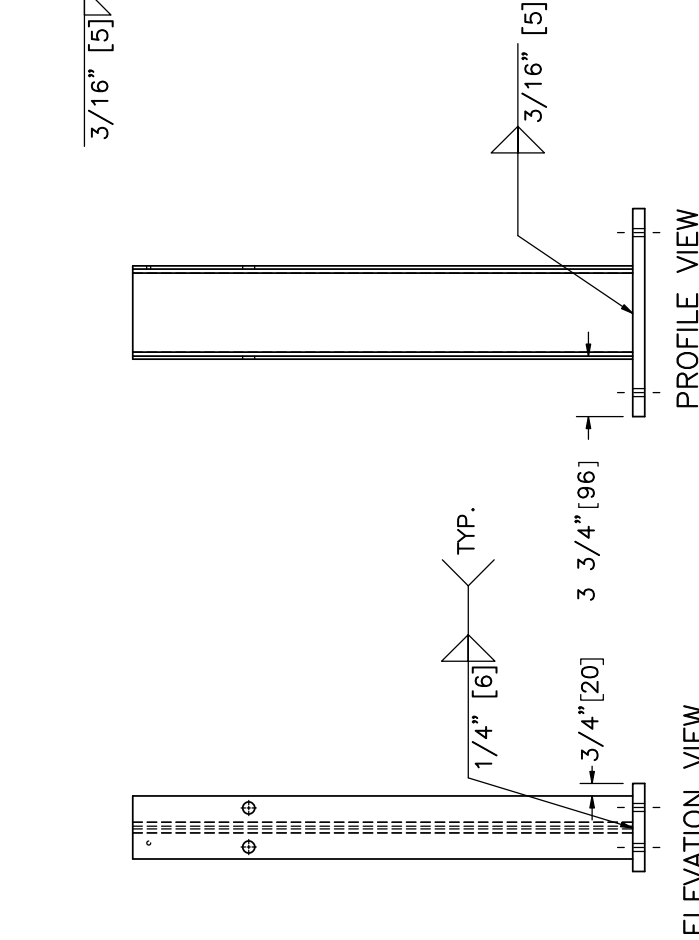


PLAN VIEW



ELEVATION VIEW

PROFILE VIEW



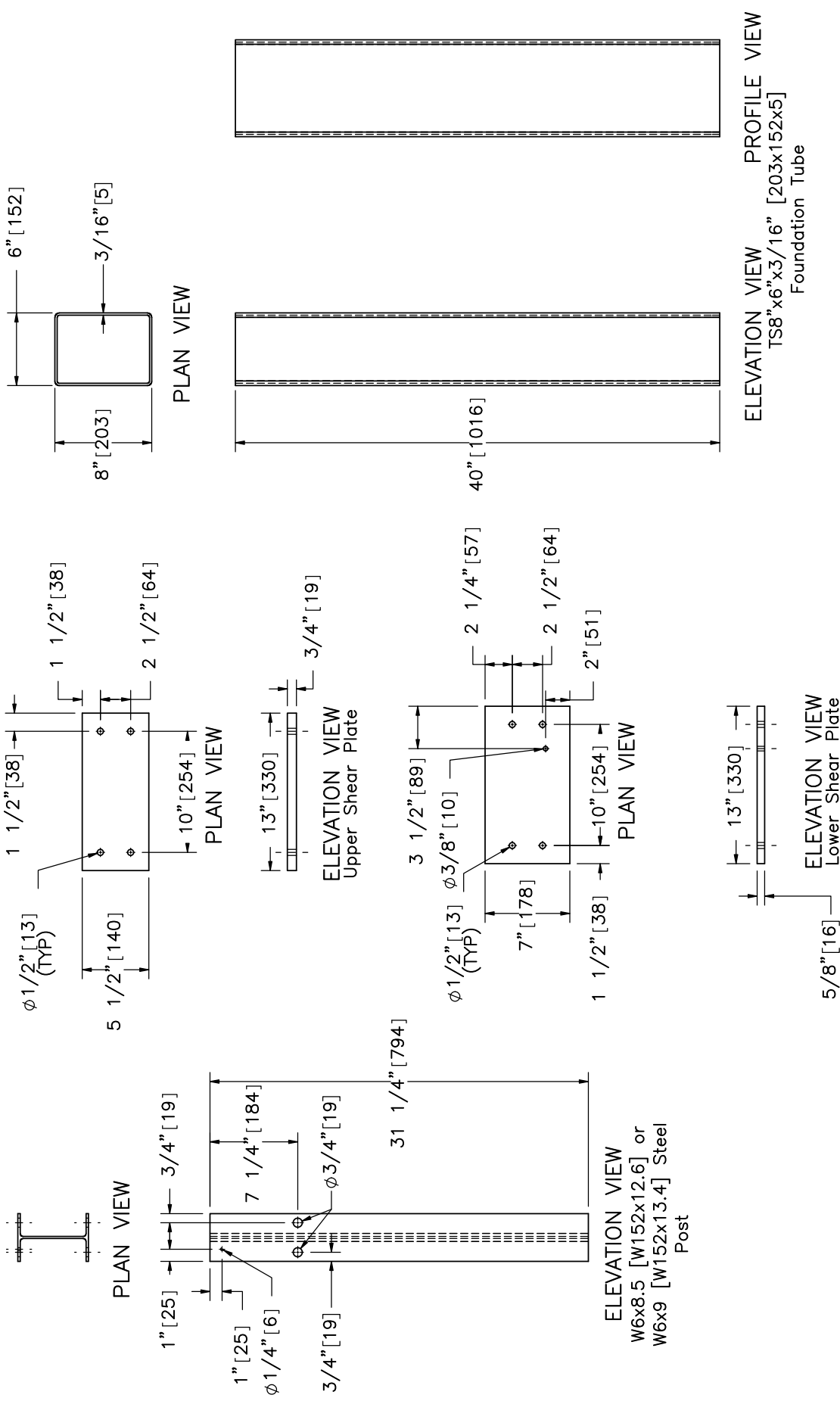
ELEVATION VIEW

PROFILE VIEW

Part a4

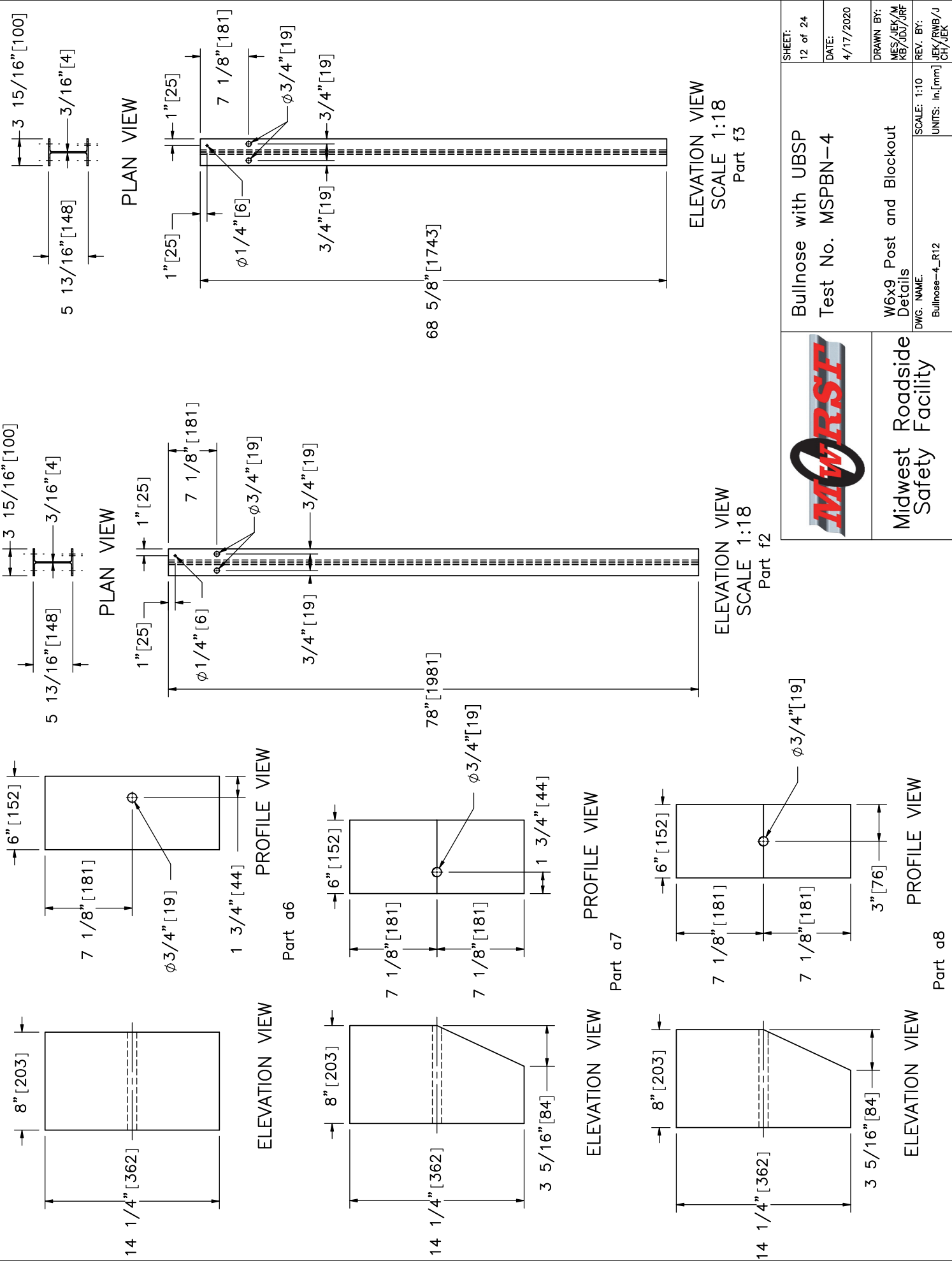
Part a5

	Bullnose with UBSP Test No. MSPBN-4		SHEET: 10 of 24
	Upper and Lower Post Assembly Details		DATE: 4/17/2020
Midwest Roadside Safety Facility		DWG. NAME: Bullnose-4_R12	DRAWN BY: MES/JEK/M KB/JD/JRF
		SCALE: 1:12	REV. BY: JEK/RWB/J CH/JEK
		UNITS: in, [mm]	



Note: $\phi 3/8"$ [10] Weep Hole is to be drilled in the steel plate (Part a4) to allow for draining of the hot zinc coating during the galvanization process.

	Bullnose with UBSP		SHEET: 11 of 24
	Test No. MSPBN-4		DATE: 4/17/2020
Midwest Roadside Safety Facility	UBSP Component Details		DRAWN BY: MES/JEK/M KB/JD/JRF
	DWG. NAME: Bullnose-4_R12 SCALE: 1:12 UNITS: in, [mm]		REV. BY: JEK/RWB/J CH/JEK



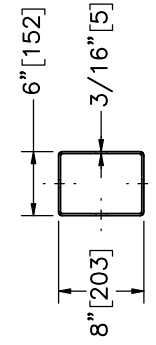
Midwest Roadside Safety Facility

Bullnose with UBSP
 Test No. MSPBN-4

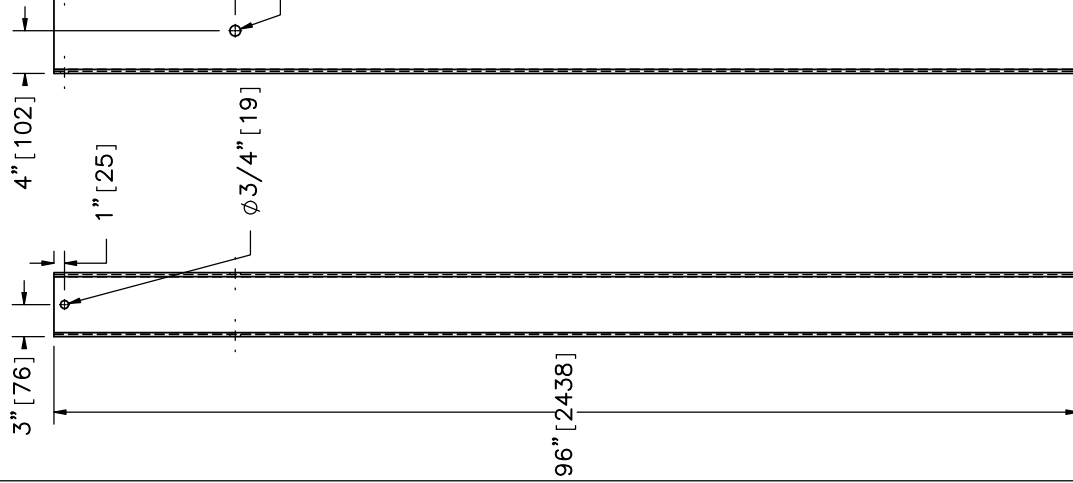
W6x9 Post and Blockout
 Details
 DWG. NAME: Bullnose-4_R12

SHEET:	12 of 24
DATE:	4/17/2020
DRAWN BY:	MES/JEK/M KB/JDJ/JRF
REV. BY:	JEK/RWB/J CH/JEK

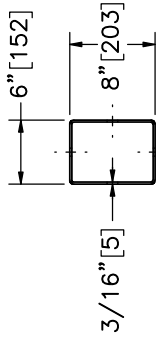
SCALE: 1:10
 UNITS: In, [mm]



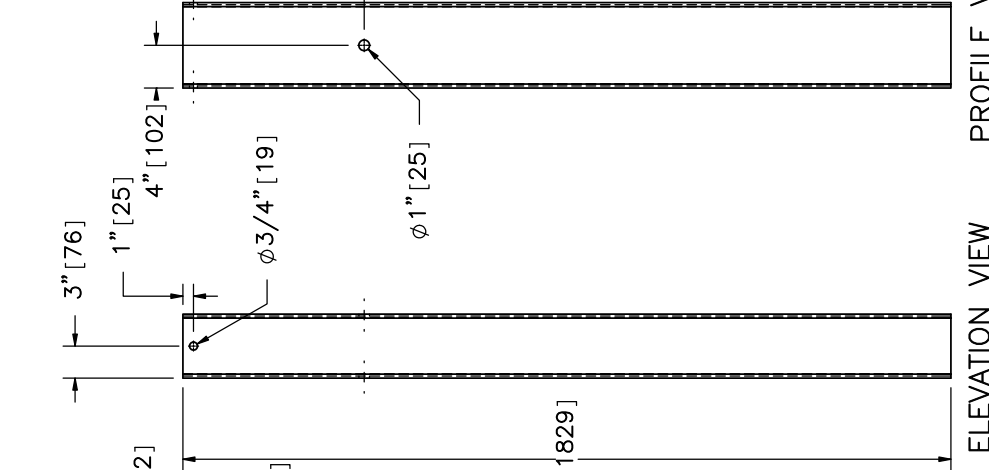
PLAN VIEW



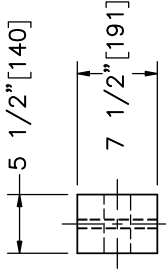
ELEVATION VIEW PROFILE VIEW
Part a1



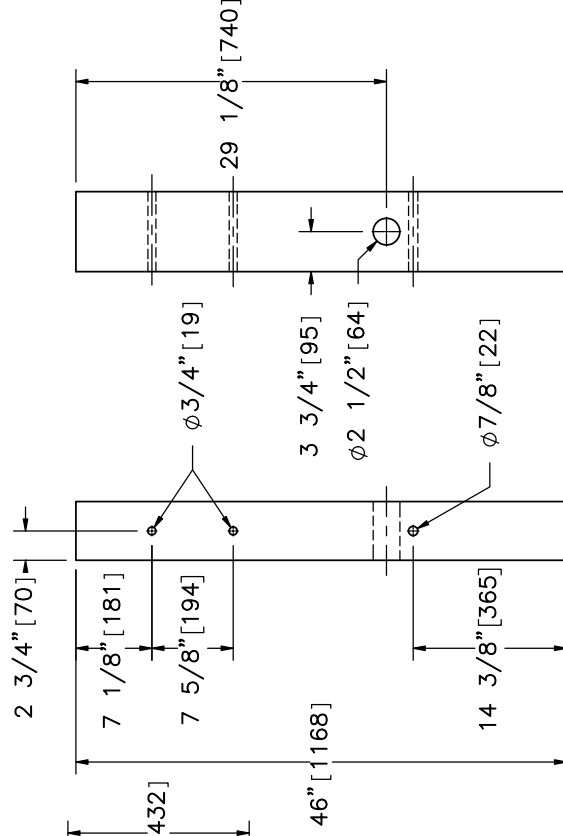
PLAN VIEW



ELEVATION VIEW PROFILE VIEW
Part a2

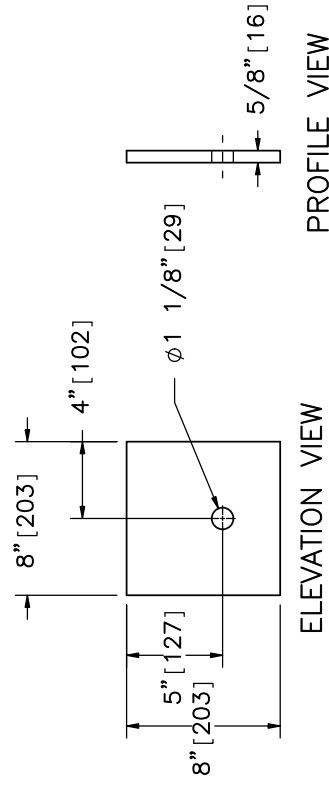
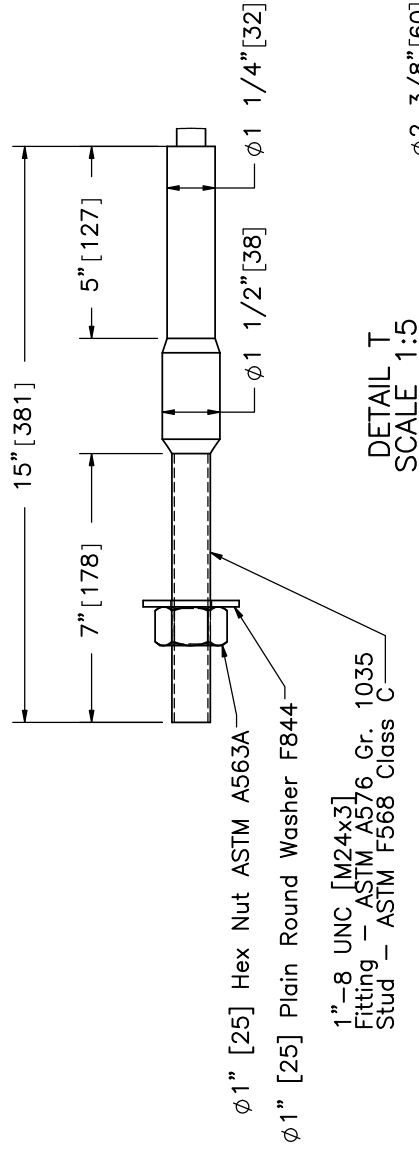
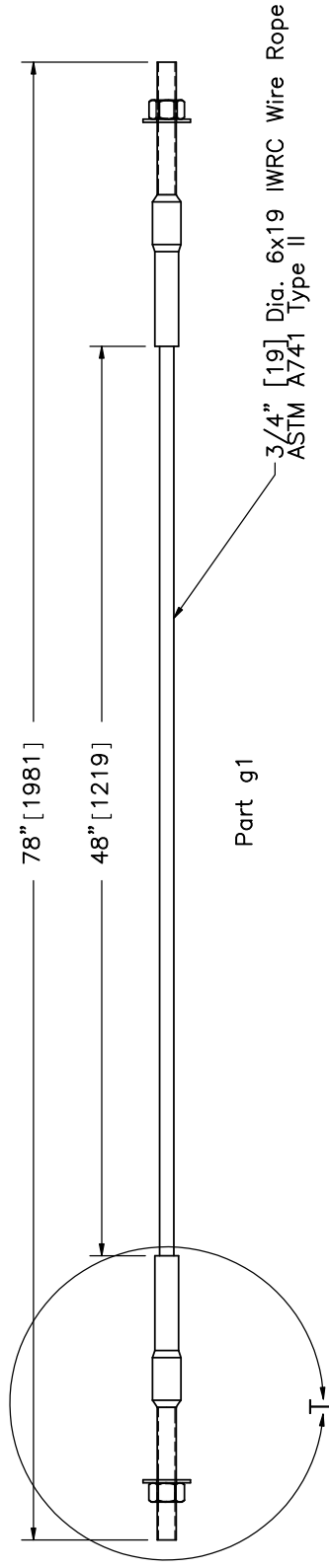


PLAN VIEW



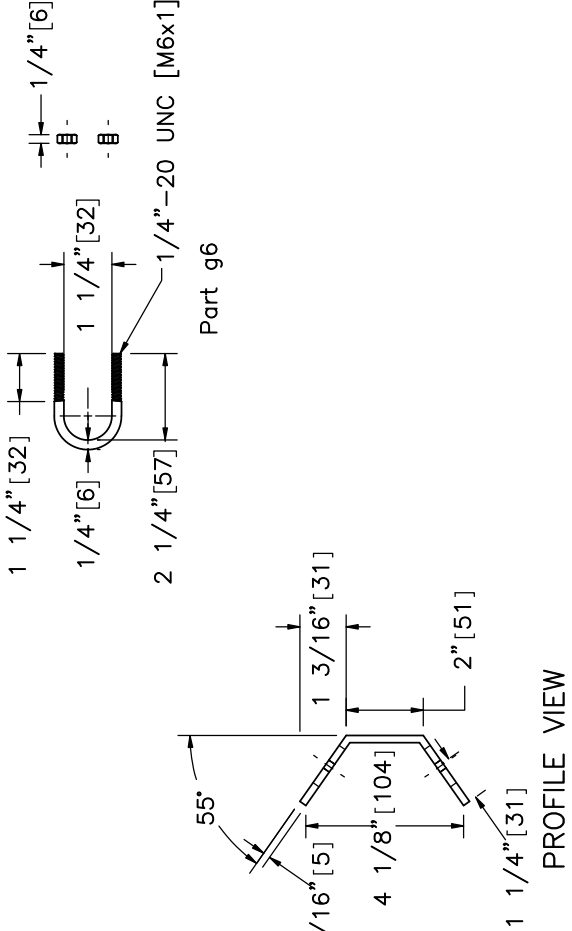
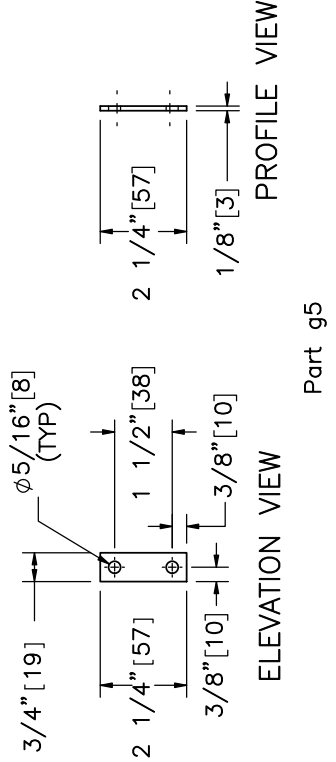
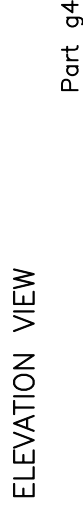
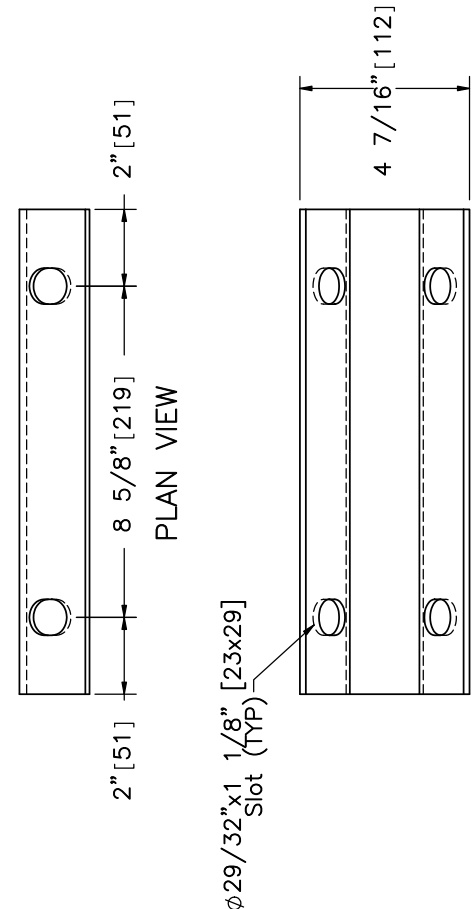
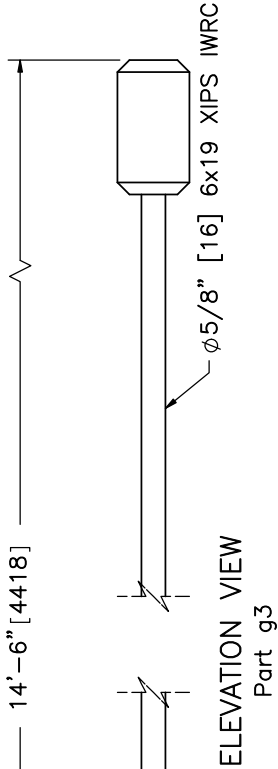
ELEVATION VIEW PROFILE VIEW
Part f1

	Bullnose with UBSP		SHEET: 13 of 24
	Test No. MSPBN-4		DATE: 4/17/2020
Midwest Roadside Safety Facility	BCT Timber Posts and Foundation Tube Details		DRAWN BY: MES/JEK/M KB/JD/JRF
	DWG. NAME: Bullnose-4_R12		REV. BY: JEK/RWB/J CH/JEK

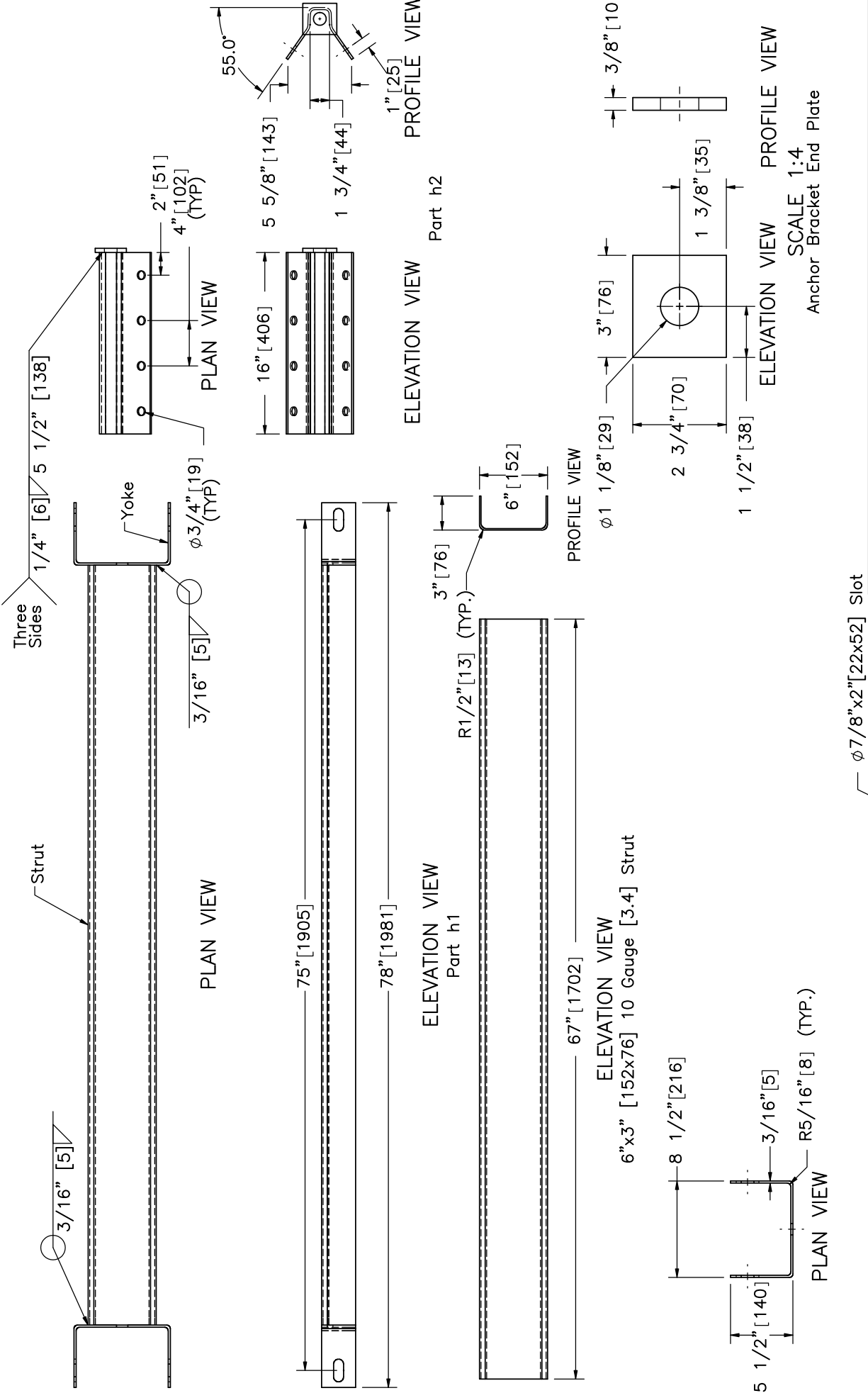


	Bullnose with UBSP		SHEET: 14 of 24
	Test No. MSPBN-4		DATE: 4/17/2020
Midwest Roadside Safety Facility	BCT Anchor Cable Detail		DRAWN BY: MES/JEK/MKB/JD/JRF
	DWG. NAME: Bullnose-4_R12	SCALE: 1:10 UNITS: In, [mm]	REV. BY: JEK/RWB/JCH/JEK

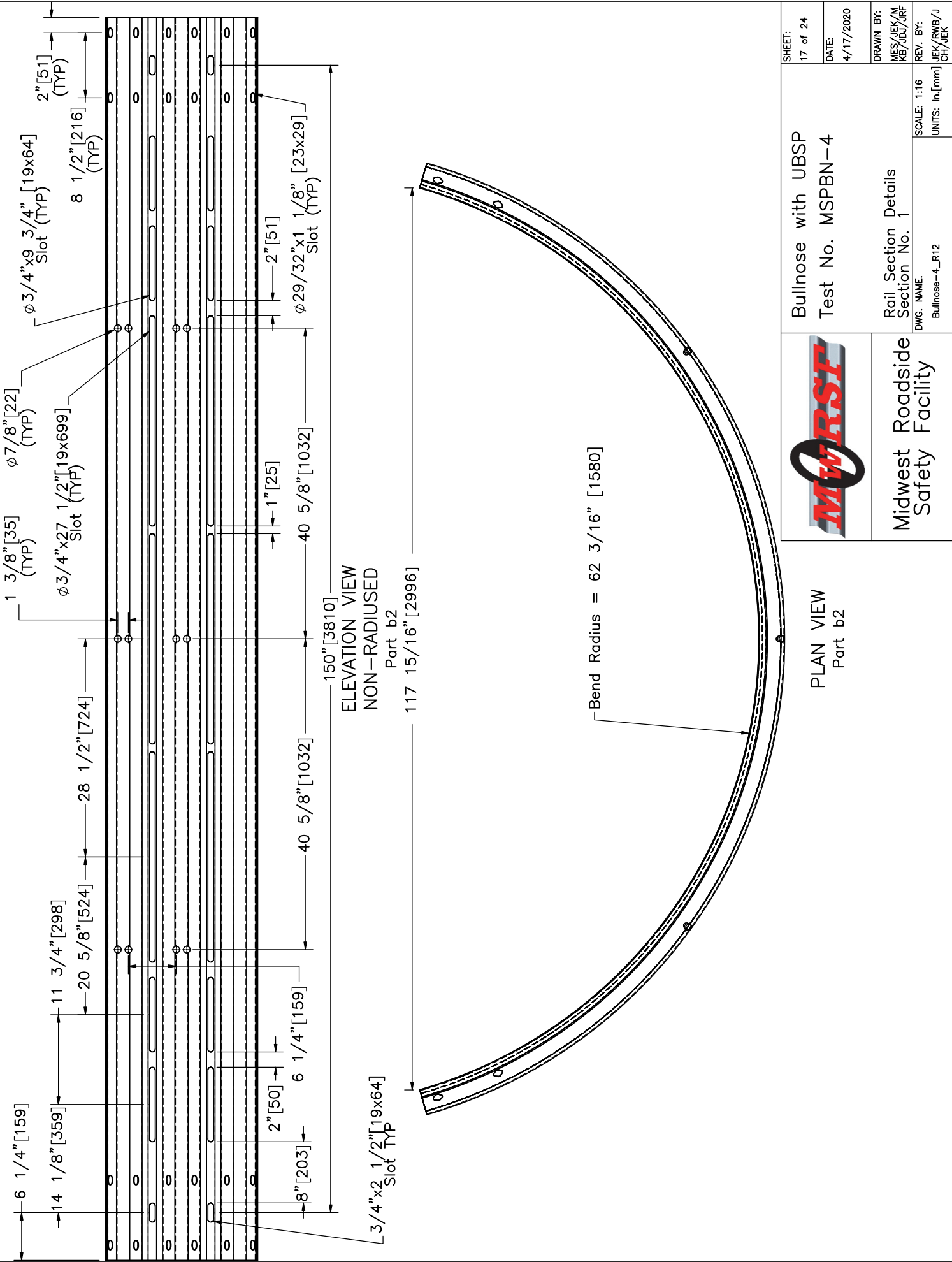
"Cold Tuff" Button, S-409
Size No. 12 SB, Stock No.
1040395 for $\phi 5/8"$ [16]
(6x19) wire rope (or any
similarly sized swage-grip
button ferrules)



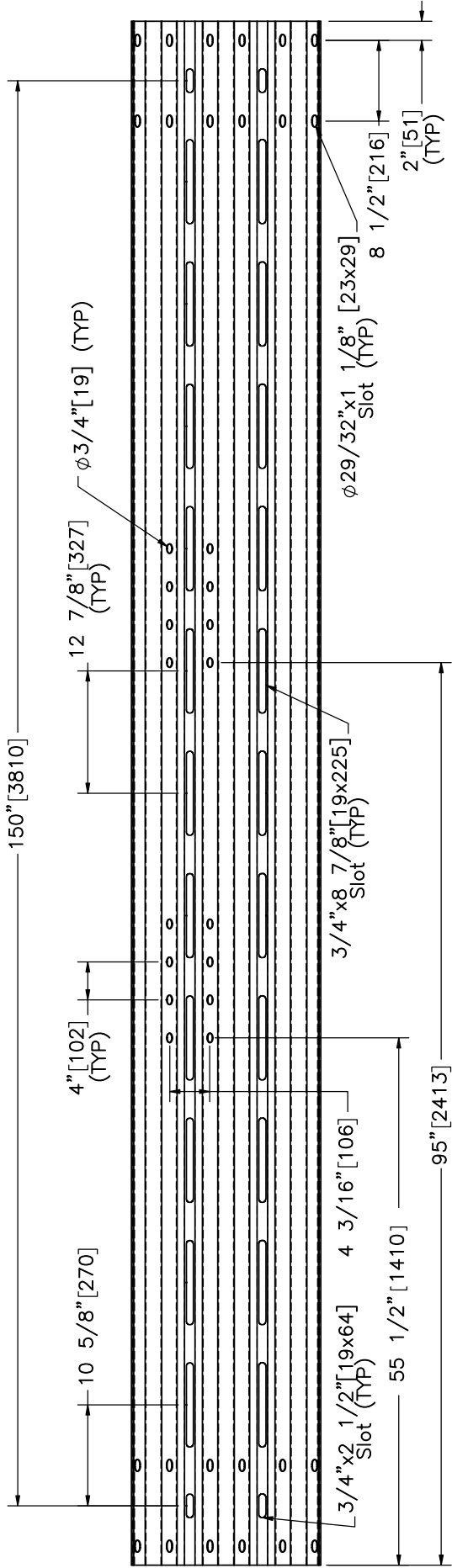
	Bullnose with UBSP Test No. MSPBN-4		SHEET: 15 of 24
	Nose Cable Detail		DATE: 4/17/2020
Midwest Roadside Safety Facility	DWG. NAME: Bullnose-4_R12	SCALE: 1:5 UNITS: In, [mm]	DRAWN BY: MES/JEK/M KB/JDY/JRF
			REV. BY: JEK/RWB/J CH/JEK



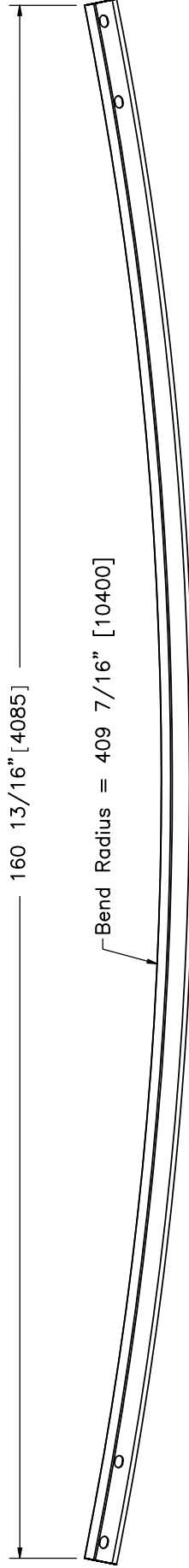
 Midwest Road Safety Facility	Bullnose with UBSP Test No. MSPBN-4		SHEET: 16 of 24
	BCT Anchorage Detail		DATE: 4/17/2020
Yoke	DWG. NAME: Bullnose-4_R12		DRAWN BY: MES/JEK/M KB/JD/JRF
	SCALE: 1:12 UNITS: in, [mm]		REV. BY: JEK/RWB/J CH/JEK



	Bullnose with UBSP Test No. MSPBN-4		SHEET: 17 of 24
	Rail Section Details Section No. 1		DATE: 4/17/2020
Midwest Roadside Safety Facility		DWG. NAME: Bullnose-4_R12	DRAWN BY: MES/JEK/M KB/JD/JRF
		SCALE: 1:16 UNITS: in, [mm]	REV. BY: JEK/RWB/J CH/JEK

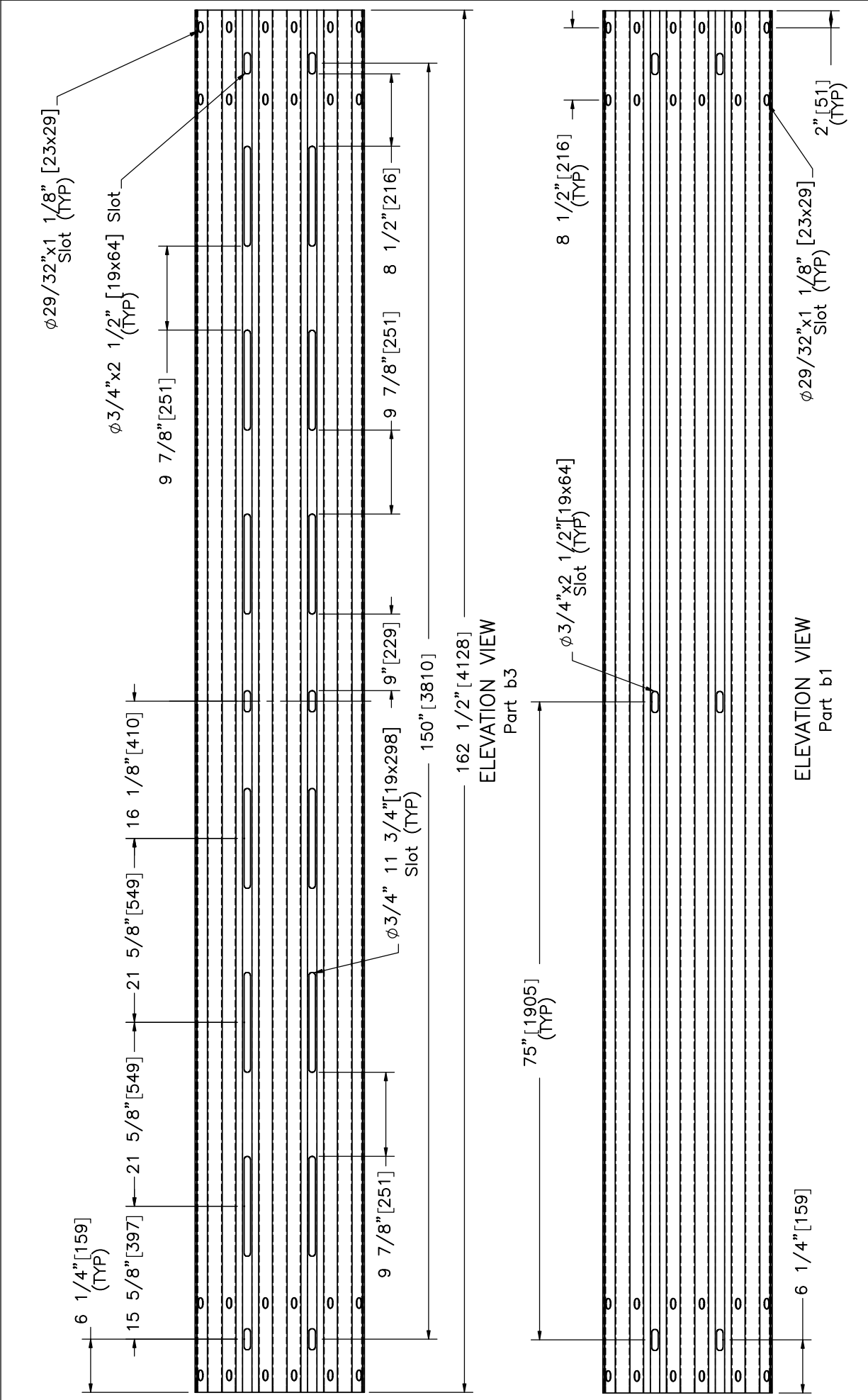


ELEVATION VIEW
NON-RADIUSED
Part b6

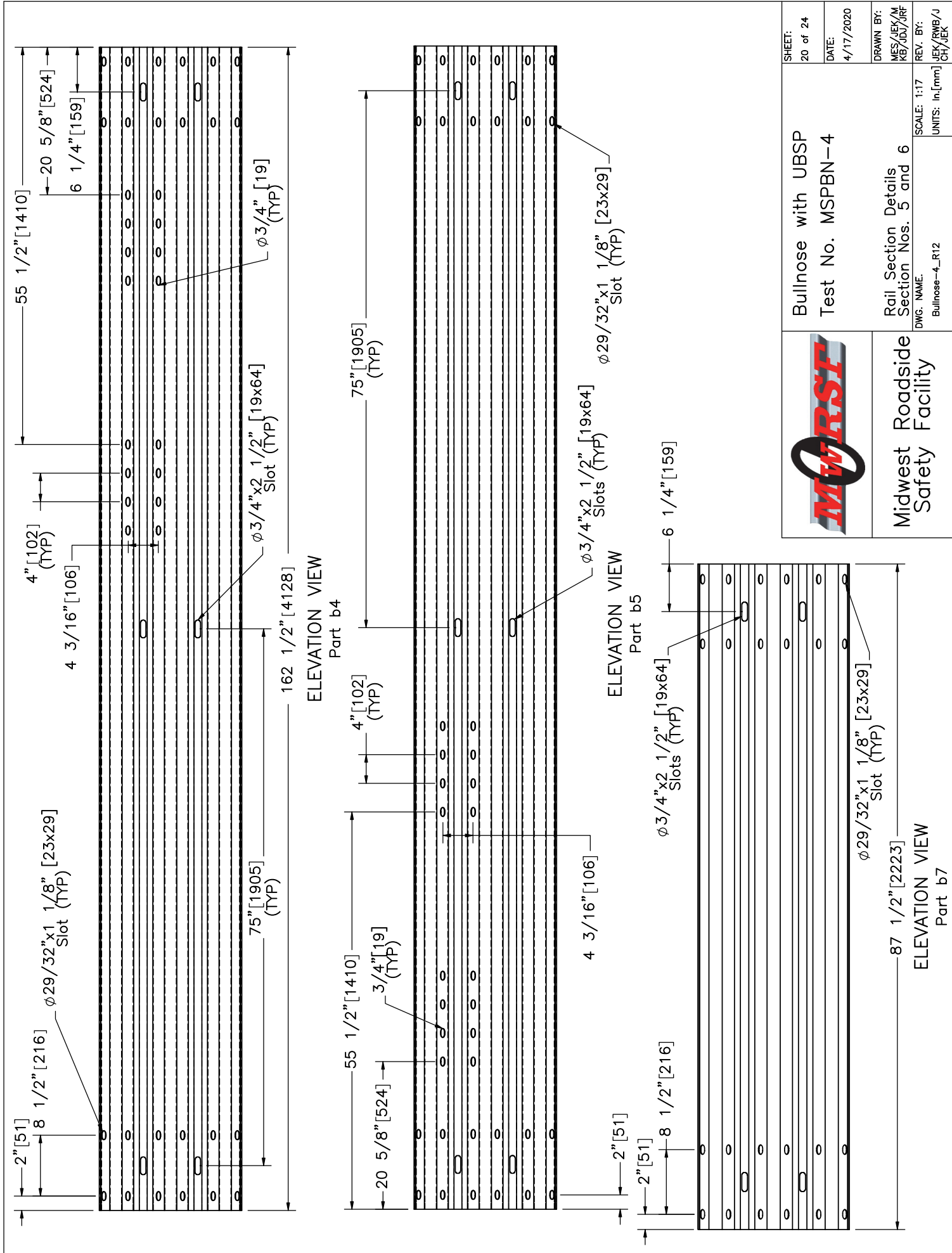


PLAN VIEW
Part b6

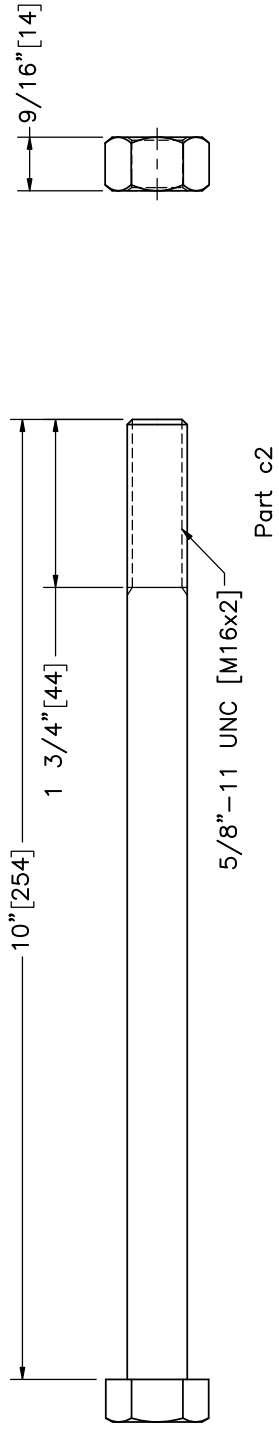
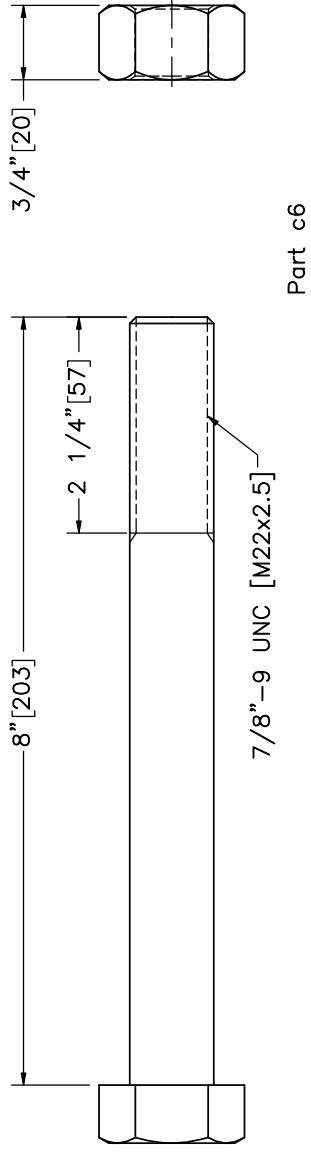
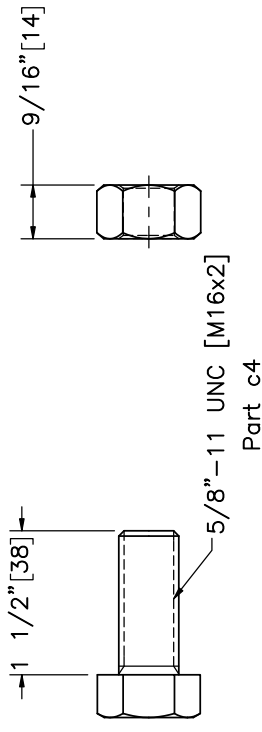
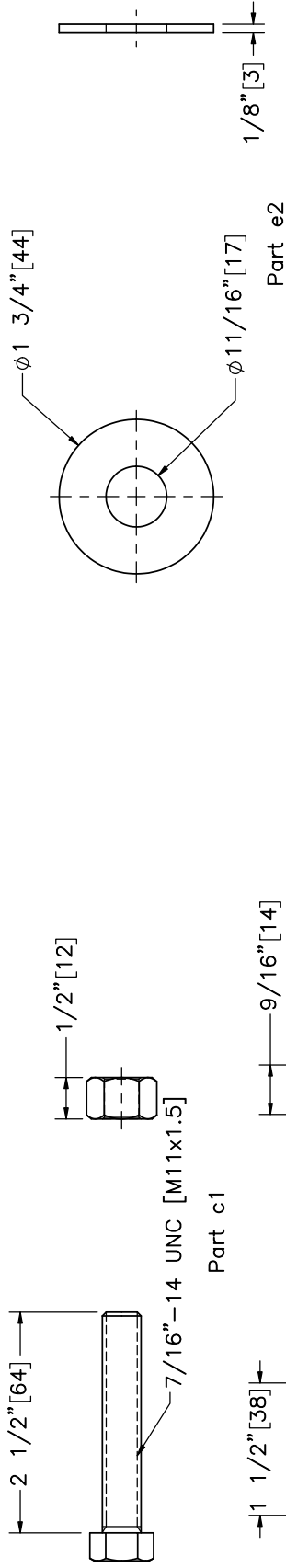
	Bullnose with UBSP		SHEET: 18 of 24
	Test No. MSPBN-4		DATE: 4/17/2020
Midwest Roadside Safety Facility	Rail Section Details		DRAWN BY: MES/JEK/M KB/JD/JRF
	Section No. 2		REV. BY: JEK/RWB/J CH/JEK
DWG. NAME: Bullnose-4_R12		SCALE: 1:17	UNITS: in, [mm]



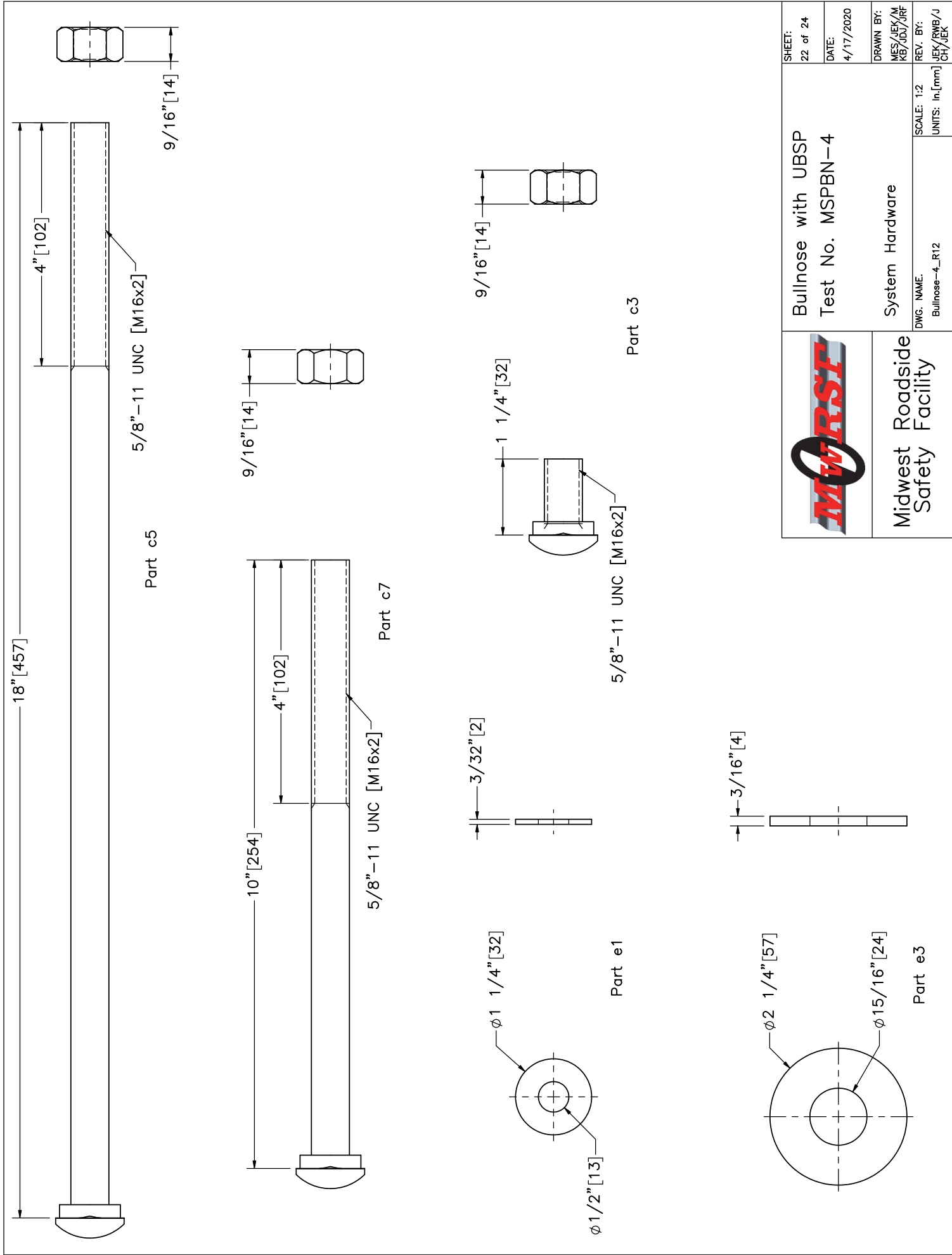
	Bullnose with UBSP Test No. MSPBN-4		SHEET: 19 of 24
	Rail Section Details Section Nos. 3 and 4		DATE: 4/17/2020
Midwest Roadside Safety Facility	Rail Section Details Section Nos. 3 and 4		DRAWN BY: MES/JEK/M KB/JD/JRF
	DWG. NAME: Bullnose-4_R12		REV. BY: JEK/RWB/J CH/JEK
		SCALE: 1:16 UNITS: in, [mm]	



	Bullnose with UBSP Test No. MSPBN-4		SHEET: 20 of 24
	Rail Section Details Section Nos. 5 and 6 DWG. NAME: Bullnose-4_R12		DATE: 4/17/2020
		SCALE: 1:17 UNITS: in, [mm]	DRAWN BY: MES/JEK/M KB/JD/JRF
			REV. BY: JEK/RWB/J CH/JEK



	Bullnose with UBSP		SHEET: 21 of 24
	Test No. MSPBN-4		DATE: 4/17/2020
Midwest Roadside Safety Facility	System Hardware		DRAWN BY: MES/JEK/MKB/JD/JRF
	DWG. NAME: Bullnose-4_R12	SCALE: 1:2	REV. BY: JEK/RWB/JCH/JEK



Item No.	QTY.	Description	Material Specification	Treatment Specification	Hardware Guide
a1	2	TS8"x6"x3/16" [203x152x5], 96" [2,438] Long Foundation Tube	ASTM A500 Gr. B	ASTM A123	PTE07
a2	6	TS8"x6"x3/16" [203x152x5], 72" [1,829] Long Foundation Tube	ASTM A500 Gr. B	ASTM A123	PTE06
a3	6	8"x8"x5/8" [203x203x16] Anchor Bearing Plate	ASTM A36	ASTM A123	FPB01
a4	12	Lower Slip Post Assembly	Plate-ASTM A36 Foundation Tube-ASTM A500 Gr. B	ASTM A123	PTE08
a5	12	Upper Slip Post Assembly	Plate-ASTM A36 Post-ASTM A992	ASTM A123	PWE11
a6	21	6"x8"x14 1/4" [152x203x362] Timber Blockout	SYP Grade No. 1 or better	—	PDB09
a7	12	6"x8"x14 1/4" [152x203x362] Tapered Timber Blockout	SYP Grade No. 1 or better	—	PDB20
a8	2	6"x8"x14 1/4" [152x203x362] Tapered Timber Blockout — Post 2	SYP Grade No. 1 or better	—	PDB12
b1	4	12'-6" [3,810] 12 gauge [2.7] Thrie Beam Section	AASHTO M180	ASTM A123 or A653	RTM02a
b2	1	12'-6" [3,810] 12 gauge [2.7] Bent Thrie Beam Section	AASHTO M180	ASTM A123 or A653	RTM07a
b3	2	12'-6" [3,810] 12 gauge [2.7] Thrie Beam Section	AASHTO M180	ASTM A123 or A653	RTM07e
b4	1	12'-6" [3,810] 12 gauge [2.7] Thrie Beam End Section — Side A	AASHTO M180	ASTM A123 or A653	—
b5	1	12'-6" [3,810] 12 gauge [2.7] Thrie Beam End Section — Side B	AASHTO M180	ASTM A123 or A653	—
b6	2	12'-6" [3,810] 12 gauge [2.7] Bent Thrie Beam Section	AASHTO M180	ASTM A123 or A653	RTM07d
b7	1	6'-3" [1,905] 12-gauge [2.7] Thrie Beam Section	AASHTO M180	ASTM A123 or A653	RTM18a
c1	48	7/16"-14 UNC [M11x1.5], 2 1/2" [64] Long Hex Tap Bolt (Fully Threaded) and Nut	Bolt — ASTM A449 or SAE J429 Nut — ASTM A563DH or SAE J995 Gr. 5	ASTM A153 or B695 Class 55 or F2329	FBX12b
c2	8	5/8"-11 UNC [M16x2], 10" [254] Long Hex Head Bolt	Bolt — ASTM A307 Gr. A Nut — ASTM A563A	ASTM A153 or B695 Class 55 or F2329	FBX16a
c3	132	5/8"-11 UNC [M16x2], 1 1/4" [32] Long Guardrail Bolt and Nut	Bolt — ASTM A307 Gr. A Nut — ASTM A563A	ASTM A153 or B695 Class 55 or F2329	FBF01
c4	48	5/8"-11 UNC [M16x2], 1 1/2" [38] Long Hex Head Bolt and Nut	Bolt — ASTM A307 Gr. A Nut — ASTM A563A	ASTM A153 or B695 Class 55 or F2329	FBX16a
c5	14	5/8"-11 UNC [M16x2], 18" [457] Long Guardrail Bolt and Nut	Bolt — ASTM A307 Gr. A Nut — ASTM A563A	ASTM A153 or B695 Class 55 or F2329	FBF04
c6	8	7/8"-9 UNC [M22x2.5], 8" [203] Long Hex Head Bolt and Nut	Bolt — ASTM A307 Gr. A Nut — ASTM A563A	ASTM A153 or B695 Class 55 or F2329	—
c7	21	5/8"-11 UNC [M16x2], 10" [254] Long Guardrail Bolt and Nut	Bolt — ASTM A307 Gr. A Nut — ASTM A563A	ASTM A153 or B695 Class 55 or F2329	FBF03
c8	46	16D Double Head Nail	—	—	—



Midwest Roadside
Safety
Facility

Bullnose with UBSP
Test No. MSPBN-4

Bill of Materials

DWG. NAME:
Bullnose-4_R12

SCALE: None
UNITS: in, [mm]

SHEET:
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DATE:
4/17/2020

DRAWN BY:
MES/JEK/M
KB/JD/JRF

REV. BY:
JEK/RWB/J
CH/JEK

Item No.	QTY.	Description	Material Specification	Treatment Specification	Hardware Guide
e1	192	7/16" [11] Dia. Plain Round Washer	ASTM F844	ASTM A153 or B695 Class 55 or F2329	FWC12a
e2	118	5/8" [16] Dia. Plain Round Washer	ASTM F844	ASTM A153 or B695 Class 55 or F2329	FWC16a
e3	16	7/8" [22] Dia. Plain Round Washer	ASTM F844	ASTM A153 or B695 Class 55 or F2329	–
f1	8	BCT Timber Post – MGS Height	SYP Grade No. 1 or better (No knots +/- 18" [457] from ground on tension face)	–	PDF04
f2	8	W6x8.5 [W152x12.6] or W6x9 [W152x13.4], 78" [1,981] Long Steel Post	ASTM A992	ASTM A123	–
f3	1	W6x8.5 [W152x12.6] or W6x9 [W152x13.4], 68 5/8" [1,743] Long Steel Post	ASTM A992	ASTM A123	–
g1	6	BCT Anchor Cable Assembly	–		FCA01
g2	6	2 3/8" [60] O.D. x 6" [152] Long BCT Post Sleeve	ASTM A53 Gr. B Schedule 40	ASTM A123	FMM02
g3	2	5/8" Dia. [15.9] x 14.4' [4,389] Long Cable and Swage Button	"Cold Tuff" Button, S-409 Size No. 12 SB, Stock No. 1040395 for 5/8" [16] Dia. (6x19) wire rope (or any similarly sized swage-grip button ferrules)	Wire Rope – Class A Coating	RCM02
g4	4	12 5/8"x5 13/16"x3/16" [321x148x5] Nose Cable Anchor Plate	ASTM A36	ASTM A123	FPA04
g5	6	2 1/4"x3/4" [57x19] 11 gauge [3] U-Bolt Plate Washer	ASTM A1011 CS Type B	ASTM A123	–
g6	6	1/4" [6] Dia. U-Bolt and Nut	U-Bolt – ASTM A307 Gr. A Nut – ASTM A563A	ASTM A153 or B695 Class 55 or F2329	–
h1	2	Ground Strut Assembly	ASTM A36	ASTM A123	PFP01
h2	6	Anchor Bracket Assmbely	ASTM A36	ASTM A123	FPA01



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