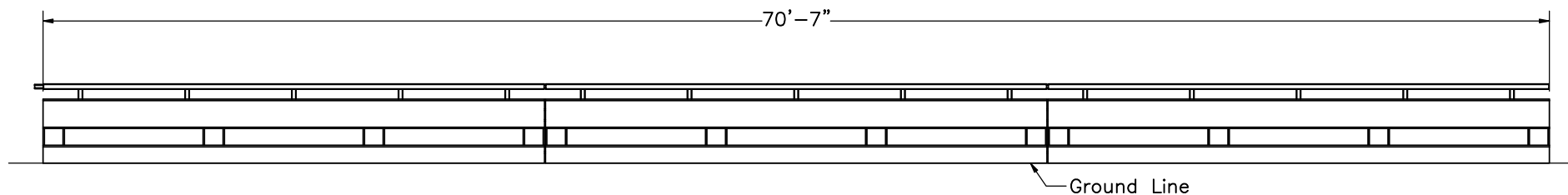


PLAN VIEW



ELEVATION VIEW

- Notes: (1) Test no. HNTBR-1 will be performed according to test designation no. 3-11 of MASH 2016 criteria.
 (2) The impact location for test no. HNTBR-1 is 51 1/2" upstream from the centerline of expansion joint no. 1.



Midwest Roadside
Safety Facility

HDOT Modified Natchez
Trace Bridge Rail
Test No. HNTBR-1

Bridge Rail Layout

DWG. NAME.
HNTBR-1_R14

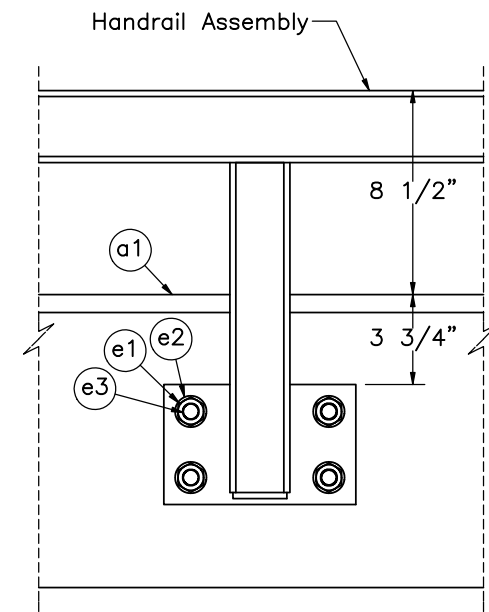
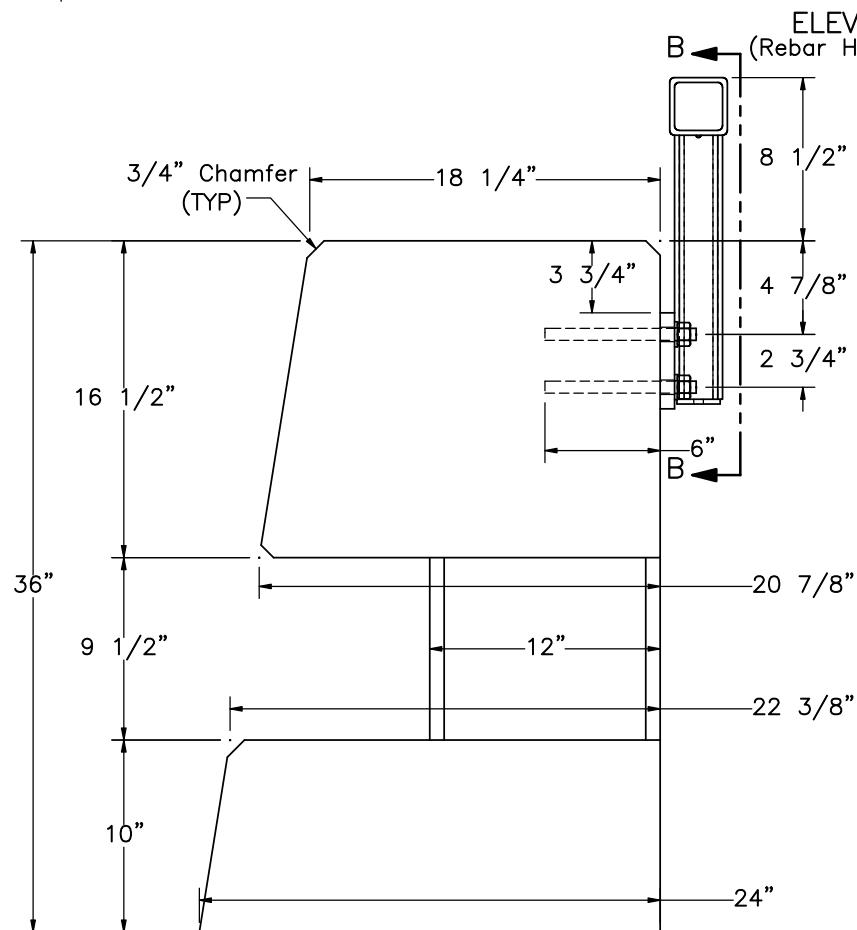
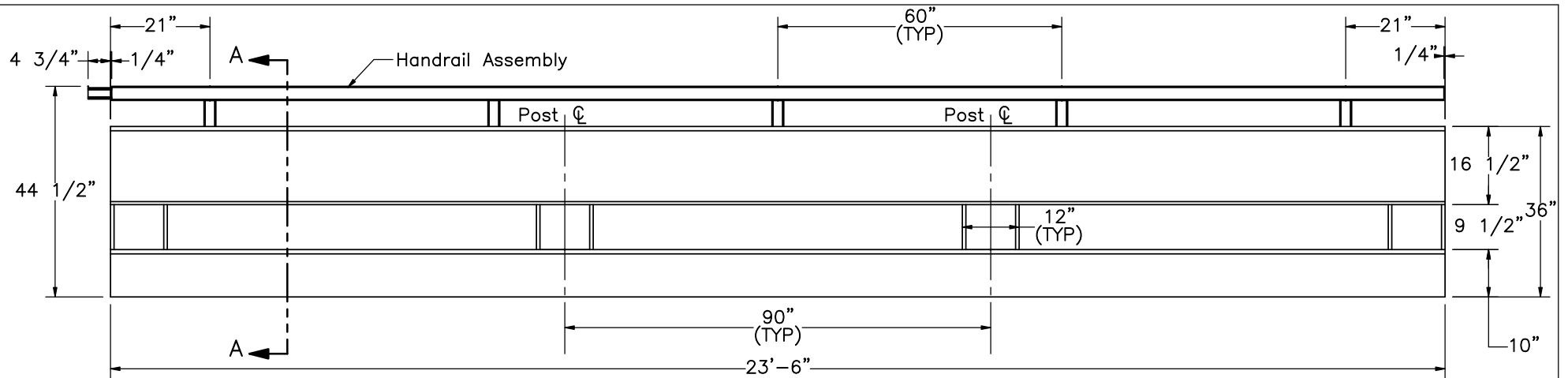
SCALE: 1:90
UNITS: in.

SHEET:
1 of 11

DATE:
8/15/2024

DRAWN BY:
SBW/JPA/Z
MM/JJO/MS
W

REV. BY:
SBW/SKR/M
P/KAL



Midwest Roadside
Safety Facility

HDOT Modified Natchez
Trace Bridge Rail
Test No. HNTBR-1

HNTBR Single Bridge Segment

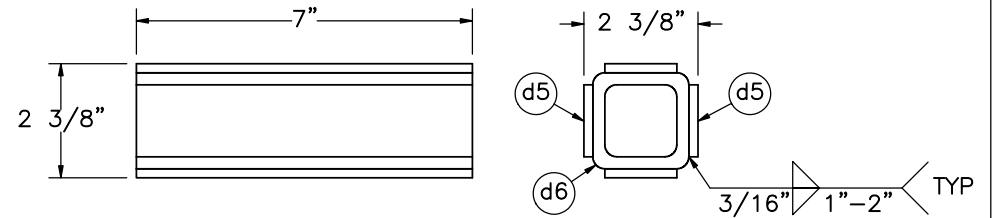
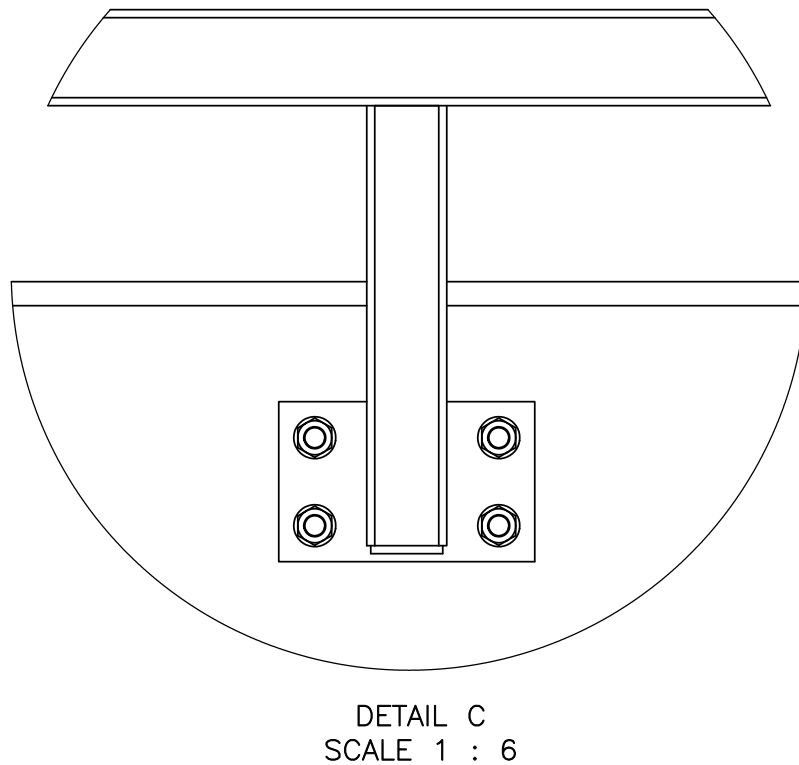
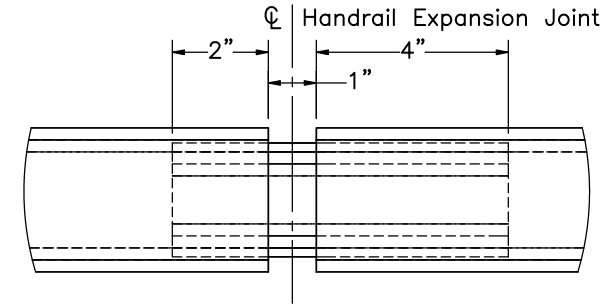
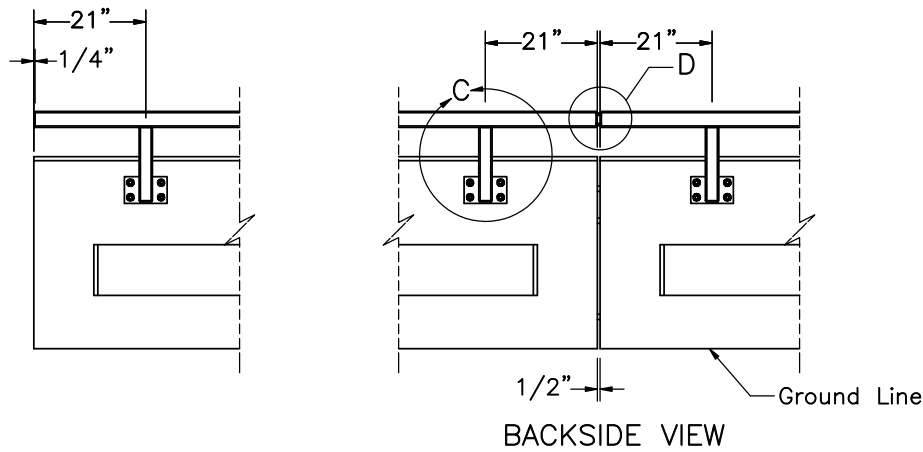
DWG. NAME.
HNTBR-1_R14

SCALE: 1:32
UNITS: in.

SHEET:
2 of 11

DATE:
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DRAWN BY:
SBW/JPA/Z
MM/JJO/MS
W
REV. BY:
SBW/SKR/M
P/KAL



Splice Assembly

- Notes: (1) Drill four $\phi 3/4$ " holes in back of concrete parapet for threaded anchor rods (part e3). Secure with epoxy adhesive (Part e4).
 (2) Handrail splice tubes (parts) shall be welded directly to shims (part) before galvanization.
 (3) Handrail assembly shall be galvanized according to ASTM A123 after welding is complete.
 (4) Rebar Hidden from all views.



Midwest Roadside
Safety Facility

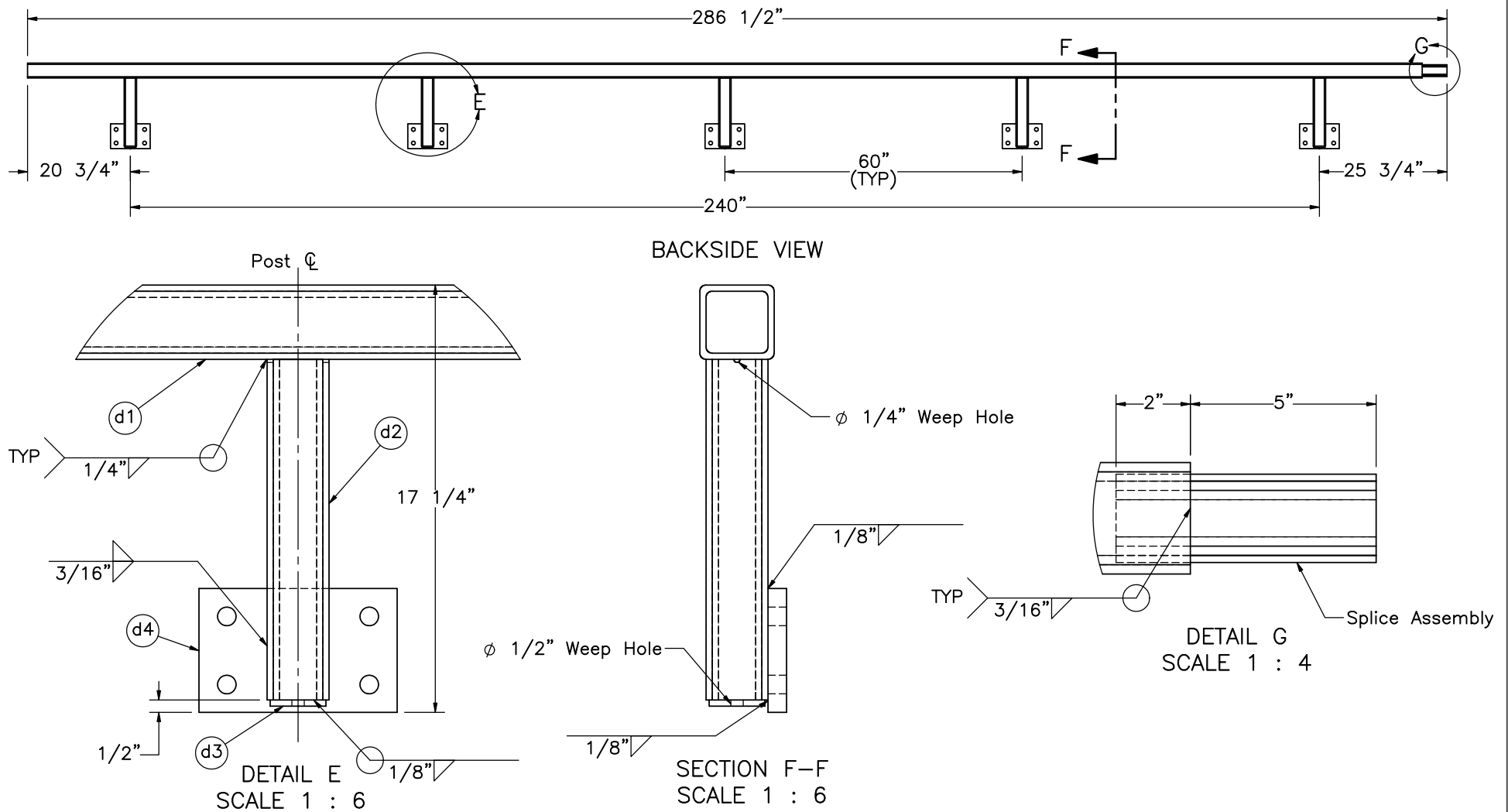
HDOT Modified Natchez
Trace Bridge Rail
Test No. HNTBR-1

Handrail Layout

DWG. NAME.
HNTBR-1_R14

SCALE: 1:36
UNITS: in.

SHEET:
3 of 11
DATE:
8/15/2024
DRAWN BY:
SBW/JPA/Z
MM/JJO/MS
REV. BY:
SBW/SKR/M
P/KAL



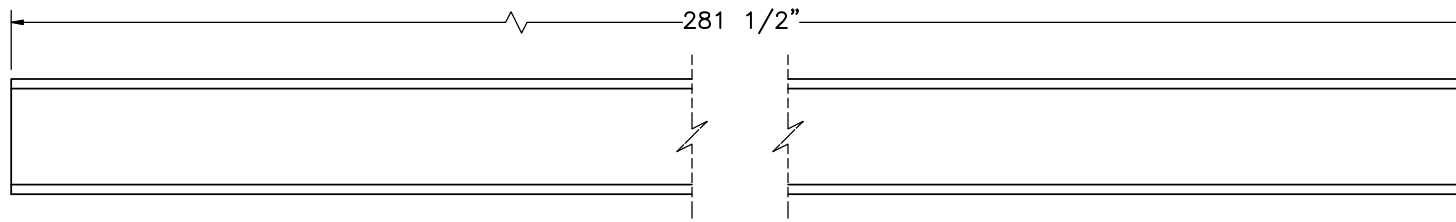
- Notes: (1) Handrail assemblies shall be galvanized according to ASTM A123 after all welding is complete.
 (2) Details are typical for all handrail assemblies.

Item No.	QTY.	Description	Material Specification	Treatment Specification
—	1	Handrail Assembly	—	ASTM A123
d1	1	HSS 3"x3"x1/4", 281 1/2" Long	ASTM A500 Gr. B	See Assembly
d2	5	HSS 2 1/2"x2 1/2"x1/4", 13 3/4" Long	ASTM A500 Gr. B	See Assembly
d3	5	2 1/4"x2 1/4"x1/4" Steel Plate	ASTM A36	See Assembly
d4	5	8"x5"x3/4" Steel Plate	ASTM A36	See Assembly
d5	4	7"x1 1/2"x3/16" Shim	ASTM A36	See Assembly
d6	1	HSS 2"x2"x1/4", 7" Long	ASTM A500 Gr. B	See Assembly

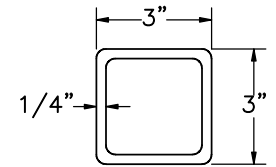


Midwest Roadside
Safety Facility

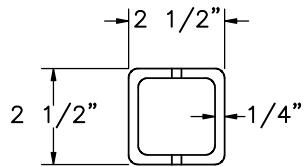
HDOT Modified Natchez Trace Bridge Rail Test No. HNTBR-1		SHEET: 4 of 11
		DATE: 8/15/2024
		DRAWN BY: SBW/JPA/Z MM/JJO/MS P/KAL
Handrail Assembly Details		REV. BY:
DWG. NAME: HNTBR-1_R14	SCALE: 1:30 UNITS: in.	



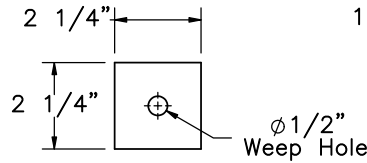
ELEVATION VIEW
Part d1



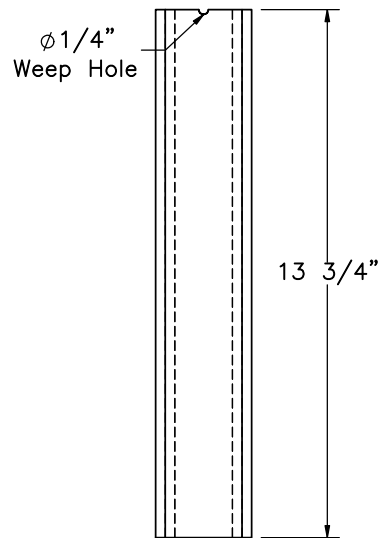
PROFILE VIEW



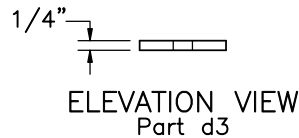
PLAN VIEW



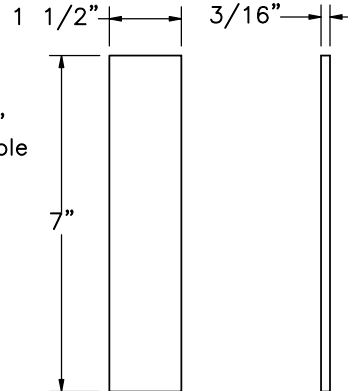
PLAN VIEW



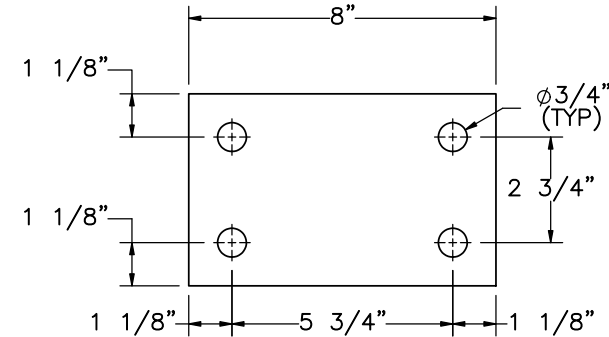
ELEVATION VIEW
Part d2



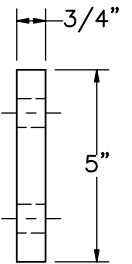
ELEVATION VIEW
Part d3



Part d5

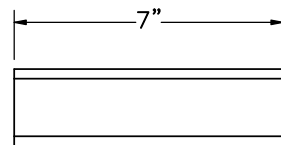


ELEVATION VIEW

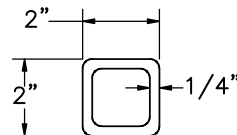


PROFILE VIEW

Part d4

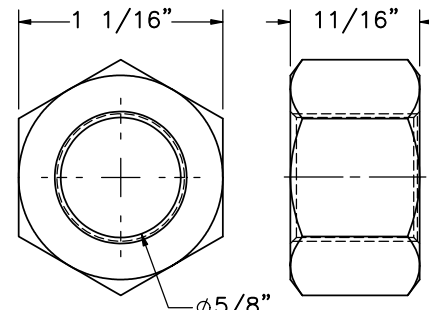


ELEVATION VIEW

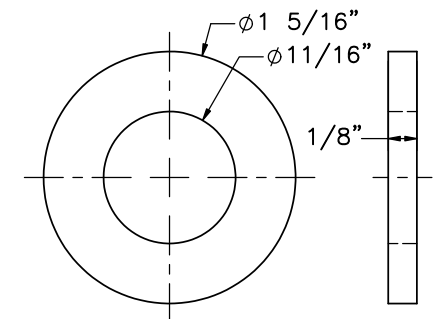


PROFILE VIEW

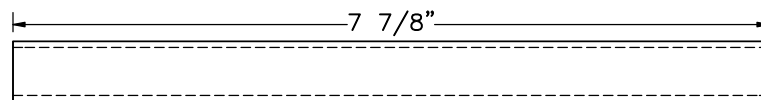
Part d6



SCALE 1 : 1
Part e1



SCALE 1 : 1
Part e2



SCALE 1 : 2
Part e3



Midwest Roadside
Safety Facility

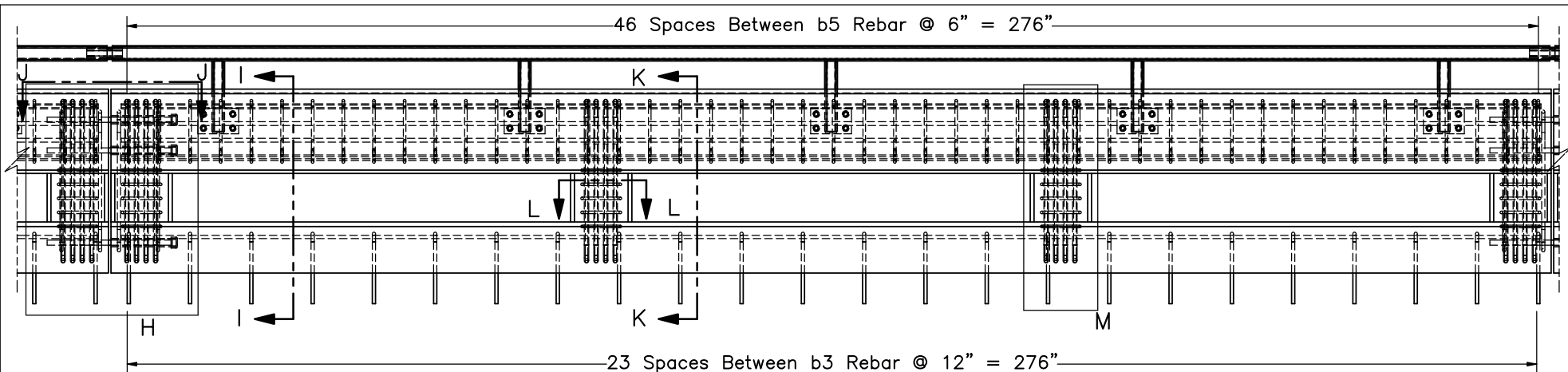
HDOT Modified Natchez
Trace Bridge Rail
Test No. HNTBR-1

Handrail Components

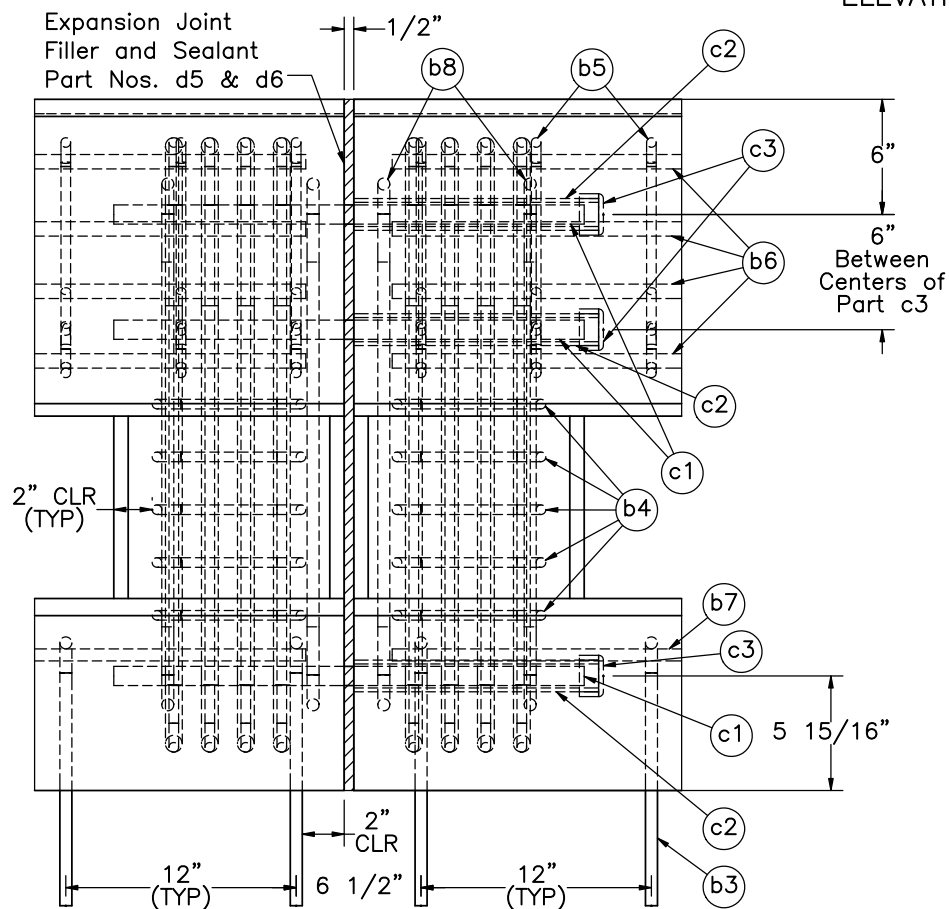
DWG. NAME.
HNTBR-1_R14

SCALE: 1:5
UNITS: in.

SHEET:
5 of 11
DATE:
8/15/2024
DRAWN BY:
SBW/JPA/Z
MM/JJO/MS
REV. BY:
SBW/SKR/M
P/KAL



ELEVATION VIEW



DETAIL H
SCALE 1 : 10

- Notes: (1) MIN. lap length is 18" for b7 longitudinal bars.
 (2) MIN. lap length is 21" for b6 longitudinal bars.
 (3) 1/2" Expansion joints to be bonded together by premolded joint filler (Part d5) and joint sealant (Part d6) according to specifications.



Midwest Roadside
Safety Facility

HDOT Modified Natchez
Trace Bridge Rail
Test No. HNTBR-1

HNTBR Rebar Layout

DWG. NAME.
HNTBR-1_R14

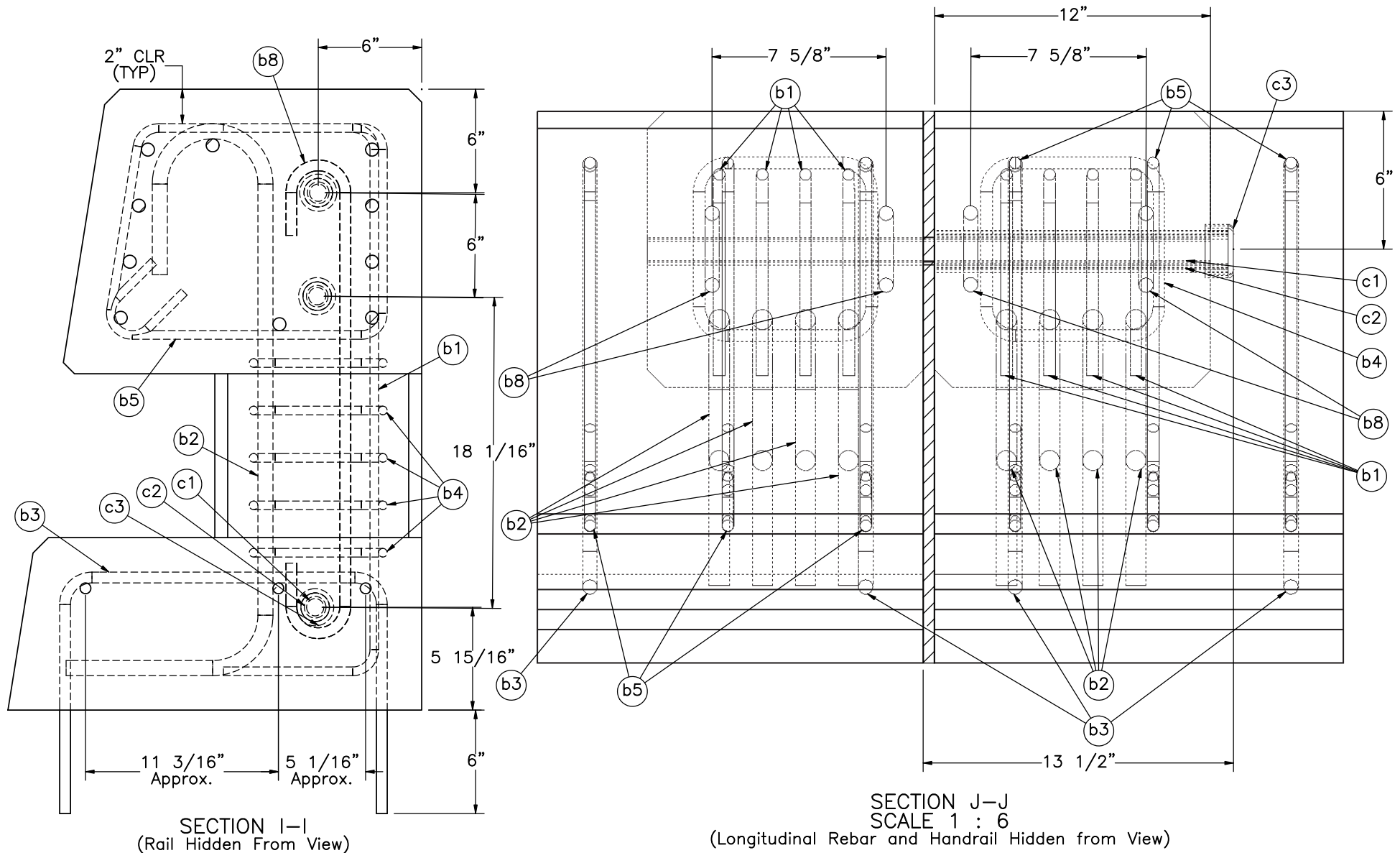
SCALE: 1:30
UNITS: in.

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DATE:
8/15/2024

DRAWN BY:
SBW/JPA/Z
MM/JJO/MS
W

REV. BY:
SBW/SKR/M
P/KAL



- Notes:
- (1) Smooth dowels (part c1) are cast in place on one side of the expansion joint, and inserted into plastic sleeves (part c2), which are cast into the barrier on the other side of the expansion joint.
 - (2) 1/2" expansion joints to be bonded together by premolded joint filler (part e5) and joint sealant (part e6) according to specifications.
 - (3) PVC tubes (part nos. c2 & c3) are to be cast into the upstream side of the expansion joints for testing purposes.
 - (4) Bars (part b8) may be placed either inside stoops (part b4) or adjacent to them, as shown in section J-J



Midwest Roadside
Safety Facility

HDOT Modified Natchez
Trace Bridge Rail
Test No. HNTBR-1

Expansion Joint Details

DWG. NAME.
HNTBR-1_R14

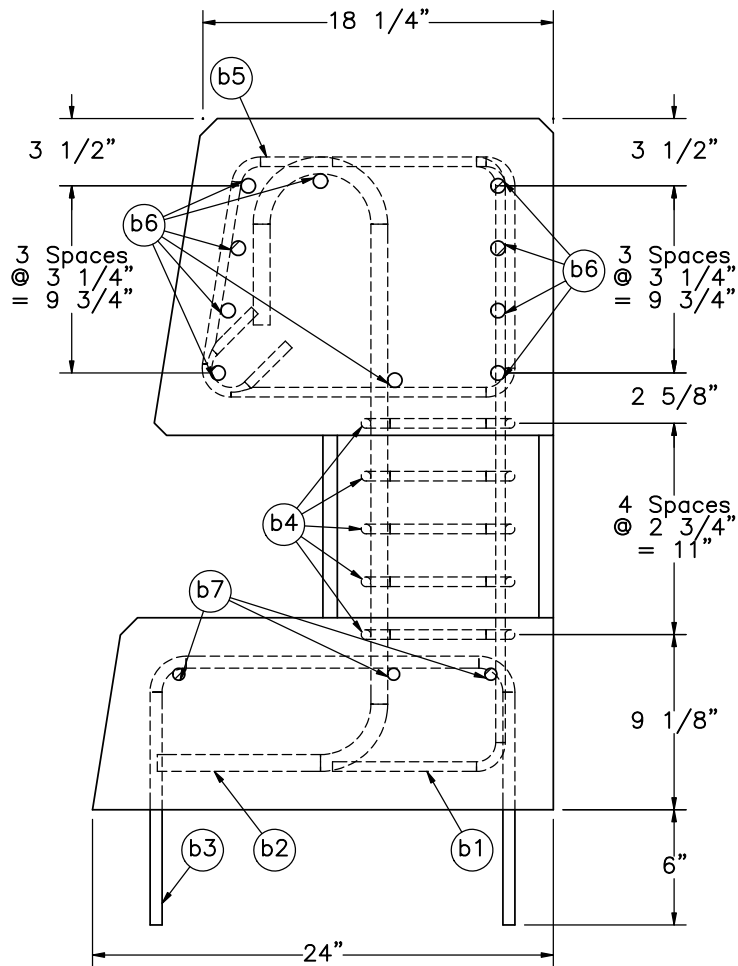
SCALE: 1:8
UNITS: in.

SHEET:
7 of 11

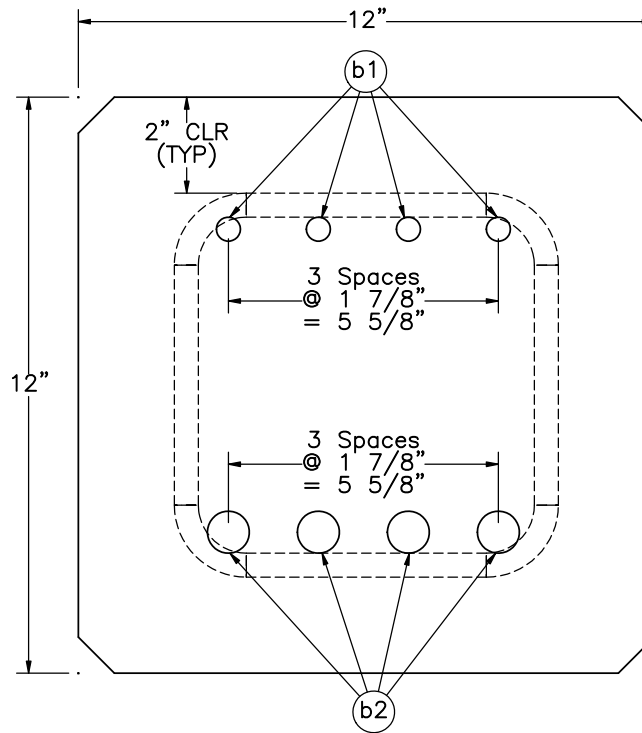
DATE:
8/15/2024

DRAWN BY:
SBW/JPA/Z
MM/JJO/MS
W

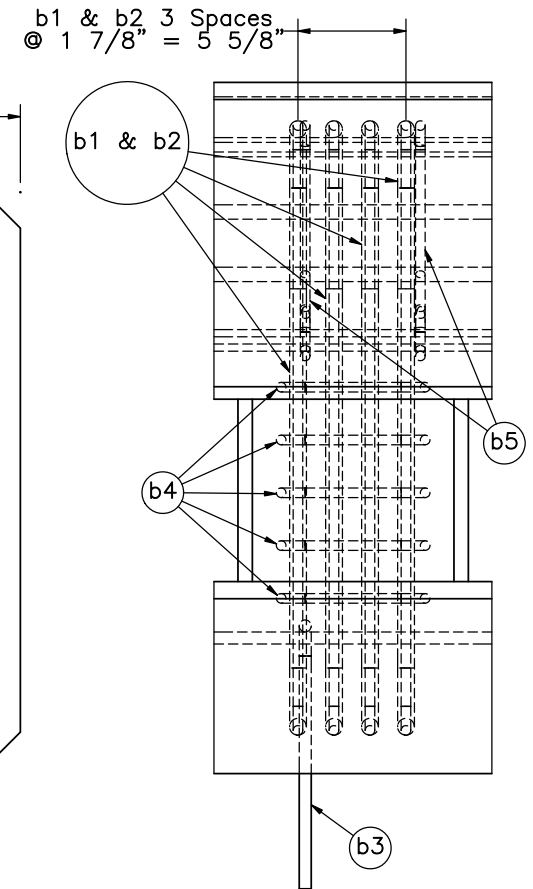
REV. BY:
SBW/SKR/M
P/KAL



SECTION K-K
(Rail Hidden From View)



SECTION L-L
SCALE 1 : 4



DETAIL M
(Rail Hidden From View)

Notes: (1) b3 bars embedded $6"$ into tarmac using epoxy adhesive (part d4).



Midwest Roadside
Safety Facility

HDOT Modified Natchez
Trace Bridge Rail
Test No. HNTBR-1

Typical Bridge Post Details

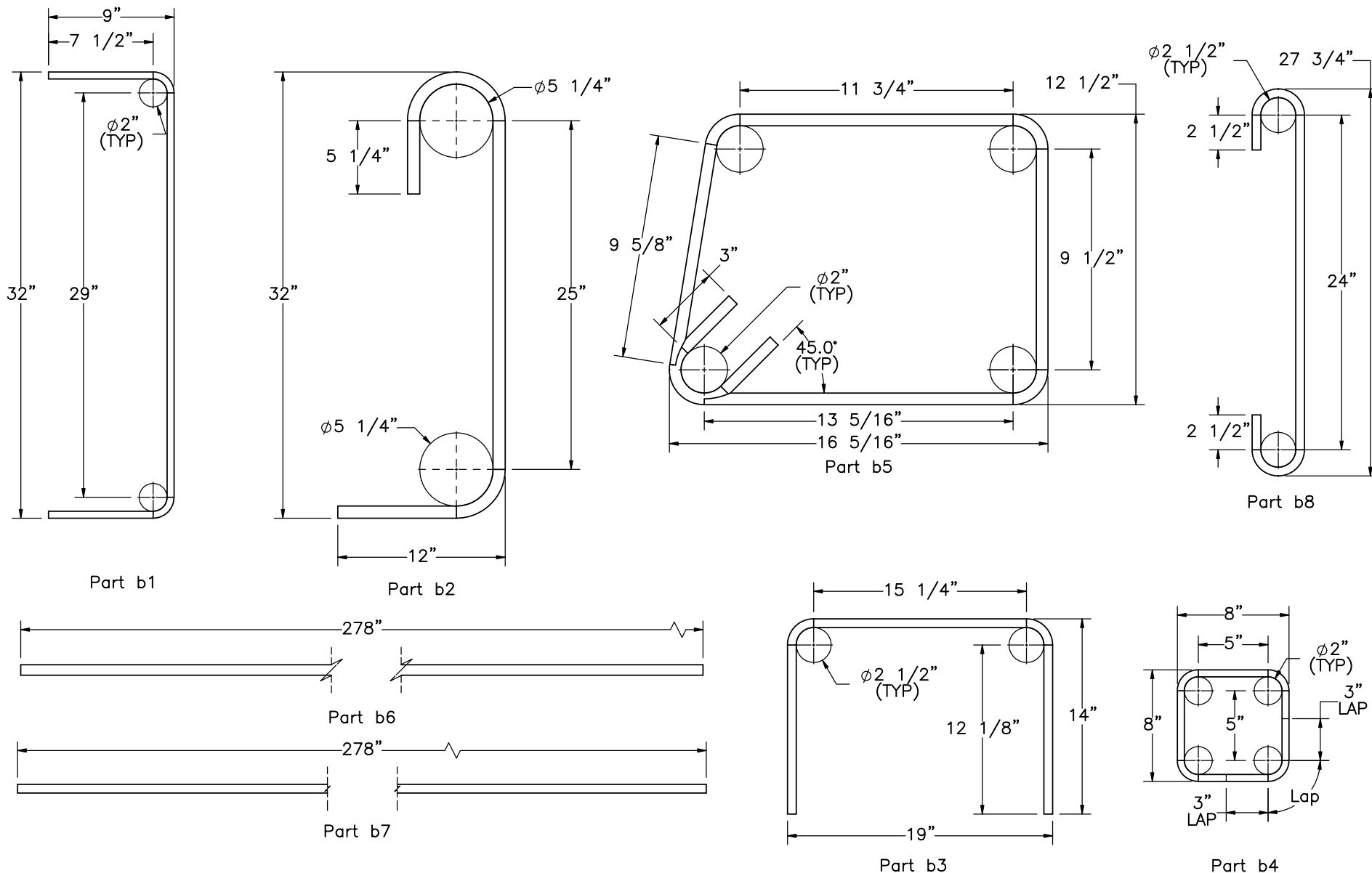
DWG. NAME:
HNTBR-1_R14

SCALE: 1:10
UNITS: in.

SHEET:
8 of 11

DATE:
8/15/2024

DRAWN BY:
SBW/JPA/Z
MM/JJO/MS
REV. BY:
SBW/SKR/M
P/KAL



Bill of Bars

Part No.	Size	QTY	Unbent Length	Min. Lap	Material Specification
b1	#4	48	46"	—	ASTM A615 Gr. 60
b2	#7	48	53 1/4"	—	ASTM A615 Gr. 60
b3	#5	72	44 1/2"	—	ASTM A615 Gr. 60
b4	#4	60	35 3/4"	—	ASTM A615 Gr. 60
b5	#4	141	62"	—	ASTM A615 Gr. 60
b6	#6	27	278"	21"	ASTM A615 Gr. 60
b7	#5	9	278"	18"	ASTM A615 Gr. 60



Midwest Roadside
Safety Facility

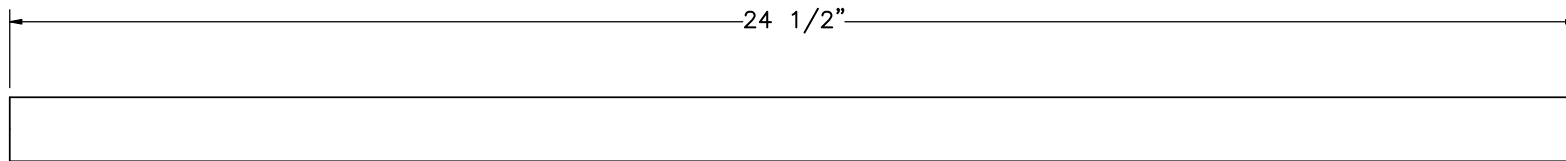
HDOT Modified Natchez
Trace Bridge Rail
Test No. HNTBR-1

Bridge Rail Rebar

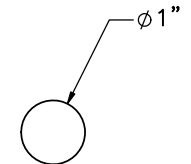
DWG. NAME.
HNTBR-1_R14

SCALE: 1:10
UNITS: in.

SHEET:
9 of 11
DATE:
8/15/2024
DRAWN BY:
SBW/JPA/Z
MM/JJO/MS
REV. BY:
SBW/SKR/M
P/KAL

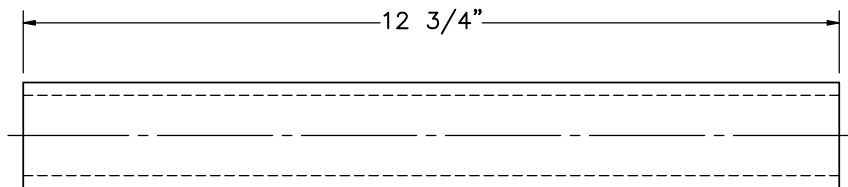


ELEVATION VIEW

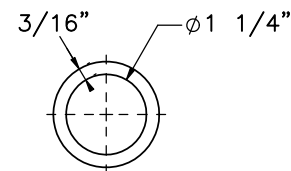


PROFILE VIEW

Part c1

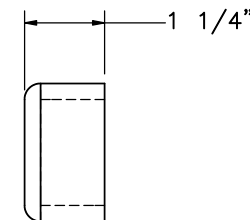


ELEVATION VIEW

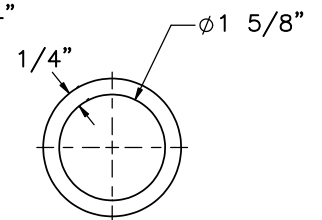


PROFILE VIEW

Part c2



ELEVATION VIEW



PROFILE VIEW

Part c3



Midwest Roadside
Safety Facility

HDOT Modified Natchez Trace Bridge Rail Test No. HNTBR-1		SHEET: 10 of 11
Expansion Joint Components		DATE: 8/15/2024
DWG. NAME: HNTBR-1_R14	SCALE: 1:3 UNITS: in.	DRAWN BY: SBW/JPA/Z MM/JJO/MS W REV. BY: SBW/SKR/M P/KAL

Item No.	QTY.	Description	Material Specification	Treatment Specification	Hardware Guide
a1	3	Concrete*	Min. f'c = 4,000 psi	—	—
b1	48	#4 Rebar, 46" Total Unbent Length	ASTM A615 Gr. 60	**Epoxy-Coated (ASTM A775 or A934)	—
b2	48	#7 Rebar, 53 1/4" Total Unbent Length	ASTM A615 Gr. 60	**Epoxy-Coated (ASTM A775 or A934)	—
b3	72	#5 Rebar, 44 1/2" Total Unbent Length	ASTM A615 Gr. 60	**Epoxy-Coated (ASTM A775 or A934)	—
b4	60	#4 Rebar, 35 3/4" Total Unbent Length	ASTM A615 Gr. 60	**Epoxy-Coated (ASTM A775 or A934)	—
b5	141	#4 Rebar, 62" Total Unbent Length	ASTM A615 Gr. 60	**Epoxy-Coated (ASTM A775 or A934)	—
b6	30	#6 Rebar, 278" Total Length	ASTM A615 Gr. 60	**Epoxy-Coated (ASTM A775 or A934)	—
b7	9	#5 Rebar, 278" Total Length	ASTM A615 Gr. 60	**Epoxy-Coated (ASTM A775 or A934)	—
b8	8	#5 Rebar, 38 7/8" Total Unbent Length	ASTM A615 Gr. 60	**Epoxy Coated (ASTM A775 or A934)	—
c1	6	#8 Smooth Rebar, 24 1/2" Long	ASTM A615 Gr. 60	**Epoxy Coated (ASTM A775 or A934)	—
c2	6	1 1/4" Dia. PVC Pipe	Schedule 80 PVC Gr. 12454	—	—
c3	6	1 1/4" Dia. PVC End Cap	Schedule 80 PVC Gr. 12454	—	—
d1	3	HSS 3"x3"x1/4", 281 1/2" Long	ASTM A500 Gr. B	See Assembly	—
d2	15	HSS 2 1/2"x2 1/2"x1/4", 13 3/4" Long	ASTM A500 Gr. B	See Assembly	—
d3	15	2 1/4"x2 1/4"x1/4" Steel Plate	ASTM A36	See Assembly	—
d4	15	8"x5"x3/4" Steel Plate	ASTM A36	See Assembly	—
d5	12	7"x1 1/2"x3/16" Shim	ASTM A36	See Assembly	—
d6	3	HSS 2"x2"x1/4", 7" Long	ASTM A500 Gr. B	See Assembly	—
e1	60	5/8"—11 UNC Heavy Hex Nut	ASTM A563—15 Grade DH	ASTM F2329	FNX18b
e2	60	5/8" Dia. Hardened Washer	ASTM F436	ASTM F2329	FWC18b
e3	60	5/8"—11 UNC, 7 7/8" Long Threaded Rod	ASTM F1554—15 Gr. 105	ASTM F2329	—
e4	—	Epoxy Adhesive	Hilti HIT RE—500 V3	—	—
e5	—	Joint Filler	AASHTO M33, M153, or M213	—	—
e6	—	Expansion Joint Sealant	AASHTO M173, M282, M301, ASTM D3581, or ASTM D5893	—	—

* NE Mix 47B15/1PF4000HW was used for testing purposes.

** Rebar does not need to be epoxy-coated for testing purposes.



Midwest Roadside
Safety Facility

HDOT Modified Natchez
Trace Bridge Rail
Test No. HNTBR—1

HNTBR BOM

DWG. NAME.
HNTBR—1_R14

SCALE: 1:192
UNITS: in.

SHEET:
11 of 11

DATE:
8/15/2024

DRAWN BY:
SBW/JPA/Z
MM/JJO/MS
P/KAL
REV. BY:

REV.	DATE OF ISSUE	Page	NATURE OF CHANGES	REVIEWER	REVISED BY
0	7/5/2022	–	Drawing created.	–	SBW
1	8/3/2022	–	Finished drawing after solidworks access was restored.	SBW	SBW
2	9/8/2022	–	Rearranged sheets to group NTBR sheets and NTAGT sheets together. Split BOM into NTAGT and NTBR sections.	SR/MP	SBW
		NTBR	Rearranged rebar to put all vertical stirups within part b4 and to have consistent spacing between part b5. Eliminated upstream and downstream handrail assemblies. Now only one handrail assembly based off the midspan assembly will be used. Consolidated NTBR BOM into one section.		
		NTAGT	Rearranged rebar in endpost assembly. Eliminated extra rebar configurations in endpost assembly to limit the number configurations to be bent. Added chamfer to endpost assembly. Consolidated NTAGT BOM into one section.		
3	11/18/2022	NTBR	No change in sheet order, page updated described below.	SKR/MP	SBW
		NTAGT	Reordered Sheets, individual page changes described below. Reordered many section and detail view designations.		
		1	Added impact locations and test designations. Updated notes. Changed rail denotation in elevation view.		
		2	Hid rebar, updated dimensions in plan and elevation views, changed NTAGT callout in plan view. Updated notes.		
		3	Added handrain assembly note. Hid rebar. Added note to elevation and plan view to denote that rebar is hidden from view.		
		4	Updated note.		
		5	Updated subassembly treatment specs. Added typ to dimension. Removed note 2, updated note 3.		
		6	Added dims to elevation view of part c4		
		7	Moved gap dim in elevation view. Added part lables in detail G, updated dims in detail G. Edited notes.		
		8	Changed spacing in section H and I		
		9	Updated dims on parts b2, b3, b4, and b5. Updated bill of bars for rebar size on b3 and b5. Updated unbent length on parts b2–b5.		

		10	Updated description of parts b2–b5.		
		11	Removed trench and dims from plan view. Flipped post nos. in plan view, updated notes.		
		12	Hid rebar, added nested to part f1 call out.		
		13	Removed note 4. Hid rebar in both sections. Added and removed dims from both systems.		
		15	Added part bubbles to elevation view of end section.		
		21	Added part h6 to sheet.		
		31	Combined seciton views showing rebar locations.		
		32	Combined with curb details page. Added dims and notation to section views.		
		33	Consolidated stirrups onto one page, removed 135 degree bend to stirrups.		
		34	Removed 135 degree bend from part i13, updated bill of bars.		
		BOM	Updated BOM		
4	12/15/2022	All	Split NTBR and NTAGT into separate drawing sets.	SKR/MP	SBW
		1	Removed notes 1, 3, 4, and 5. Cleaned up both plan view and Elevaiton view.		
		2	Added impact notes to plan view, removed note 1, edited note 2.		
		3	Added dimensions to and removed rebar from section A, changed sheet name.		
		4	Added note to detail C, edited note 1		
		5	Edited weld note of Detail F		
		6	Shifted part denotation over for part c1.		
		7	Edited dims on elevation view for clarity, added part ballons and cleaned up rebar in detail G.		
		8	Added Dims to section H, flipped rebar hook on part b2, shifted location of part b1, corrected spacing on detail J. Added note 1.		
		9	Flipped hook on part b2.		
		BOM	Removed note 2.		
		All	Renamed test to NTBR test series.		
		1	Added dims in plan view.		

5	12/15/2022	4	Edited dims in backside view for clarity	SKR/MP	SBW
		8	Moved location of parts b1 and b2 in section I and detail J		
		9	Rounded bar lengths to nearest 1/4"		
		BOM	Made edits to reflect changes on page 9.		
6	1/25/2023	All	Added expansion joint to model, Renamed test to HNTBR	SKR/MP/KAL	SBW
		3	Added section C.		
		7	Added Expansion joint and associated dims.		
		8	Added page to detail expansion joint.		
		10	Added part b8.		
		11	Added page for expansion joint components.		
		BOM	Updated BOM.		
7	2/14/2023	–	Removed sheet 1. This caused sheets to be renumbered.	SKR/MP	JPA
		1	Flipped section view and extended length of view. Removed view breaks and note. Updated notes 2, 4, and 5. Updated dimension.		
		3	Updated view break. Removed end post note.		
		4	Corrected spelling error in note 1.		
		6	Shifted middle c3 up 1 1/4". Shifted c3 to be flush with end cap. Edited note 2. Added dimensions. Extended dimension line.		
		7	Flipped Section A–A. Moved part nos. c1, c2, c3, up 1 1/4" and updated dimensions accordingly. Corrected spelling errors in drawing view title and note 2.		
		8	Moved balloon leader.		
		10	Added dimension.		
8	2/15/2023	8,9	Updated part b3, removed angled section.	SKR/KAL	SBW
9	2/20/2023	1	Removed Section on elevation view.	KAL	SBW
		6	Added section I to elevation view.		
		7	Section A is now called section I, showed lower rebar in section I.		
		8	Removed expansion joint components and added spacing details to section K.		

10	3/29/2023	7	Changed scale of section J, added dims to section L, added part ballons to both section J and L.	SKR/JH	SBW
11	6/7/2023	6,7,8	Added notes on page 7, flipped C2 and C3 to the U.S. side of joints, moved b8.	JCH/RN	MM
		11	Fixed number error		
12	7/17/2023	1	Fixed note 1, 2, 3, 4 and changed the Test name notes from 1 for 1100C to 2 and 2 for 2270P to 1	KAL	ZMM
13	12/6/2023	All	Updated drawing name to HNTBR-1_R13	KAL	JJO
		8	Added top and bottom width dimensions		
14	8/15/2024	1	Deleted HNTBR-2 test plans, includes notes 3-5.	KAL	MSW
		BOM	Deleted note		
		ALL	Made all file names include HNTBR-1, not NTBR.		