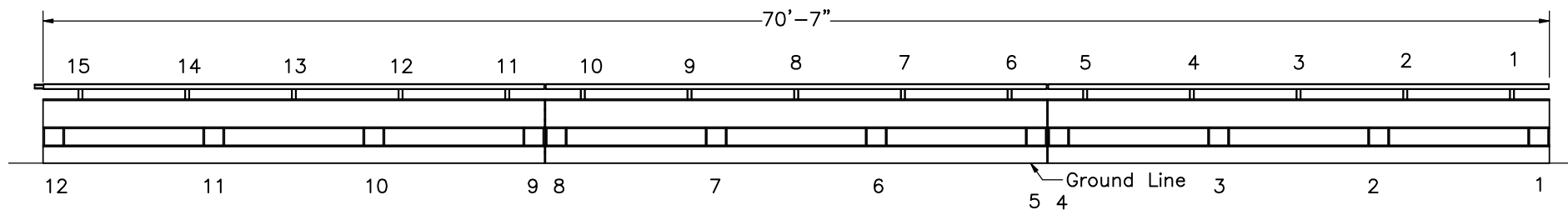


PLAN VIEW



ELEVATION VIEW

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



Midwest Roadside
Safety Facility

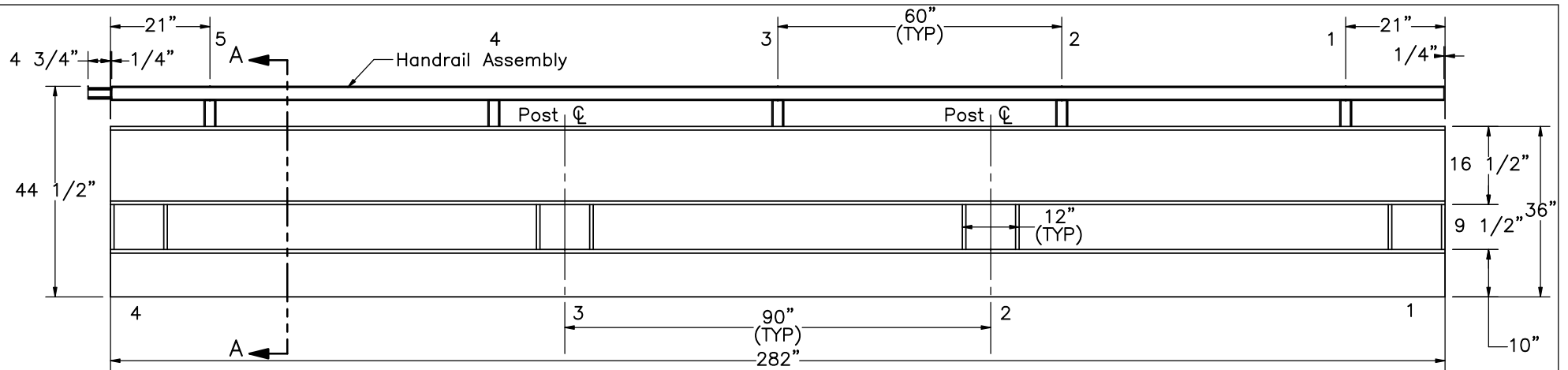
Hawaii Concrete Post
and Beam Bridge Rail
Test No. HNTBR-2

Bridge Rail Layout

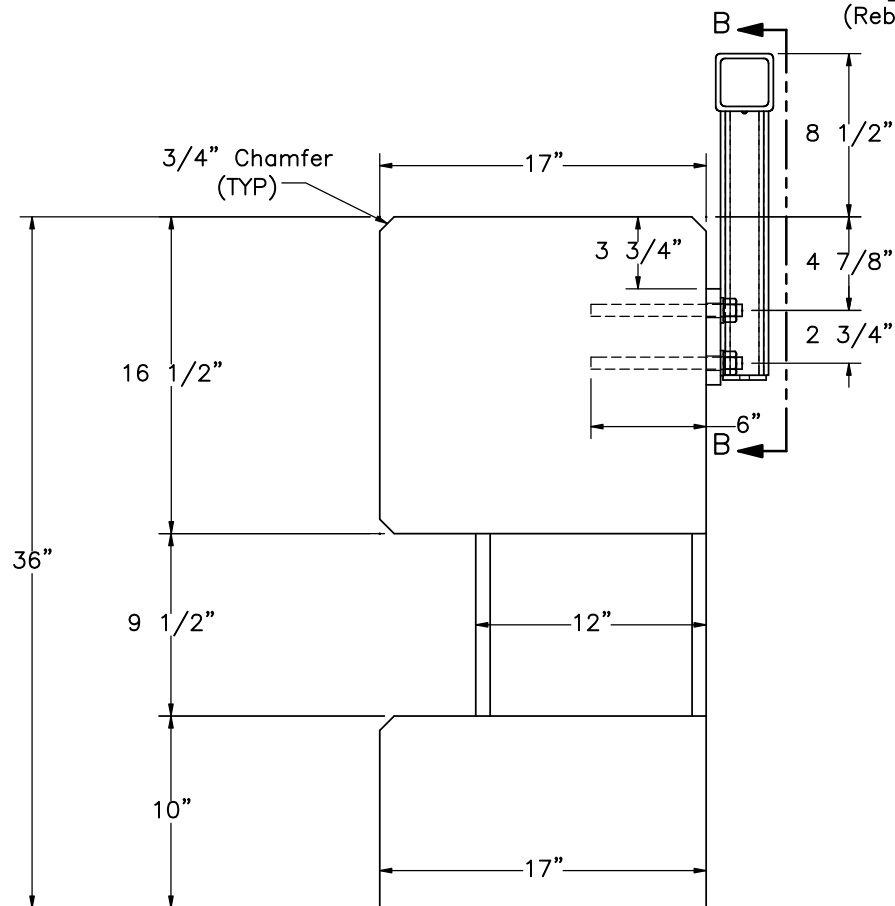
DWG. NAME:
HNTBR-2_R8

SCALE: 1:90
UNITS: in.

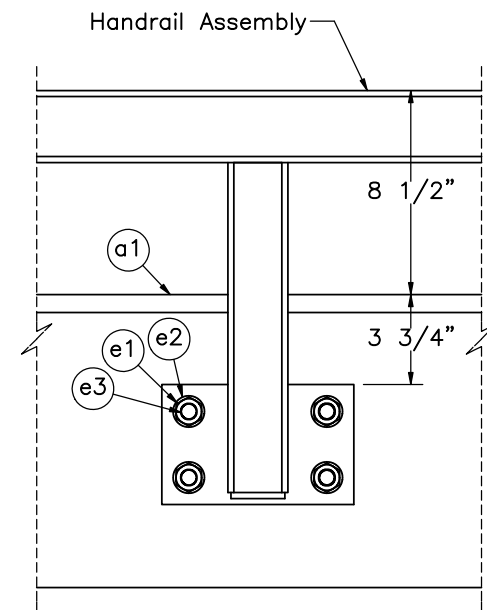
SHEET:
1 of 11
DATE:
2/10/2025
DRAWN BY:
ZMM/MSW/J
JO
REV. BY:
KAL



ELEVATION VIEW
(Rebar Hidden from View)



SECTION A-A
SCALE 1 : 10
(Rebar Hidden from View)



SECTION B-B
SCALE 1 : 8



Midwest Roadside
Safety Facility

Hawaii Concrete Post
and Beam Bridge Rail
Test No. HNTBR-2

HNTBR Single Bridge Segment

DWG. NAME.
HNTBR-2_R8

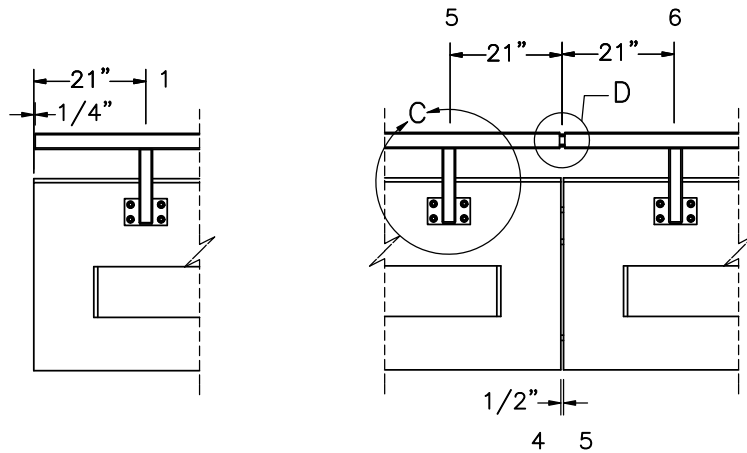
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SHEET:
2 of 11

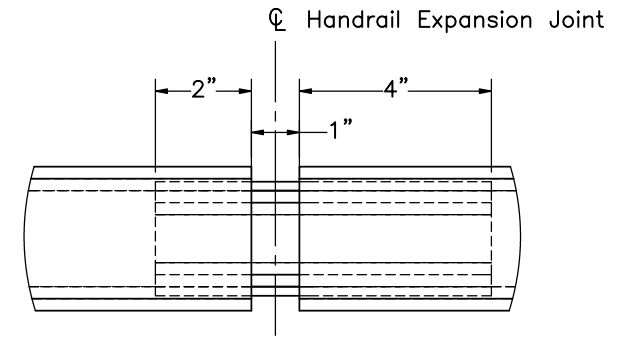
DATE:
2/10/2025

DRAWN BY:
ZMM/MSW/J
JO

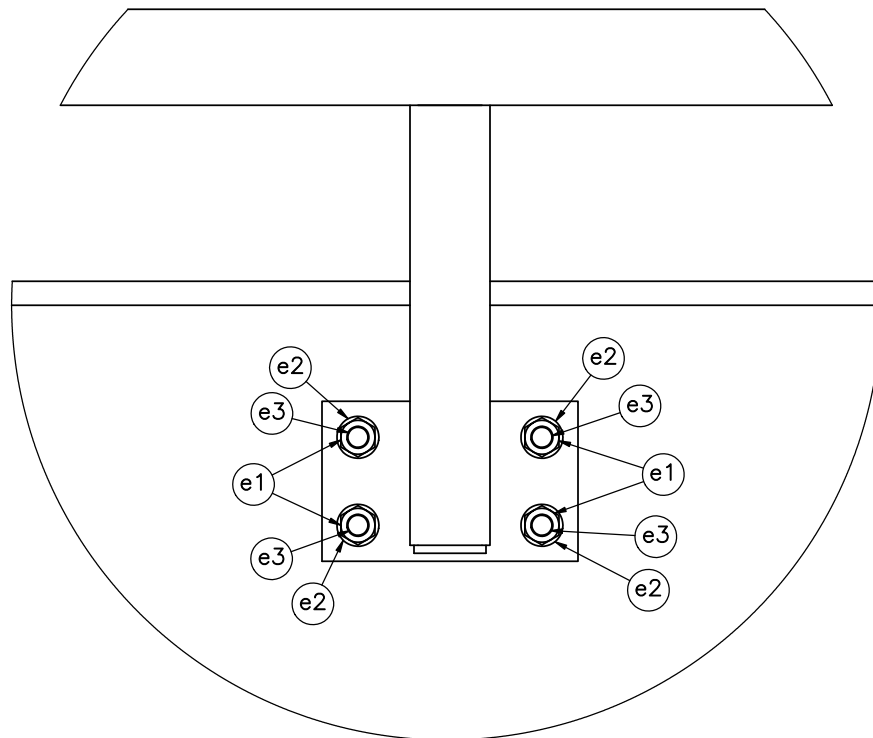
REV. BY:
KAL



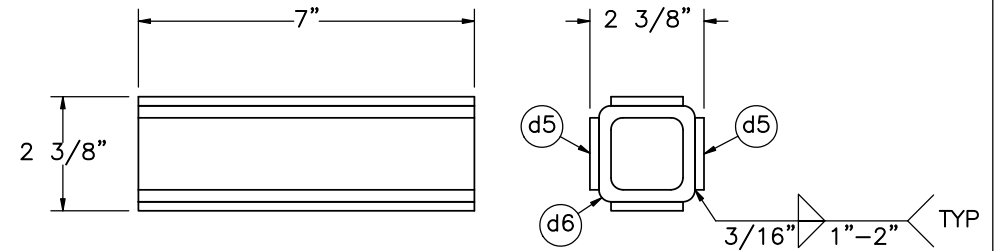
BACKSIDE VIEW



DETAIL D
SCALE 1 : 4
(TYPICAL SPLICE)



DETAIL C
SCALE 1 : 6



ELEVATION VIEW
SCALE 1 : 4

PROFILE VIEW
SCALE 1 : 4

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

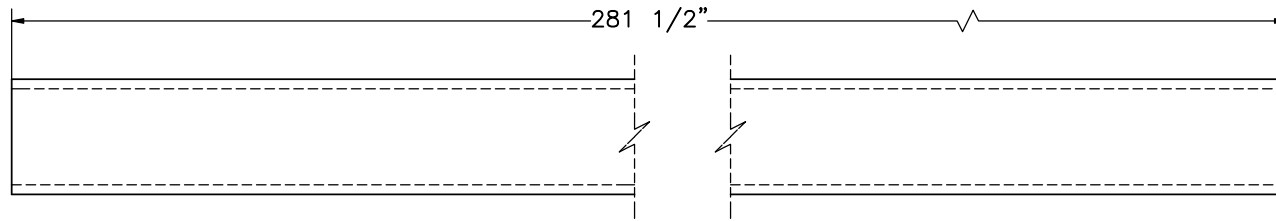
Hawaii Concrete Post
and Beam Bridge Rail
Test No. HNTBR-2

Handrail Layout

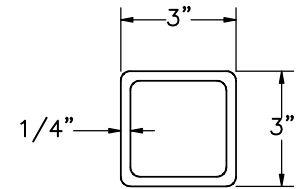
DWG. NAME.
HNTBR-2_R8

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UNITS: in.

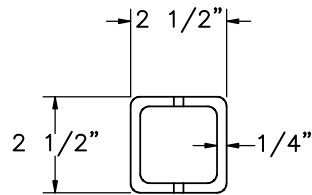
SHEET:
3 of 11
DATE:
2/10/2025
DRAWN BY:
ZMM/MSW/J
JO
REV. BY:
KAL



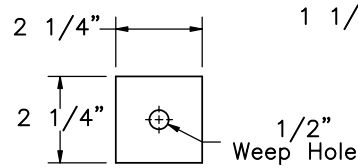
ELEVATION VIEW
Part d1



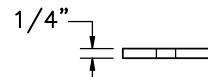
PROFILE VIEW



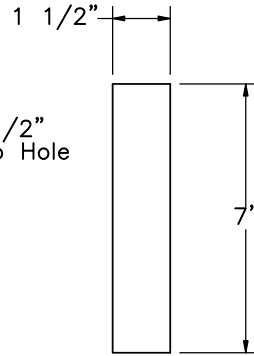
PLAN VIEW



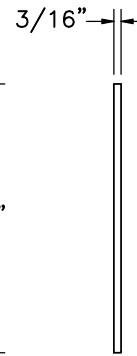
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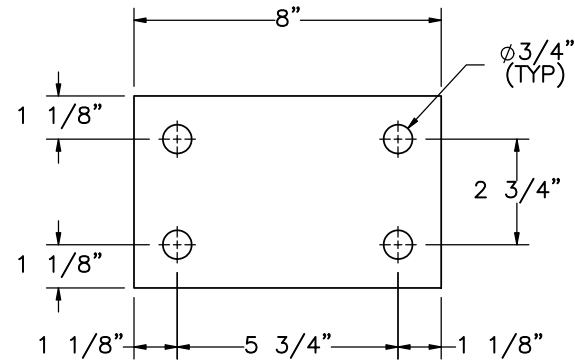
ELEVATION VIEW
Part d3



ELEVATION VIEW
Part d5

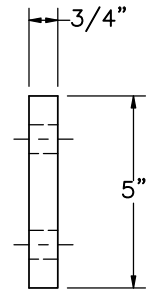


PROFILE VIEW

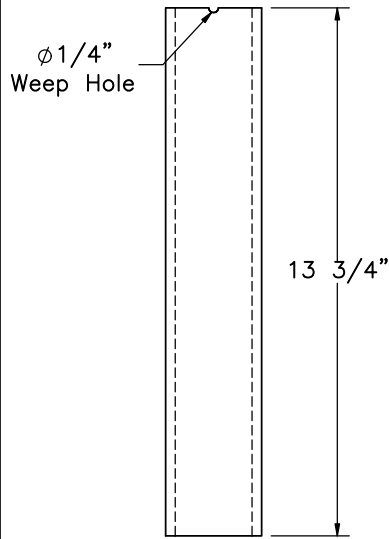


ELEVATION VIEW

Part d4

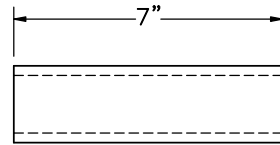


PROFILE VIEW



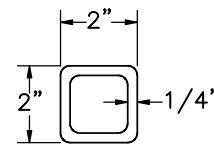
ELEVATION VIEW

Part d2

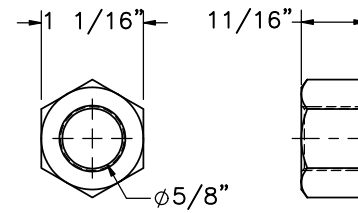


ELEVATION VIEW

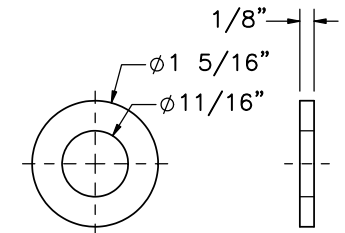
Part d6



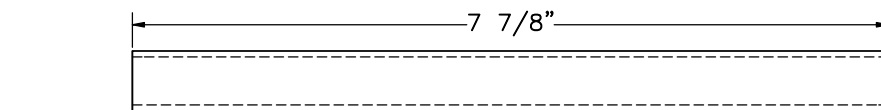
PROFILE VIEW



SCALE 1 : 2
Part e1



SCALE 1 : 2
Part e2



SCALE 1 : 2
Part e3



Midwest Roadside
Safety Facility

Hawaii Concrete Post
and Beam Bridge Rail
Test No. HNTBR-2

Handrail Components

DWG. NAME.
HNTBR-2_R8

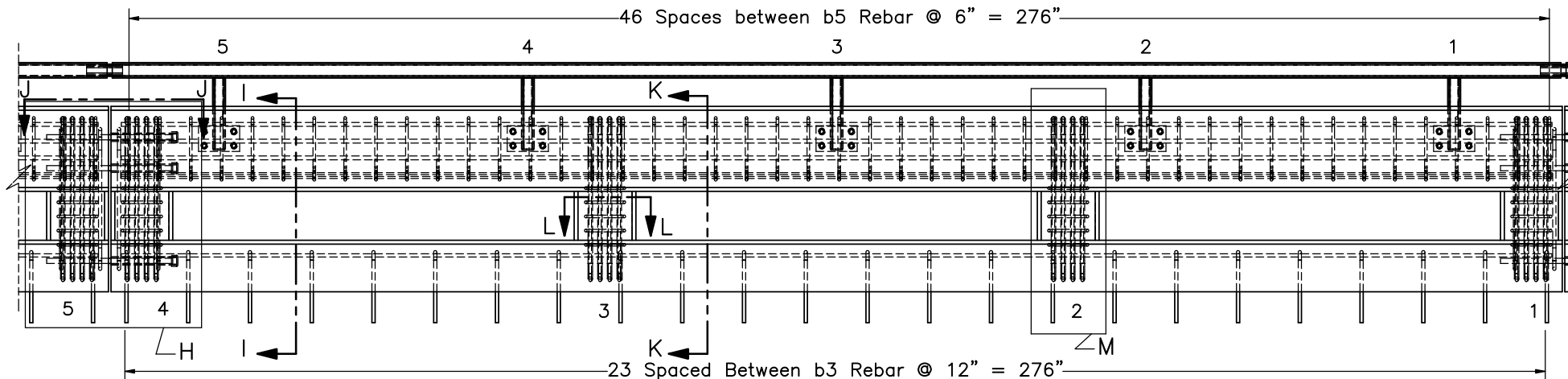
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UNITS: in.

SHEET:
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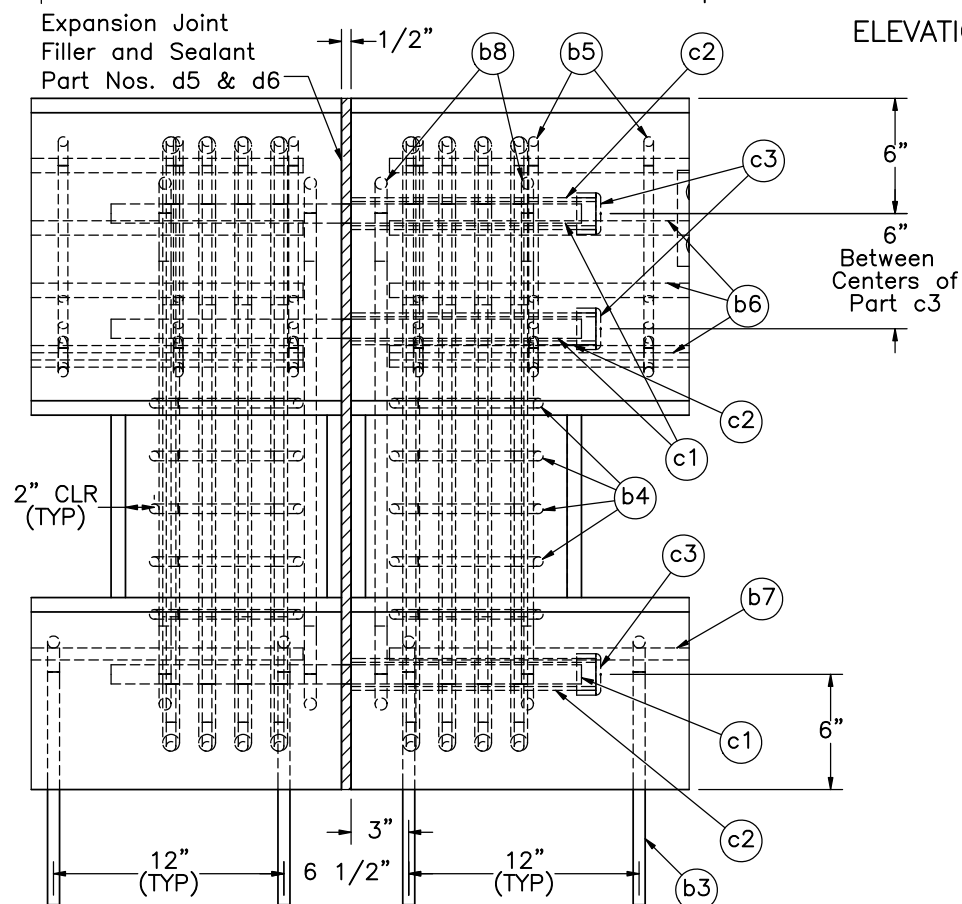
DATE:
2/10/2025

DRAWN BY:
ZMM/MSW/J
JO

REV. BY:
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

Hawaii Concrete Post
and Beam Bridge Rail
Test No. HNTBR-2

HNTBR Rebar Layout

DWG. NAME.
HNTBR-2_R8

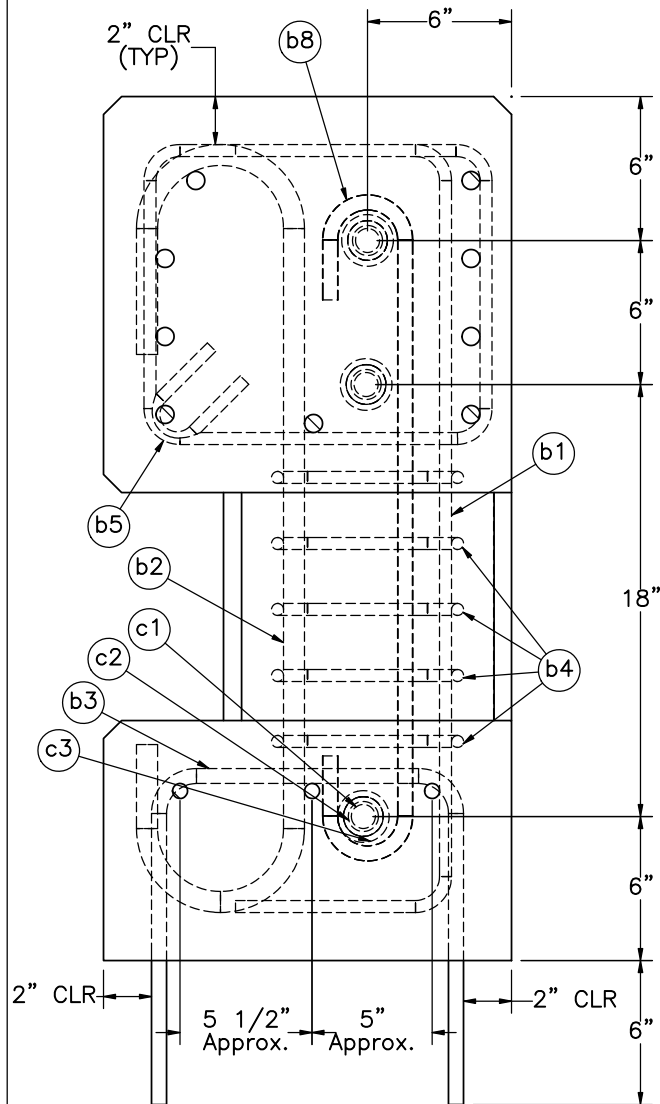
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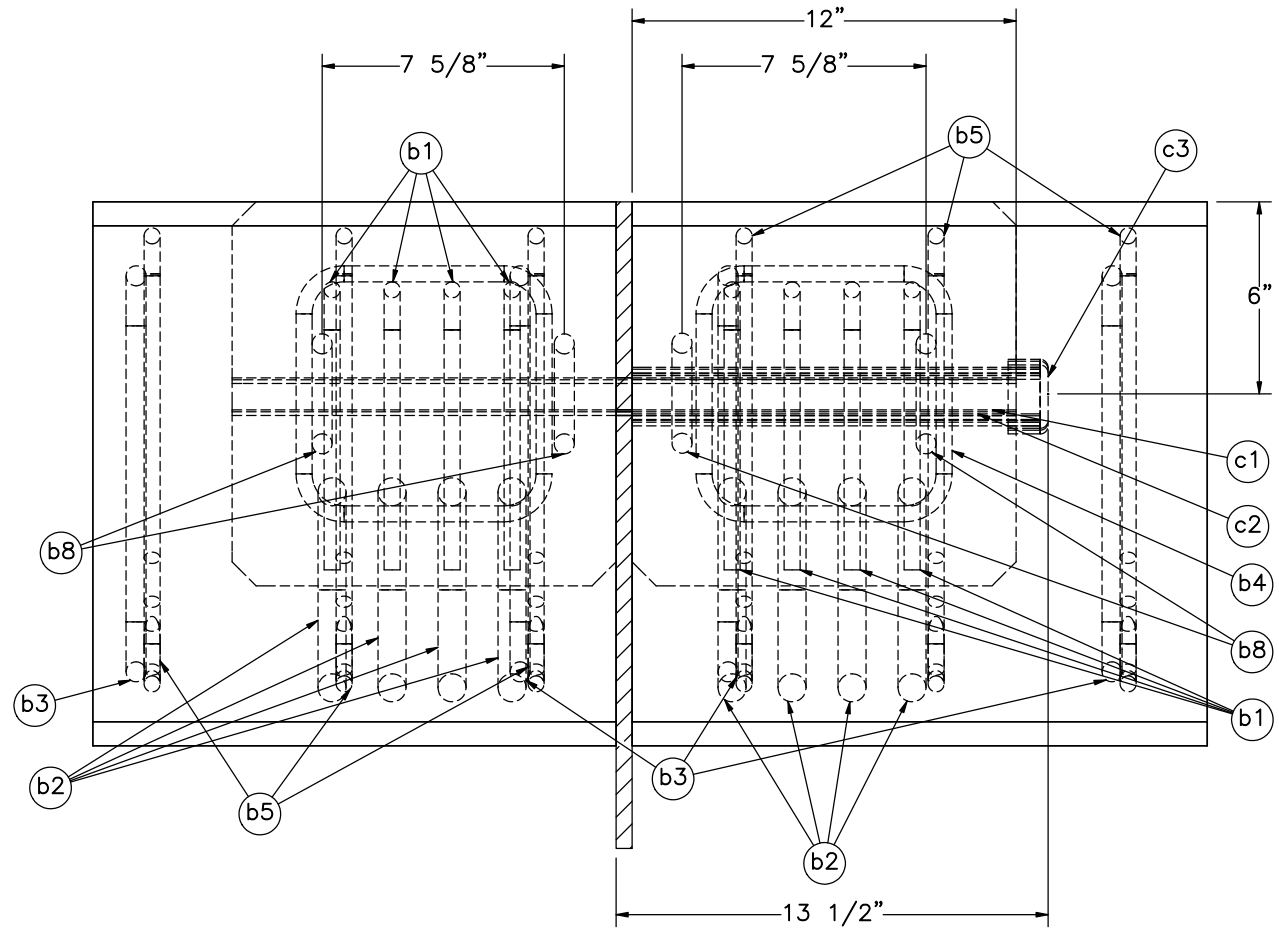
DRAWN BY:
ZMM/MSW/J
JO

REV. BY:
KAL



SECTION I-I
(Rail Hidden From View)

- 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



SECTION J-J
SCALE 1 : 6
(Longitudinal Rebar and Handrail Hidden from View)



Midwest Roadside
Safety Facility

Hawaii Concrete Post
and Beam Bridge Rail
Test No. HNTBR-2

Expansion Joint Details

DWG. NAME.
HNTBR-2_R8

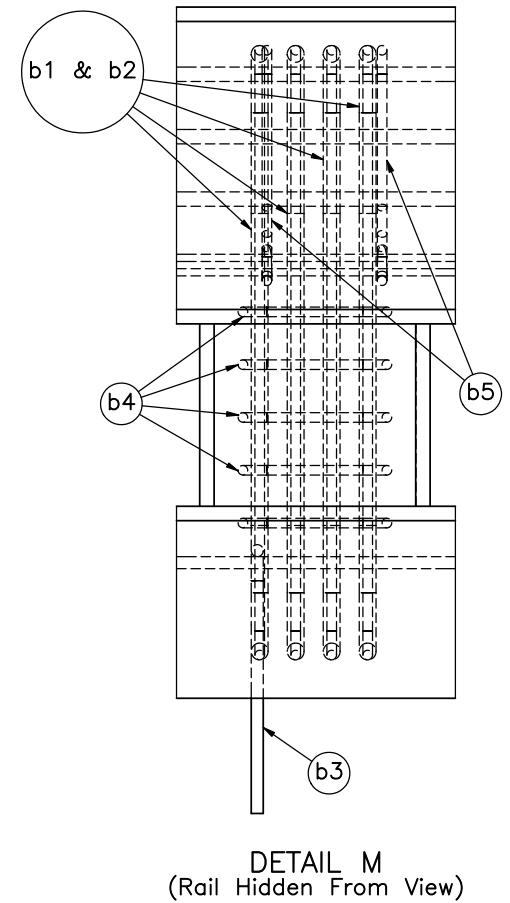
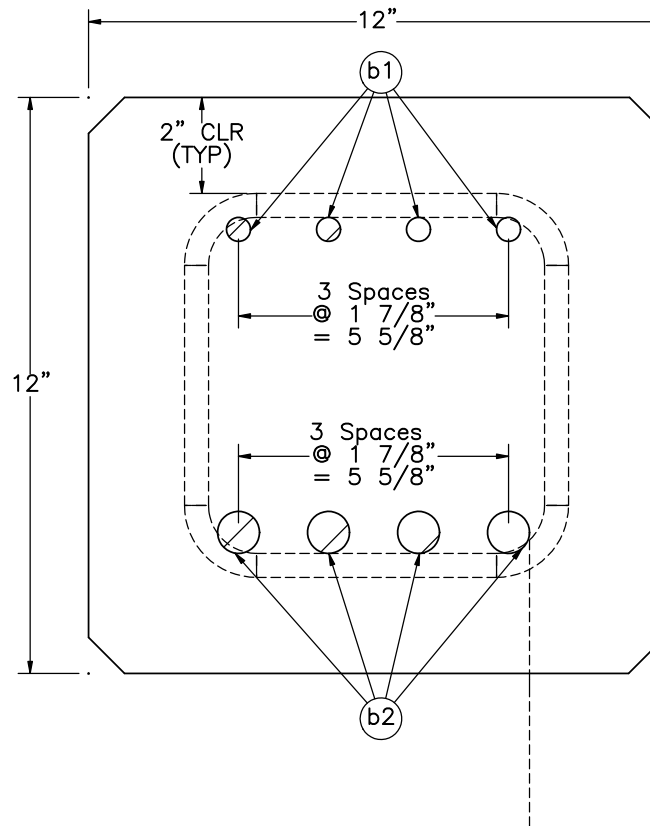
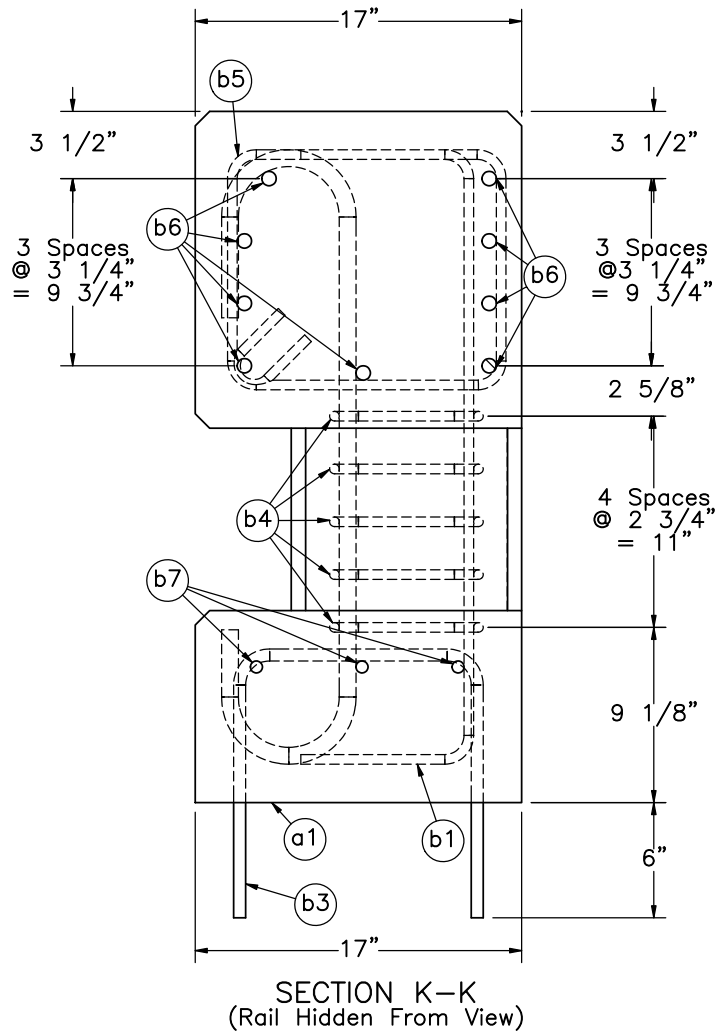
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UNITS: in.

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DATE:
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JO

REV. BY:
KAL



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



Hawaii Concrete Post
and Beam Bridge Rail
Test No. HNTBR-2

Typical Bridge Post Details

DWG. NAME:
HNTBR-2_R8

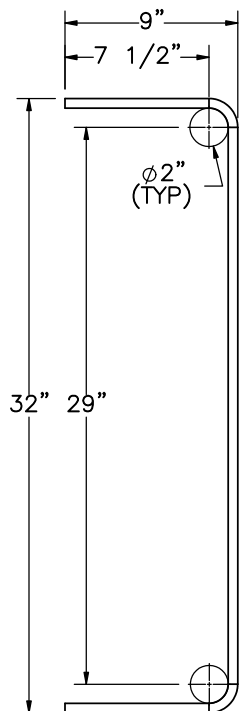
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UNITS: in.

SHEET:
8 of 11

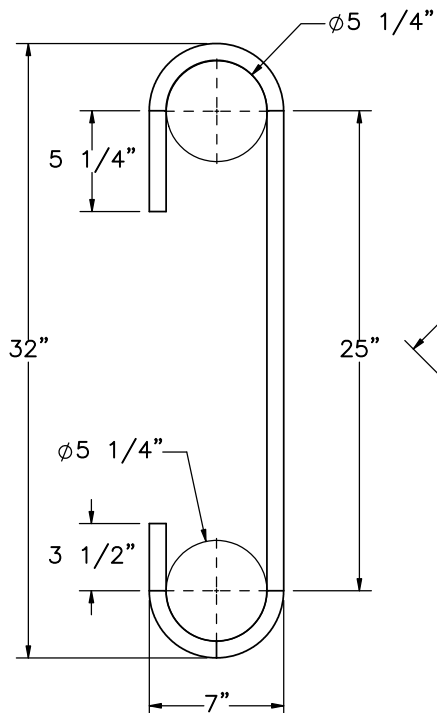
DATE:
2/10/2025

DRAWN BY:
ZMM/MSW/J
JO

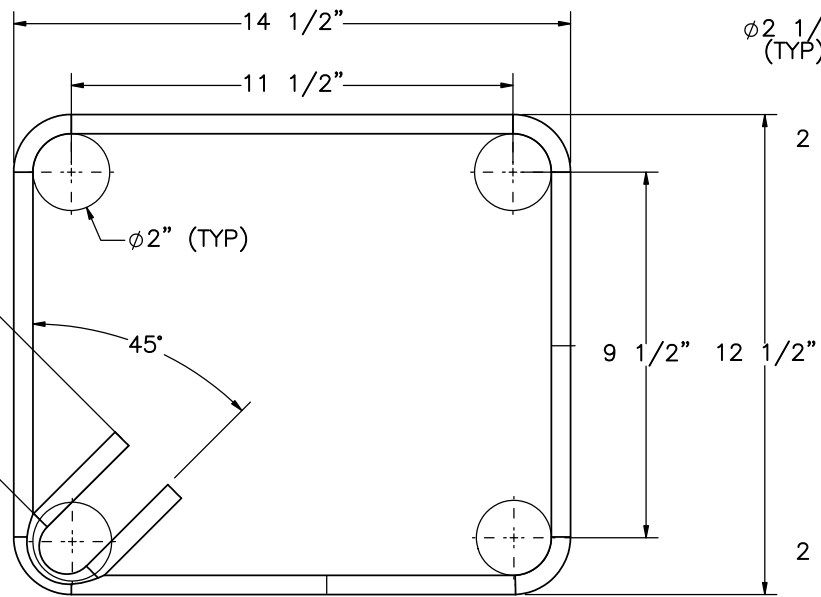
REV. BY:
KAL



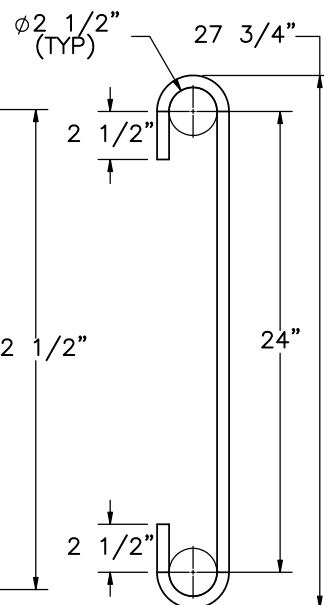
Part b1



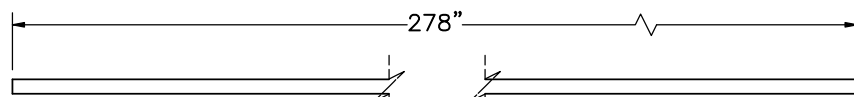
Part b2



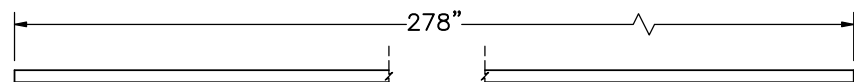
Part b5



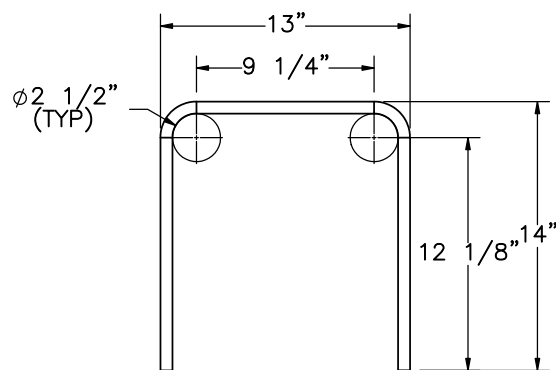
Part b8



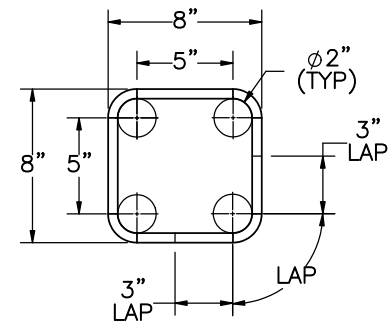
Part b6



Part b7



Part b3



Part b4

Bill of Bars

Part No.	Size	QTY	Unbent Length	Min. Lap	Material Specification
b1	#4	48	47 1/2"	—	ASTM A615 Gr. 60
b2	#7	48	43 1/2"	—	ASTM A615 Gr. 60
b3	#5	72	38 1/2"	—	ASTM A615 Gr. 60
b4	#4	60	35"	8"	ASTM A615 Gr. 60
b5	#4	141	57"	—	ASTM A615 Gr. 60
b6	#6	27	278"	21"	ASTM A615 Gr. 60
b7	#5	9	278"	18"	ASTM A615 Gr. 60
b8	#5	8	39"	—	ASTM A615 Gr. 60



Midwest Roadside
Safety Facility

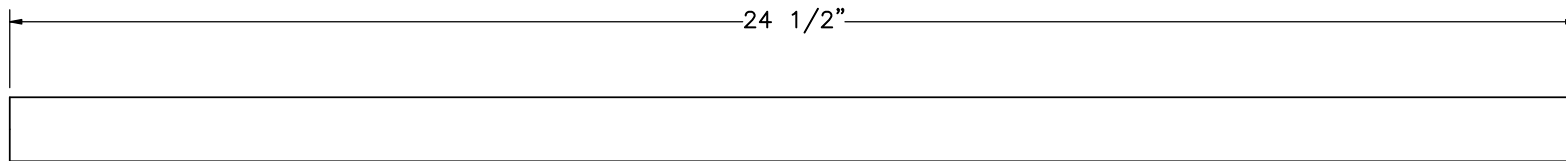
Hawaii Concrete Post
and Beam Bridge Rail
Test No. HNTBR-2

Bridge Rail Rebar

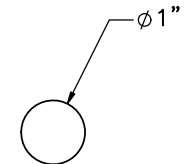
DWG. NAME.
HNTBR-2_R8

SCALE: 1:10
UNITS: in.

SHEET:
9 of 11
DATE:
2/10/2025
DRAWN BY:
ZMM/MSW/J
JO
REV. BY:
KAL

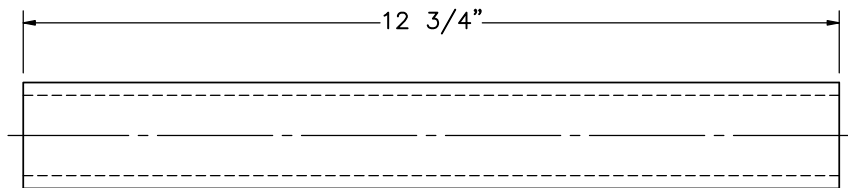


ELEVATION VIEW

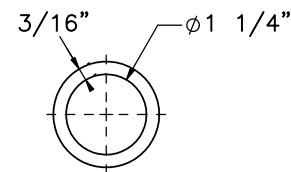


PROFILE VIEW

Part c1

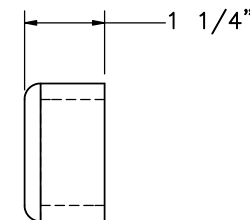


ELEVATION VIEW

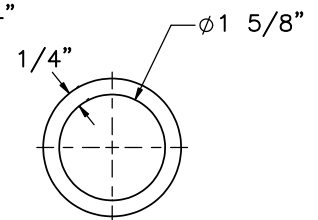


PROFILE VIEW

Part c2



ELEVATION VIEW



PROFILE VIEW

Part c3



Midwest Roadside
Safety Facility

Hawaii Concrete Post
and Beam Bridge Rail
Test No. HNTBR-2

Expansion Joint Components

DWG. NAME:
HNTBR-2_R8

SCALE: 1:3
UNITS: in.

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DATE:
2/10/2025

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ZMM/MSW/J
JO

REV. BY:
KAL

Item No.	QTY.	Description	Material Specification	Treatment Specification	Hardware Guide
a1	3	Concrete*	Min. f'c = 4,000 psi	—	—
b1	48	#4 Rebar, 47 1/2" Total Unbent Length	ASTM A615 Gr. 60	**Epoxy-Coated (ASTM A775 or A934)	—
b2	48	#7 Rebar, 43 1/2" Total Unbent Length	ASTM A615 Gr. 60	**Epoxy-Coated (ASTM A775 or A934)	—
b3	72	#5 Rebar, 38 1/2" Total Unbent Length	ASTM A615 Gr. 60	**Epoxy-Coated (ASTM A775 or A934)	—
b4	60	#4 Rebar, 35" Total Unbent Length	ASTM A615 Gr. 60	**Epoxy-Coated (ASTM A775 or A934)	—
b5	141	#4 Rebar, 57" Total Unbent Length	ASTM A615 Gr. 60	**Epoxy-Coated (ASTM A775 or A934)	—
b6	27	#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, 39" 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

Hawaii Concrete Post
and Beam Bridge Rail
Test No. HNTBR—2

HNTBR BOM

DWG. NAME.
HNTBR—2_R8

SCALE: 1:192
UNITS: in.

SHEET:
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DATE:
2/10/2025

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ZMM/MSW/J
JO

REV. BY:
KAL

REV.	DATE OF ISSUE	Page	NATURE OF CHANGES	REVIEWER	REVISED BY
0	9/25/2023	ALL	Created from HNTBR-1, changed rebar and concrete	—	ZMM
1	9/25/2023	ALL	Added post and handrail numbers and fixed naming	KAL	ZMM
2	9/27/2023	ALL	Fixed post numbers and sheet details	KAL	ZMM
3	11/9/2023	ALL	Fixed referencing issues that cause pages to be blank.	KAL	MSW
4	12/7/2023	8	Added width dimension	KAL	JJO
5	12/7/2023	2	Corected and updated dimensions	KAL	JJO
6	12/7/2023	2	Round width dimension	KAL, SKR	JJO
		4	Updated row width of BOM		
		6	Moved rail numbers to actual position		
		7	Dimension 18" was 18 1/6, 6" was 5 15/16", 5" was 5 1/16		
		8	Changed width dimension from 17 1/16" to 17"		
7	5/23/2024	6	Changed dim to 3" to make symetric	KAL, SKR	JJO
		7	Added 2" CLR		
		9	Updated part b3 to 13" width		
		11	Updated BOM		
8	2/10/2025	ALL	Updated title block for all pages.	SKR	MSW