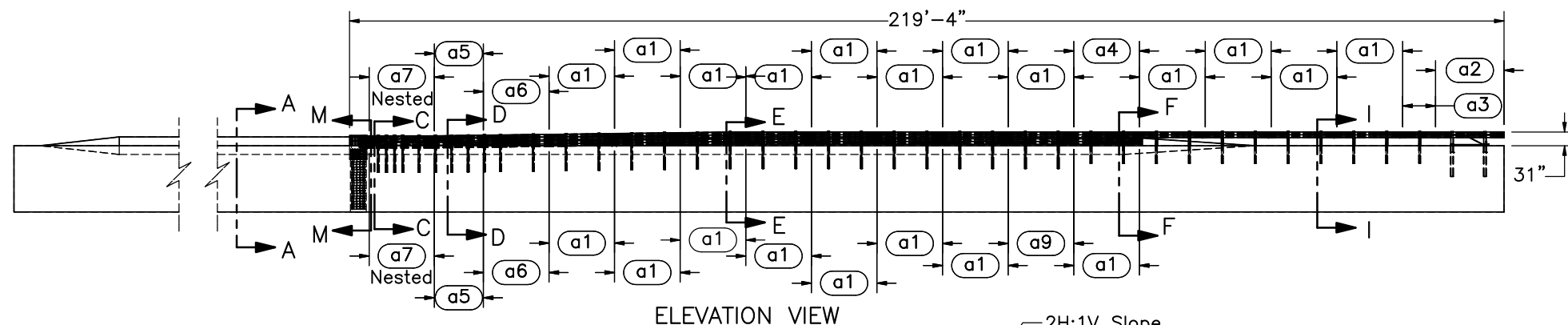
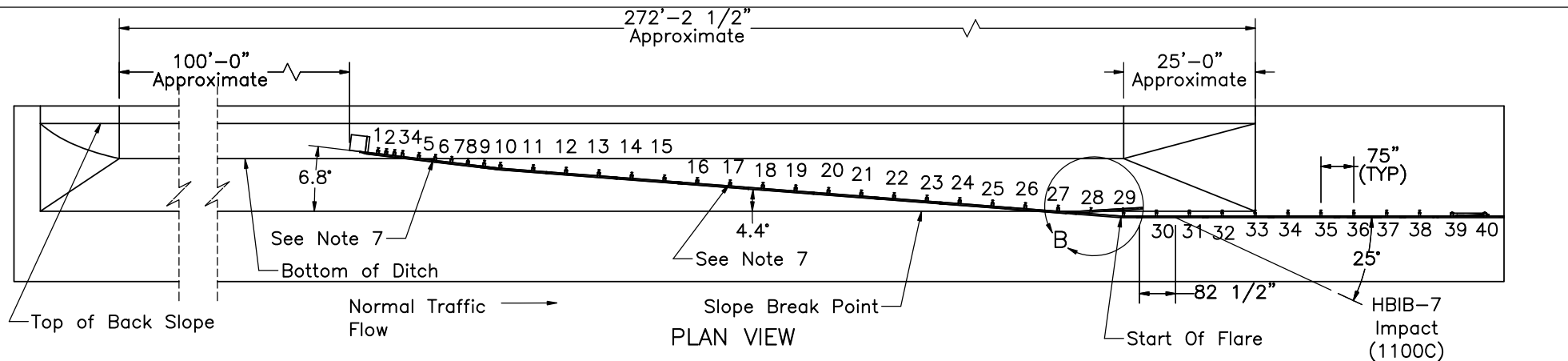
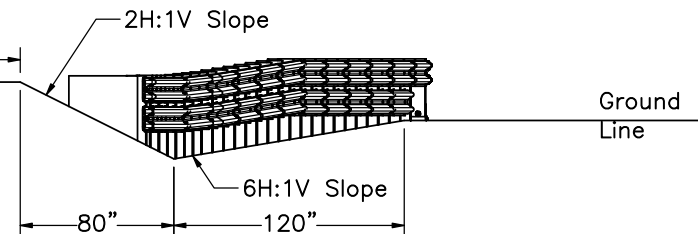




Notes:

- (1) Test no. HBIB-7 shall be performed according to modified test designation no. 3-37b using MASH 2016 criteria.
- (2) Impact location for test no. HBIB-7 is 82 1/2" upstream from the centerline of the splice between post no. 29 and 30 or 45" upstream from post no. 30.
- (3) Impact angle is respect to tangent portion of system between post nos. 30 and 40.
- (4) Critical regions are located between post nos. 1 thru 10 and post nos. 26 thru 33.
- (5) Width of backstop plateau extends for 2' behind system before transitioning back to the nominal ground line.
- (6) Rails shall be lapped in accordance with traffic flow from lower numbered posts to higher numbered posts.
- (7) Downstream end of nested W-beam sections (part a7) sandwich upstream end of adjacent W-beam section (part a5) at splice location in accordance with traffic flow.
- (8) Guardrail system has a linear slope up and out of ditch between post nos. 6-17.

24"
(See note 5)



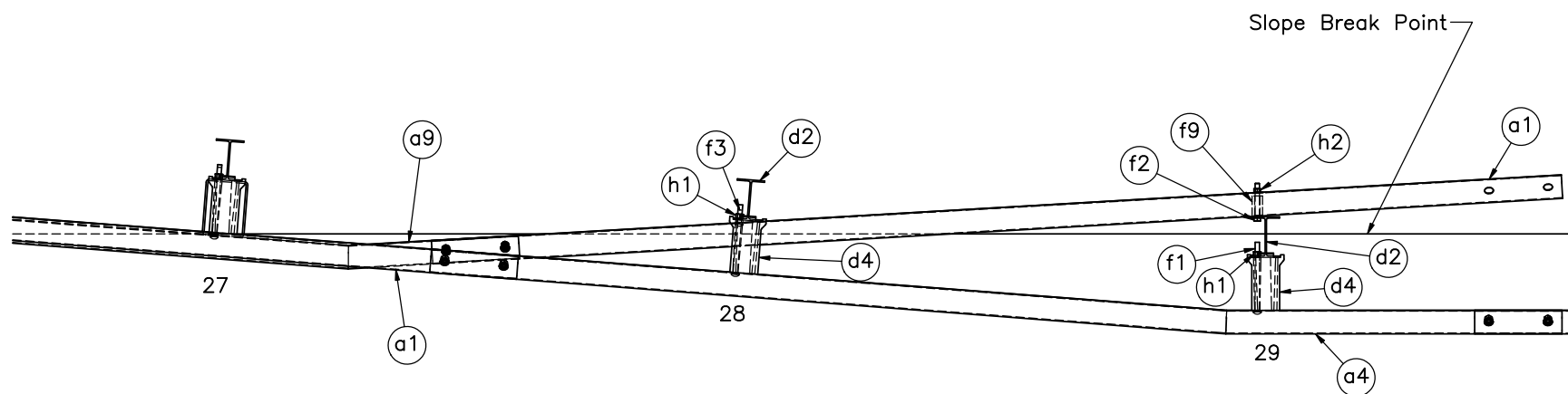
Hawaii Buried in Backslope
Test No. HBIB-7

System Layout

DWG. NAME.
HBIB-7_R2

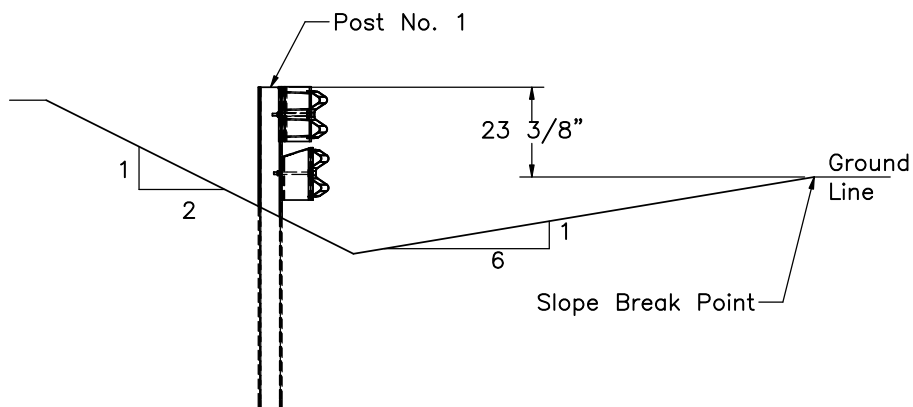
SCALE: 1:350
UNITS: in.

SHEET:
1 of 35
DATE:
05/15/2025
DRAWN BY:
JJO
REV. BY:
KAL

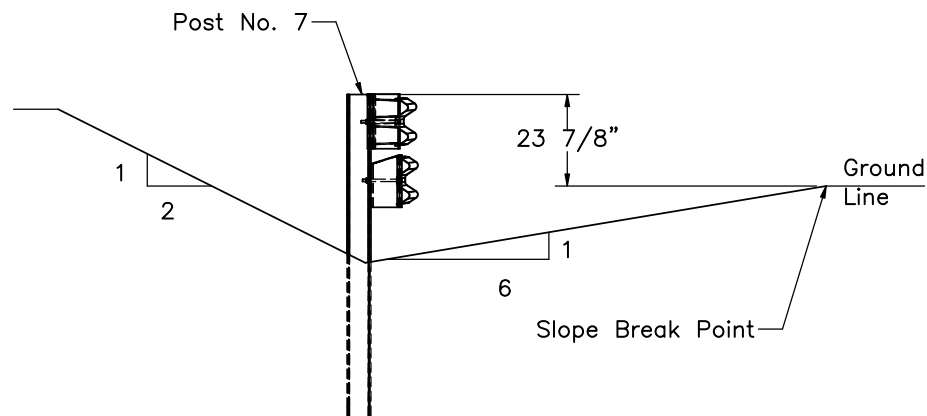


Detail B

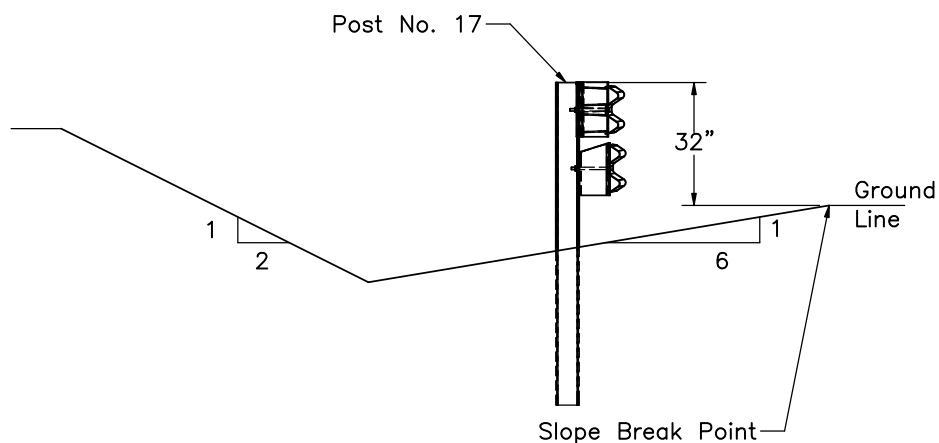
	Hawaii Buried in Backslope		SHEET:
	Test No. HBIB-7		2 of 35
Midwest Roadside Safety Facility	Detail B View		DATE:
	DWG. NAME: HBIB-7_R2		05/15/2025
SCALE: 1:25 UNITS: in.		DRAWN BY:	REV. BY:
		JJO	KAL



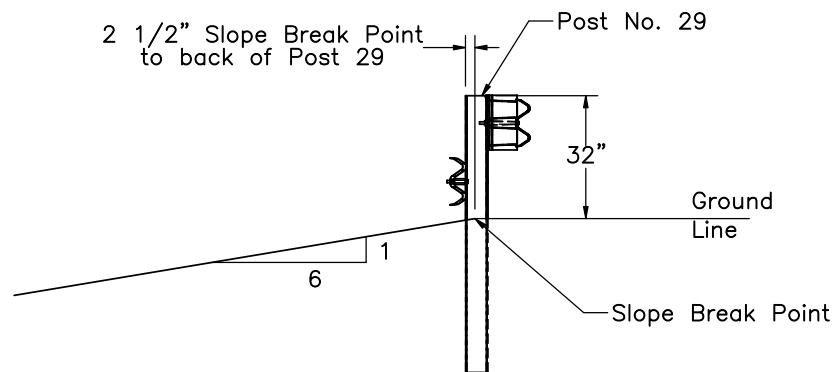
SECTION C-C



SECTION D-D



SECTION E-E



SECTION F-F

Note: (1) Post heights are measured from the Ground Line to the center back of the post.

(2) The top of the upper W-beam rail is located 1" below the top of the post and blockout at each post location. The lower W-beam is located 3" below the bottom of the upper W-beam.



Midwest Roadside
Safety Facility

Hawaii Buried in Backslope
Test No. HBIB-7

Ground Cross Sections

DWG. NAME.
HBIB-7_R2

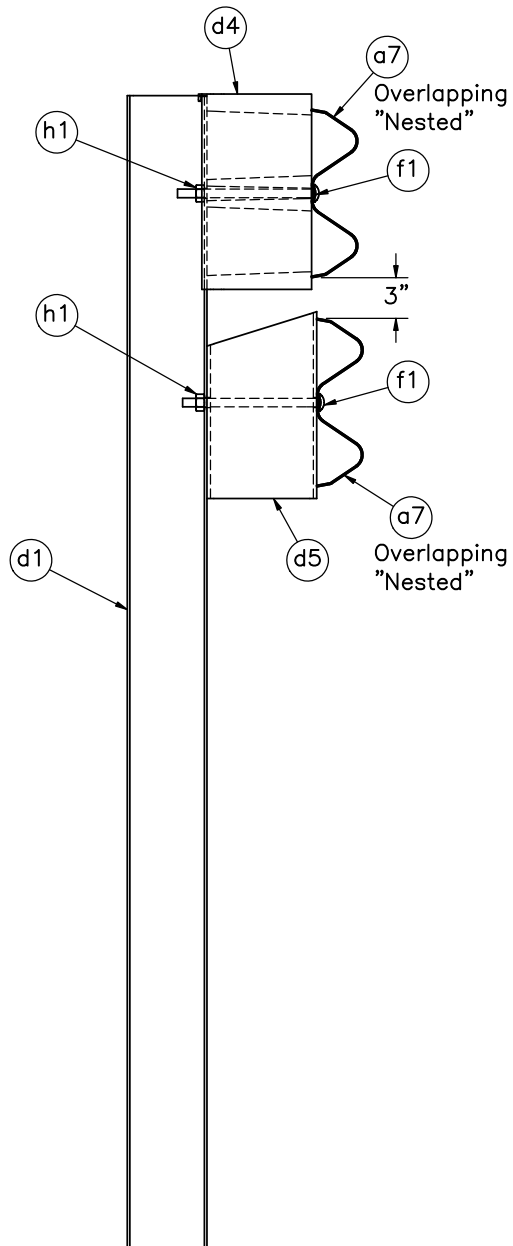
SCALE: 1:50
UNITS: in.

SHEET:
3 of 35

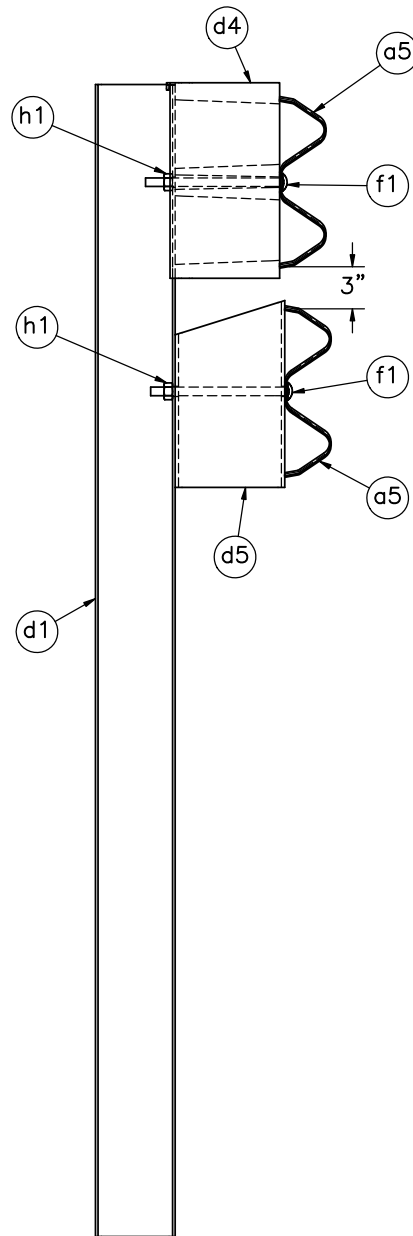
DATE:
05/15/2025

DRAWN BY:
JJO

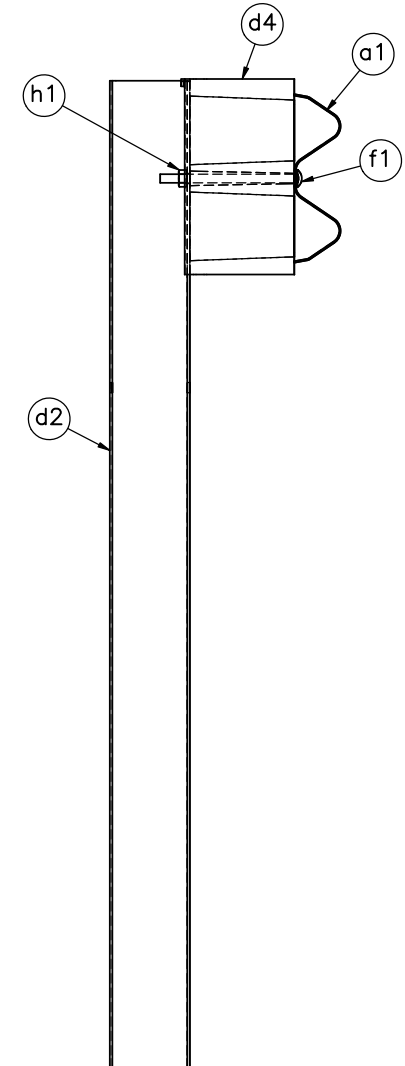
REV. BY:
KAL



SECTION G-G
Post 1-6



SECTION H-H
Post 7



SECTION I-I
Post 35

Note: (1) 3" Gap between bottom of top rail and top of Rub rail, Posts 1-27



Midwest Roadside
Safety Facility

Hawaii Buried in Backslope
Test No. HBIB-7

Post Nos. 1-38 Details

DWG. NAME.
HBIB-7_R2

SCALE: 1:14
UNITS: in.

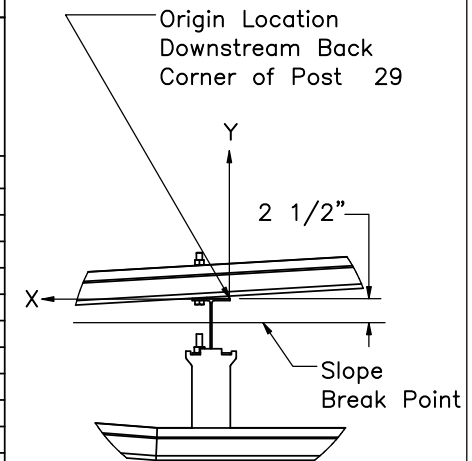
SHEET:
4 of 35

DATE:
05/15/2025

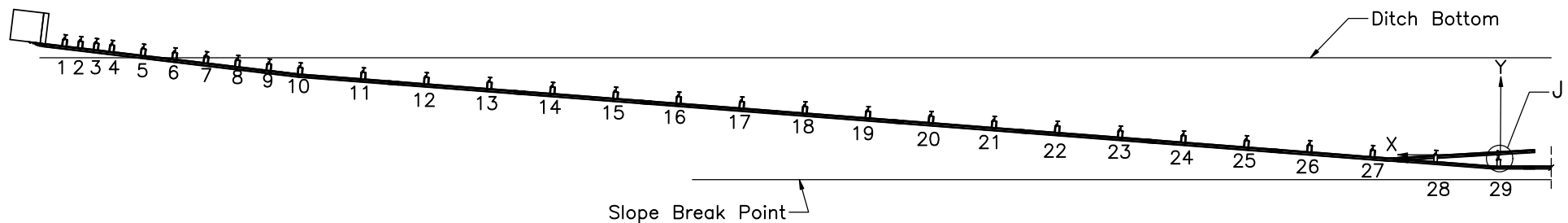
DRAWN BY:
JJO

REV. BY:
KAL

Post Locations						
Post No.	Downstream Back Corner of Post		Upstream Back Corner of Post		Top of the post to ground line	Top of the Back Side Centerline Post to Ditch
	X	Y	X	Y		
1	141'-6 11/16"	11'-9 55/64"	141'-10 19/32"	11'-10 21/64"	1'-11 3/8"	2'-7 3/32"
2	140'-0 1/16"	11'-7 41/64"	140'-3 63/64"	11'-8 7/64"	1'-11 3/8"	2'-8 13/64"
3	138'-3 29/64"	11'-5 27/64"	138'-9 23/64"	11'-5 7/8"	1'-11 3/8"	2'-9 5/16"
4	136'-10 53/64"	11'-3 13/64"	137'-2 3/4"	11'-3 43/64"	1'-11 3/8"	2'-10 27/64"
5	133'-9 19/32"	10'-10 49/64"	134'-1 1/2"	10'-11 15/64"	1'-11 3/8"	3'-0 41/64"
6	130'-8 23/64"	10'-6 5/16"	131'-0 17/64"	10'-6 51/64"	1'-11 3/8"	3'-2 7/8"
7	127'-7 1/8"	10'-1 7/8"	127'-11 1/32"	10'-2 11/32"	1'-11 27/32"	3'-5 9/16"
8	124'-5 7/8"	9'-9 7/16"	125'-2 7/16"	9'-9 29/32"	2'-0 21/64"	3'-7 27/32"
9	121'-4 21/32"	9'-5"	121'-8 9/16"	9'-5 15/32"	2'-0 13/16"	3'-7 27/32"
10	118'-3 31/32"	9'-0 11/16"	118'-7 57/64"	9'-1"	2'-1 19/64"	3'-7 27/32"
11	112'-1"	8'-6 15/16"	112'-4 15/16"	8'-7 15/64"	2'-2 1/4"	3'-7 27/32"
12	105'-10 23/64"	8'-1 3/16"	106'-2 9/32"	8'-1 31/64"	2'-3 13/64"	3'-7 27/32"
13	99'-7 37/64"	7'-7 7/16"	99'-11 33/64"	7'-7 47/64"	2'-4 5/32"	3'-7 27/32"
14	93'-4 13/16"	7'-1 11/16"	93'-8 47/64"	7'-1 63/64"	2'-5 1/8"	3'-7 7/8"
15	87'-2 3/64"	6'-7 15/16"	87'-5 61/64"	6'-8 15/64"	2'-6 5/64"	3'-7 27/32"
16	80'-11 9/32"	6'-2 3/16"	81'-3 13/64"	6'-2 31/64"	2'-7 3/64"	3'-7 7/8"
17	74'-8 1/2"	5'-8 27/64"	75'-0 27/64"	5'-8 23/32"	2'-8"	3'-7 27/32"
18	68'-5 23/32"	5'-2 43/64"	68'-9 41/64"	5'-2 31/32"	2'-8"	3'-6 15/16"
19	62'-2 15/16"	4'-8 29/32"	62'-6 55/64"	4'-9 7/32"	2'-8"	3'-5 29/32"
20	56'-0 5/32"	4'-3 5/32"	56'-4 3/32"	4'-3 29/64"	2'-8"	3'-5"
21	49'-9 3/8"	3'-9 13/32"	50'-1 5/16"	3'-9 45/64"	2'-8"	3'-4 1/32"
22	43'-6 19/32"	3'-3 21/32"	43'-10 17/32"	3'-3 61/64"	2'-8"	3'-3 1/32"
23	37'-3 13/16"	2'-9 29/32"	37'-7 3/4"	2'-10 13/64"	2'-8"	3'-2 3/32"
24	31'-1 3/64"	2'-4 9/64"	31'-4 31/32"	2'-4 29/64"	2'-8"	3'-1 5/32"
25	24'-10 9/32"	1'-10 25/64"	25'-2 13/64"	1'-10 11/16"	2'-8"	3'-3/16"
26	18'-7 18/32"	1'-4 41/64"	18'-11 13/32"	1'-4 15/16"	2'-8"	2'-11 7/32"
27	12'-4 45/64"	0'-10 7/8"	12'-8 5/8"	0'-11 3/16"	2'-8"	2'-10 1/4"
28	6'-1 29/32"	0'-5 9/64"	6'-5 27/32"	0'-5 29/64"	2'-8"	2'-9 9/32"
29	0	0	0'-3 15/16"	0	2'-8"	2'-8 13/32"



DETAIL J
SCALE 1 : 20



- Note: (1) Post x,y,z dimensions are measured from downstream back corner of post 29. Vertical dimensions are from the top of the front slope break point to the top of the post.
- (2) Post no. 17 through No. 29 do not change in height from the top of the post to the ground line.



Hawaii Buried in Backslope
Test No. HBIB-7

Post Location Layout

DWG. NAME.
HBIB-7_R2

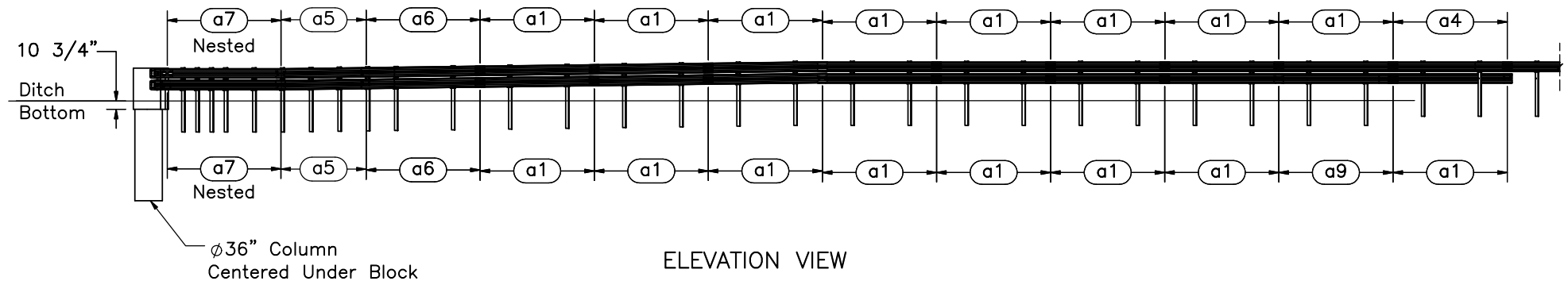
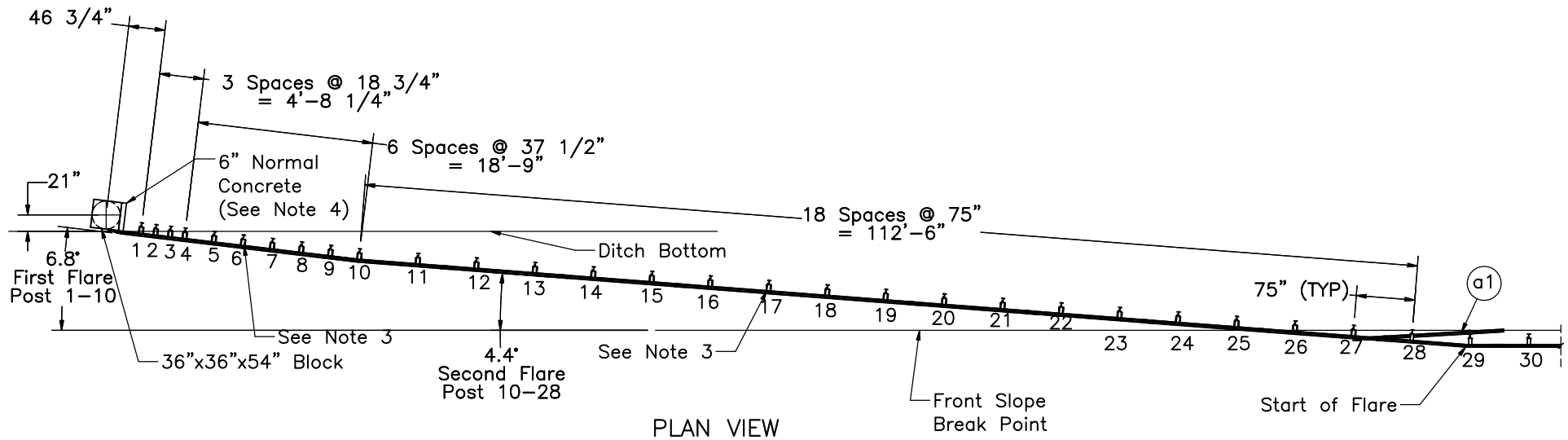
SCALE: 1:185
UNITS: in.

SHEET:
5 of 35

DATE:
05/15/2025

DRAWN BY:
JJO

REV. BY:
KAL



- Notes:
- (1) Elevation view is normal to the front face of the first flared rail.
 - (2) Downstream end of nested W-beam sections (part a7) sandwich upstream end of adjacent W-beam section (part a5) at splice location in accordance with traffic flow.
 - (3) System slopes with ditch between post nos. 6-17. Vertical slope will be accomplished by offsetting the vertical angles of the W-beam rails at splice locations.
 - (4) Compact crushed limestone under add-on 6" wall cast on rock or formwork.



Midwest Roadside
Safety Facility

Hawaii Buried in Backslope
Test No. HBIB-7

Flare Details

DWG. NAME.
HBIB-7_R2

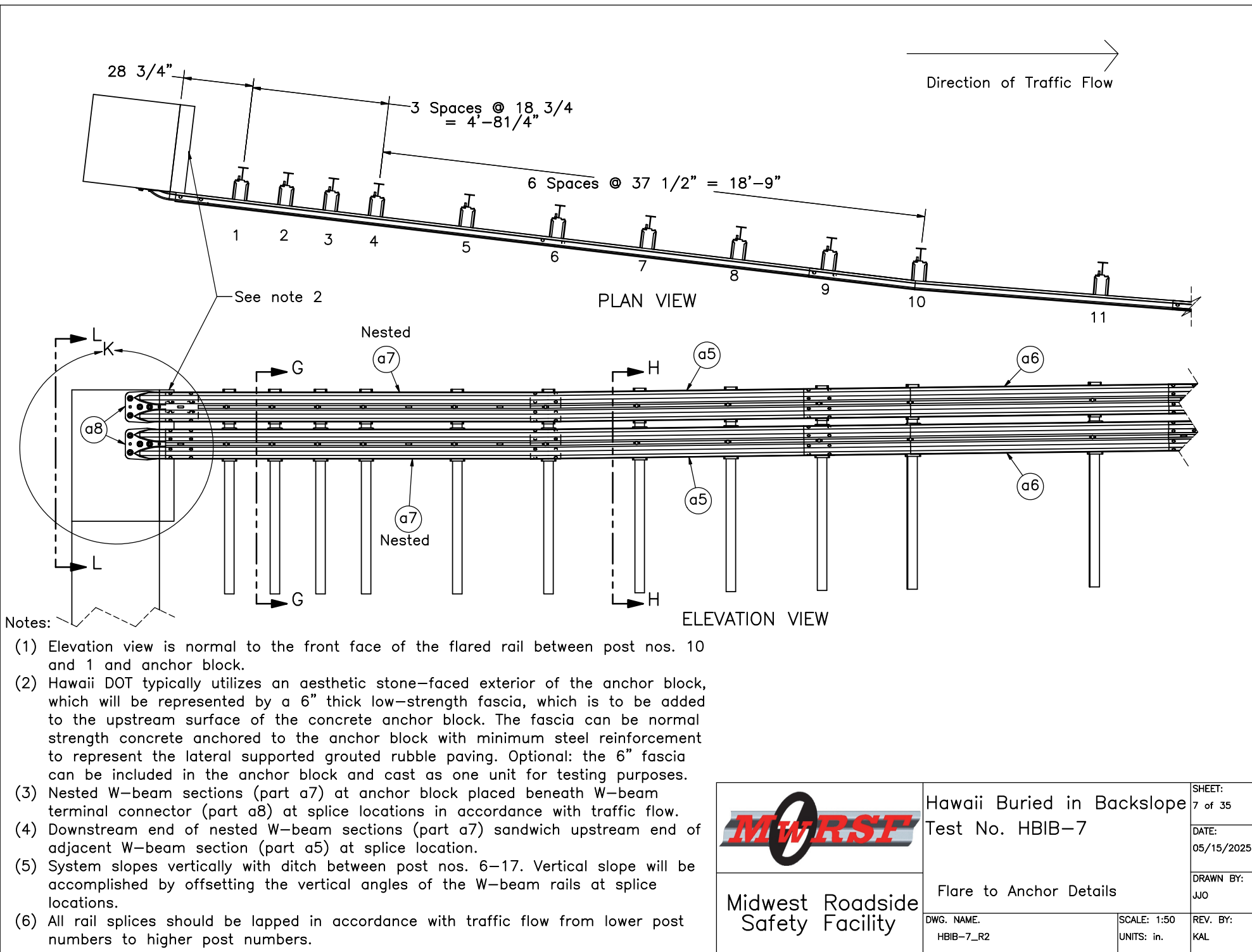
SCALE: 1:200
UNITS: in.

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DATE:
05/15/2025

DRAWN BY:
JJO

REV. BY:
KAL



Midwest Roadside
Safety Facility

Hawaii Buried in Backslope
Test No. HBIB-7

Flare to Anchor Details

DWG. NAME.
HBIB-7_R2

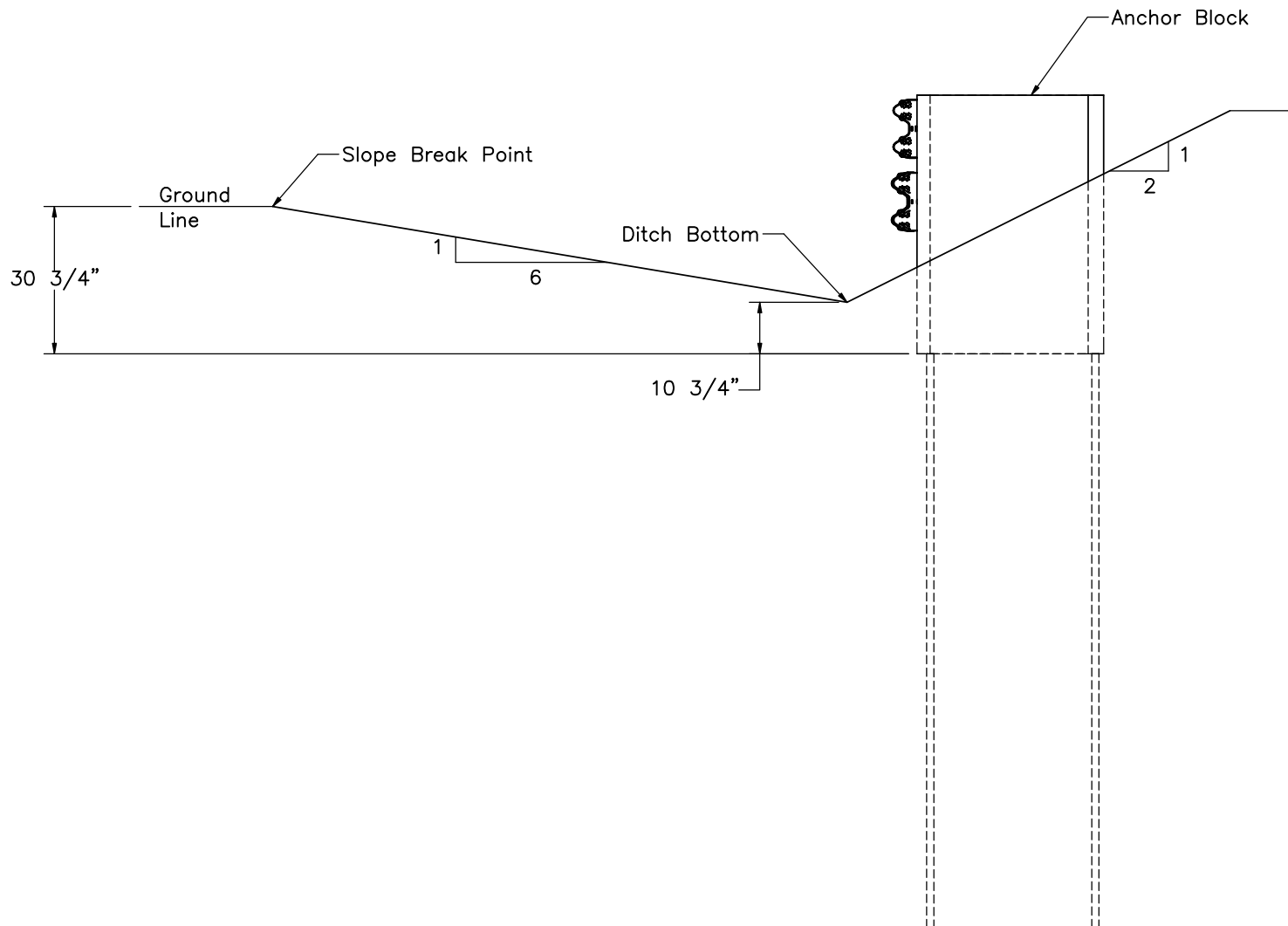
SCALE: 1:50
UNITS: in.

SHEET:
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DATE:
05/15/2025

DRAWN BY:
JJO

REV. BY:
KAL



SECTION M-M



Midwest Roadside
Safety Facility

Hawaii Buried in Backslope
Test No. HBIB-7

Anchor Block Section View

DWG. NAME.
HBIB-7_R2

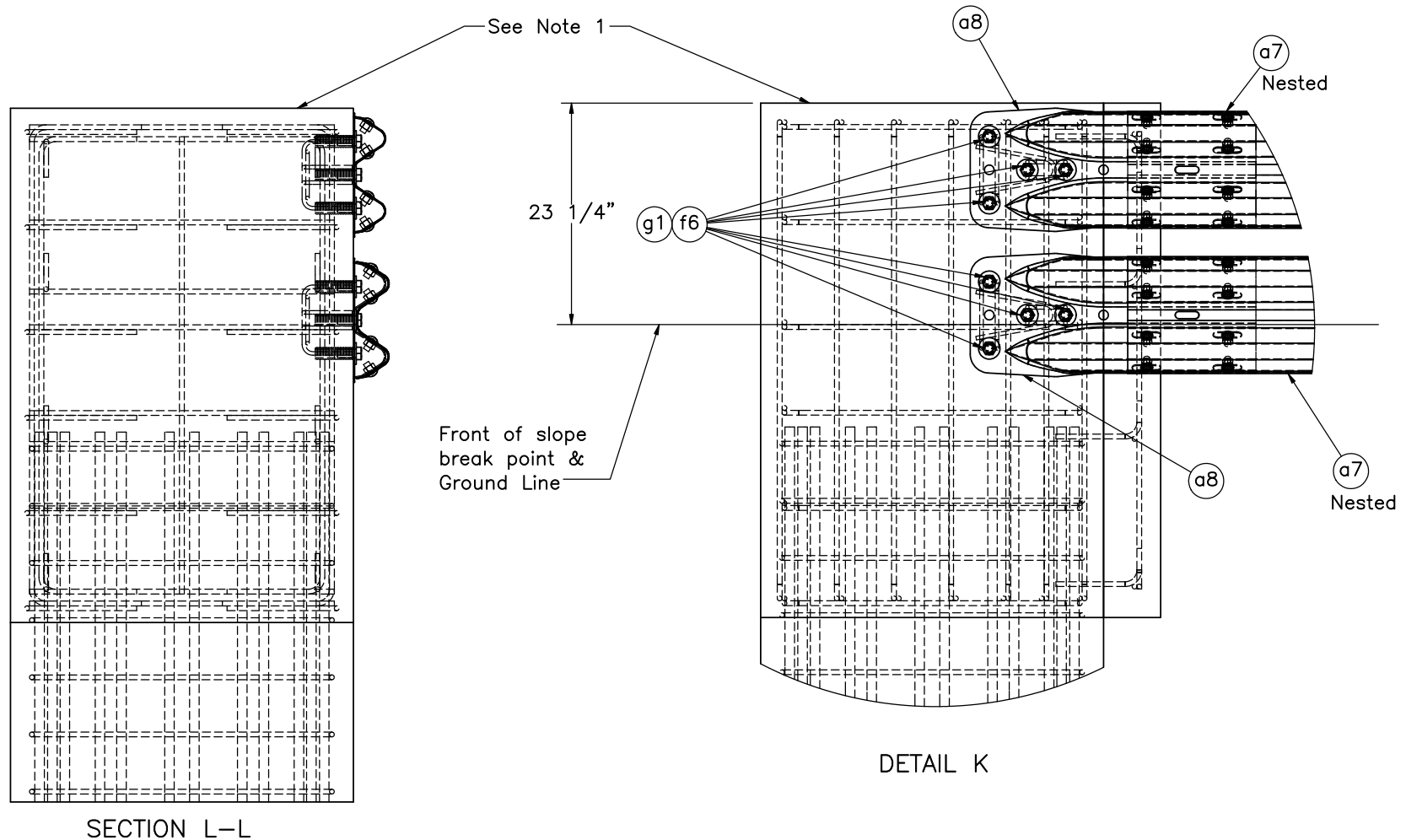
SCALE: 1:35
UNITS: in.

SHEET:
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DATE:
05/15/2025

DRAWN BY:
JJO

REV. BY:
KAL



- Notes: (1) Hawaii DOT typically utilizes an aesthetic stone-faced exterior of the anchor block, which will be represented by a 6" thick low-strength fascia, which is to be added to the upstream surface of the concrete anchor block. The fascia can be normal strength concrete anchored to the anchor block with minimum steel reinforcement to represent the lateral supported grouted rubble paving. Optional: the 6" fascia can be included in the anchor block and cast as one unit for testing purposes.
- (2) View is normal to concrete block, back slope is shown at an angle.
- (3) See sheet 12 for optional end section installation details.



Midwest Roadside
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Hawaii Buried in Backslope
Test No. HBIB-7

End Section Installation Details

DWG. NAME.
HBIB-7_R2

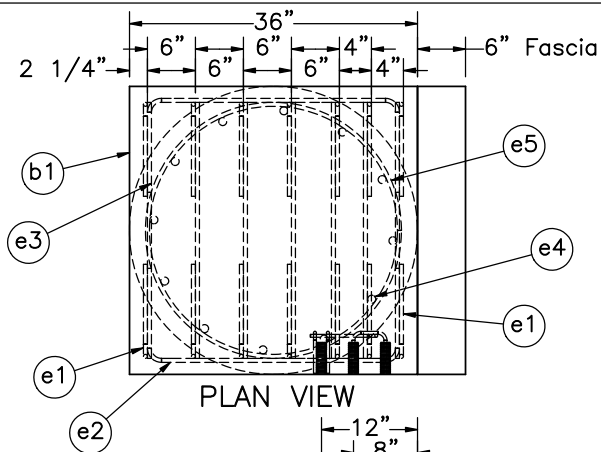
SCALE: 1:17
UNITS: in.

SHEET:
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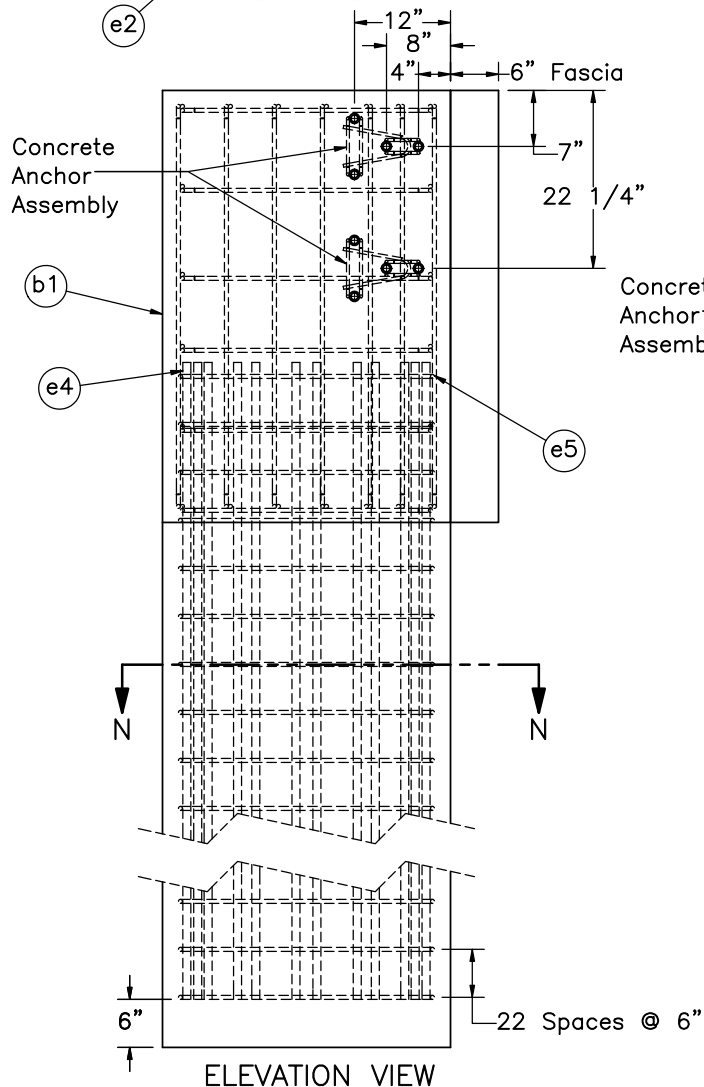
DATE:
05/15/2025

DRAWN BY:
JJO

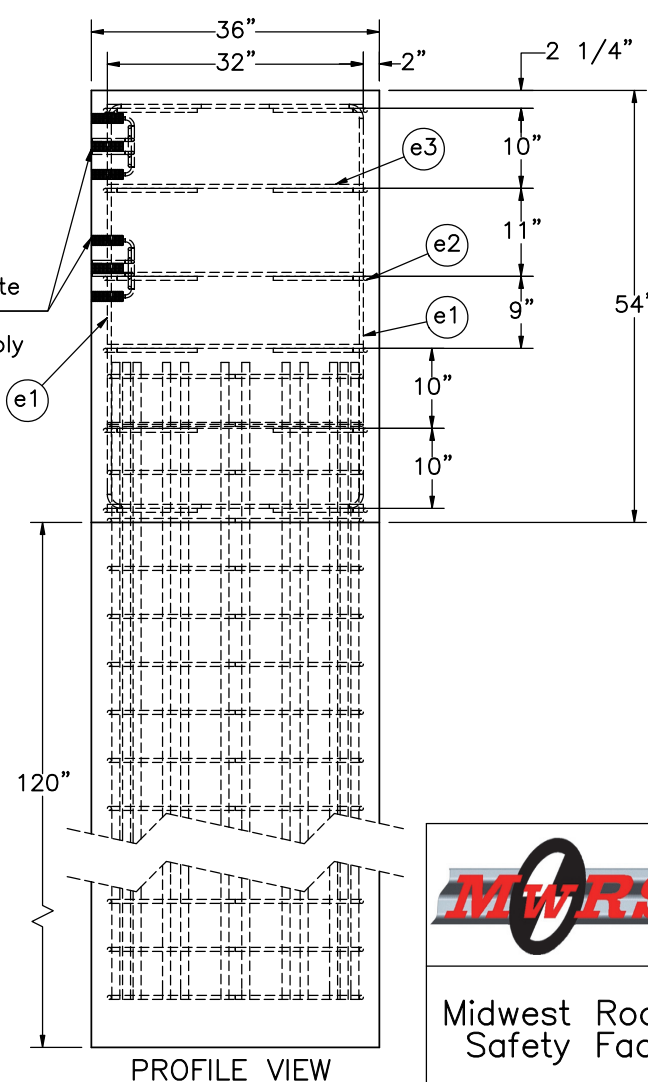
REV. BY:
KAL



PLAN VIEW

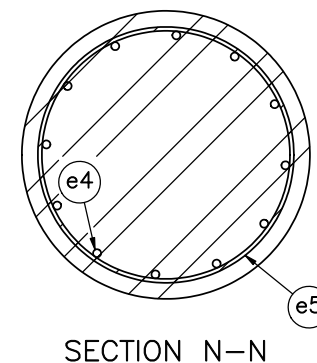


ELEVATION VIEW



PROFILE VIEW

- Notes: (1) Hawaii DOT typically utilizes an aesthetic stone-faced exterior of the anchor block, which will be represented by a 6" thick low-strength fascia, which is to be added to the upstream surface of the concrete anchor block. The fascia can be normal strength concrete anchored to the anchor block with minimum steel reinforcement to represent the lateral supported grouted rubble paving.
- (2) Optional: the 6" fascia can be included in the anchor block and cast as one unit for testing purposes.
- (3) Rebar in fascia not shown in these views for clarity.
- (4) Additional reinforcement and subgrade anchorage added to Hawaii DOT anchor block to increase rigidity.



SECTION N-N



Hawaii Buried in Backslope
Test No. HBIB-7

Concrete Anchor Block Details

DWG. NAME.
HBIB-7_R2

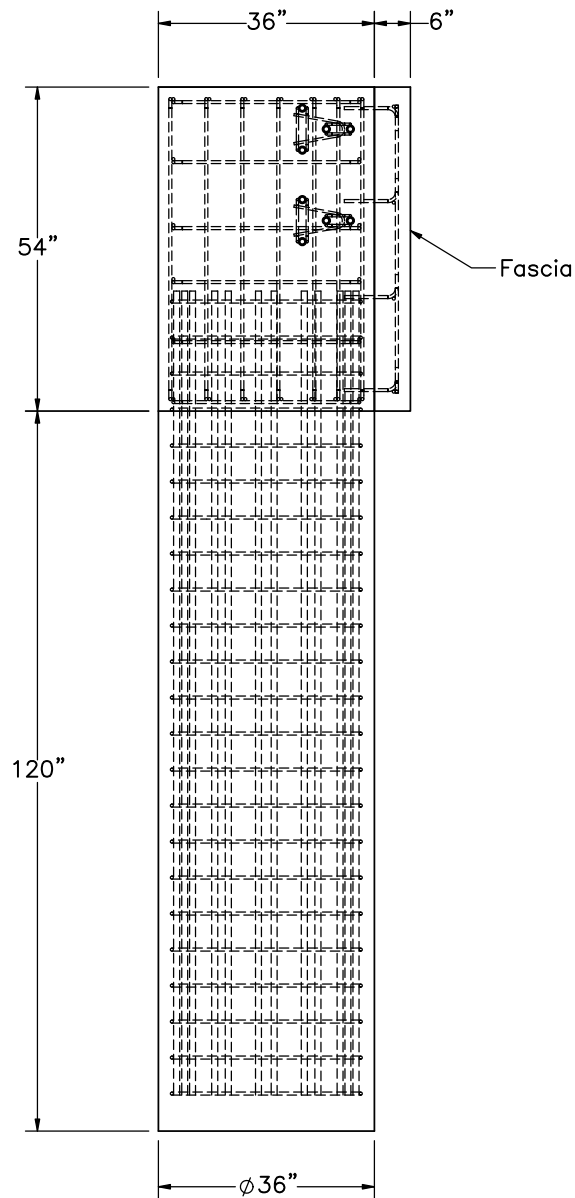
SCALE: 1:24
UNITS: in.

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DATE:
05/15/2025

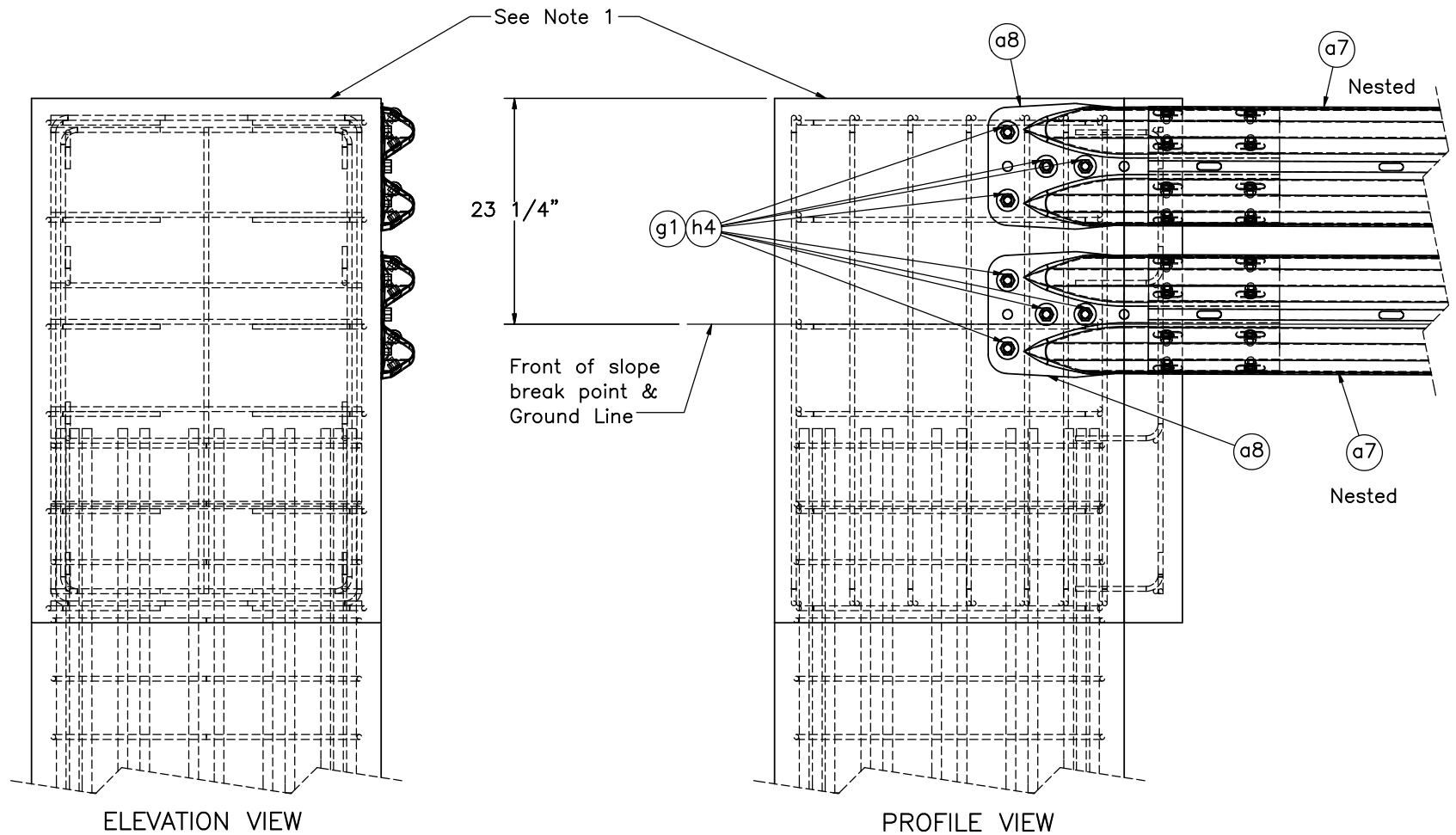
DRAWN BY:
JJO

REV. BY:
KAL



- Notes:
- (1) Hawaii DOT typically utilizes an aesthetic stone-faced exterior of the anchor block, which will be represented by a 6" thick low-strength fascia, which is to be added to the upstream surface of the concrete anchor block. The fascia can be normal strength concrete anchored to the anchor block with minimum steel reinforcement to represent the lateral supported grouted rubble paving.
 - (2) Optional: the 6" fascia can be included in the anchor block and cast as one unit for testing purposes.

	Hawaii Buried in Backslope		SHEET:
	Test No. HBIB-7		11 of 35
Midwest Roadside Safety Facility	Anchor Block Assembly		DATE:
	DWG. NAME.		05/15/2025
	HBIB-7_R2		DRAWN BY:
SCALE: 1:32		REV. BY:	JJO
UNITS: in.		KAL	



Optional Concrete Anchor Assembly

Notes:

- (1) Hawaii DOT typically utilizes an aesthetic stone-faced exterior of the anchor block, which will be represented by a 6" thick low-strength fascia, which is to be added to the upstream surface of the concrete anchor block. The fascia can be normal strength concrete anchored to the anchor block with minimum steel reinforcement to represent the lateral supported grouted rubble paving.
- (2) Optional: the 6" fascia can be included in the anchor block and cast as one unit for testing purposes.
- (3) View is normal to concrete block, back slope is shown at an angle.



Midwest Roadside
Safety Facility

Hawaii Buried in Backslope
Test No. HBIB-7

Optional End Section
Installation Details

DWG. NAME.
HBIB-7_R2

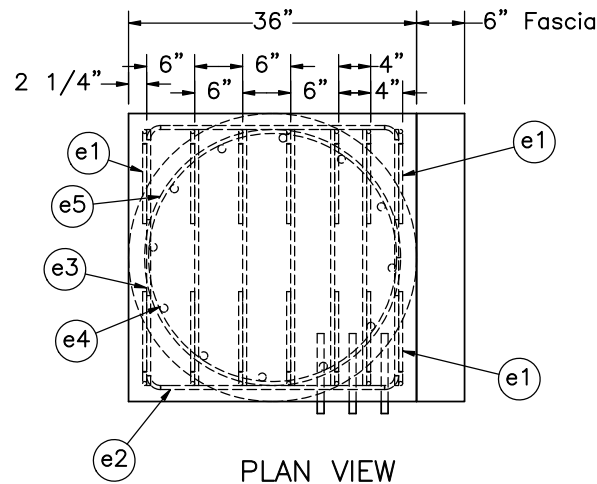
SCALE: 1:17
UNITS: in.

SHEET:
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DATE:
05/15/2025

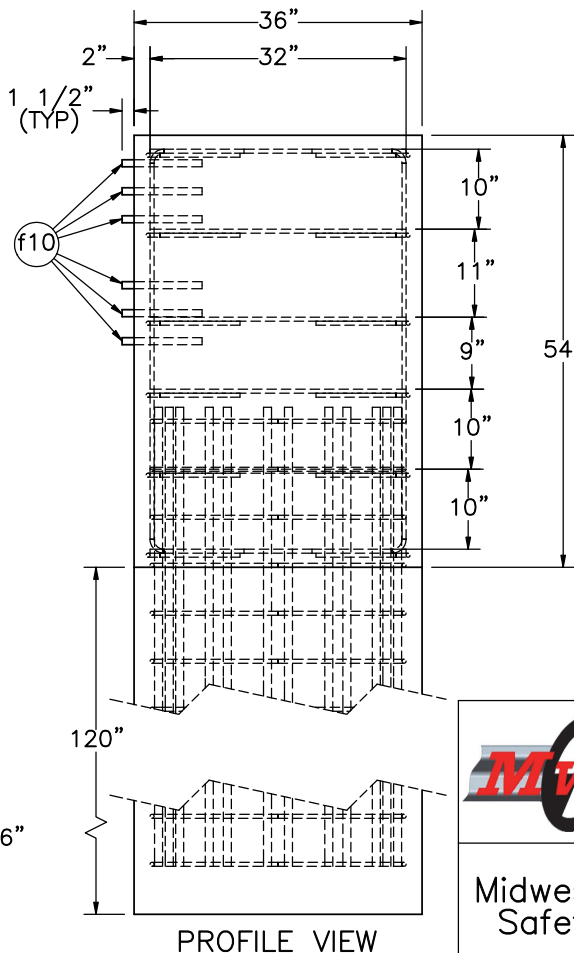
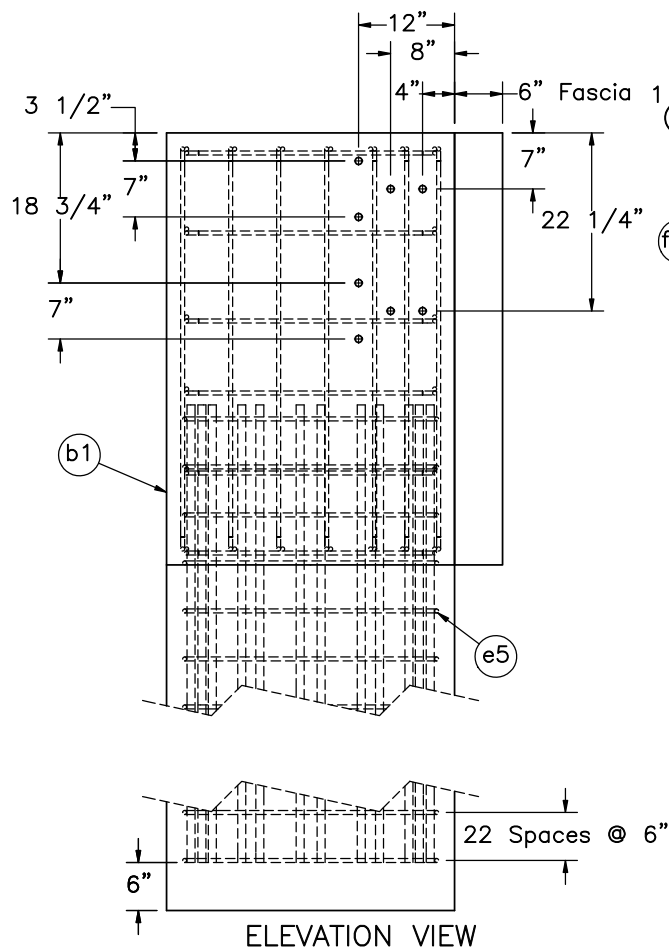
DRAWN BY:
JJO

REV. BY:
KAL



Notes:

- (1) Hawaii DOT typically utilizes an aesthetic stone-faced exterior of the anchor block, which will be represented by a 6" thick low-strength fascia, which is to be added to the upstream surface of the concrete anchor block. The fascia can be normal strength concrete anchored to the anchor block with minimum steel reinforcement to represent the lateral supported grouted rubble paving.
- (2) Optional: the 6" fascia can be included in the anchor block and cast as one unit for testing purposes.
- (3) Rebar in fascia not shown in these views for clarity.
- (4) Additional reinforcement and subgrade anchorage added to Hawaii DOT anchor block to increase rigidity.
- (5) Optional concrete anchor assembly shown with threaded rods (part f10).
- (6) Epoxy install threaded rods using a chemical epoxy adhesive with a minimum bond strength of 1,450 psi.



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Hawaii Buried in Backslope
Test No. HBIB-7

Optional Concrete Anchor
Details

DWG. NAME:
HBIB-7_R2

SCALE: 1:24
UNITS: in.

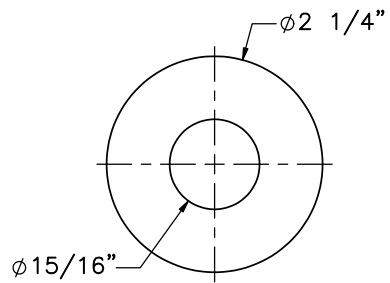
SHEET:
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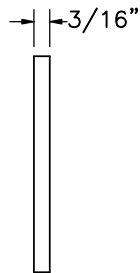
DRAWN BY:
JJO

REV. BY:
KAL

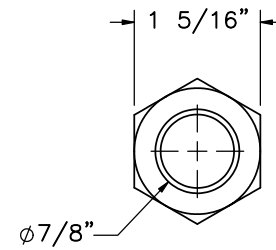
*Optional Hardware					
Item No.	QTY.	Description	Material Specification	Treatment Specification	
f10	8	7/8" Dia. 9 UNC, 10" Long Fully Threaded Rod	ASTM A307 Gr. A or Equivalent	ASTM A153 or B695 Class 55 or F2329	—
g1	8	7/8" Dia. Plain Round Washer	ASTM F844	ASTM A123 or A153 or F2329	FWC20a
h4	8	7/8" Dia. UNC Hex Nut	ASTM A307A or equivalent	ASTM A153 (AASHTO M232) for Class C or ASTM B695 (AASHTO M298) for Class 50	—



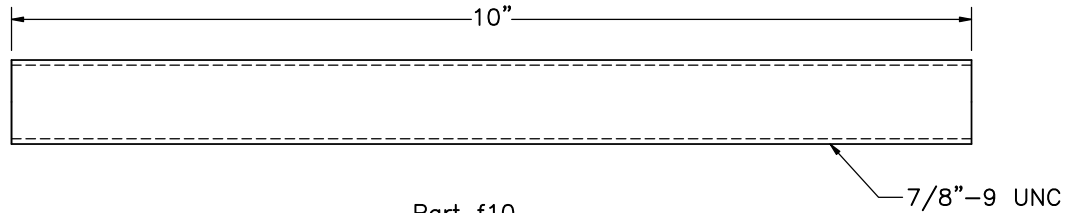
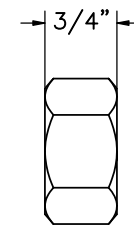
Part g1



Part f10

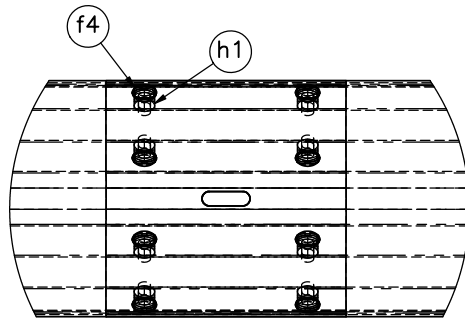


Part h4

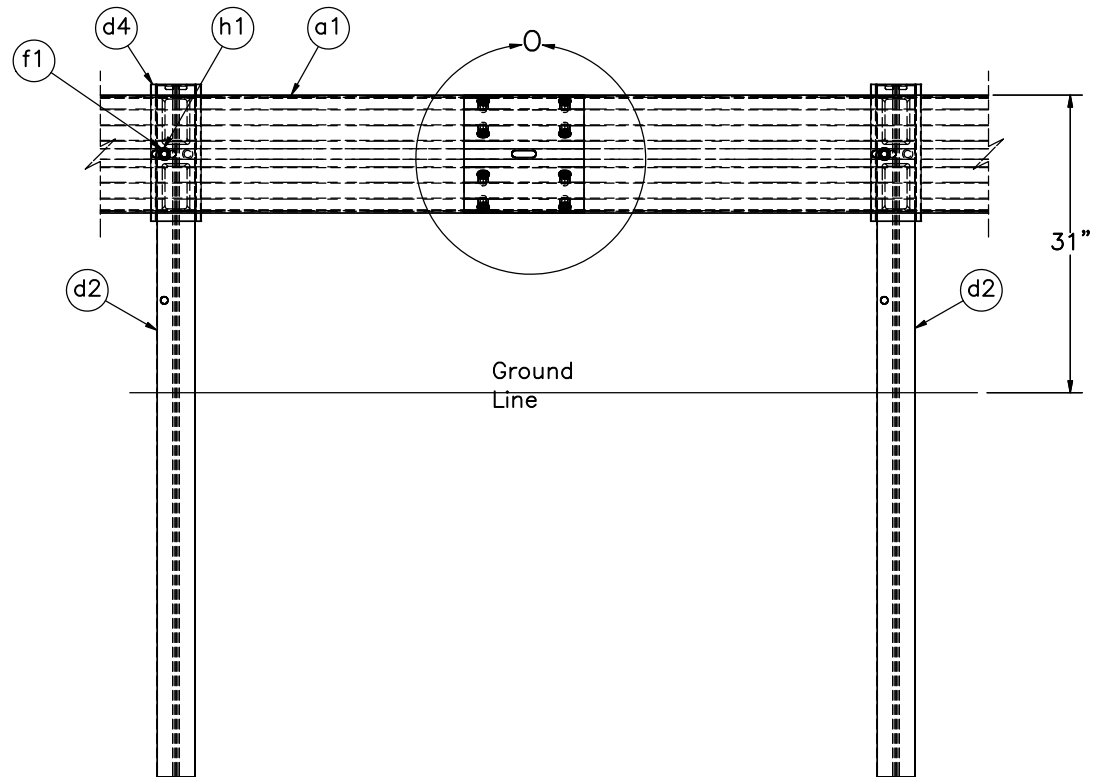


Notes: (1) Additional hardware required for optional anchor.

	Hawaii Buried in Backslope		SHEET:
	Test No. HBIB-7		14 of 35
			DATE:
			05/15/2025
Midwest Roadside Safety Facility	Optional Concrete Anchor Block Hardware		DRAWN BY:
			JJO
DWG. NAME:	SCALE: 1:2	REV. BY:	
HBIB-7_R2	UNITS: in.	KAL	



DETAIL O
SCALE 1 : 10



Post no. 38

Post no. 37

Note:

- (1) Guardrail bolts (part f1) on the upstream side of the web.
- (2) Guardrail bolts (part f4) may be used in place of guardrail bolts (part f3) in nested W-beam splices if the nut can be fully threaded (dependent on thickness of stacked guardrail layers).
- (3) All rail splices should be lapped in accordance with traffic flow from lower post numbers to higher post numbers.



Midwest Roadside
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Hawaii Buried in Backslope
Test No. HBIB-7

Splice Detail

DWG. NAME.
HBIB-7_R2

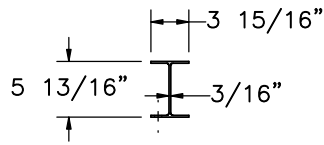
SCALE: 1:20
UNITS: in.

SHEET:
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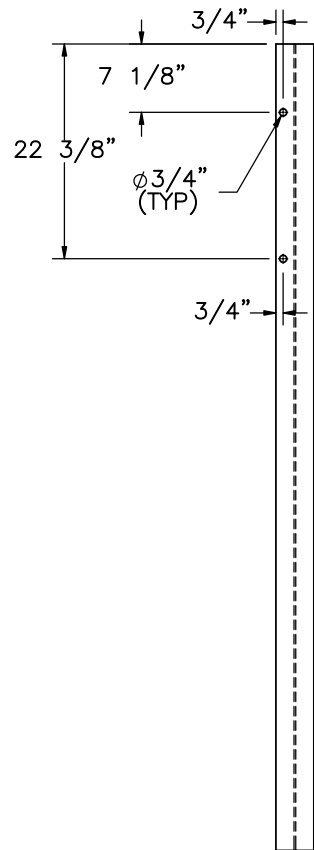
DATE:
05/15/2025

DRAWN BY:
JJO

REV. BY:
KAL

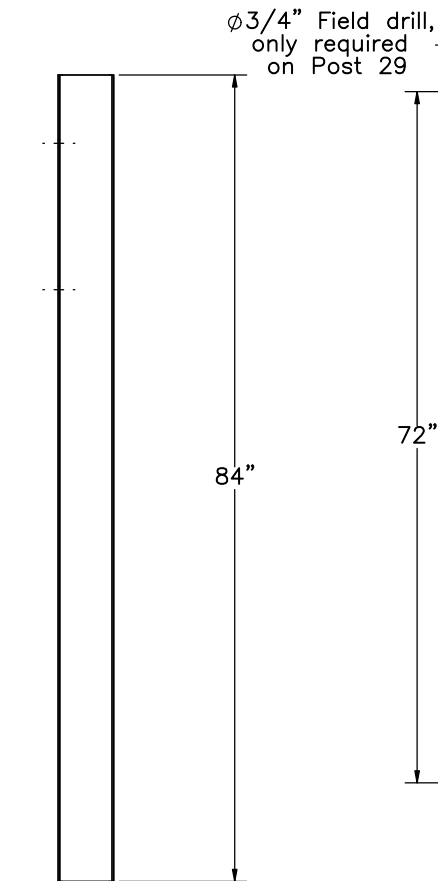


PLAN VIEW

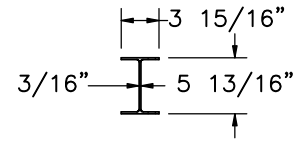


ELEVATION VIEW

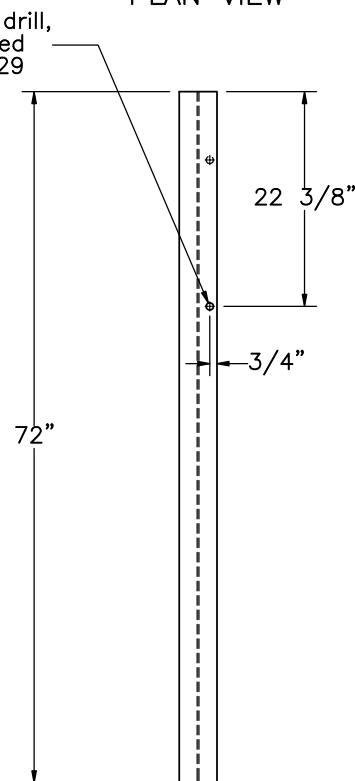
Part d1



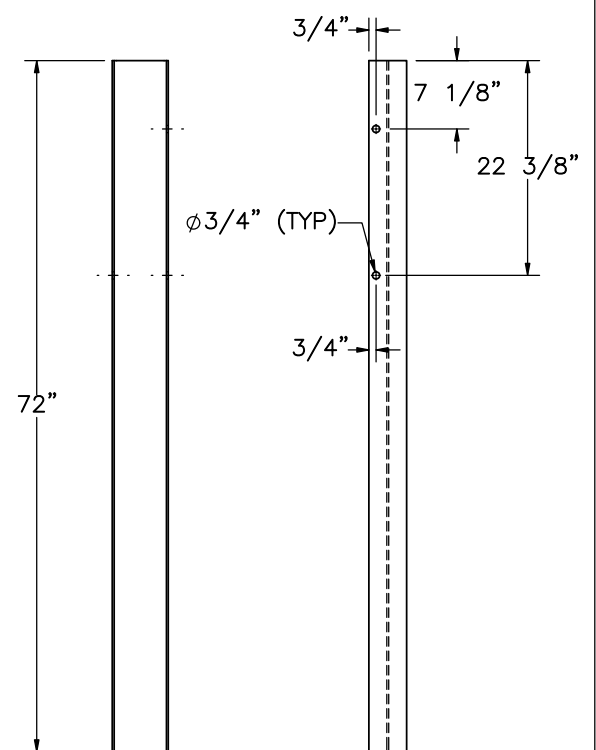
PROFILE VIEW



PLAN VIEW



REAR VIEW



ELEVATION VIEW

PROFILE VIEW
Part d2



Hawaii Buried in Backslope
Test No. HBIB-7

Post Components

DWG. NAME.
HBIB-7_R2

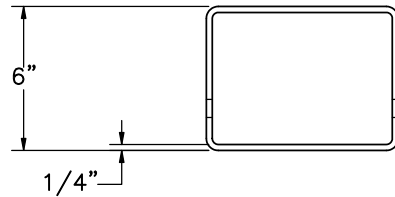
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SHEET:
16 of 35

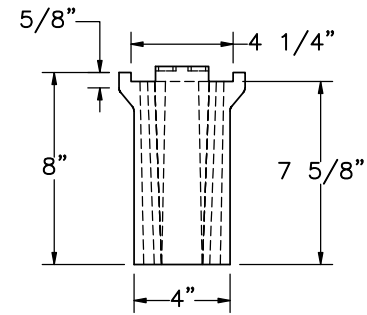
DATE:
05/15/2025

DRAWN BY:
JJO

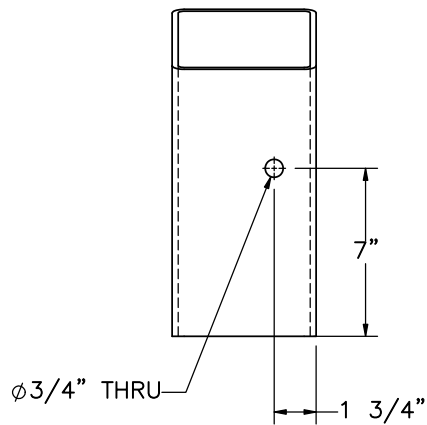
REV. BY:
KAL



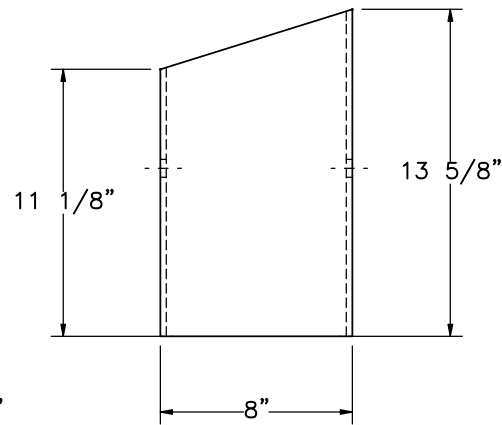
PLAN VIEW



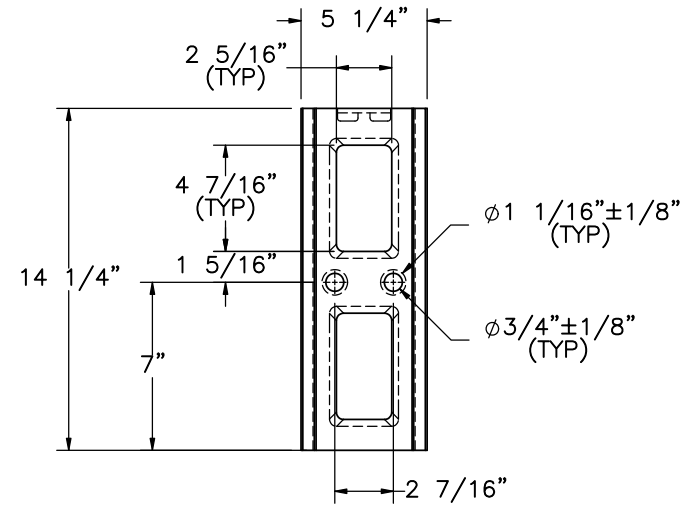
PLAN VIEW



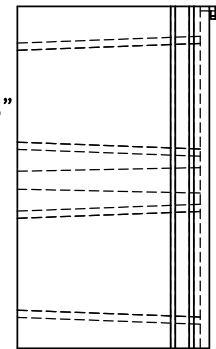
ELEVATION VIEW



PROFILE VIEW



ELEVATION VIEW



PROFILE VIEW

Part d4

Part d5



Hawaii Buried in Backslope
Test No. HBIB-7

Tapered Blockout Details

DWG. NAME.
HBIB-7_R2

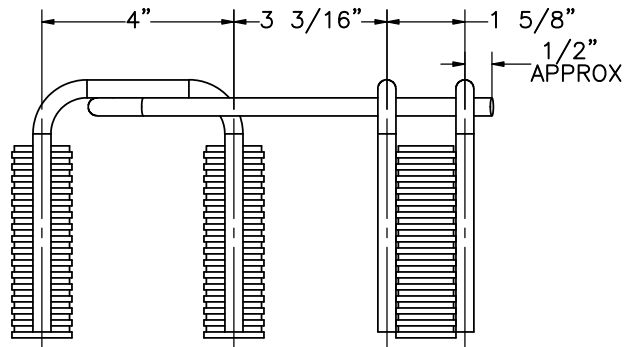
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SHEET:
17 of 35

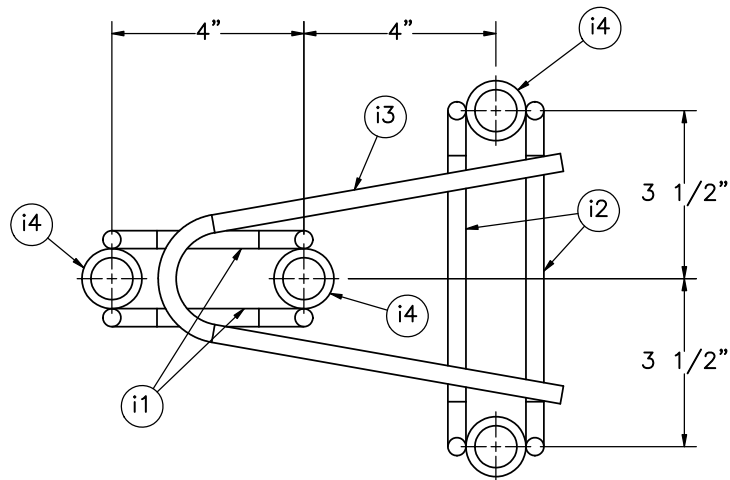
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05/15/2025

DRAWN BY:
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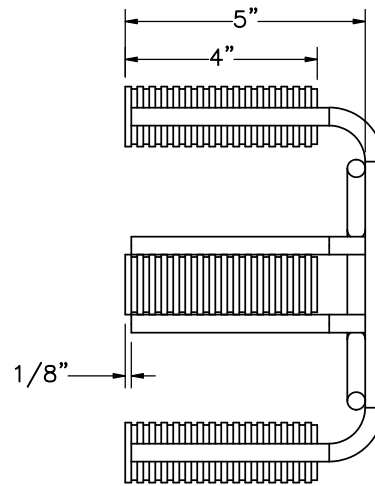
REV. BY:
KAL



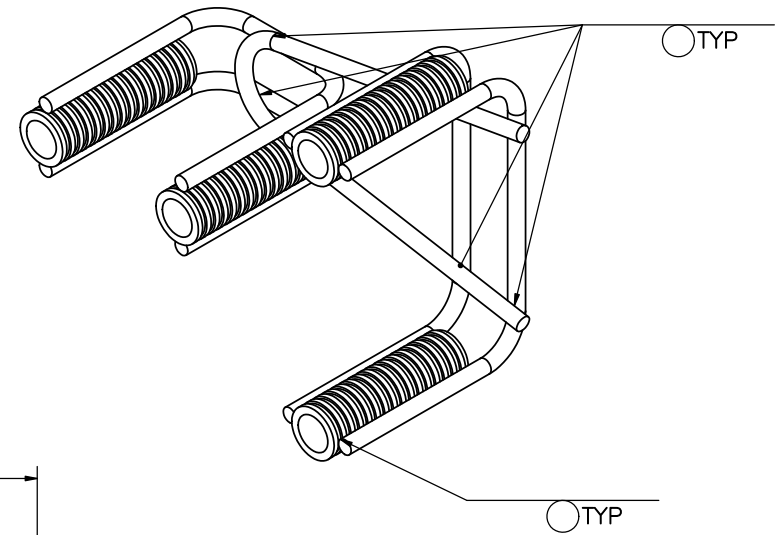
PLAN VIEW



ELEVATION VIEW



PROFILE VIEW



Note:

- (1) Ferrule and threaded fasteners shown for connection to concrete anchor block. Alternative anchorages may include cast or post-installed threaded rods or bolts. Details of alternative anchor blocks not shown here.
- (2) See BOM for threaded rod information.

Item No.	QTY.	Description	Material Specification	Treatment Specification
—	2	Concrete Anchor	—	—
i1	2	3/8" Dia. Wire Strut, 13 3/8" Long Unbent	Min. Tensile Strength = 100,000 psi	AASHTO M111
i2	2	3/8" Dia. Wire Strut, 16 3/8" Long Unbent	Min. Tensile Strength = 100,000 psi	AASHTO M111
i3	1	3/8" Dia. Wire Strut, 18" Long Unbent	Min. Tensile Strength = 100,000 psi	AASHTO M111
i4	4	7/8 Dia. Threaded Ferrule	—	—



Midwest Roadside Safety Facility

Hawaii Buried in Backslope
Test No. HBIB-7

Concrete Anchor Block Insert Assembly

DWG. NAME:
HBIB-7_R2

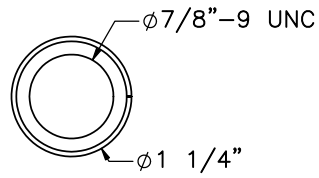
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UNITS: in.

SHEET:
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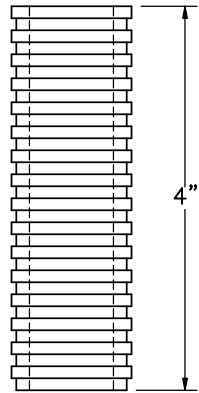
DATE:
05/15/2025

DRAWN BY:
JJO

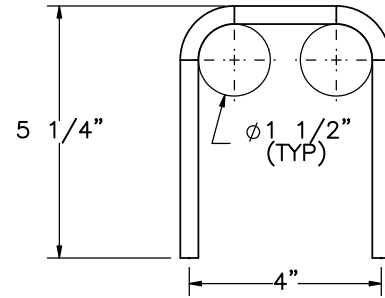
REV. BY:
KAL



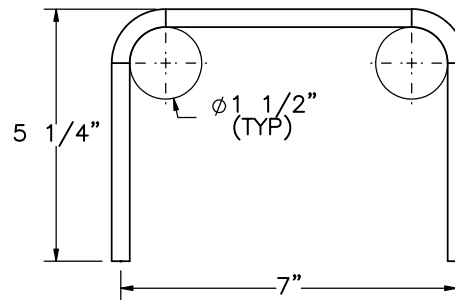
PLAN VIEW



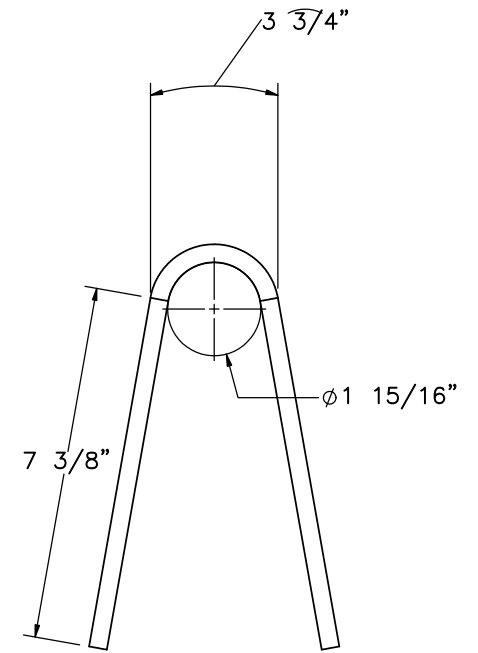
ELEVATION VIEW
Part i4



Part i1



Part i2



Part i3

Bill of Bars					
Bar	QTY (Per Anchor)	Bar Size	Length	Material	Treatment
i1	2	#3	13 3/8"	Min. Tensile Strength = 100,000 psi	AASHTO M111
i2	2	#3	16 3/8"	Min. Tensile Strength = 100,000 psi	AASHTO M111
i3	1	#3	18"	Min. Tensile Strength = 100,000 psi	AASHTO M111



Hawaii Buried in Backslope
Test No. HBIB-7

Insert Component Details

DWG. NAME.
HBIB-7_R2

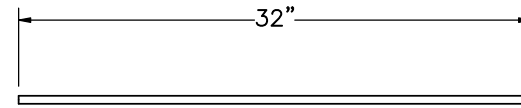
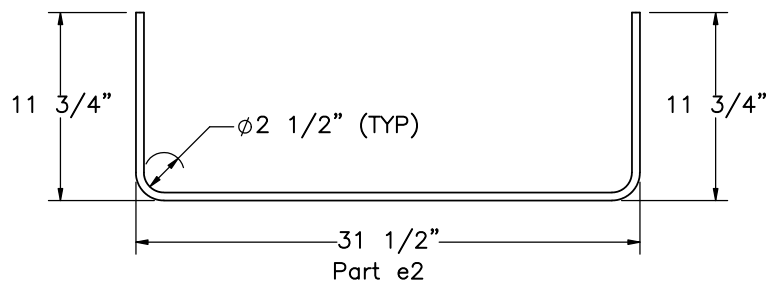
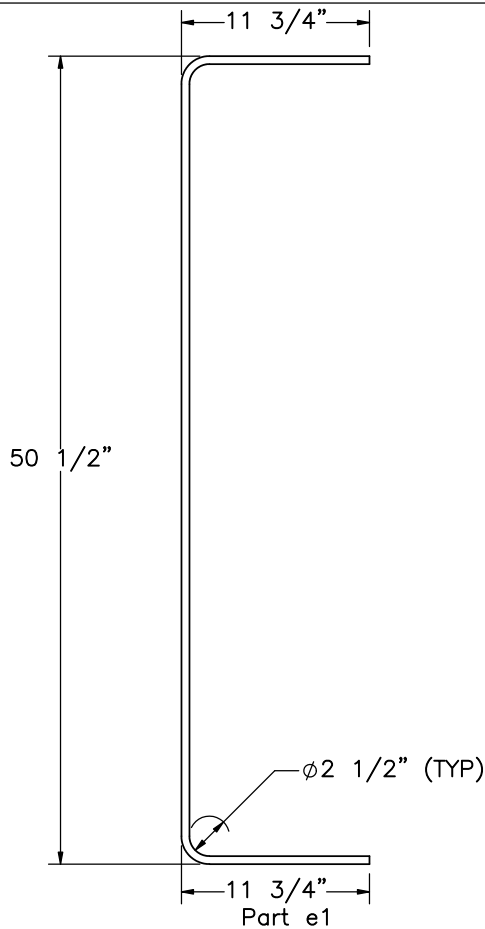
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SHEET:
19 of 35

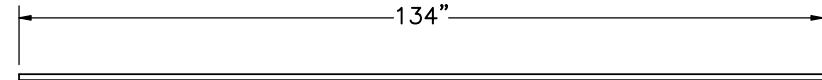
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05/15/2025

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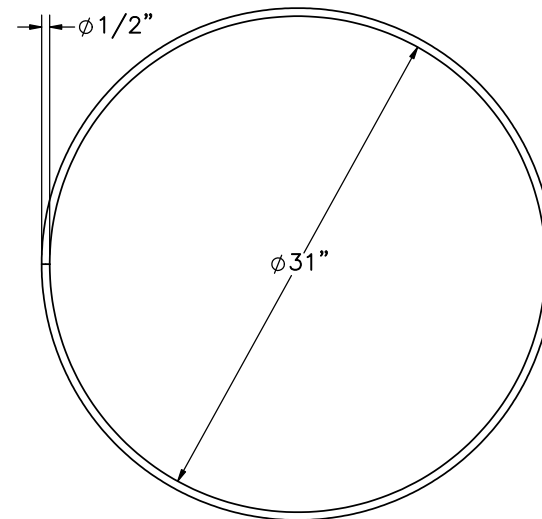
REV. BY:
KAL



Part e3



Part e4



Part e5

Bill of Bars

Bar	QTY	Size	Length	Material	Treatment
e1	14	#4	72"	ASTM A615 Gr. 60	Epoxy Coated (ASTM A775 or A934)
e2	10	#4	53"	ASTM A615 Gr. 60	Epoxy Coated (ASTM A775 or A934)
e3	20	#4	32"	ASTM A615 Gr. 60	Epoxy Coated (ASTM A775 or A934)
e4	16	#8	134"	ASTM A615 Gr. 60	Epoxy Coated (ASTM A775 or A934)
e5	23	#4	99"	ASTM A615 Gr. 60	Epoxy Coated (ASTM A775 or A934)



Midwest Roadside
Safety Facility

Hawaii Buried in Backslope
Test No. HBIB-7

Anchor Block Rebar Details

DWG. NAME.
HBIB-7_R2

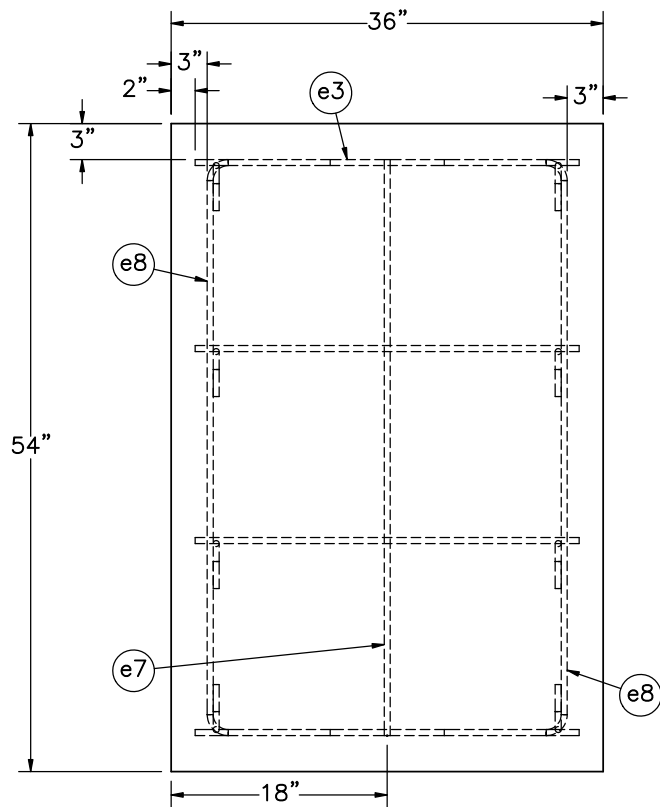
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UNITS: in.

SHEET:
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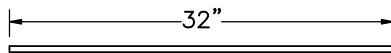
DATE:
05/15/2025

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JJO

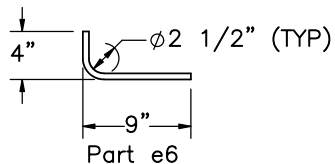
REV. BY:
KAL



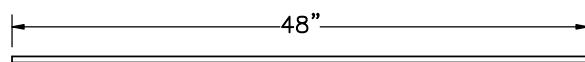
ELEVATION VIEW



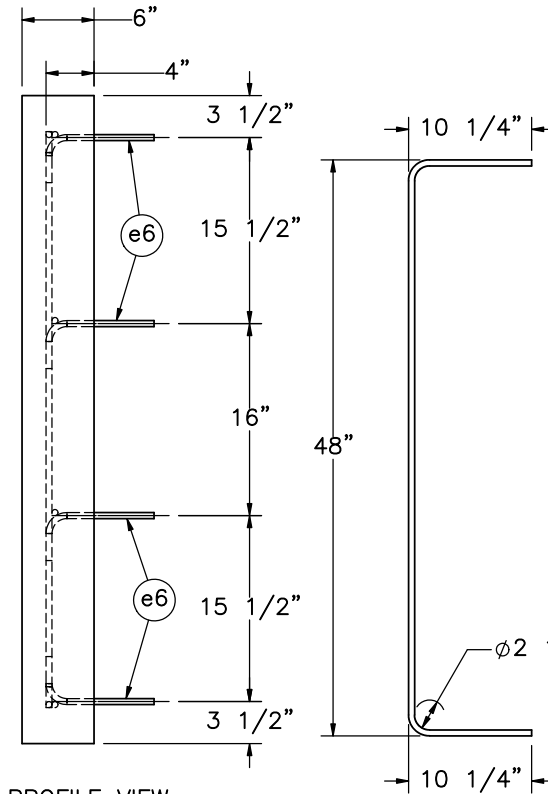
Part e3



Part e6

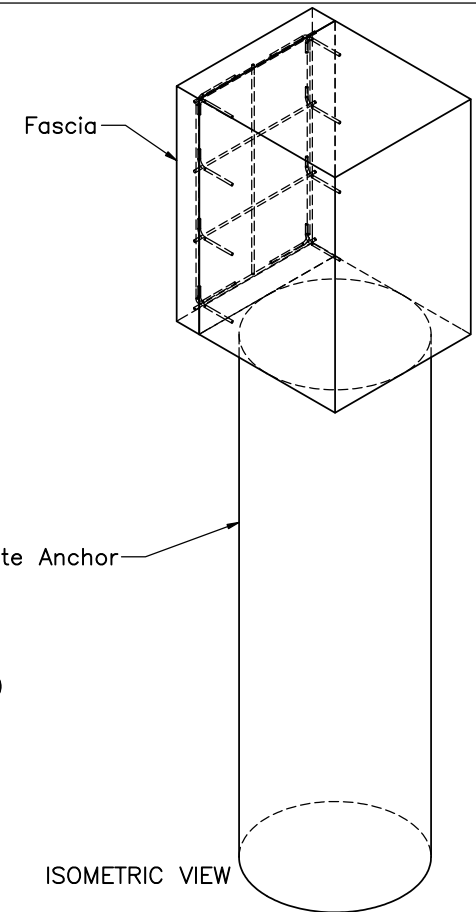


Part e7



PROFILE VIEW

Part e8



ISOMETRIC VIEW

Notes:

- (1) Hawaii DOT typically utilizes an aesthetic stone-faced exterior of the anchor block, which will be represented by a 6" thick fascia, which is to be added to the upstream surface of the concrete anchor block. The fascia can be normal strength concrete anchored to the anchor block with minimum steel reinforcement to represent the lateral supported grouted rubble paving. The installation procedure should be followed. Remove forms from the concrete anchor and drill holes in the anchor block. Install epoxied rebar as shown. Apply Fascia then backfill and compact soil.
- (2) Optional: the 6" fascia can be included in the anchor block and cast as one unit for testing purposes.

Bill of Bars					
Bar	QTY	Size	Length	Material	Treatment
e3	4	#4	32"	ASTM A615 Gr. 60	Epoxy Coated (ASTM A775 or A934)
e6	8	#4	12"	ASTM A615 Gr. 60	Epoxy Coated (ASTM A775 or A934)
e7	1	#4	48"	ASTM A615 Gr. 60	Epoxy Coated (ASTM A775 or A934)
e8	2	#4	67"	ASTM A615 Gr. 60	Epoxy Coated (ASTM A775 or A934)



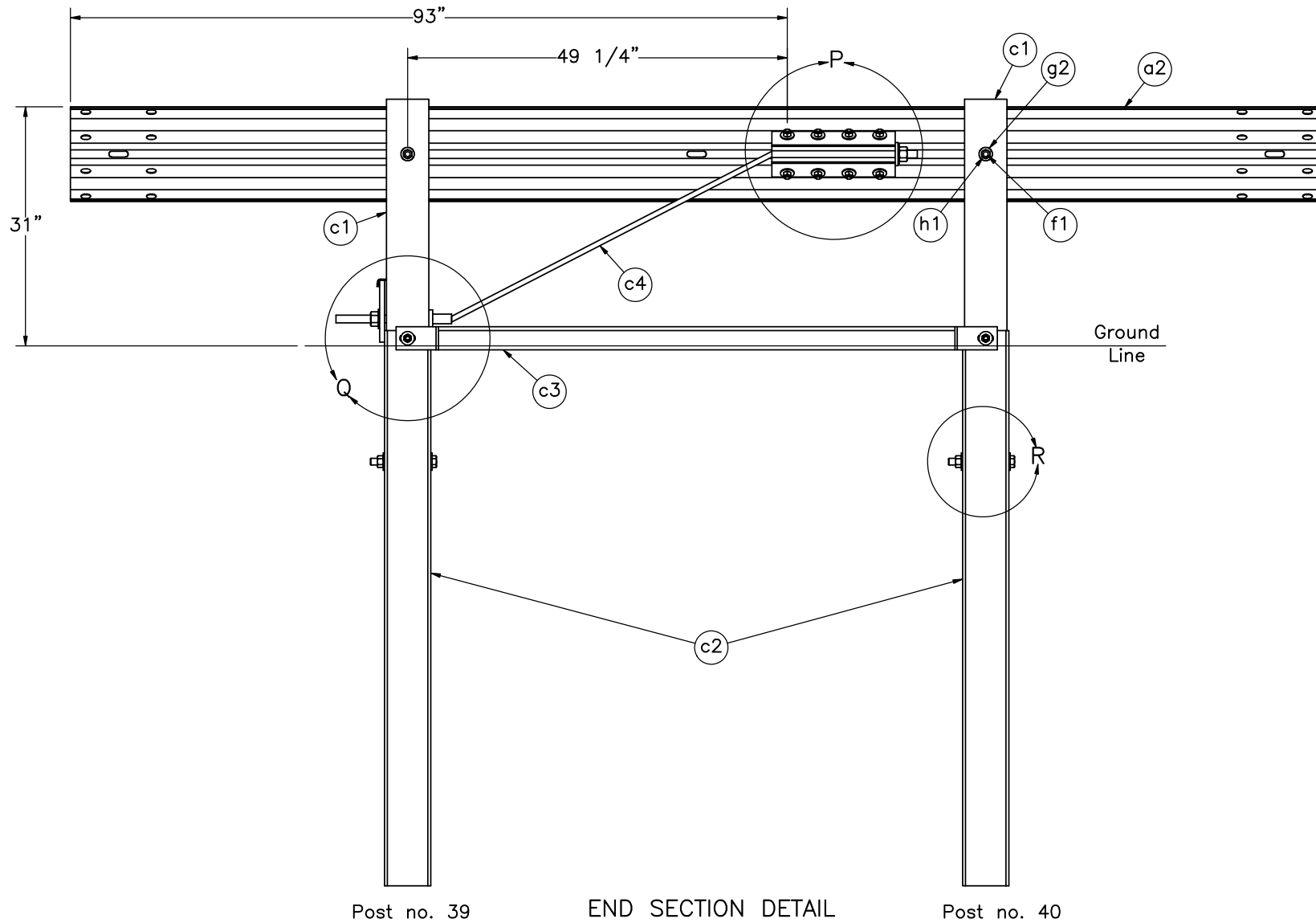
Hawaii Buried in Backslope
Test No. HBIB-7

Fascia Installation

DWG. NAME.
HBIB-7_R2

SCALE: 1:16
UNITS: in.

SHEET:
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DATE:
05/15/2025
DRAWN BY:
JJO
REV. BY:
KAL



Post no. 39

END SECTION DETAIL BACKSIDE

Post no. 40



Midwest Roadside
Safety Facility

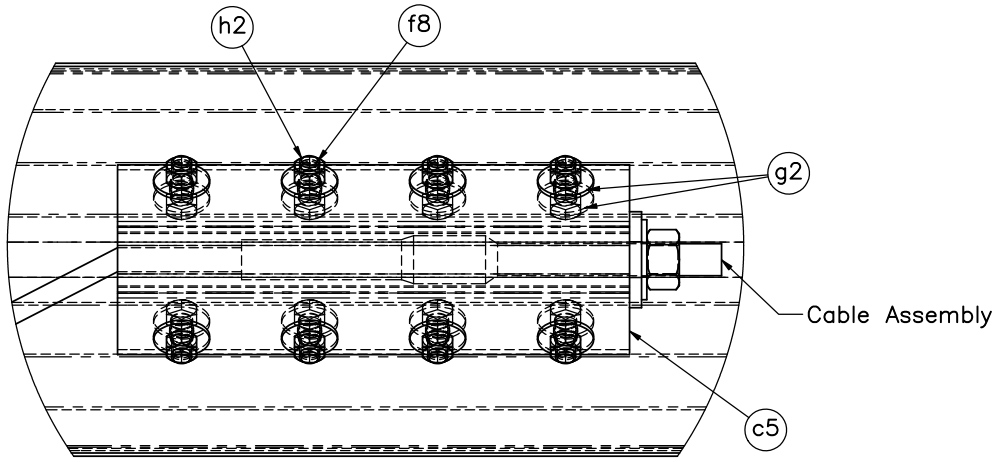
Hawaii Buried in Backslope
Test No. HBIB-7

End Section Detail

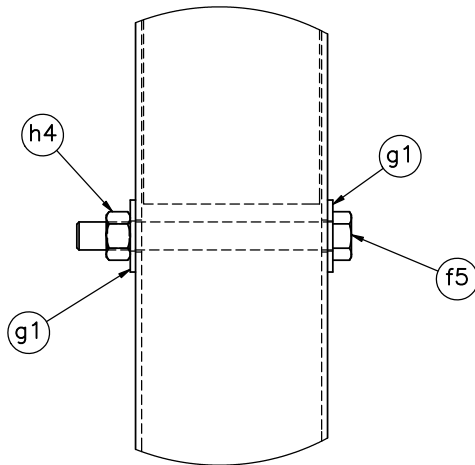
DWG. NAME.
HBIB-7_R2

SCALE: 1:20
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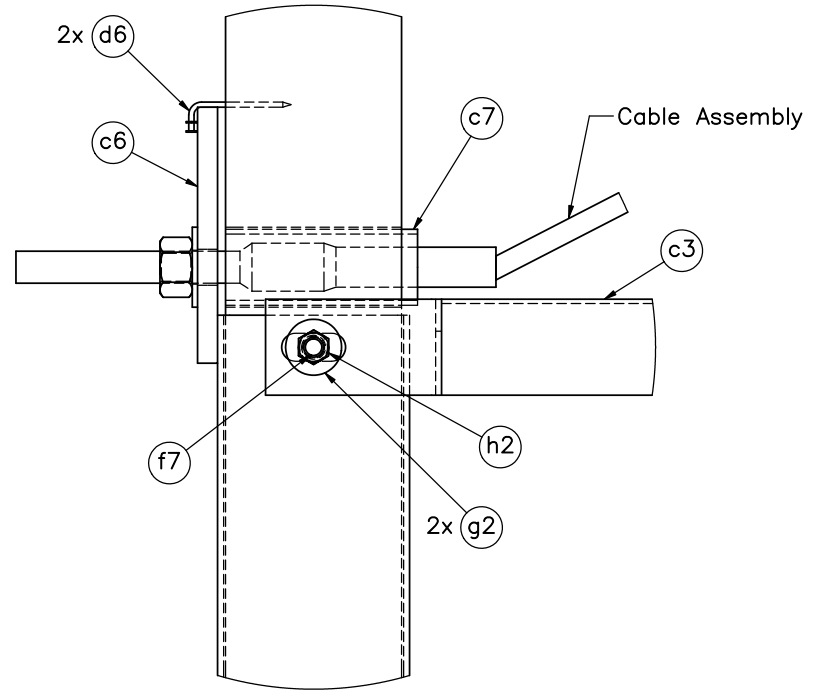
SHEET: 22 of 35
DATE: 05/15/2025
DRAWN BY: JJO
REV. BY: KAL



DETAIL P



DETAIL R



DETAIL Q



Midwest Roadside
Safety Facility

Hawaii Buried in Backslope
Test No. HBIB-7

BCT Anchor Details

DWG. NAME.
HBIB-7_R2

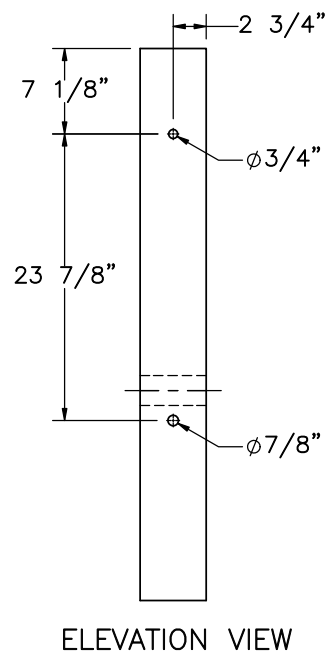
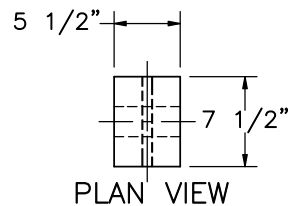
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SHEET:
23 of 35

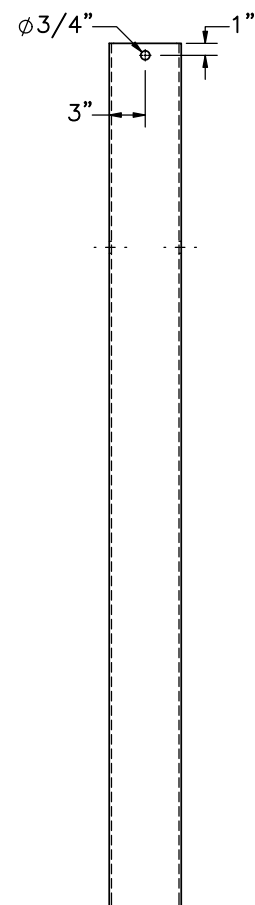
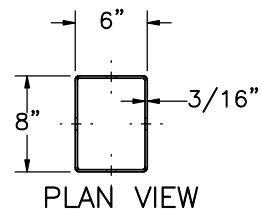
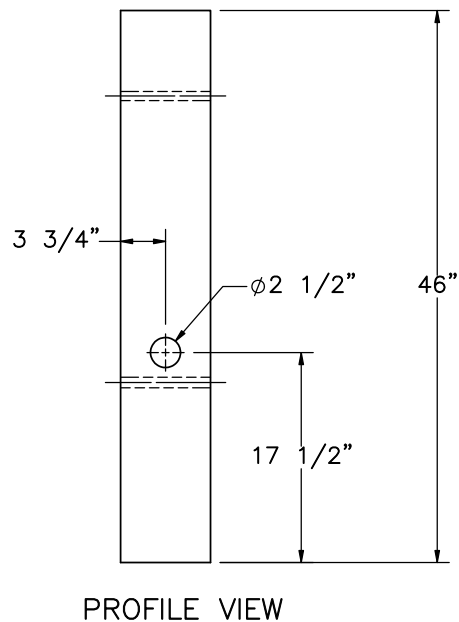
DATE:
05/15/2025

DRAWN BY:
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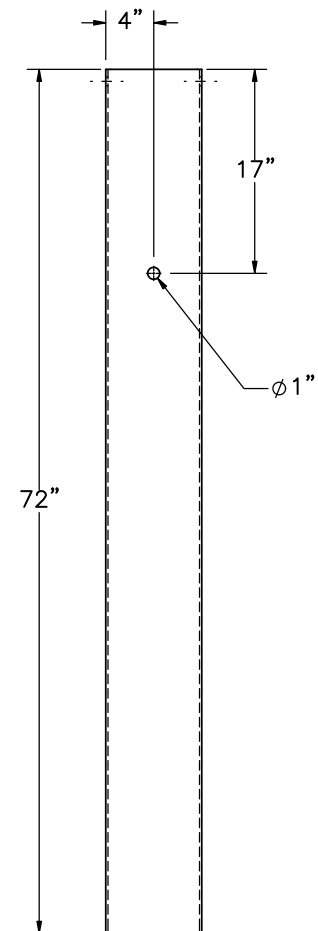
REV. BY:
KAL



Part c1



Part c2



Midwest Roadside
Safety Facility

Hawaii Buried in Backslope
Test No. HBIB-7

BCT Timber Post and
Foundation Tube Details

DWG. NAME.
HBIB-7_R2

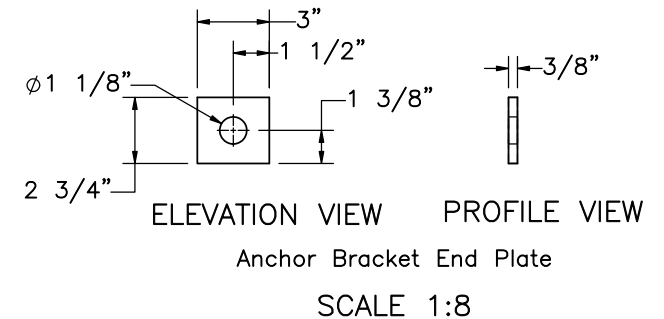
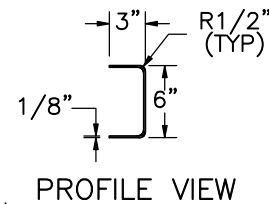
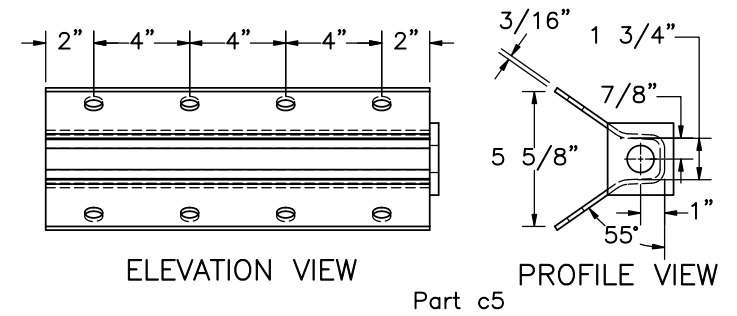
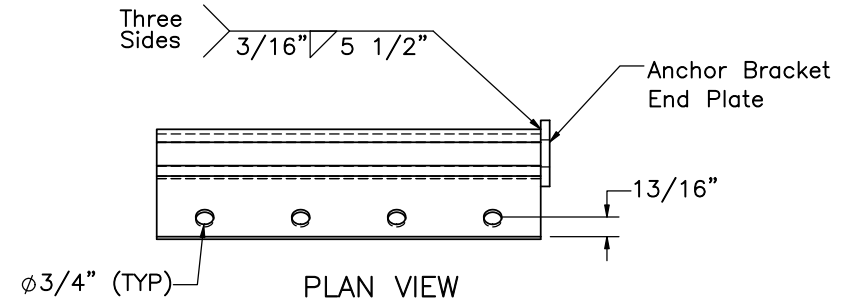
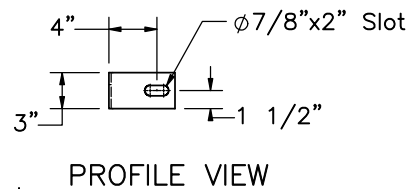
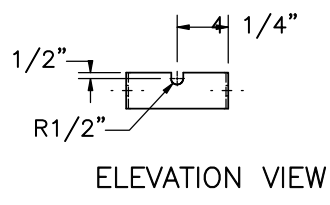
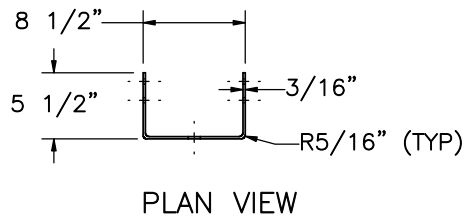
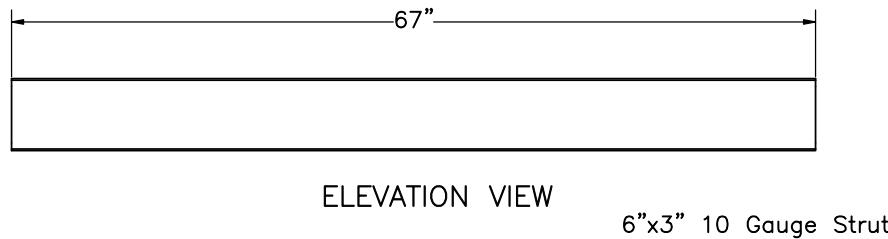
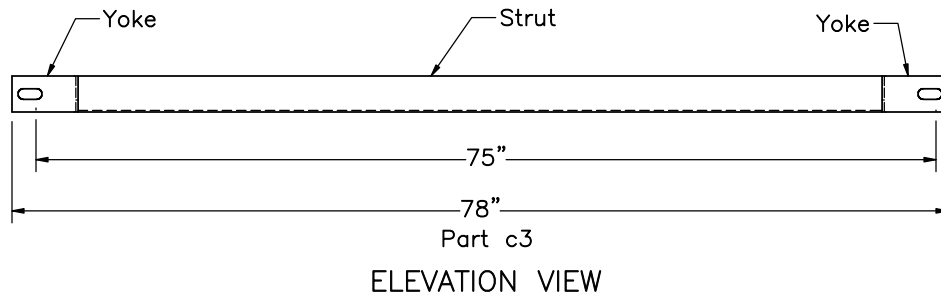
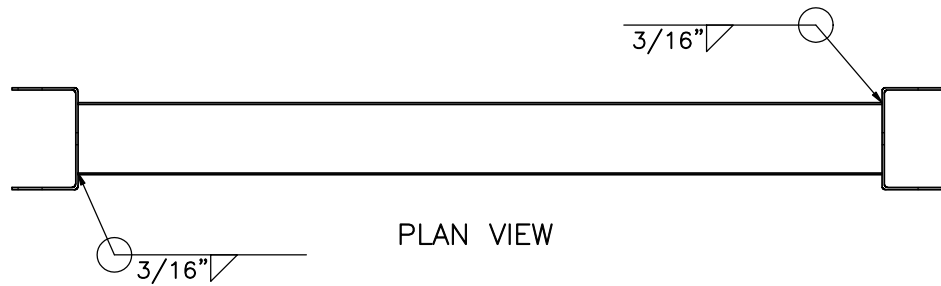
SCALE: 1:16
UNITS: in.

SHEET:
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DATE:
05/15/2025

DRAWN BY:
JJO

REV. BY:
KAL



Midwest Roadside
Safety Facility

Hawaii Buried in Backslope
Test No. HBIB-7

Ground Strut Details

DWG. NAME.
HBIB-7_R2

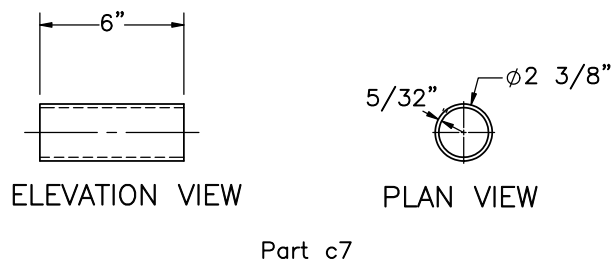
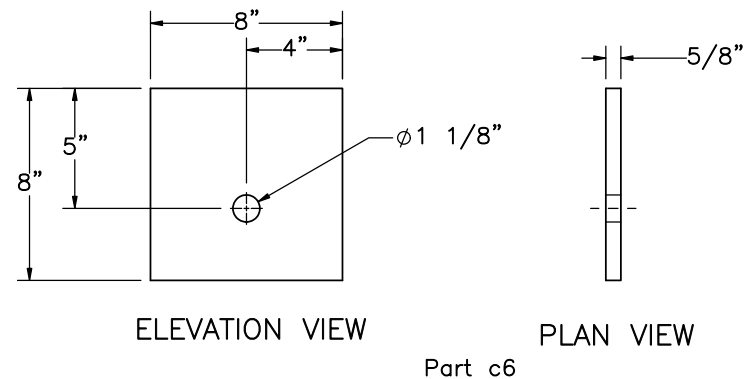
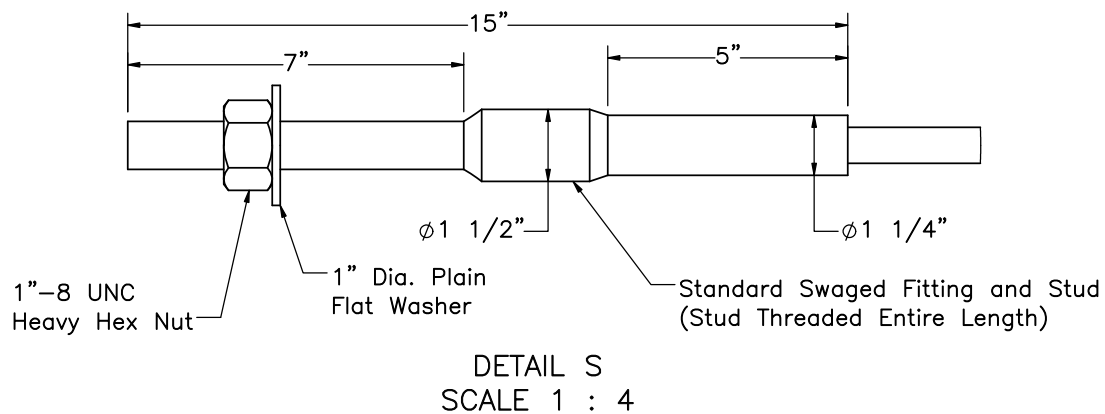
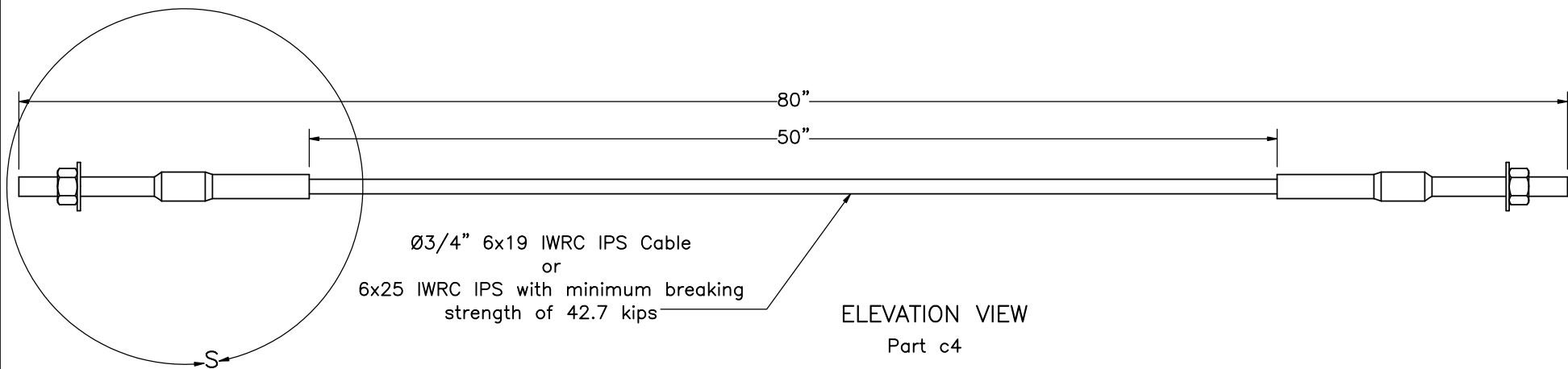
SCALE: 1:16
UNITS: in.

SHEET:
25 of 35

DATE:
05/15/2025

DRAWN BY:
JJO

REV. BY:
KAL



Midwest Roadside
Safety Facility

Hawaii Buried in Backslope
Test No. HBIB-7

BCT Anchor Cable

DWG. NAME.
HBIB-7_R2

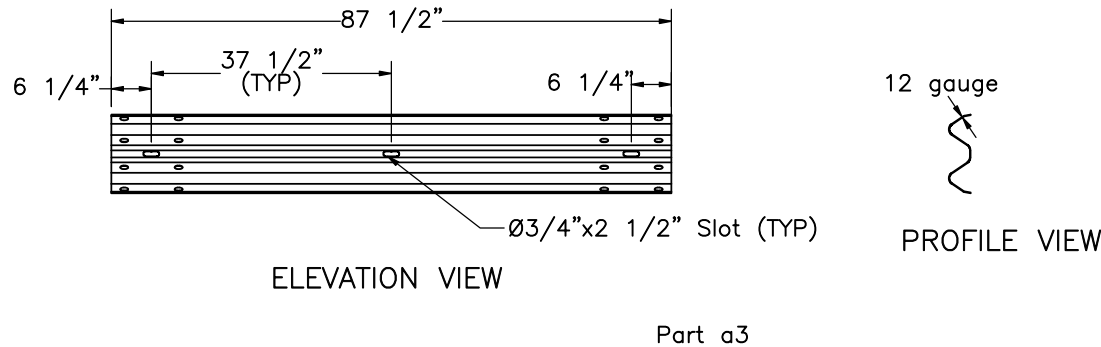
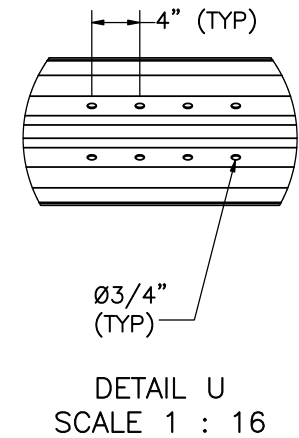
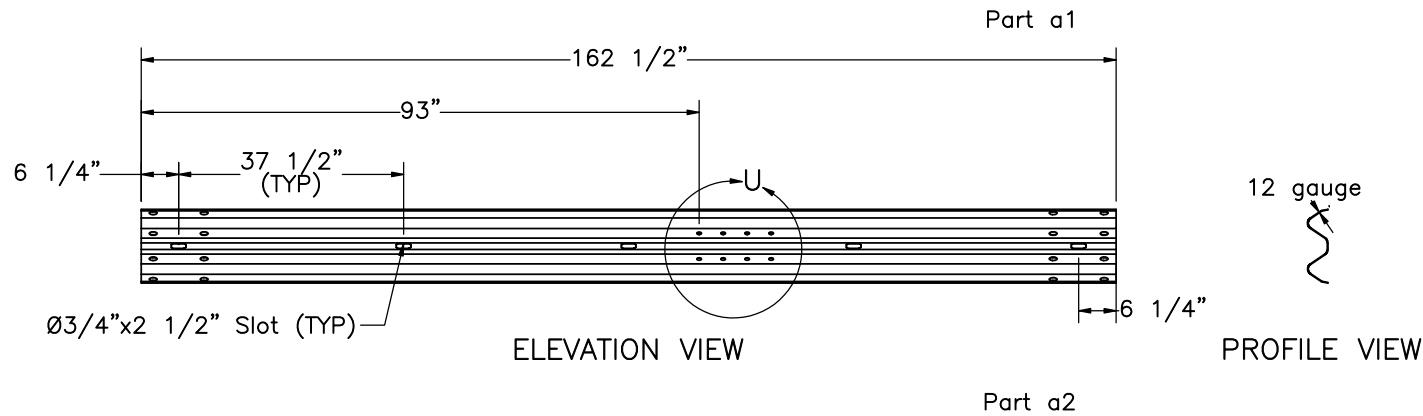
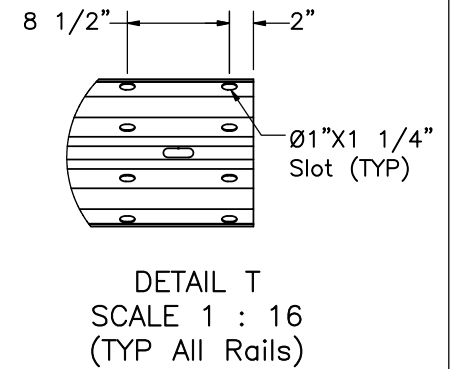
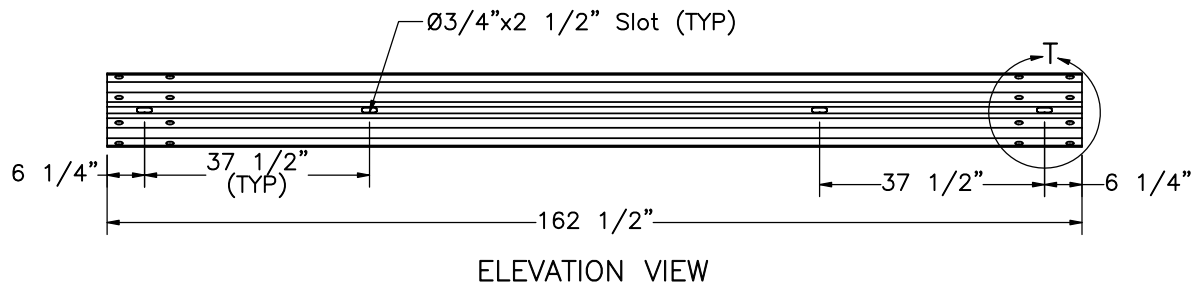
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SHEET:
26 of 35

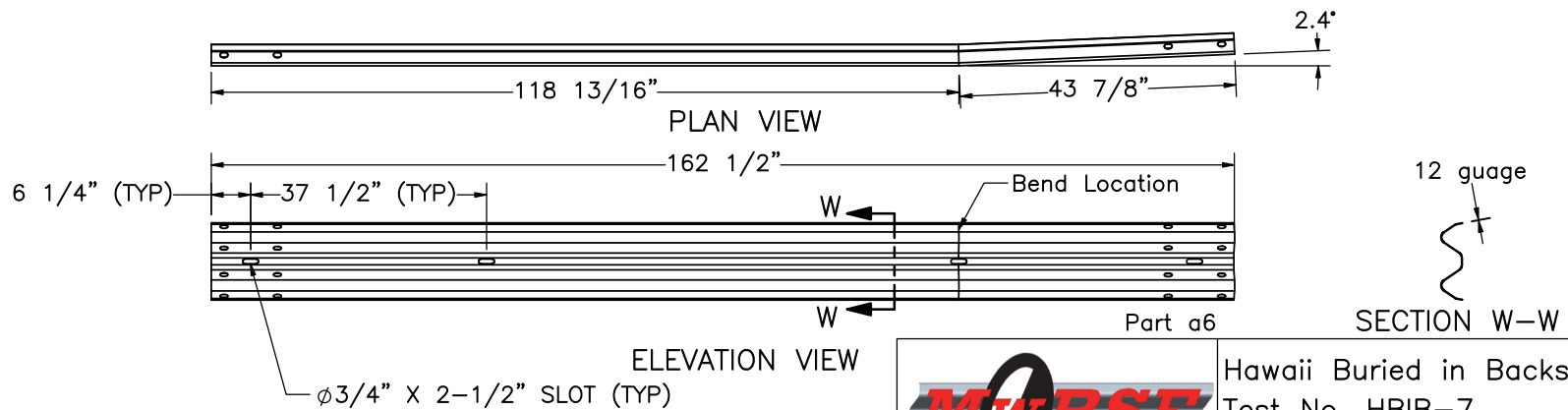
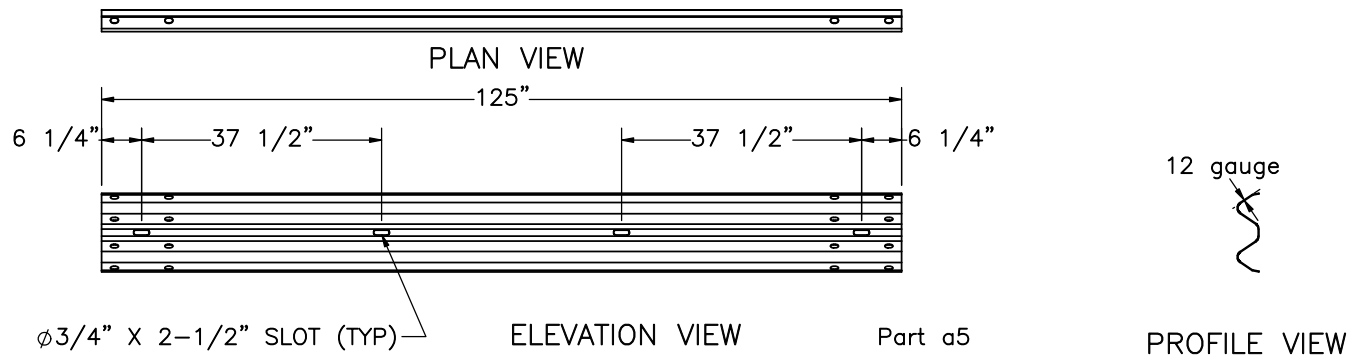
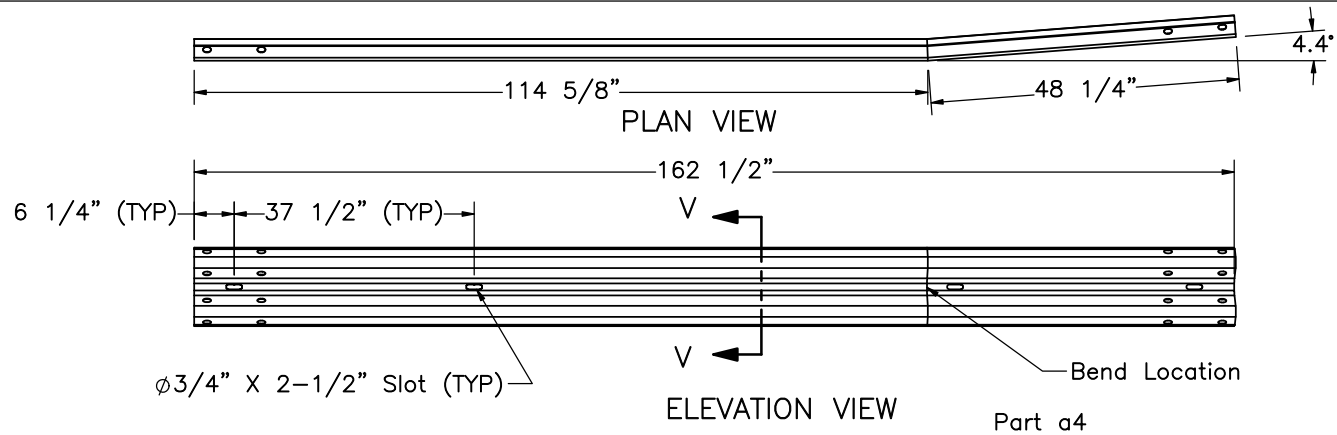
DATE:
05/15/2025

DRAWN BY:
JJO

REV. BY:
KAL



	Hawaii Buried in Backslope		SHEET:
	Test No. HBIB-7		27 of 35
Midwest Roadside Safety Facility	Guardrail Section Details		DATE:
	DWG. NAME: HBIB-7_R2		05/15/2025
SCALE: 1:30 UNITS: in.		REV. BY:	
		JJO	
		KAL	



Midwest Roadside
Safety Facility

Hawaii Buried in Backslope
Test No. HBIB-7

Guardrail Section Details

DWG. NAME.
HBIB-7_R2

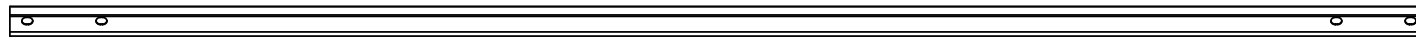
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SHEET:
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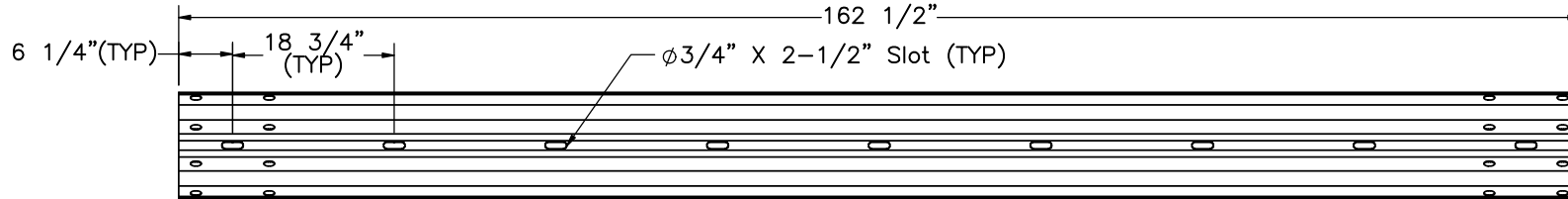
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05/15/2025

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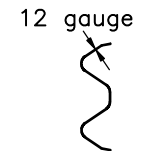


PLAN VIEW

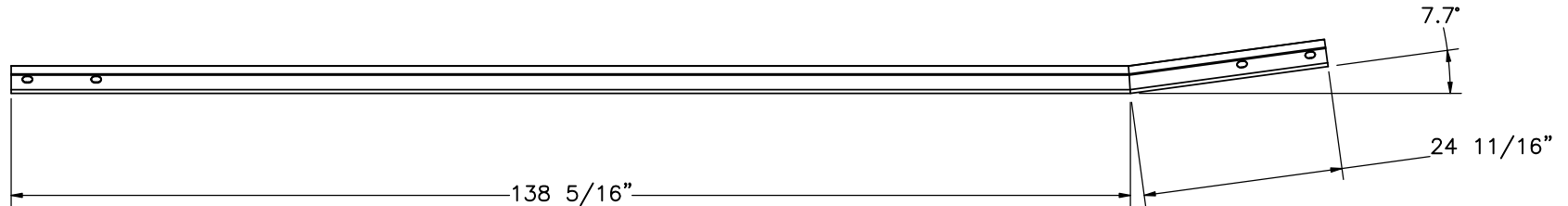


ELEVATION VIEW

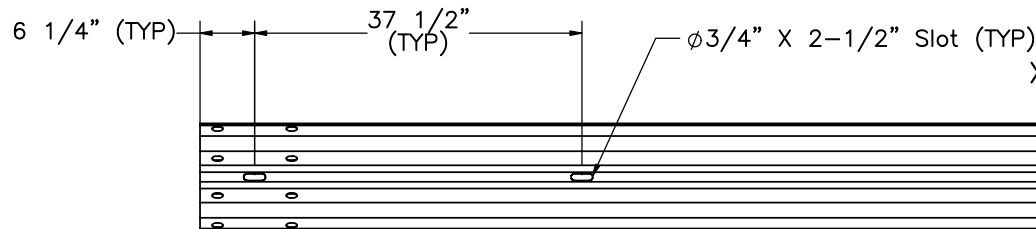
Part a7



PROFILE VIEW



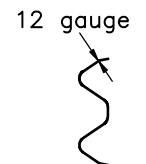
PLAN VIEW



ELEVATION VIEW

Part a9

Bend Location



SECTION X-X



Midwest Roadside
Safety Facility

Hawaii Buried in Backslope
Test No. HBIB-7

Guardrail Section Details

DWG. NAME.
HBIB-7_R2

SCALE: 1:22
UNITS: in.

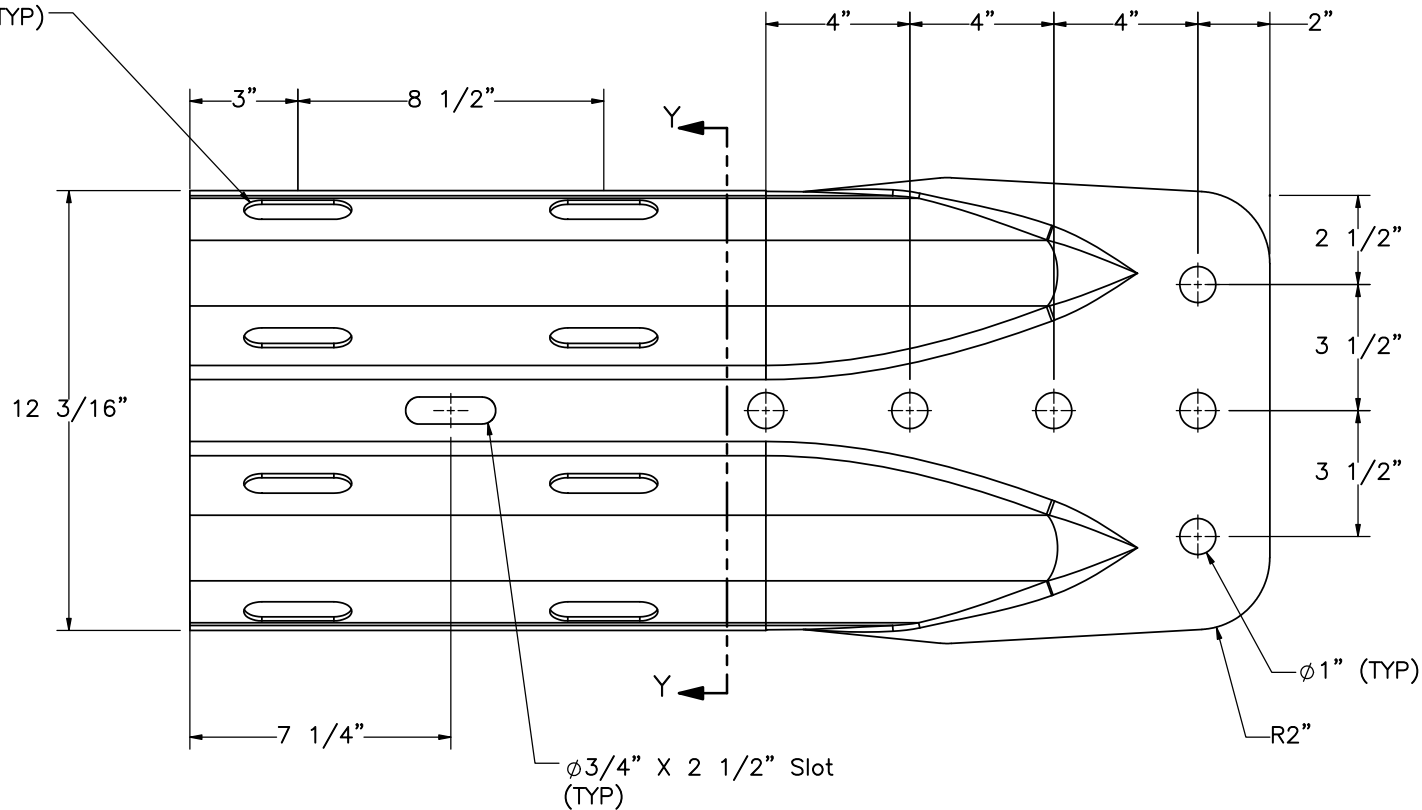
SHEET:
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DATE:
05/15/2025

DRAWN BY:
JJO

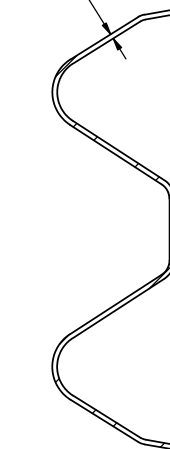
REV. BY:
KAL

ø1" X 3" Slot
(TYP)



ELEVATION VIEW

10 gauge



SECTION Y-Y

Part a8



Midwest Roadside
Safety Facility

Hawaii Buried in Backslope
Test No. HBIB-7

Terminal Connector Details

DWG. NAME.
HBIB-7_R2

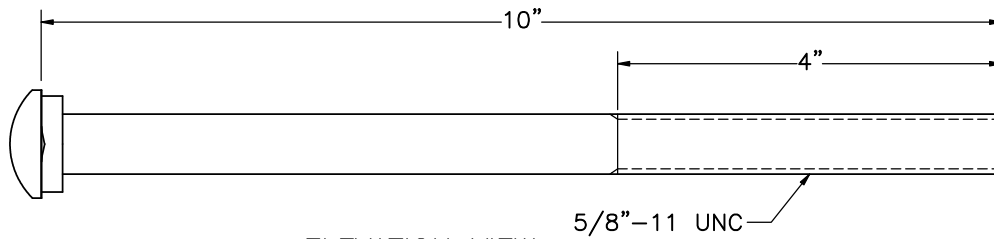
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UNITS: in.

SHEET:
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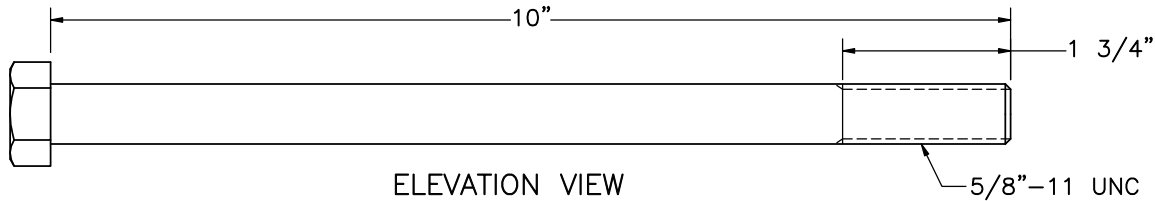
DATE:
05/15/2025

DRAWN BY:
JJO

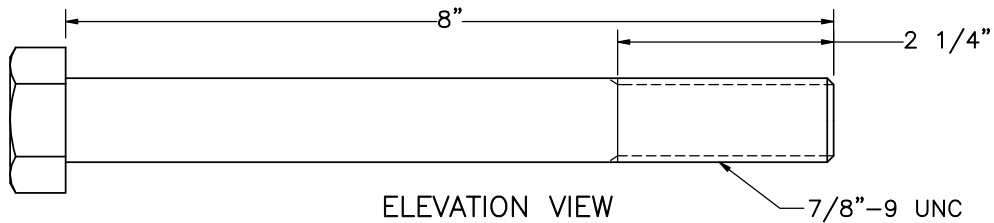
REV. BY:
KAL



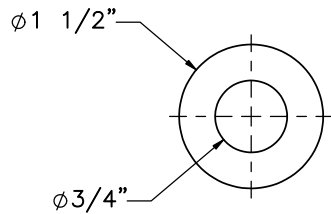
ELEVATION VIEW
Part f1



ELEVATION VIEW
Part f7

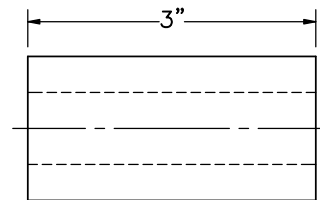


ELEVATION VIEW
Part f5

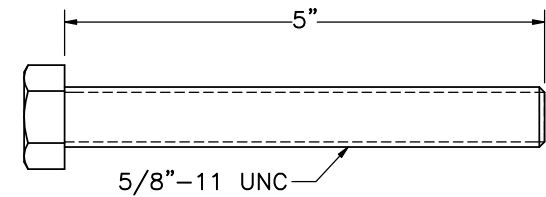


ELEVATION VIEW

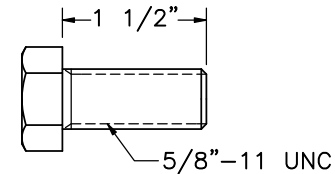
Part f9



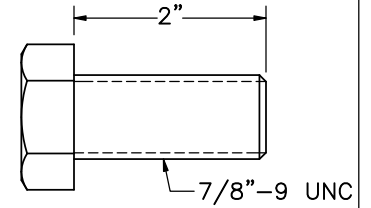
PROFILE VIEW



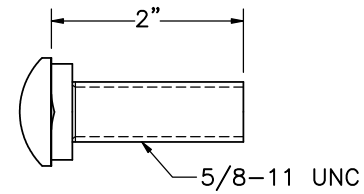
ELEVATION VIEW
Part f2



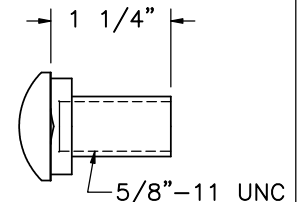
ELEVATION VIEW
Part f8



ELEVATION VIEW
Part f6



ELEVATION VIEW
Part f3



ELEVATION VIEW
Part f4



Midwest Roadside
Safety Facility

Hawaii Buried in Backslope
Test No. HBIB-7

Hardware

DWG. NAME.
HBIB-7_R2

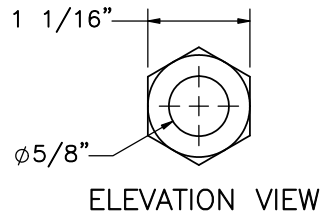
SCALE: 1:2
UNITS: in.

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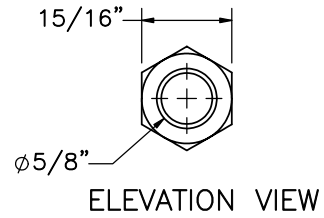
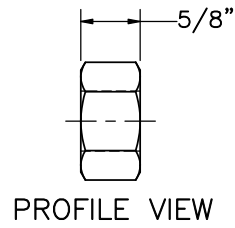
DATE:
05/15/2025

DRAWN BY:
JJO

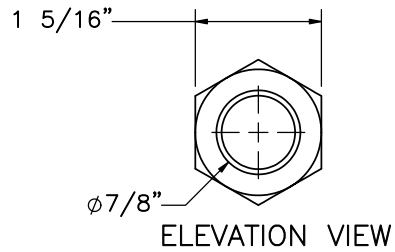
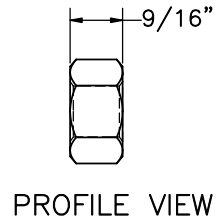
REV. BY:
KAL



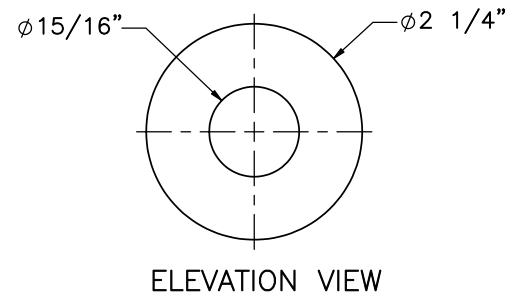
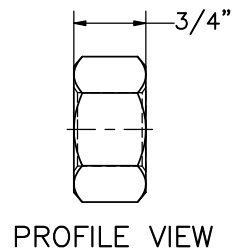
Part h1



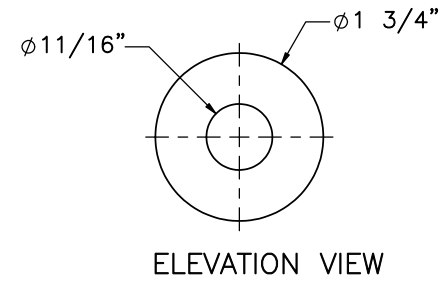
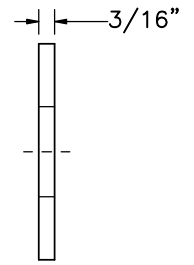
Part h2



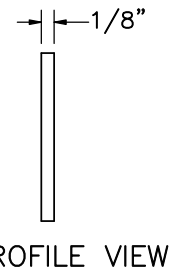
Part h4



Part g1



Part g2



Midwest Roadside
Safety Facility

Hawaii Buried in Backslope
Test No. HBIB-7

Hardware

DWG. NAME.
HBIB-7_R2

SCALE: 1:2
UNITS: in.

SHEET:
32 of 35

DATE:
05/15/2025

DRAWN BY:
JJU

REV. BY:
KAL

Item No.	QTY.	Description	Material Specification	Treatment Specification	Hardware Guide
a1	20	12'-6" 12-gauge W-Beam MGS Section	AASHTO M180	ASTM A123 or A653	RWM04a
a2	1	12'-6" 12-gauge W-Beam MGS End Section	AASHTO M180	ASTM A123 or A653	RWM14a
a3	1	6'-3" 12-gauge W-Beam Section	AASHTO M180	ASTM A123 or A653	RWM01b
a4	1	12'-6" 12-gauge Bent W-Beam [4.4 deg]	AASHTO M180	ASTM A123 or A653	—
a5	2	9'-4 1/2" 12-gauge W-Beam	AASHTO M180	ASTM A123 or A653	—
a6	2	12'-6" 12-gauge Bent W-Beam [2.4 deg]	AASHTO M180	ASTM A123 or A653	—
a7	4	12'-6" 12-gauge W-Beam Section — 1/4 Post Spacing	AASHTO M180	ASTM A123 or A653	RWM04a
a8	2	W-Beam Terminal Connector	AASHTO M180	ASTM A123 or A653	RWE02b
a9	1	12'-6" 12-gauge Bent W-Beam [7.7 deg]	AASHTO M180	ASTM A123 or A653	—
b1	1	3'x3' Concrete Anchor Block	Min. f'c = 4,000 psi	—	—
c1	2	BCT Timber Post — MGS Height	SYP Grd No. 1 or better (No knots +/- 18" from ground on tension face)	—	PDF01
c2	2	72" Long Foundation Tube	ASTM A500 Gr. B	ASTM A123	PTE06
c3	1	Ground Strut Assembly	ASTM A36	ASTM A123	PFP02
c4	2	BCT Anchor Cable Assembly with Heavy Hex Nuts and Washers	Fitting—ASTM A576 Gr. 1035 Stud—ASTM F568 Class C	Fitting—ASTM A153 Cable, Nut, Washer & Stud—ASTM A153 or B695	FCA01
c5	1	Ground Anchor Bracket Assembly	ASTM A36	ASTM A123	FPA01
c6	1	8"x8"x5/8" Anchor Bearing Plate	ASTM A36	ASTM A123	FPB01
c7	1	2 3/8" O.D. 6" Long BCT Post Sleeve	ASTM A53 Gr. B Schedule 40	ASTM A123	FMM02
d1	27	W6x8.5 or W6x9, 84" Long Steel Post	ASTM A992 Gr. 50	ASTM A123	PWE06
d2	11	W6x8.5 or W6x9, 72" Long Steel Post	ASTM A992 Gr. 50	ASTM A123	PWE06
d4	38	14 3/16"x8"x5 1/8" Composite Recycled Blockout	Mondo Polymer GB14SH2 or Equivalent	—	—
d5	27	13 5/8" Long, 8"x6"x1/4" Steel Blockout	ASTM A500 Gr. B	*ASTM A123	—
d6	2	16D Double Head Nail	—	—	—



Midwest Roadside
Safety Facility

Hawaii Buried in Backslope
Test No. HBIB-7

Bill of Materials

DWG. NAME.
HBIB-7_R2

SCALE: None
UNITS: in.

SHEET:
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DATE:
05/15/2025

DRAWN BY:
JJO

REV. BY:
KAL

Item No.	QTY.	Description	Material Specification	Treatment Specification	Hardware Guide	
e1	14	61” Unbent Length #4 Rebar	ASTM A615 Gr. 60	Epoxy Coated (ASTM A775 or A934)	—	
e2	12	51” Unbent Length #4 Rebar	ASTM A615 Gr. 60	Epoxy Coated (ASTM A775 or A934)	—	
e3	27	32” Long #4 Rebar	ASTM A615 Gr. 60	Epoxy Coated (ASTM A775 or A934)	—	
e4	12	138 1/2” Long #8 Rebar	ASTM A615 Gr. 60	Epoxy Coated (ASTM A775 or A934)	—	
e5	23	103” Unbent Length #4 Rebar	ASTM A615 Gr. 60	Epoxy Coated (ASTM A775 or A934)	—	
e6	8	12” Long Unbent #4 Rebar	ASTM A615 Gr. 60	Epoxy Coated (ASTM A775 or A934)	—	
e7	1	48” Long #4 Rebar	ASTM A615 Gr. 60	Epoxy Coated (ASTM A775 or A934)	—	
e8	2	67” Unbent Length #4 Rebar	ASTM A615 Gr. 60	Epoxy Coated (ASTM A775 or A934)	—	
f1	67	5/8” Dia. UNC, 10” Long Guardrail Bolt	ASTM A307 Gr. A	ASTM A153 or B695 Class 55 or F2329	FBB03	
f2	1	5/8 Dia, UNC, 5” Long Hex Head Bolt	ASTM A459 Gr. 5 or equivalent	ASTM A153 or B695 Class 55 or F2329	FBX16a	
f3	1	5/8” Dia. UNC, 2” Long Guardrail Bolt	ASTM A307 Gr. A	ASTM A153 or B695 Class 55 or F2329	FBB01	
f4	240	5/8” Dia. UNC, 1 1/4” Long Guardrail Bolt	ASTM A307 Gr. A	ASTM A153 or B695 Class 55 or F2329	FBB01	
f5	2	7/8” Dia. UNC, 8” Long Hex Head Bolt	ASTM A307 Gr. A or equivalent	ASTM A153 or B695 Class 55 or F2329	FBX22a	
f6	8	7/8” Dia. UNC, 2” Long Hex Head Bolt	ASTM A307 Gr. A or equivalent	ASTM A153 or B695 Class 55 or F2329	FBX22a	
f7	2	5/8” Dia. UNC, 10” Long Hex Head Bolt	ASTM A307 Gr. A or equivalent	ASTM A153 or B695 Class 55 or F2329	FBX16a	
f8	8	5/8” Dia. UNC, 1 1/2” Long Hex Head Bolt	ASTM A307 Gr. A or equivalent	ASTM A153 or B695 Class 55 or F2329	FBX16a	
f9	1	3/4 Dia, Unthreaded Spacer Sleeve	ASTM A53 Gr. B	ASTM A123	FMM03—04	
				Hawaii Buried in Backslope		SHEET: 34 of 35
				Test No. HBIB—7		DATE: 05/15/2025
			Midwest Roadside Safety Facility		Bill of Materials	
		DWG. NAME: HBIB—7_R2	SCALE: None UNITS: in.	REV. BY: KAL		

Item No.	QTY.	Description	Material Specification	Treatment Specification	Hardware Guide
g1	12	7/8" Dia. Plain Round Washer	ASTM F844	ASTM A123 or A153 or F2329	FWC20a
g2	22	5/8" Dia. Plain Round Washer	ASTM F844	ASTM A123 or A153 or F2329	FWC16a
g3	2	1" Dia. Plain Round Washer	ASTM F844	ASTM A153 (AASHTO M232) for Class D or ASTM B695 (AASHTO M298) for Class 50	FWC24a
h1	308	5/8" Dia. UNC Heavy Hex Nut	ASTM A563A or equivalent	ASTM A153 (AASHTO M232) for Class C or ASTM B695 (AASHTO M298) for Class 50	FNX16b
h2	11	5/8" Dia. Hex Nut	ASTM A563A	ASTM A153 (AASHTO M232) for Class C or ASTM B695 (AASHTO M298) for Class 50	FNX16a
h4	2	7/8" Dia. UNC Hex Nut	ASTM A307A or equivalent	ASTM A153 (AASHTO M232) for Class C or ASTM B695 (AASHTO M298) for Class 50	—
* i1	4	3/8" Dia. Wire Strut, 13 3/8" Long Unbent	Min. Tensile Strength = 100,000 psi	AASHTO M111	
* i2	4	3/8" Dia. Wire Strut, 16 3/8" Long Unbent	Min. Tensile Strength = 100,000 psi	AASHTO M111	—
* i3	2	3/8" Dia. Wire Strut, 18" Long Unbent	Min. Tensile Strength = 100,000 psi	AASHTO M111	—
* i4	8	7/8 Dia. Threaded Ferrule	—	—	—
k1	—	Soil	—	—	—
k2	1	Fascia	Min. f'c = 4,000 psi	—	—

* Components not required if optional anchor is used.



Midwest Roadside
Safety Facility

Hawaii Buried in Backslope
Test No. HBIB-7

Bill of Material

DWG. NAME.
HBIB-7_R2

SCALE: 1:768
UNITS: in.

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05/15/2025

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JJO

REV. BY:
KAL

REV.	DATE OF ISSUE	Page	NATURE OF CHANGES	REVIEWER	REVISED BY
0	9/19/2024	–	Drawing set created based off of HBIB-6	KAL	JJO
1	2/5/2025	1	Added flare to system drawing to match what was actually built. Added rail Part a6.	KAL	JJO
		5	Updated post locations with second flare.		
		6	Updated views showing two flares. Added callout for rail a6.		
		28	Added detail view for part a6		
		BOM	Added part a6		
2	5/15/2025	30	10 gauge was 12 gauge	KAL	JJO
		33	W-Beam Terminal Connector hardware guide RWE02b was RWE02a		

System: Hawaii Buried in Backslope
Drawing: HBIB-7

Revision History