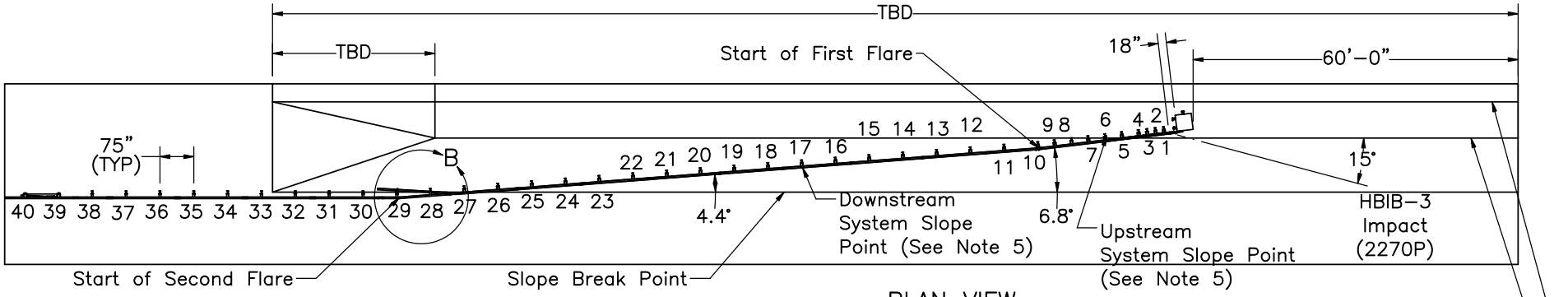
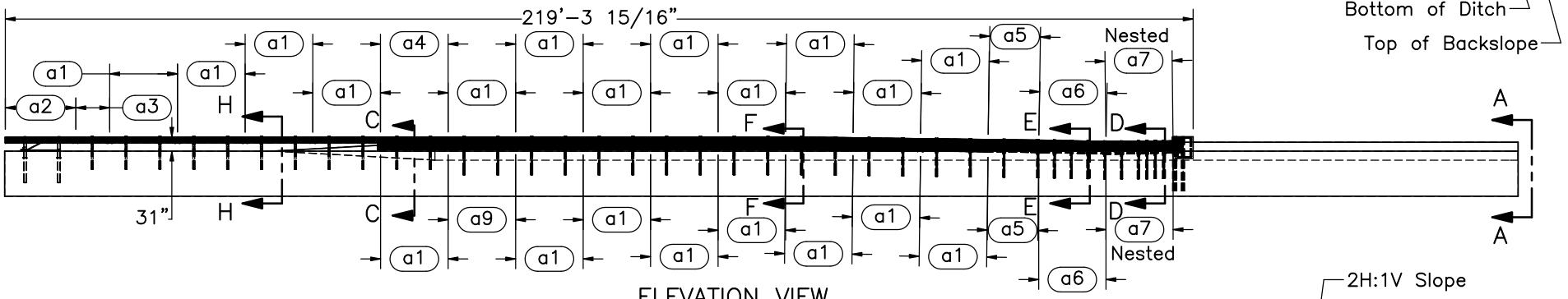
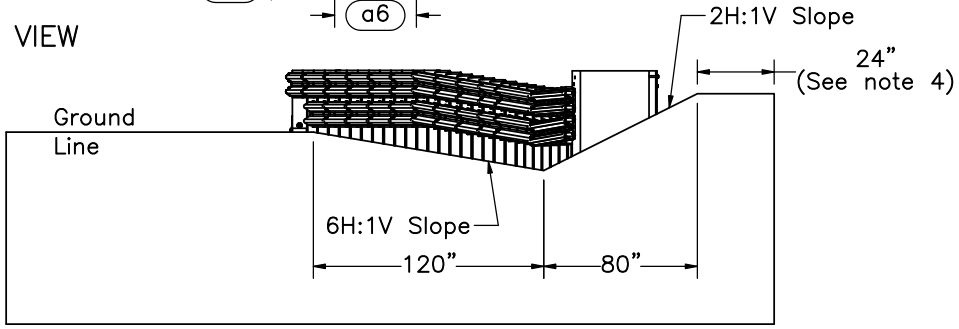



PLAN VIEW



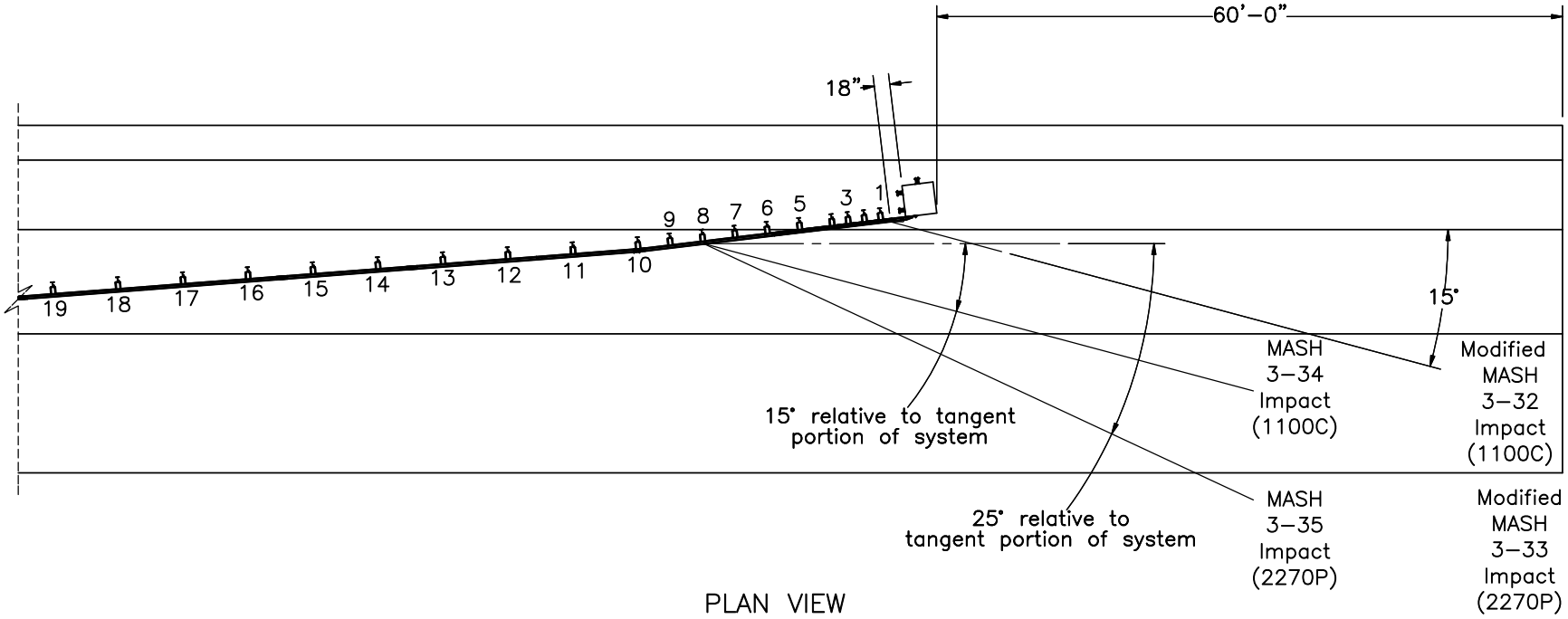

ELEVATION VIEW




SECTION A–A
SCALE 1 : 100

Note:
(1) Test no. HBIB–3 shall be performed according to modified test designation no. 3–32 using MASH 2016 criteria.
(2) Impact location for test no. HBIB–3 is 18" downstream from the downstream edge of the anchor block along the rail.
(3) Impact angle is respect to tangent portion of system between post nos. 30 and 40.
(4) Width of backstop plateau extends for 2' behind system before transitioning back to the nominal ground line.
(5) System has linear slope up out of ditch between post nos. 6–17.
(6) Nested W–beam section (part a5) at anchor block placed beneath W–beam terminal connector (part a8) at splice locations in accordance with traffic flow.
(7) Downstream end of nested W–beam sections (part a5) sandwich upstream end of adjacent W–beam section (part a6) at splice location in accordance with traffic flow.

| | | |
|---|---|---|
| MwRSF<br>Midwest Roadside Safety Facility | Hawaii Buried in Backslope<br>Test No. HBIB–3<br>System Layout | SHEET: 1 of 32<br>DATE: 5/15/2025<br>DRAWN BY: JJO/TJC |
| | DWG. NAME. HBIB–3_R6<br>SCALE: 1:350<br>UNITS: in. | REV. BY: KAL/AML |




PLAN VIEW

| MASH Test No. | Test Vehicle | Impact Condition | |
|---|---|---|---|
| | | Speed (mph) | Angle |
| Modified 3–32 | 1100C | 62 | 15° |
| Modified 3–33 | 2270P | 62 | 15° |
| 3–34 | 1100C | 62 | 15° |
| 3–35 | 2270P | 62 | 25° |

Notes:
(1) Location of test 3–35 are approximate and subject to change.
(2) Impact angle is with respect to tangent portion of system between post nos. 30 and 40.

MwRSF

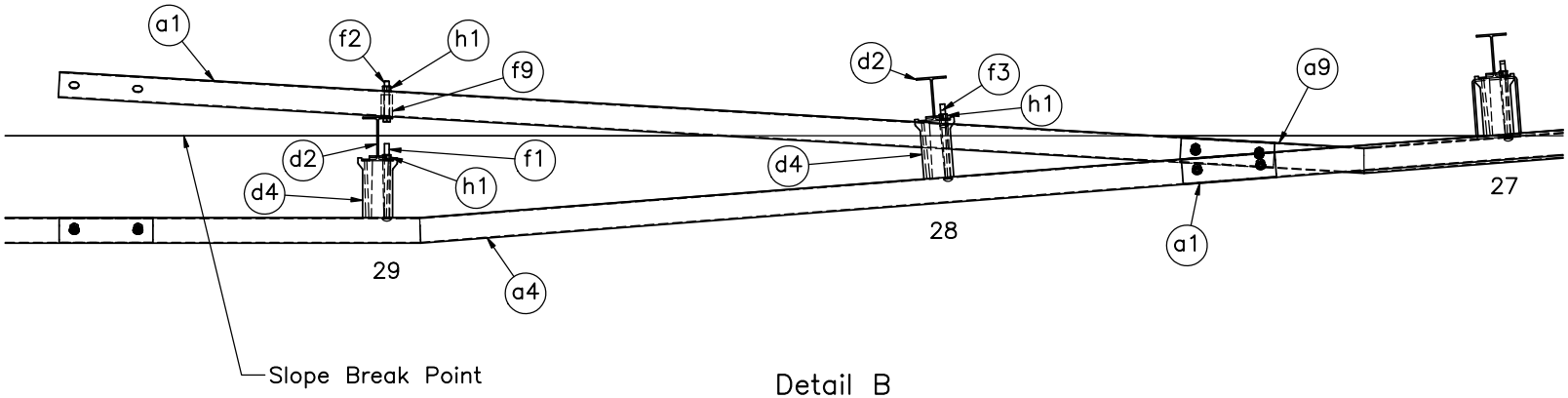
Midwest Roadside Safety Facility

Hawaii Buried in Backslope
Test No. HBIB–3

Tentative Impact Locations

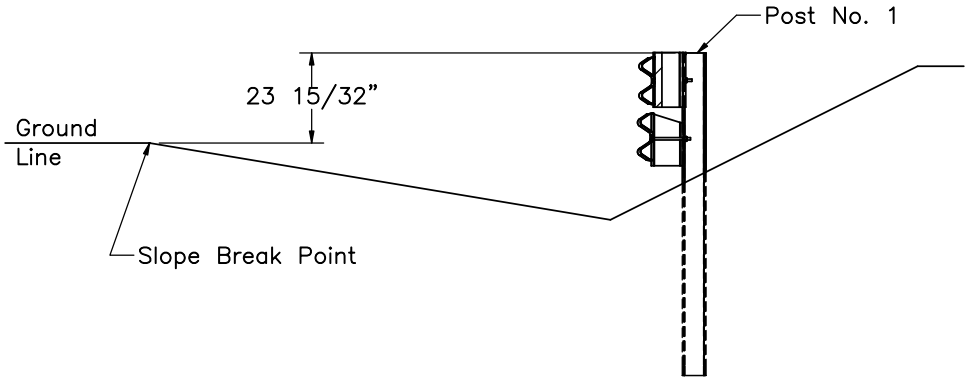
| | | |
|---|---|---|
| DWG. NAME. HBIB–3_R6 | SCALE: 1:200 UNITS: in. | REV. BY: KAL/AML |

SHEET: 2 of 32
DATE: 5/15/2025
DRAWN BY: JJO/TJC

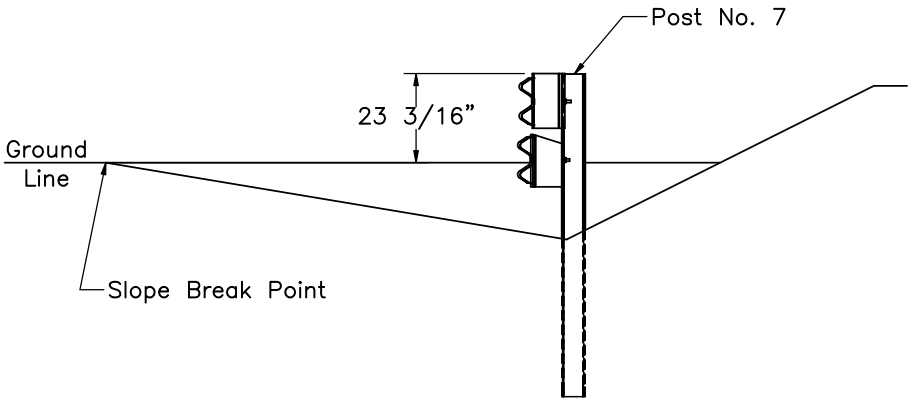



Detail B

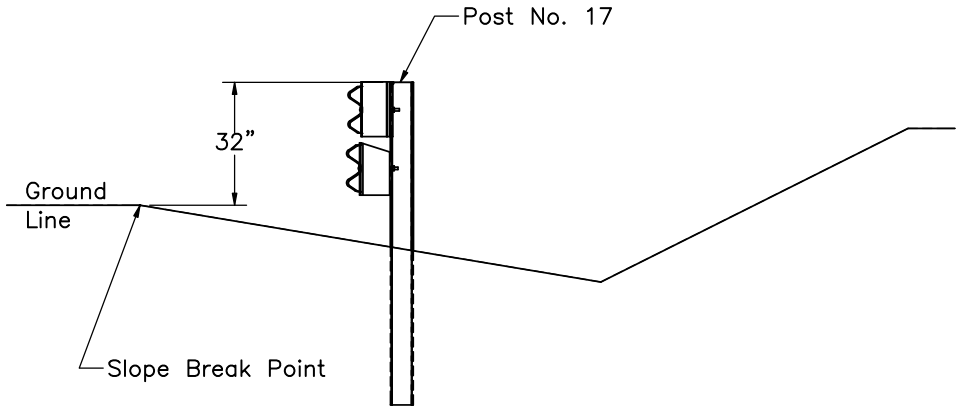
| | | |
|---|---|---|
| Midwest Roadside Safety Facility | Hawaii Buried in Backslope<br>Test No. HBIB–3<br>Detail B View | SHEET: 3 of 32<br>DATE: 5/15/2025<br>DRAWN BY: JJO/TJC |
| | DWG. NAME. HBIB–3_R6<br>SCALE: 1:25<br>UNITS: in. | REV. BY: KAL/AML |



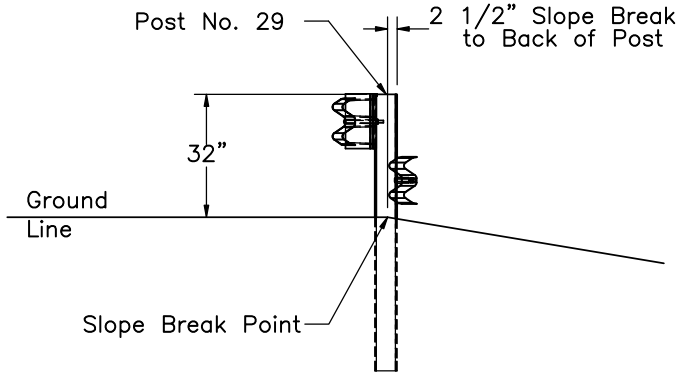

SECTION D–D




SECTION E–E



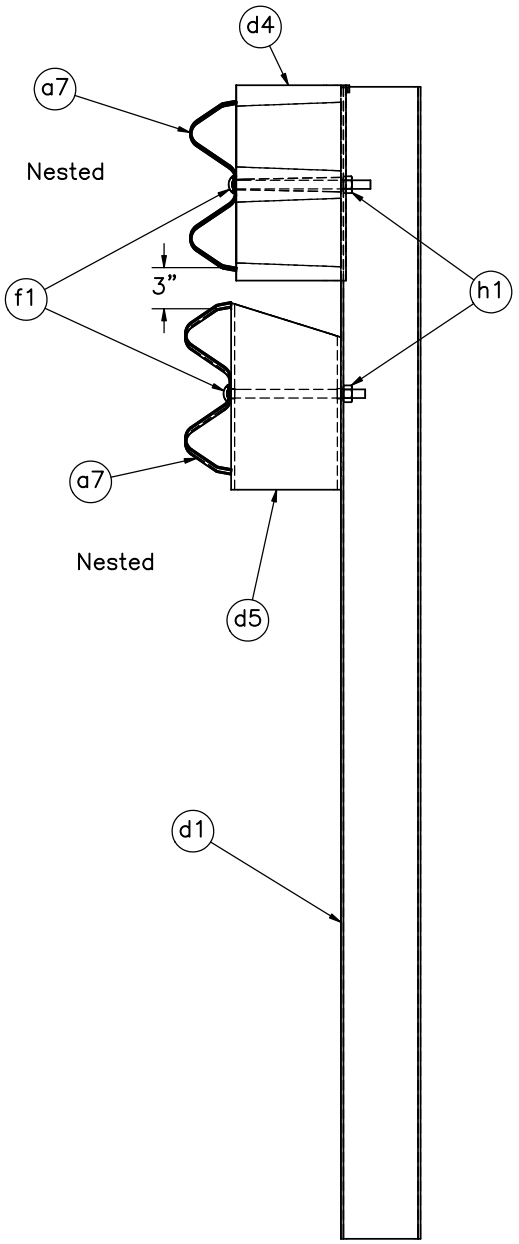

SECTION F–F



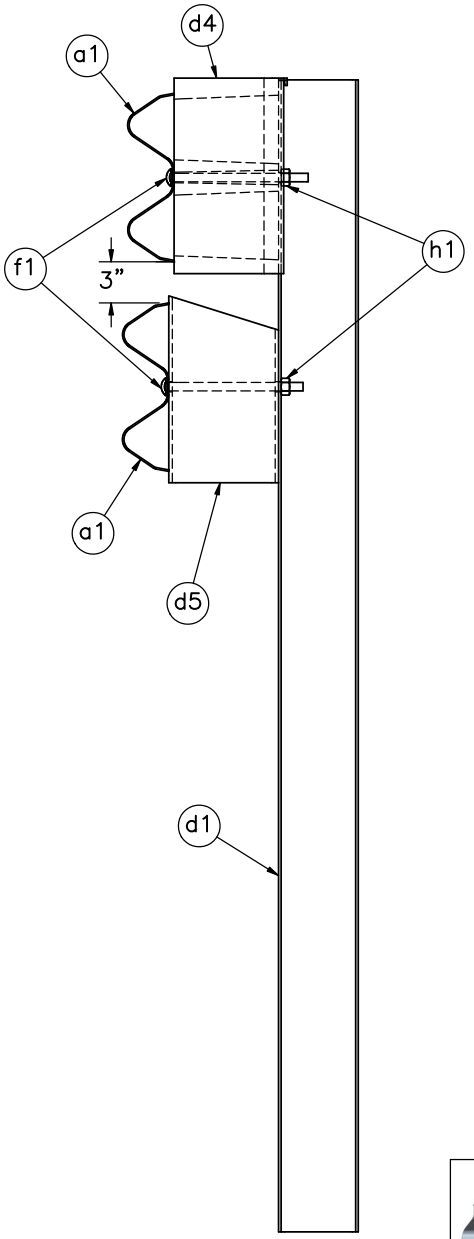

SECTION C–C

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 lodated 3" below the bottom of the upper W–beam.

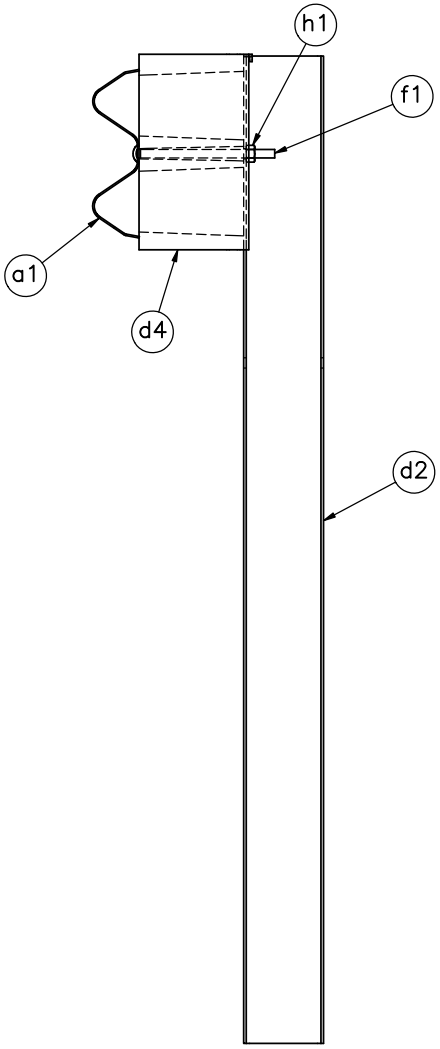
| | | |
|---|---|---|
| MwRSF Midwest Roadside Safety Facility | Hawaii Buried in Backslope Test No. HBIB–3<br>Ground Cross Sections | SHEET: 4 of 32<br>DATE: 5/15/2025<br>DRAWN BY: JJO/TJC |
| | DWG. NAME. HBIB–3_R6<br>SCALE: 1:50<br>UNITS: in. | REV. BY: KAL/AML |




SECTION M–M
Post No. 1–6




Post No. 7–27

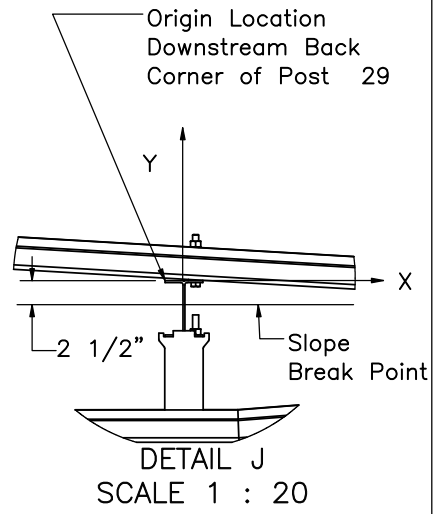



SECTION H–H
Post No. 28–38

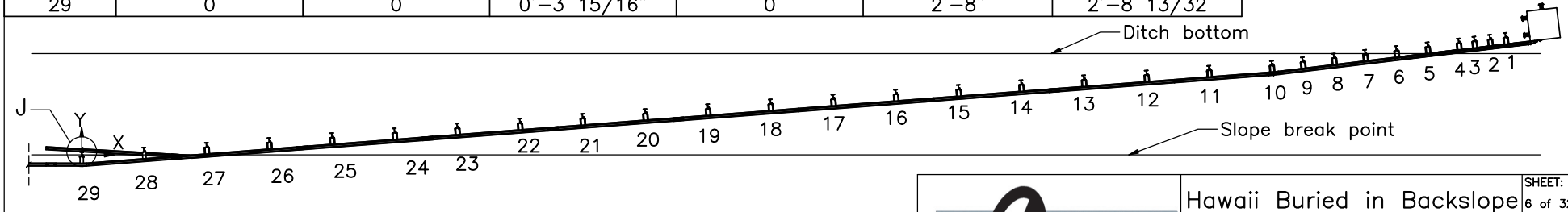
Note: (1) 3" Gap between bottom of top rail and top of Rub rail, Posts 1–27

| | | |
|---|---|---|
| MwRSF | Hawaii Buried in Backslope Test No. HBIB–3 | SHEET: 5 of 32 |
| | | DATE: 5/15/2025 |
| Midwest Roadside Safety Facility | Post Nos. 1–38 Details | DRAWN BY: JJO/TJC |
| DWG. NAME. HBIB–3_R6 | SCALE: 1:14 UNITS: in. | REV. BY: KAL/AML |

| 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 5/8' | 11'–9 63/64" | 141'–10 35/64" | 11'–10 29/64" | 1'–11 15/32" | 2'–7 1/8" |
| 2 | 140'–0 1/64 | 11'–7 49/64" | 140'–3 59/64" | 11'–8 15/64" | 1'–11 9/32" | 2'– 8 1/8" |
| 3 | 138'–5 25/64" | 11'–5 33/64" | 138'–9 19/64" | 11'–5 63/64 | 1'–10 29/32" | 2'–8 3/4" |
| 4 | 136'–10 25/32" | 11'–3 19/64" | 137'–2 11/16" | 11'–3 49/64" | 1'–10 51/64" | 2'–9 25/32" |
| 5 | 133'–9 35/64" | 10'–10 13/16" | 134'–1 29/64" | 10'–11 19/64" | 1'–10 27/64" | 2'–11 19/32" |
| 6 | 130'–8 5/16" | 10'–6 23/64" | 131'–0 7/32" | 10'–6 53/64 | 1'–10 5/16" | 3'–1 29/32" |
| 7 | 127'–7 5/64" | 10'–1 57/64" | 127'–10 63/64" | 10'–2 23/64" | 1'–11 1/16" | 3'–4 31/32" |
| 8 | 124'–5 27/32" | 9'–9 7/16" | 124'–9 3/4" | 9'–9 29/32" | 1'–11 13/16" | 3'–7 25/32" |
| 9 | 121'–4 39/64" | 9'–4 61/64" | 121'–8 33/64" | 9'–5 7/16" | 2'–0 35/64" | 3'–7 27/32" |
| 10 | 118'–3 29/32" | 9'–0 45/64" | 118'–7 53/64" | 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.

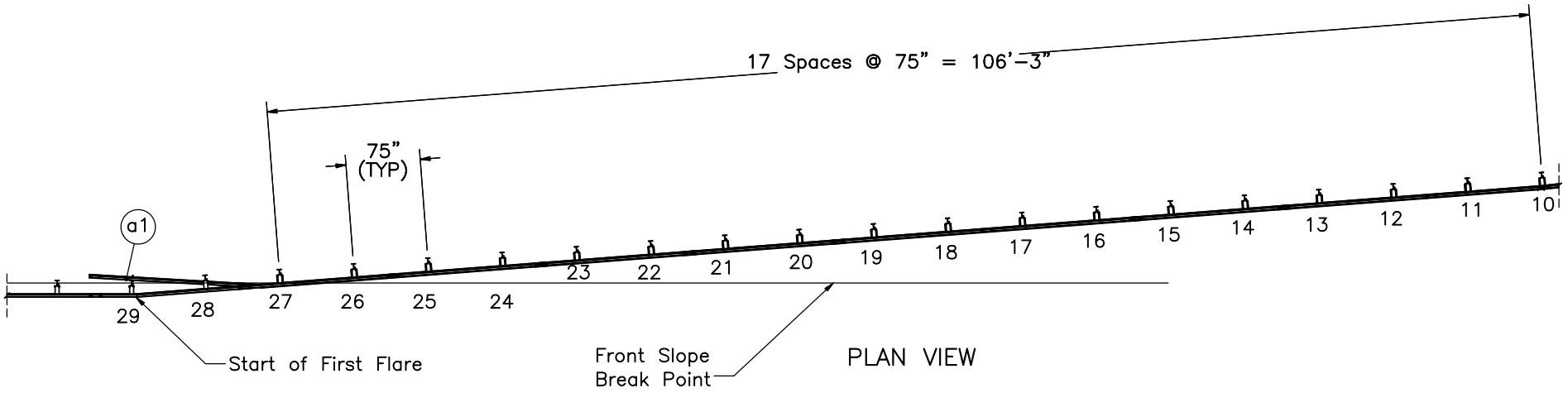
MwRSF
Midwest Roadside Safety Facility

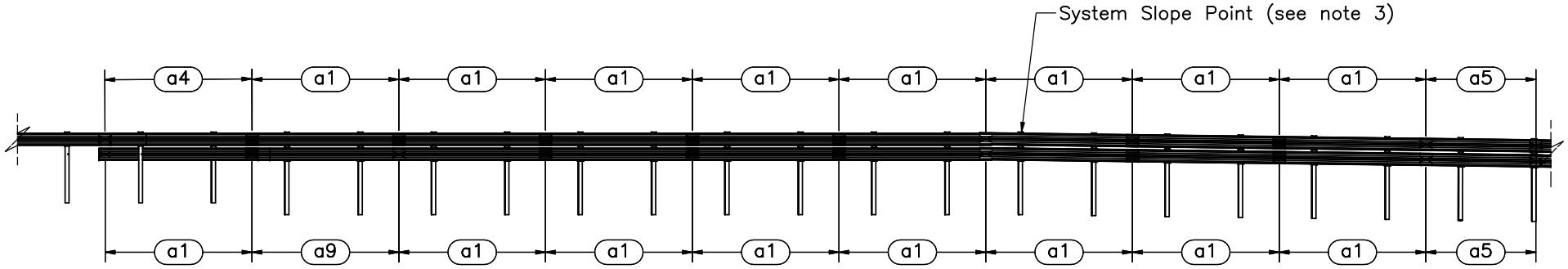
Hawaii Buried in Backslope Test No. HBIB–3

Post Location Layout

| | | |
|---|---|---|
| DWG. NAME. HBIB–3_R6 | SCALE: 1:185 UNITS: in. | REV. BY: KAL/AML |

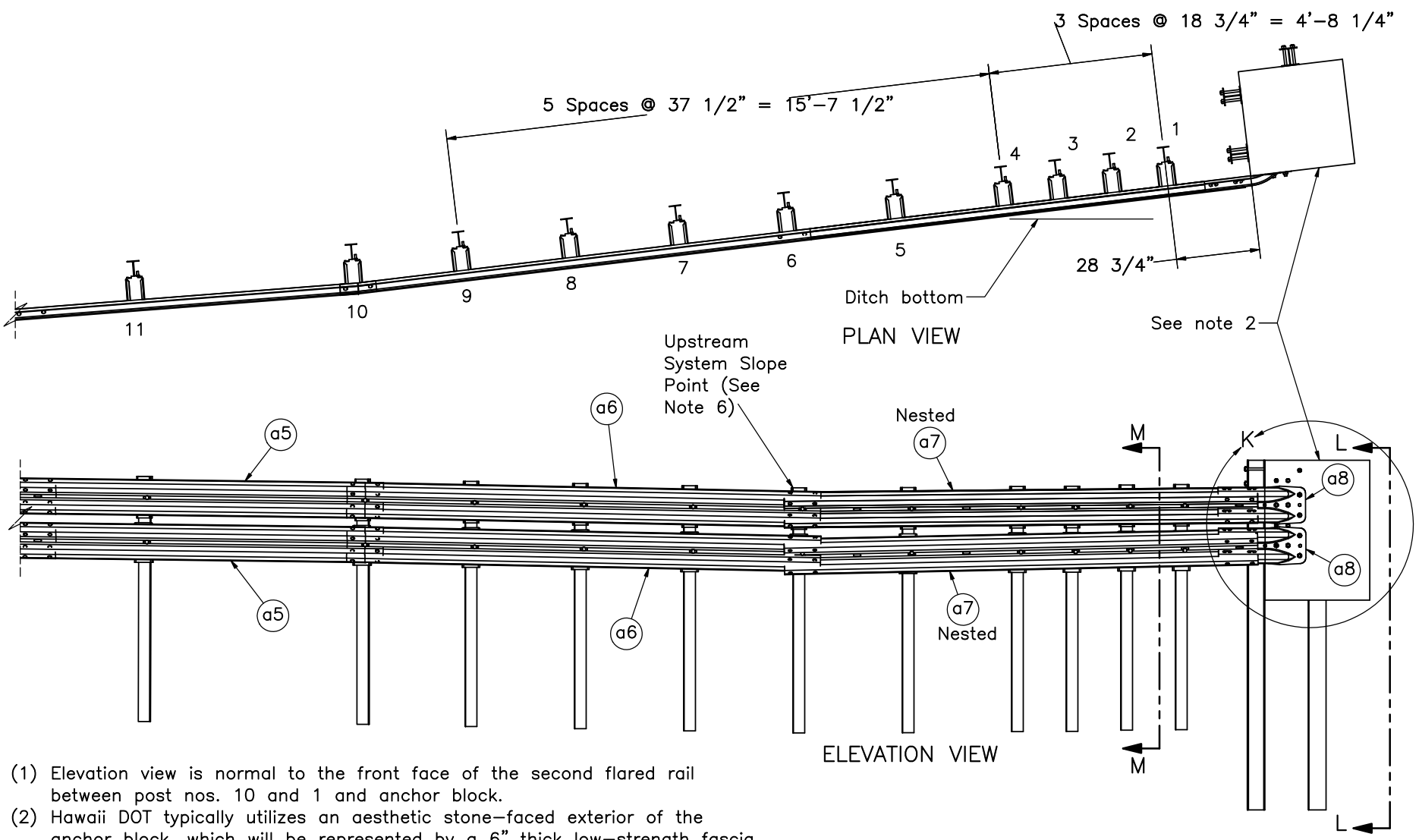
SHEET: 6 of 32
DATE: 5/15/2025
DRAWN BY: JJO/TJC



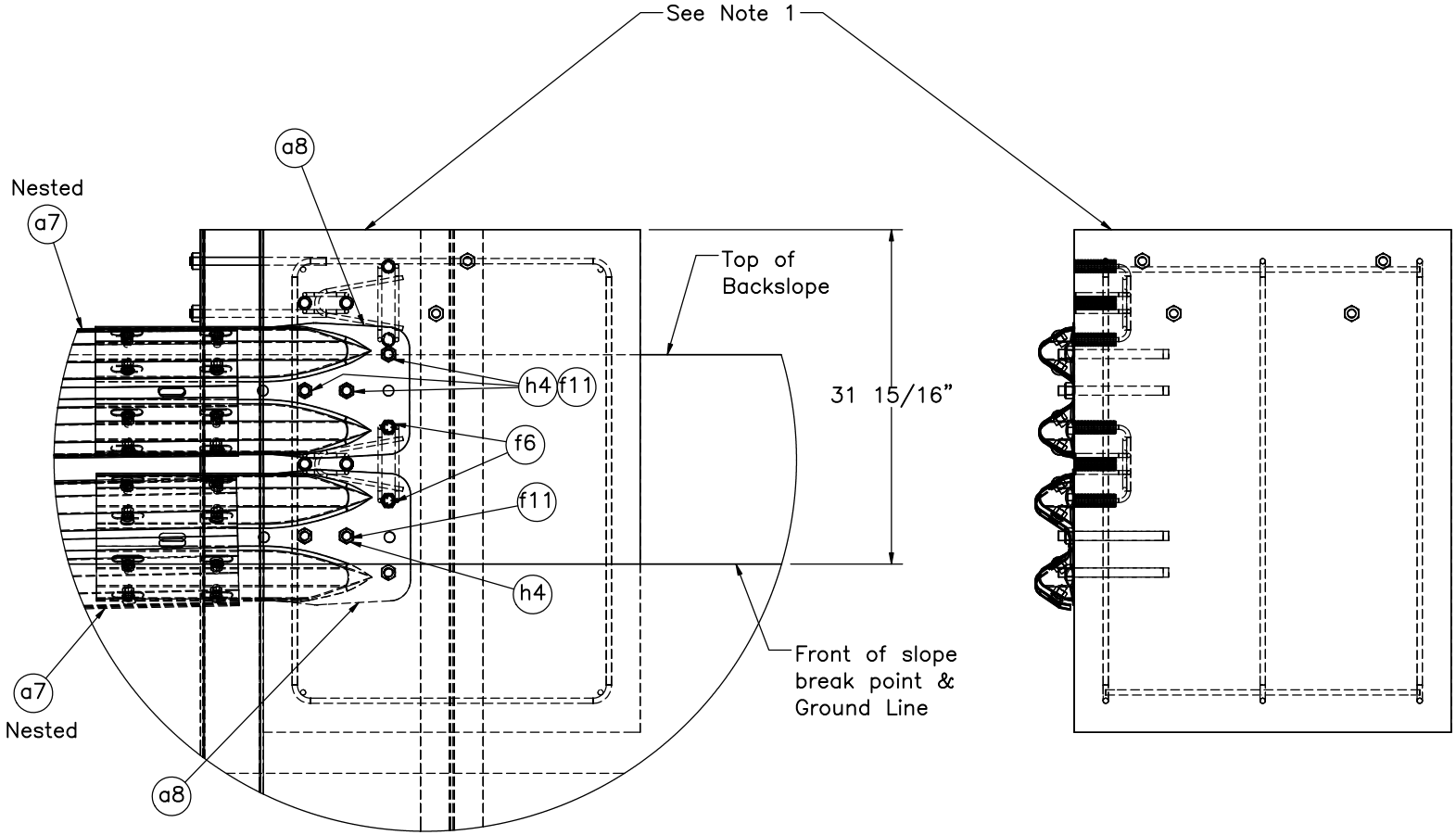

Notes:
(1) Elevation view is normal to the front face of the first flared rail.
(2) Downstream end of nested W–beam sections (part a5) sandwich upstream end of adjacent W–beam section (part a6) at splice location in accordance with traffic flow.
(3) System slopes with ditch between post nos. 6–17. Vertical slope will be accomplished by offsetting the vertical angles of the W–beam rails at splice locations.

| | | |
|---|---|---|
| MwRSF | Hawaii Buried in Backslope Test No. HBIB–3 | SHEET: 7 of 32 |
| | | DATE: 5/15/2025 |
| Midwest Roadside Safety Facility | First Flare Details | DRAWN BY: JJO/TJC |
| | DWG. NAME. HBIB–3_R6 / SCALE: 1:160 / UNITS: in. | REV. BY: KAL/AML |




Notes:
(1) Elevation view is normal to the front face of the second flared rail between post nos. 10 and 1 and anchor block.
(2) 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, top, and downstream surfaces of the concrete anchor block. The fascia can be low-strength concrete, low-aggregate sandy concrete, or grout mixture.
(3) To set anchor block follow process described in note 3 on sheet no. 10.
(4) Nested W-beam sections (part a5) at anchor block placed beneath W-beam terminal connector (part a8) at splice locations in accordance with traffic flow.
(5) Downstream end of nested W-beam sections (part a5) sandwich upstream end of adjacent W-beam section (part a6) at splice location in accordance with traffic flow.
(6) System slopes vertically 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.

| | | |
|---|---|---|
| MwRSF | Hawaii Buried in Backslope Test No. HBIB-3 | SHEET: 8 of 32 |
| | | DATE: 5/15/2025 |
| | Second Flare Details | DRAWN BY: JJO/TJC |
| Midwest Roadside Safety Facility | DWG. NAME. HBIB-3_R6 / SCALE: 1:50 / UNITS: in. | REV. BY: KAL/AML |

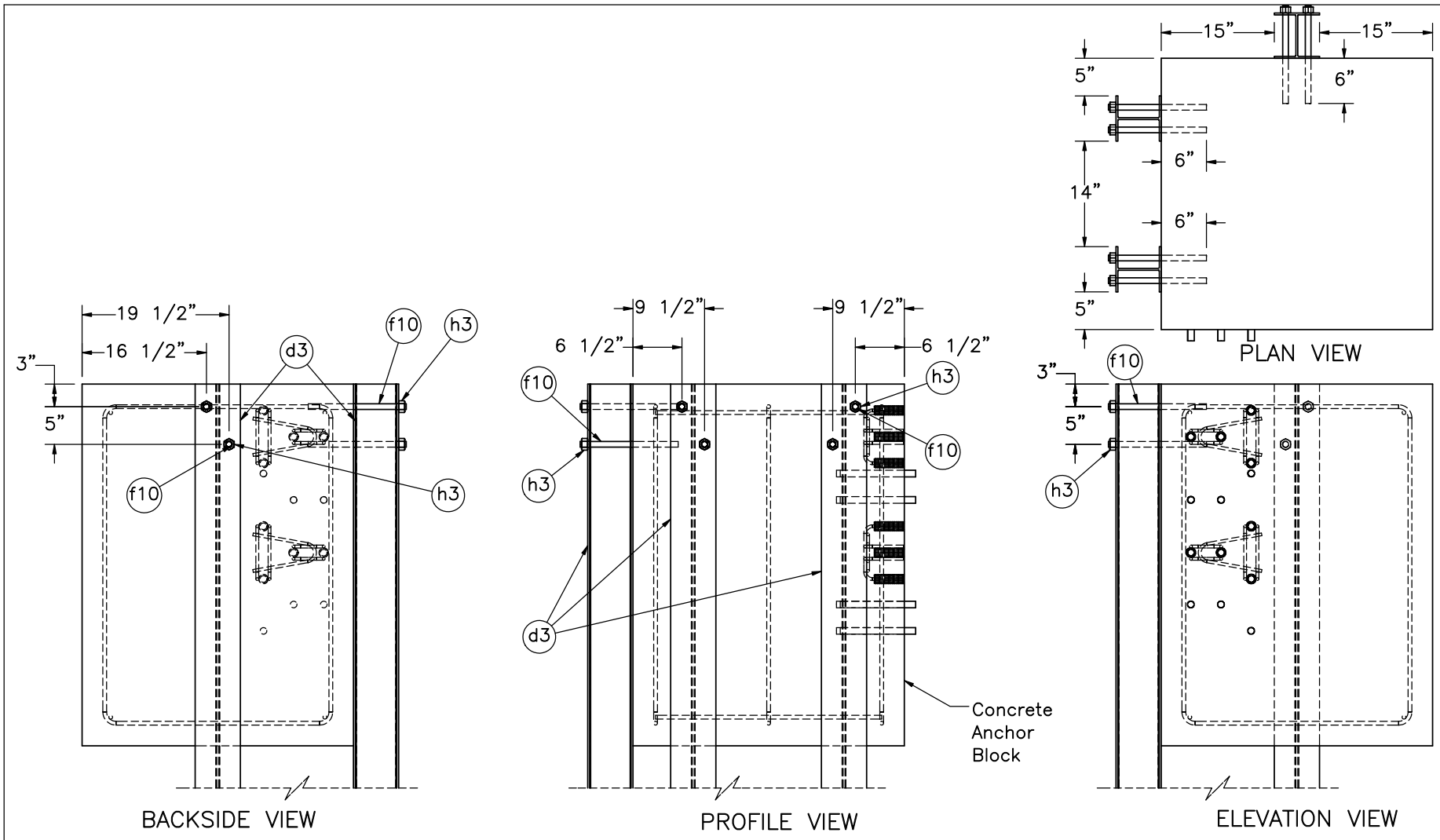



DETAIL K

SECTION L–L
(See Notes 2 & 3)

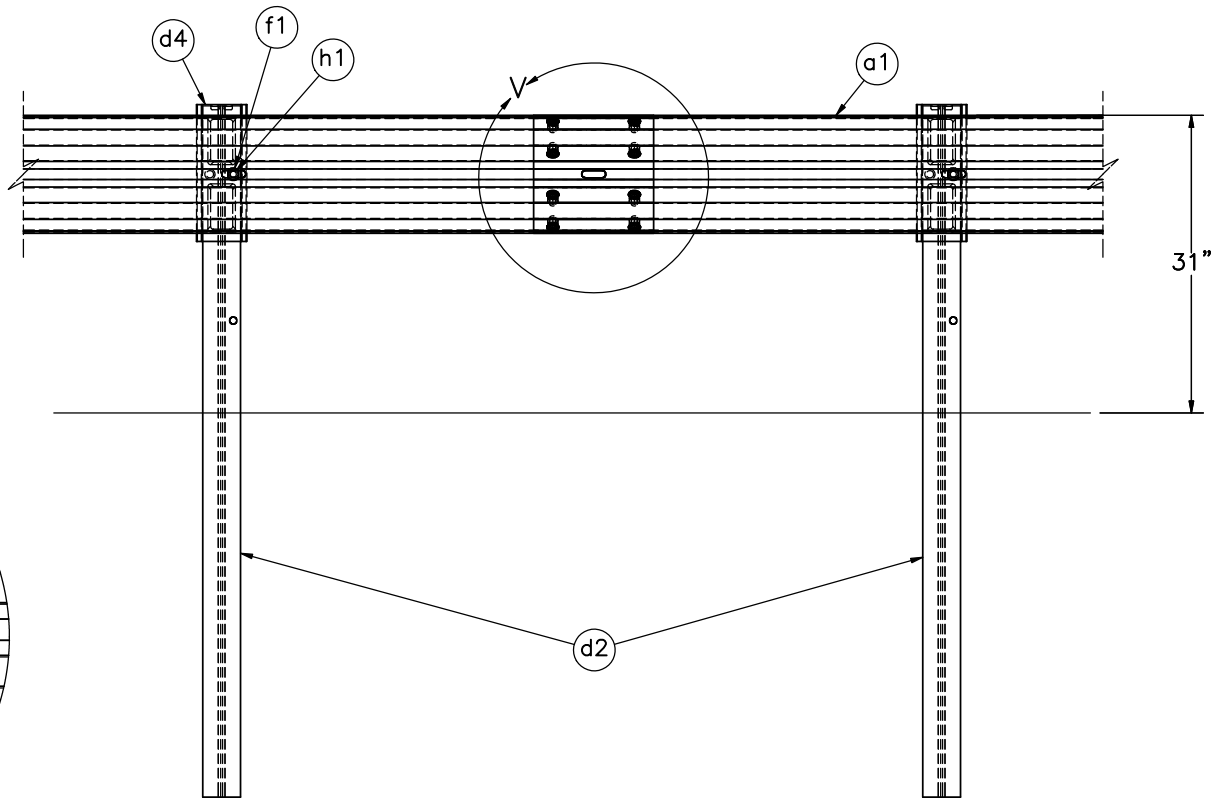
Notes:
(1) Hawaii DOT typically utilizes an aesthetic stone–faced exterior of the anchor block, which will be represented by a 6" thick low–strength fascia, which is to be added to the upstream, top, and downstream surfaces of the concrete anchor block. The fascia can be low–strength concrete, low–aggregate sandy concrete, or grout mixture.
(2) View is normal to concrete block, backslope is shown at an angle.
(3) Anchor block is reused from test no. HBIB–1. One of the anchor ferrules from the anchor block will be reused; the threaded connections between the W–beam end shoes and anchor block will be post–installed thread rods.

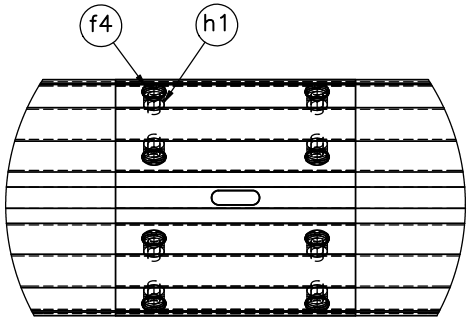
| | | |
|---|---|---|
| MwRSF | Hawaii Buried in Backslope Test No. HBIB–3 | SHEET: 9 of 32 |
| | | DATE: 5/15/2025 |
| Midwest Roadside Safety Facility | End Section Installation Details | DRAWN BY: JJO/TJC |
| | DWG. NAME. HBIB–3_R6 / SCALE: 1:17 / UNITS: in. | REV. BY: KAL/AML |




Notes: (1) Ground line hidden for clarity.
(2) 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, top, and downstream surfaces of the concrete anchor block. The fascia can be low–strength concrete, low–aggregate sandy concrete, or grout mixture.
(3) To set the anchor block use the following process:
(1) Set block.
(2) Drive post using post extender to flush with top surface of block.
(3) Drill through.
(4) Epoxy install threaded rods using a chemical epoxy adhesive with a minimum bond strenght of 1,450 psi (part j1).
(5) Add aesthetic surface treatment.
(6) Pour aestetic grout/rock/concrete surface on outside surface of block.

| | | |
|---|---|---|
| MwRSF | Hawaii Buried in Backslope Test No. HBIB–3 | SHEET: 10 of 32 |
| | | DATE: 5/15/2025 |
| Midwest Roadside Safety Facility | Post to Anchor Connection Details | DRAWN BY: JJO/TJC |
| | DWG. NAME. HBIB–3_R6 / SCALE: 1:20 / UNITS: in. | REV. BY: KAL/AML |

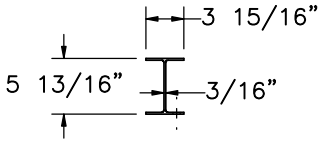


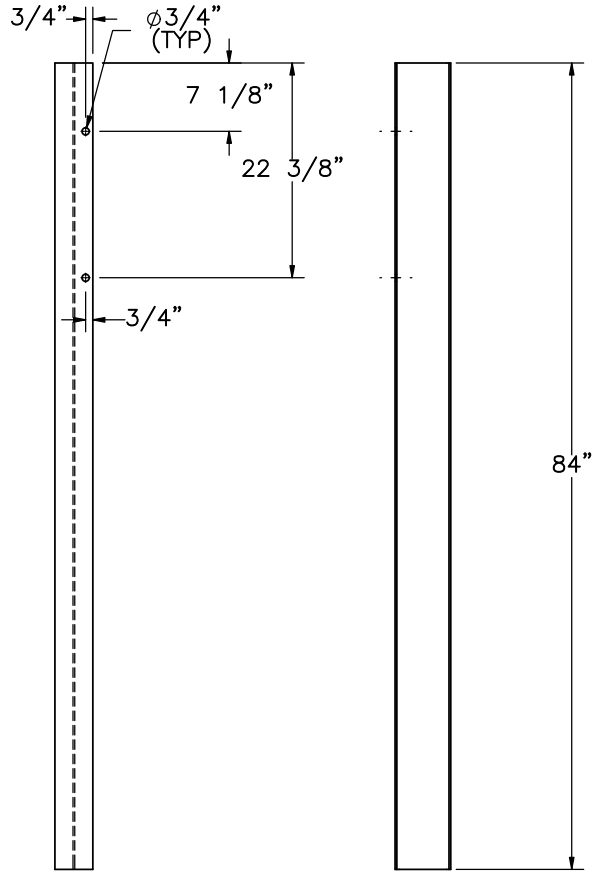

DETAIL V
SCALE 1 : 10

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).

| | | |
|---|---|---|
| MwRSF | Hawaii Buried in Backslope Test No. HBIB–3 | SHEET: 11 of 32 |
| | | DATE: 5/15/2025 |
| Midwest Roadside Safety Facility | Splice Detail | DRAWN BY: JJO/TJC |
| | DWG. NAME. HBIB–3_R6 / SCALE: 1:20 / UNITS: in. | REV. BY: KAL/AML |

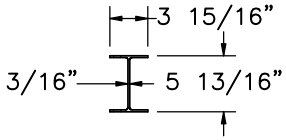



PLAN VIEW

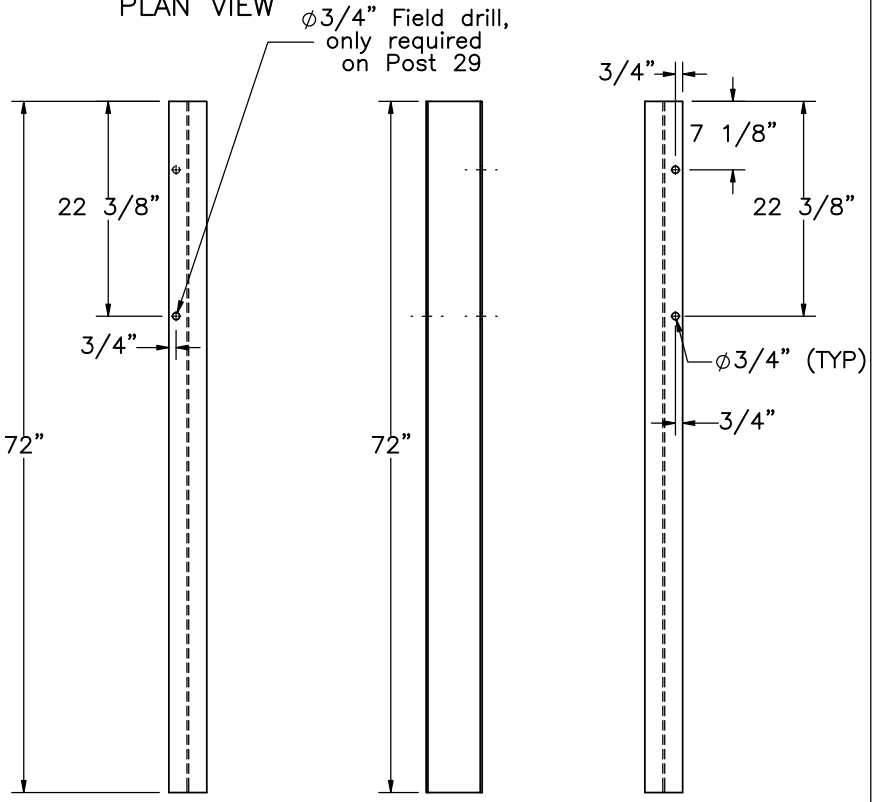



ELEVATION VIEW PROFILE VIEW

Part d1



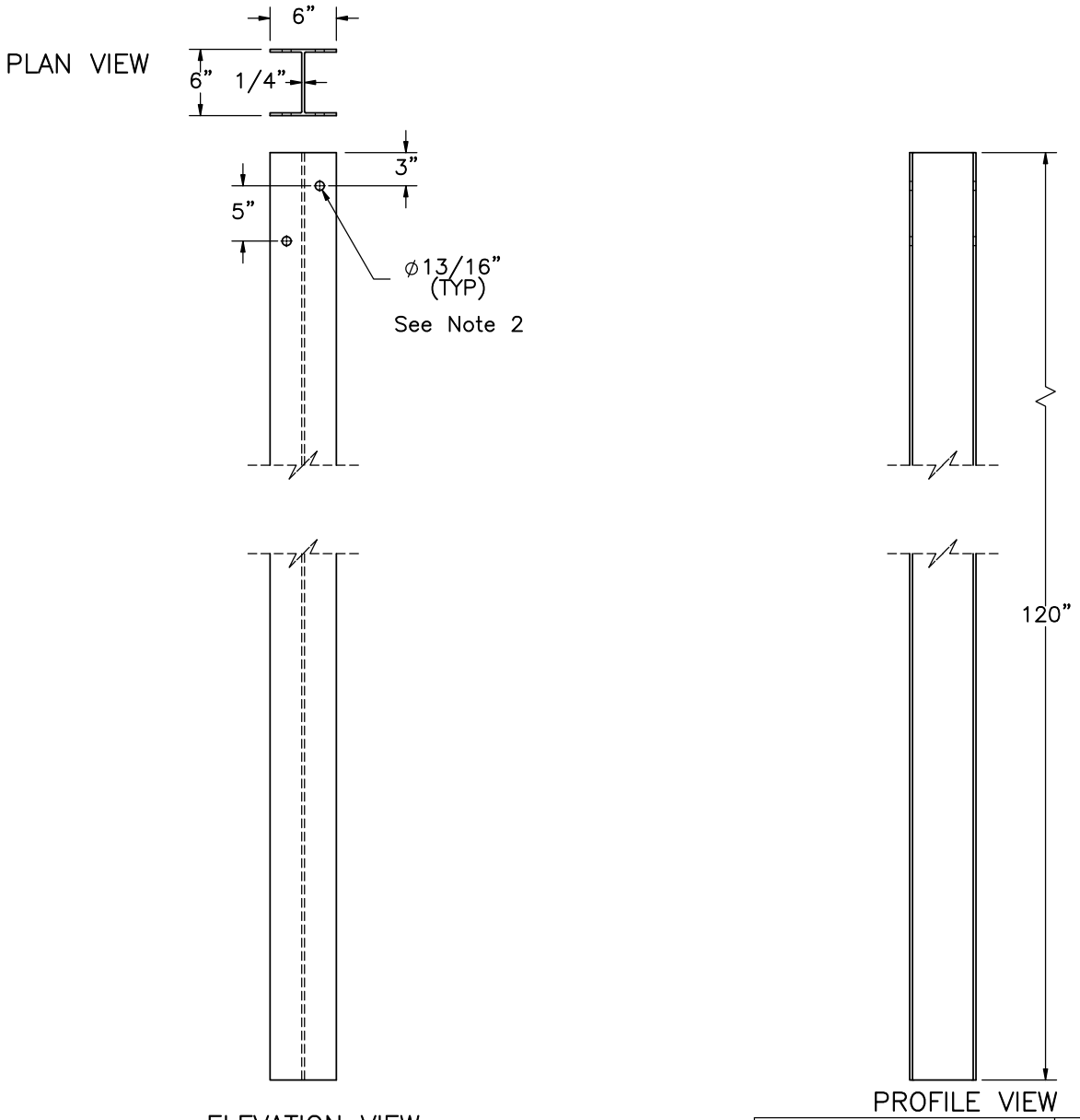

PLAN VIEW




REAR VIEW PROFILE VIEW ELEVATION VIEW

Part d2

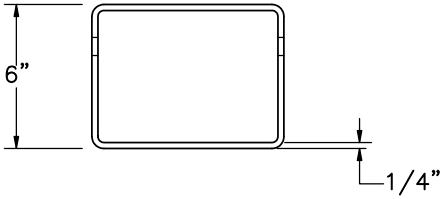
| | | |
|---|---|---|
| Midwest Roadside Safety Facility | Hawaii Buried in Backslope Test No. HBIB–3<br>Post Components | SHEET: 12 of 32<br>DATE: 5/15/2025<br>DRAWN BY: JJO/TJC |
| | DWG. NAME. HBIB–3_R6<br>SCALE: 1:20<br>UNITS: in. | REV. BY: KAL/AML |



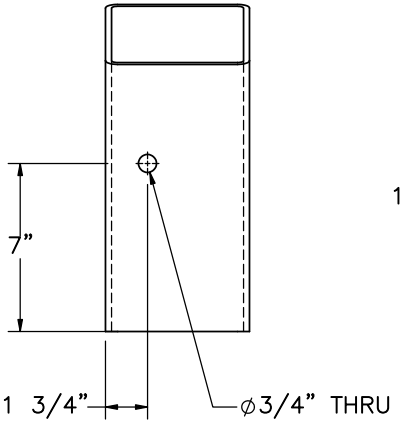

Part d3

Notes: (1) Views shown for post on non–traffic side of anchor block.
(2) Holes are field drilled

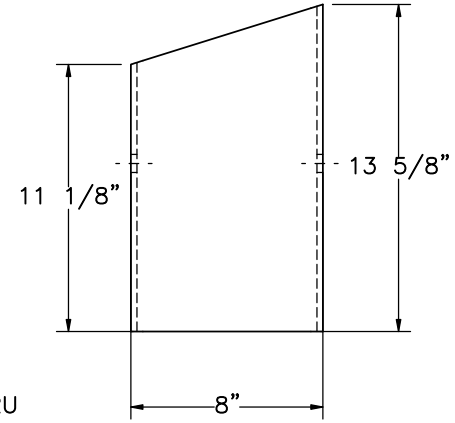
| | | |
|---|---|---|
| Midwest Roadside Safety Facility | Hawaii Buried in Backslope Test No. HBIB–3 | SHEET: 13 of 32 |
| | | DATE: 5/15/2025 |
| | Anchor Post Details | DRAWN BY: JJO/TJC |
| | DWG. NAME. HBIB–3_R6 / SCALE: 1:16 / UNITS: in. | REV. BY: KAL/AML |




PLAN VIEW

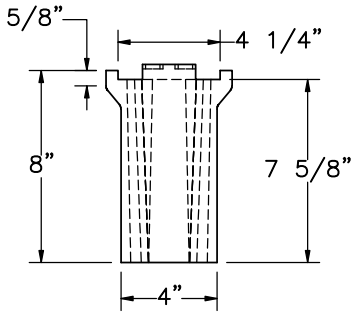



ELEVATION VIEW

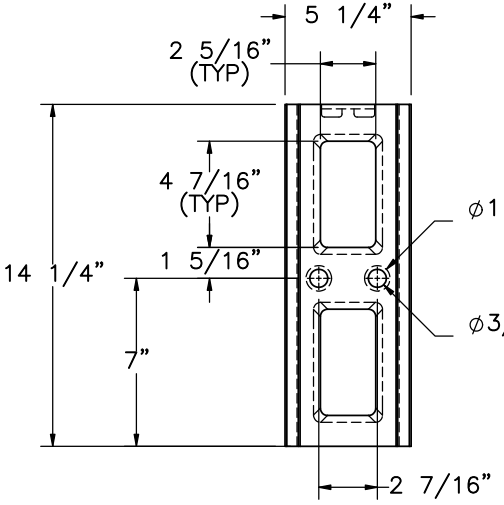



PROFILE VIEW

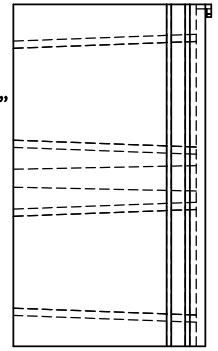
Part d5




PLAN VIEW



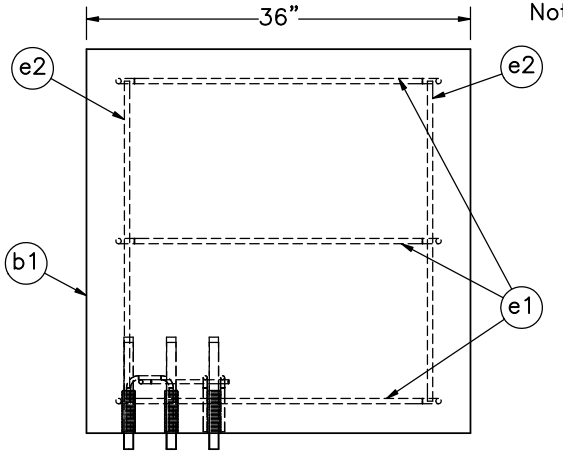

ELEVATION VIEW



PROFILE VIEW

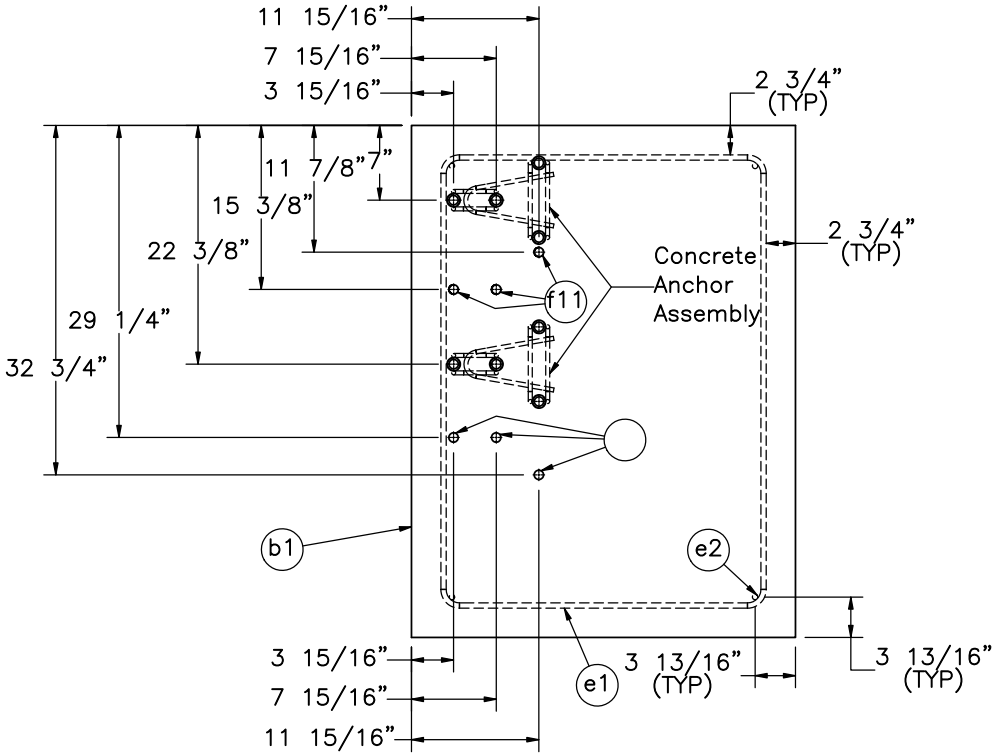
Part d4

| | | |
|---|---|---|
| MwRSF | Hawaii Buried in Backslope Test No. HBIB–3 | SHEET: 14 of 32 |
| | | DATE: 5/15/2025 |
| Midwest Roadside Safety Facility | Tapered Blockout Details | DRAWN BY: JJO/TJC |
| | DWG. NAME. HBIB–3_R6 / SCALE: 1:8 / UNITS: in. | REV. BY: KAL/AML |

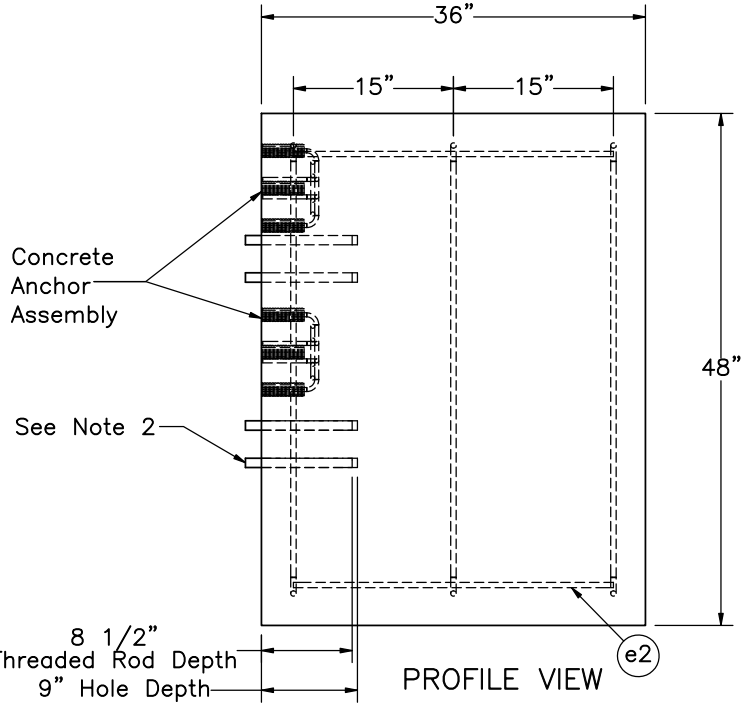



PLAN VIEW

Notes:
(1) Once anchor is installed field drill additional holes for anchoring posts.
(2) Epoxy install threaded rods using a chemical epoxy adhesive with a minimum bond strength of 1,450 psi (part j1).
(3) 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, top, and downstream surfaces of the concrete anchor block. The fascia can be low–strength concrete, low–aggregate sandy concrete, or grount mixture.
(4) Anchor block is reused from test no. HBIB–1. One of the ferrules from the anchor block will be resued; the threaded connections between the W–beam end shoes and anchor block will be post–installed threaded rods.




ELEVATION VIEW



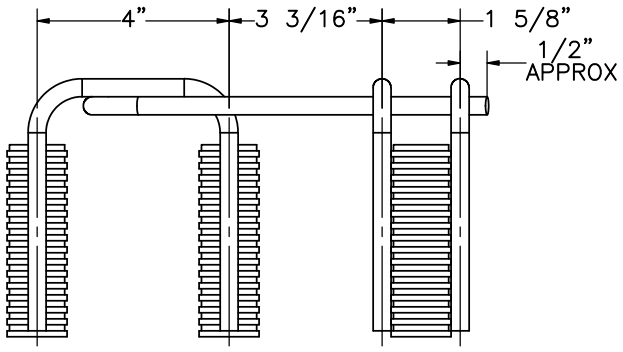

PROFILE VIEW

Midwest Roadside Safety Facility

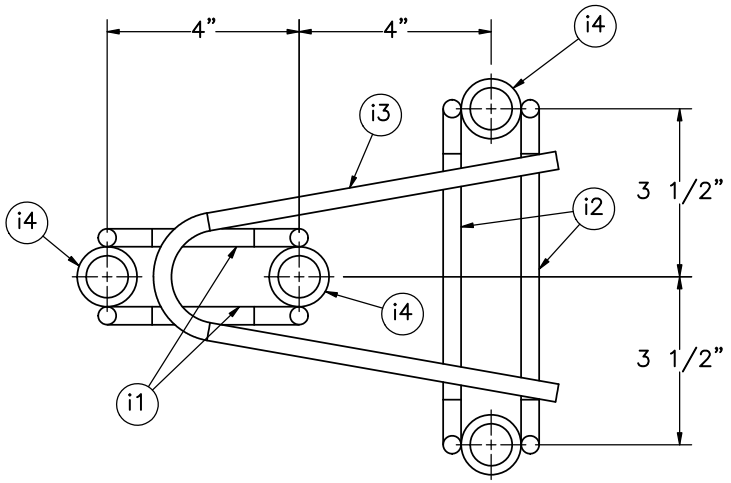
Hawaii Buried in Backslope
Test No. HBIB–3

Concrete Anchor Details

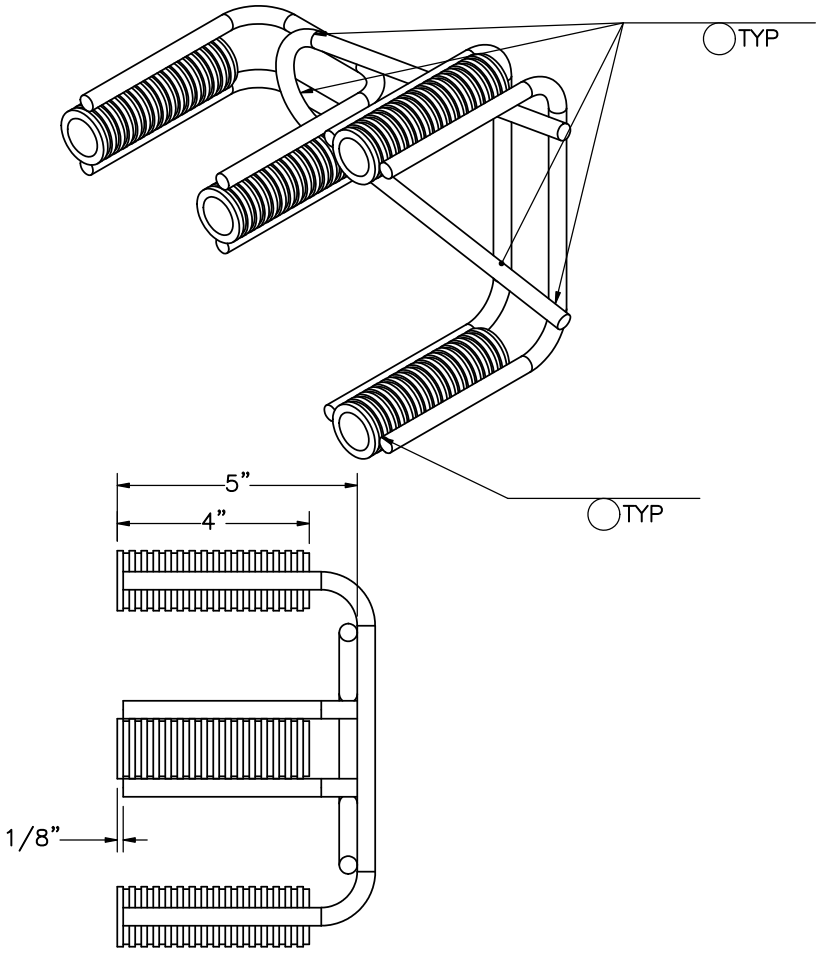
| | |
|---|---|
| SHEET: | 15 of 32 |
| DATE: | 5/15/2025 |
| DRAWN BY: | JJO/TJC |
| DWG. NAME. | HBIB–3_R6 |
| SCALE: | 1:18 |
| UNITS: | in. |
| REV. BY: | KAL/AML |




PLAN VIEW




ELEVATION VIEW




PROFILE VIEW

Note: 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.

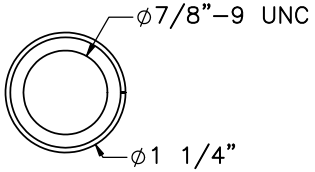
| Item No. | QTY. | Description | Material Specification | Treatment Specification |
|---|---|---|---|---|
| – | 2 | Concrete Anchor | – | – |
| i4 | 4 | 7/8 Dia. Threaded Ferrule | – | – |
| i1 | 2 | 3/4” Dia. Wire Strut, 13 3/8” Long Unbent | Min. Tensile Strength = 100,000 psi | AASHTO M111 |
| i3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

Midwest Roadside Safety Facility

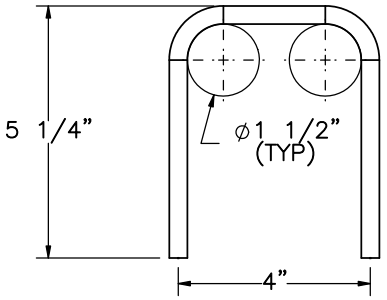
Hawaii Buried in Backslope
Test No. HBIB–3

Concrete Anchor Insert Assembly

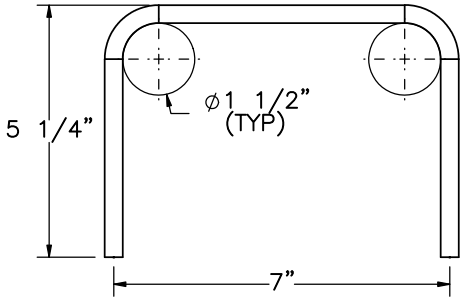
SHEET: 16 of 32
DATE: 5/15/2025
DRAWN BY: JJO/TJC
DWG. NAME. HBIB–3_R6
SCALE: 1:4
UNITS: in.
REV. BY: KAL/AML



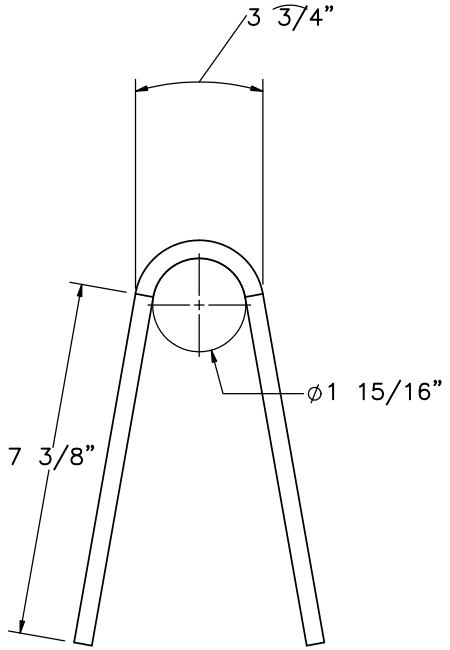

PLAN VIEW



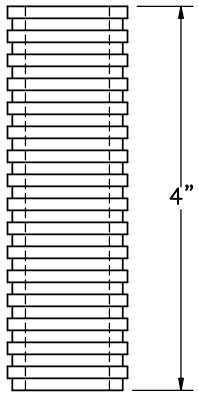

Part i1



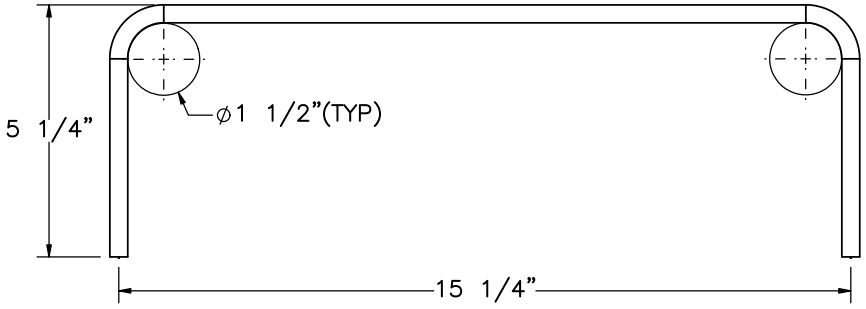

Part i2




Part i3




ELEVATION VIEW
Part i4




Part i5

| 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 |

MwRSF

Midwest Roadside Safety Facility

Hawaii Buried in Backslope
Test No. HBIB–3

Insert Component Details

SHEET: 17 of 32

DATE: 5/15/2025

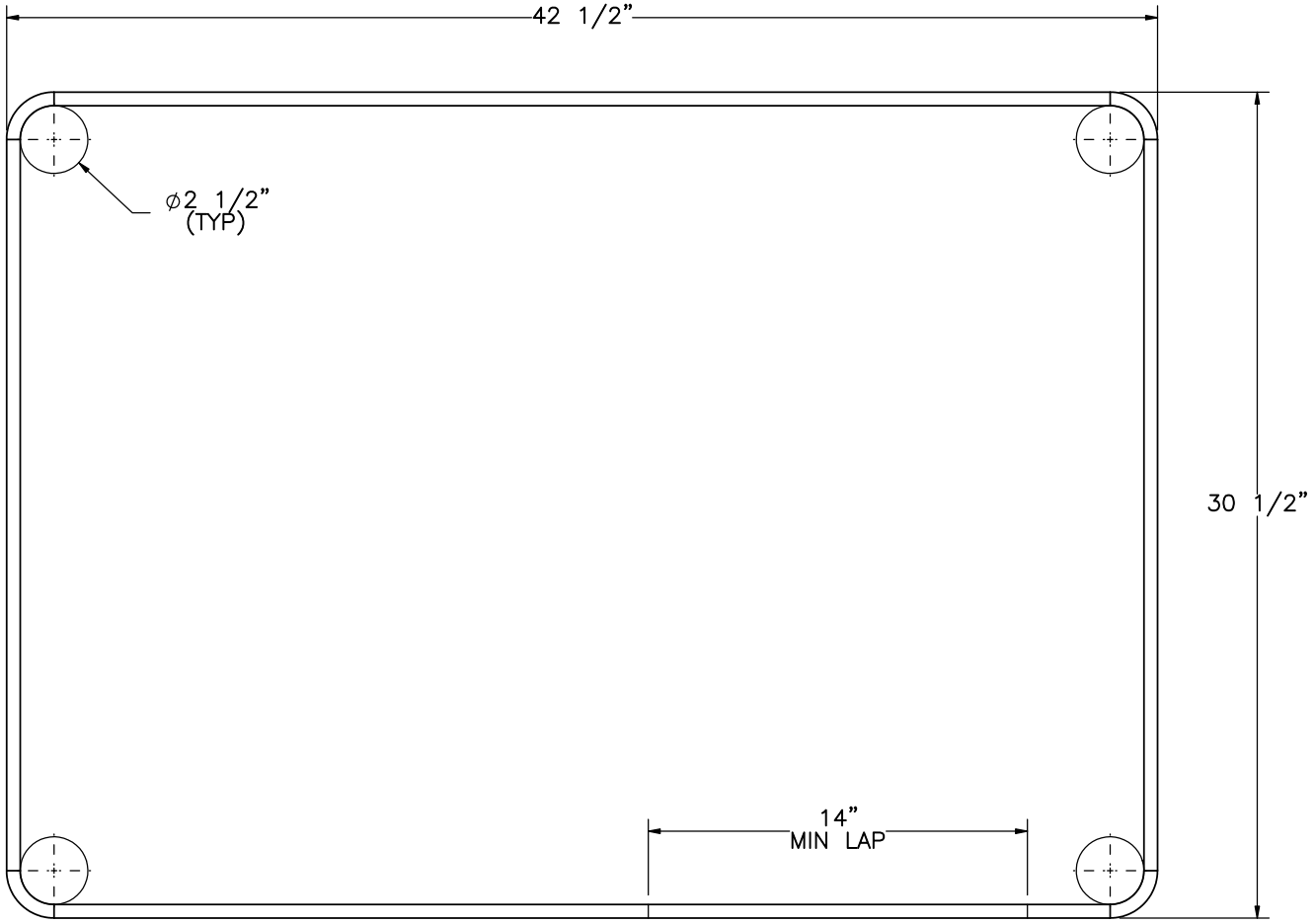
DRAWN BY: JJO/TJC

DWG. NAME. HBIB–3_R6

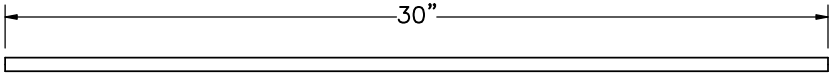
SCALE: 1:2

UNITS: in.

REV. BY: KAL/AML




Part e1




Part e2

| Bill of Bars | | | | | |
|---|---|---|---|---|---|
| Bar | QTY | Size | Length | Material | Treatment |
| e1 | 3 | #4 | 170" | ASTM A615 Gr. 60 | Epoxy Coated (ASTM A775 or A934) |
| e2 | 4 | #4 | 30" | ASTM A615 Gr. 60 | Epoxy Coated (ASTM A775 or A934) |

Midwest Roadside Safety Facility

Hawaii Buried in Backslope
Test No. HBIB-3

Rebar Details

DWG. NAME. HBIB-3_R6

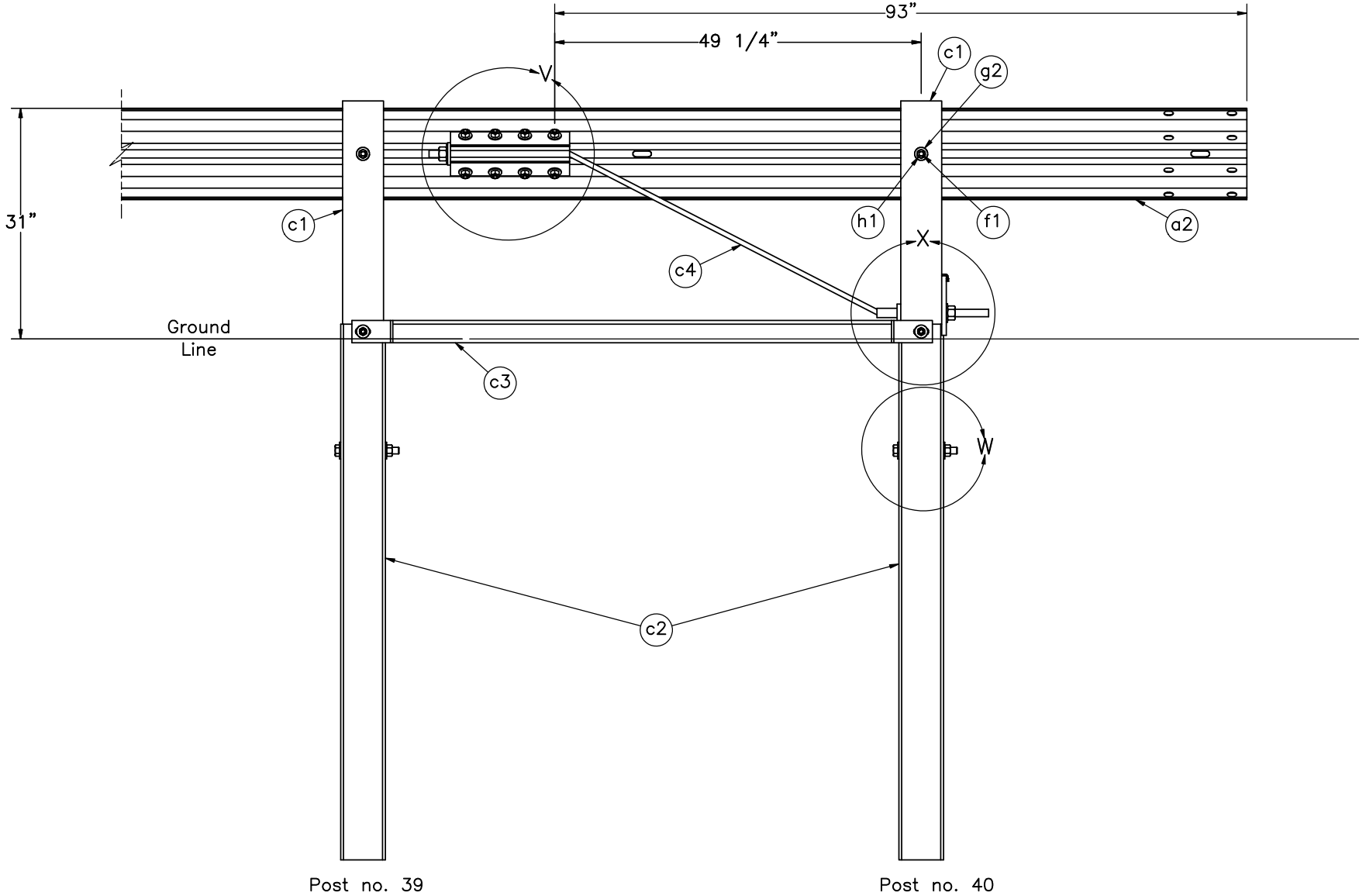
SCALE: 1:7
UNITS: in.

SHEET: 18 of 32

DATE: 5/15/2025

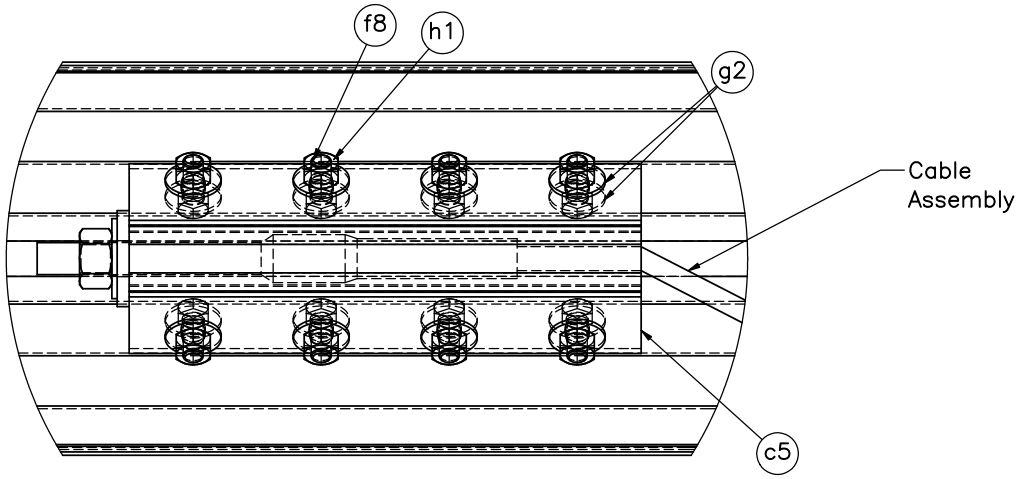
DRAWN BY: JJO/TJC

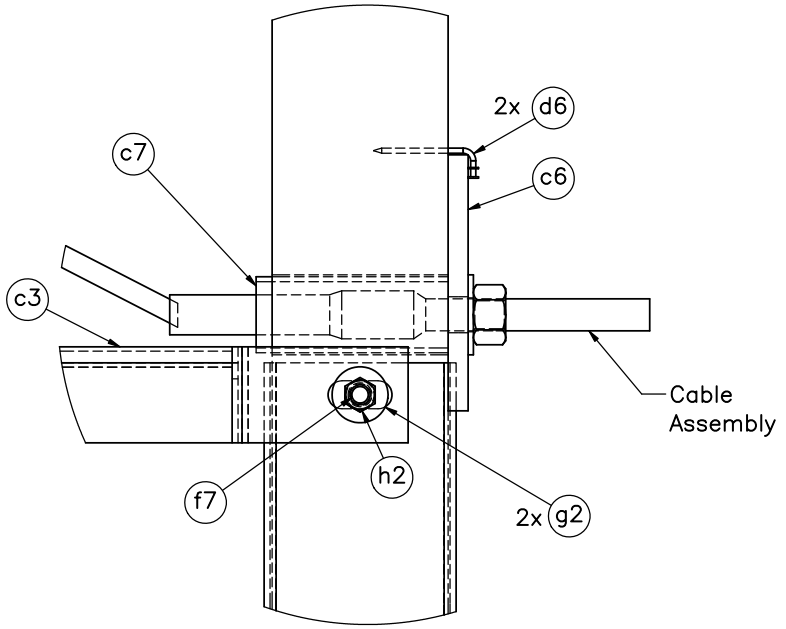
REV. BY: KAL/AML



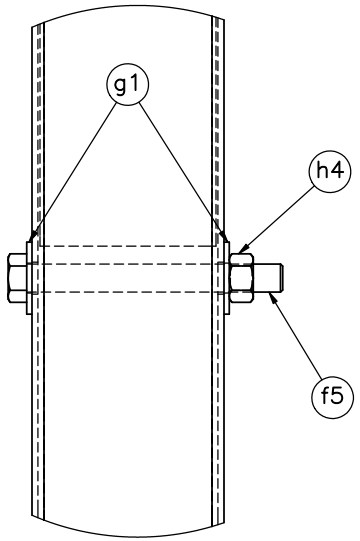

END SECTION DETAIL
BACKSIDE

| | | |
|---|---|---|
| MwRSF | Hawaii Buried in Backslope Test No. HBIB–3 | SHEET: 19 of 32 |
| | | DATE: 5/15/2025 |
| Midwest Roadside Safety Facility | End Section Detail | DRAWN BY: JJO/TJC |
| | DWG. NAME. HBIB–3_R6 / SCALE: 1:20 / UNITS: in. | REV. BY: KAL/AML |



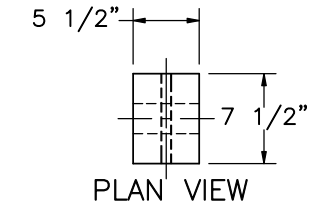



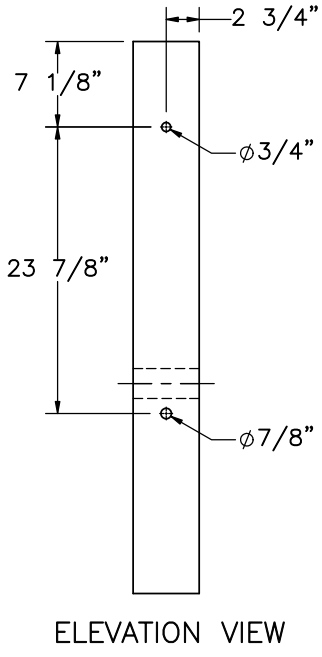

DETAIL X

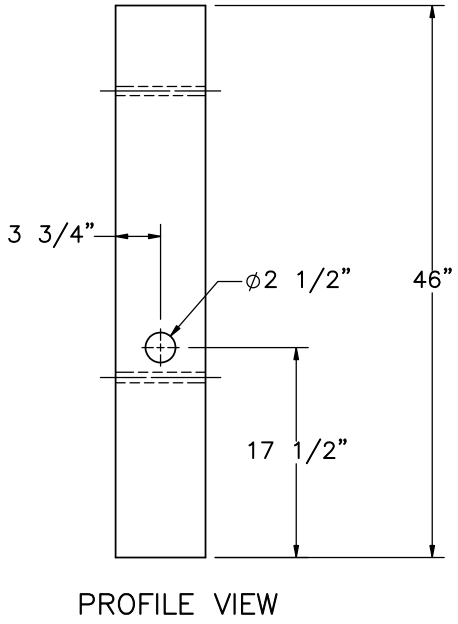



DETAIL W

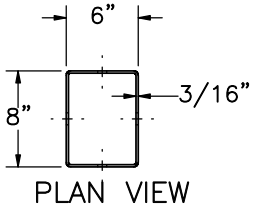
| | | |
|---|---|---|
| Midwest Roadside Safety Facility | Hawaii Buried in Backslope Test No. HBIB–3 | SHEET: 20 of 32 |
| | | DATE: 5/15/2025 |
| | BCT Anchor Details | DRAWN BY: JJO/TJC |
| | DWG. NAME. HBIB–3_R6 / SCALE: 1:6 / UNITS: in. | REV. BY: KAL/AML |

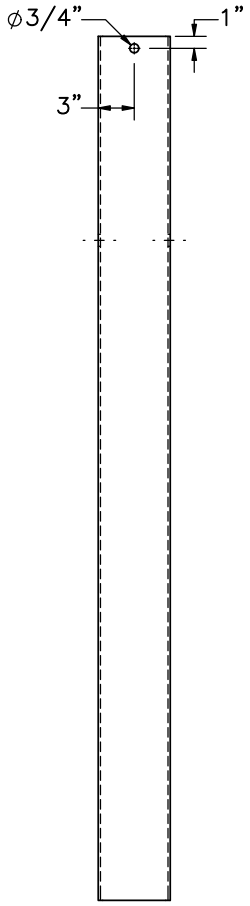


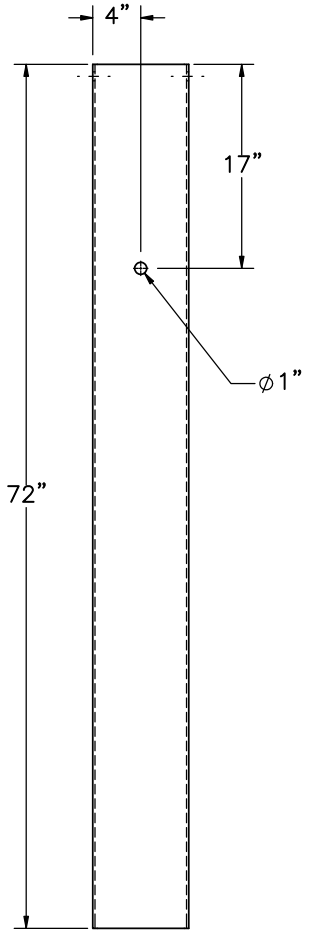




Part c1

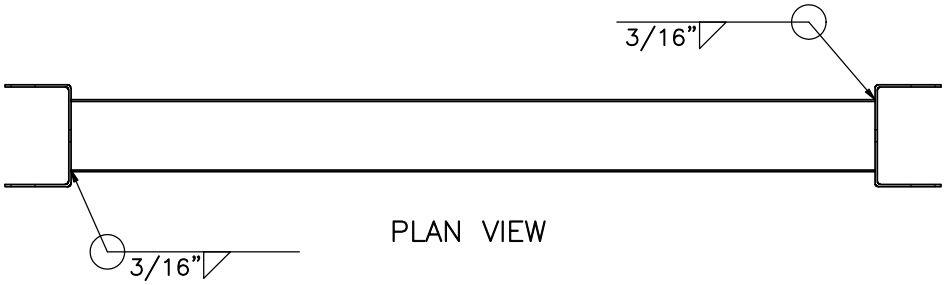


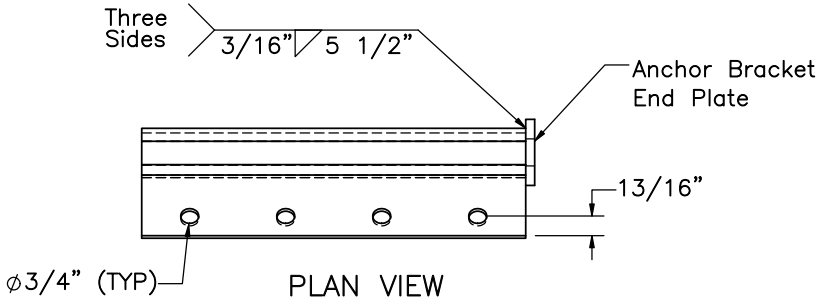

Part c2



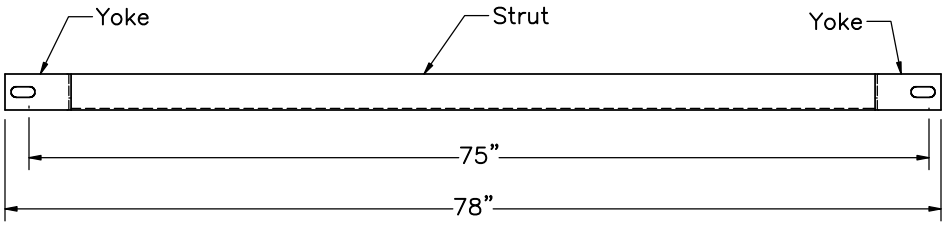

| | | |
|---|---|---|
| MwRSF | Hawaii Buried in Backslope Test No. HBIB–3 | SHEET: 21 of 32 |
| | | DATE: 5/15/2025 |
| Midwest Roadside Safety Facility | BCT Timber Post and Foundation Tube Details | DRAWN BY: JJO/TJC |
| | DWG. NAME. HBIB–3_R6 / SCALE: 1:16 / UNITS: in. | REV. BY: KAL/AML |




PLAN VIEW

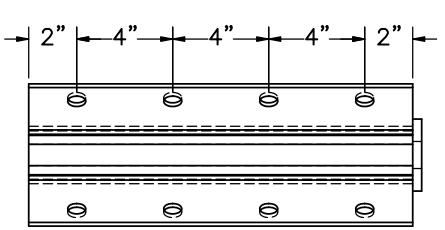



PLAN VIEW

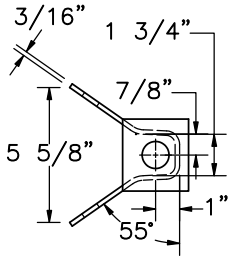



Part c3

ELEVATION VIEW



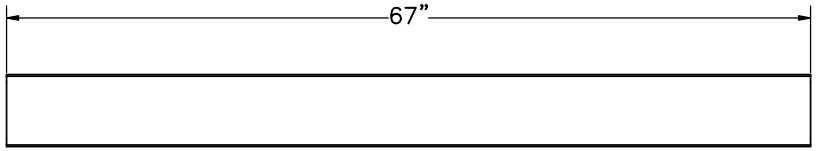

ELEVATION VIEW



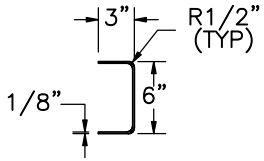

PROFILE VIEW

Part c5

SCALE 1:8

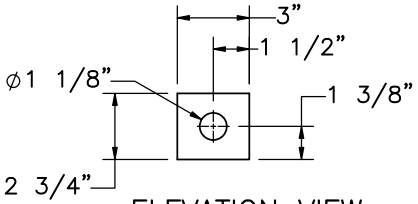



ELEVATION VIEW

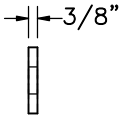



PROFILE VIEW

6"x3" 10 Gauge Strut



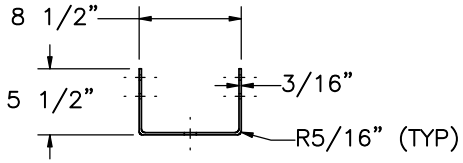

ELEVATION VIEW



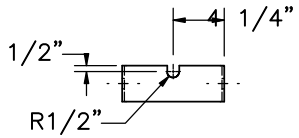

PROFILE VIEW

Anchor Bracket End Plate

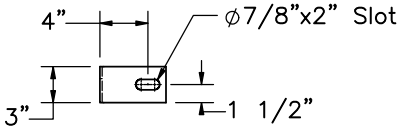
SCALE 1:8




PLAN VIEW



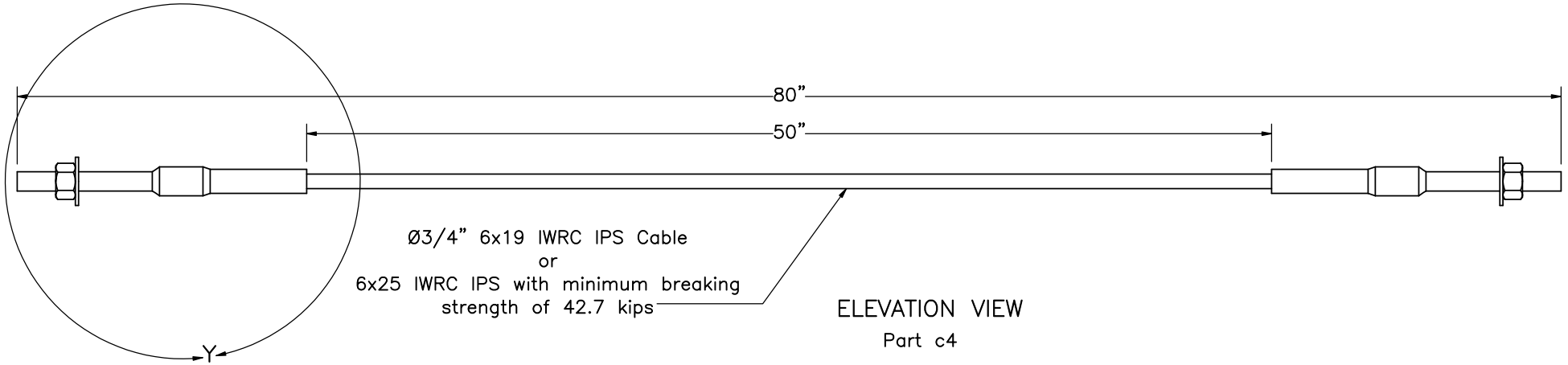

ELEVATION VIEW




PROFILE VIEW

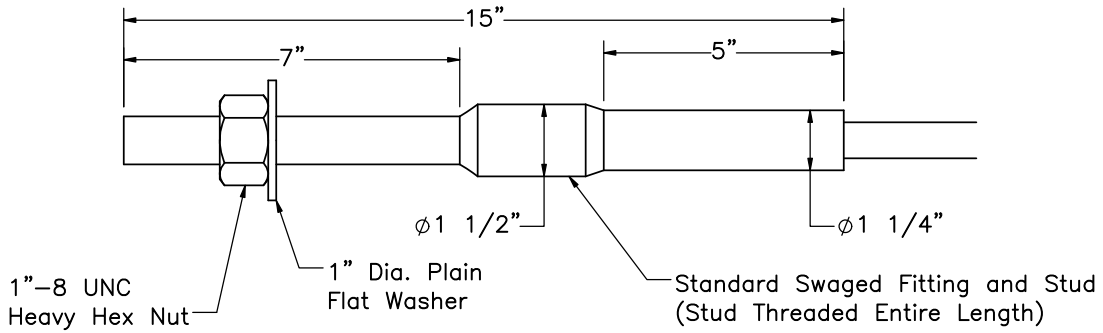
Yoke Channel

| | | | |
|---|---|---|---|
| MwRSF | Hawaii Buried in Backslope Test No. HBIB-3 | | SHEET: 22 of 32 |
| | | | DATE: 5/15/2025 |
| Midwest Roadside Safety Facility | Ground Strut Details | | DRAWN BY: JJO/TJC |
| | DWG. NAME. HBIB-3_R6 | SCALE: 1:16 UNITS: in. | REV. BY: KAL/AML |



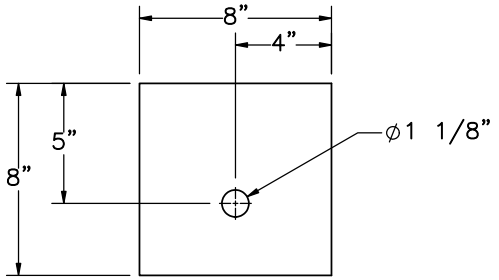

ELEVATION VIEW

Part c4

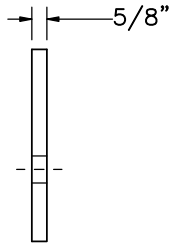



DETAIL Y

SCALE 1 : 4

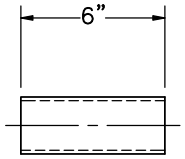



ELEVATION VIEW

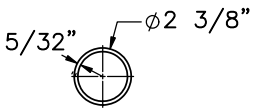



PLAN VIEW

Part c6



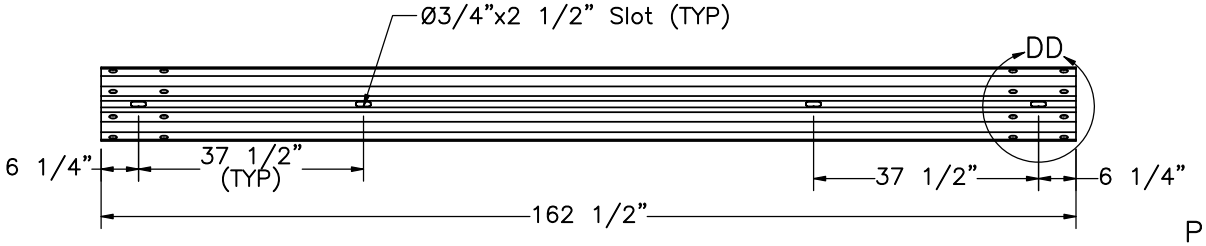

ELEVATION VIEW



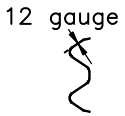

PLAN VIEW

Part c7

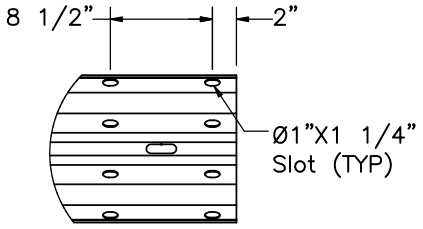
| | | | |
|---|---|---|---|
| Midwest Roadside Safety Facility | Hawaii Buried in Backslope Test No. HBIB–3 | | SHEET: 23 of 32 |
| | BCT Anchor Cable | | DATE: 5/15/2025 |
| | | | DRAWN BY: JJO/TJC |
| | DWG. NAME. HBIB–3_R6 | SCALE: 1:8 UNITS: in. | REV. BY: KAL/AML |




ELEVATION VIEW

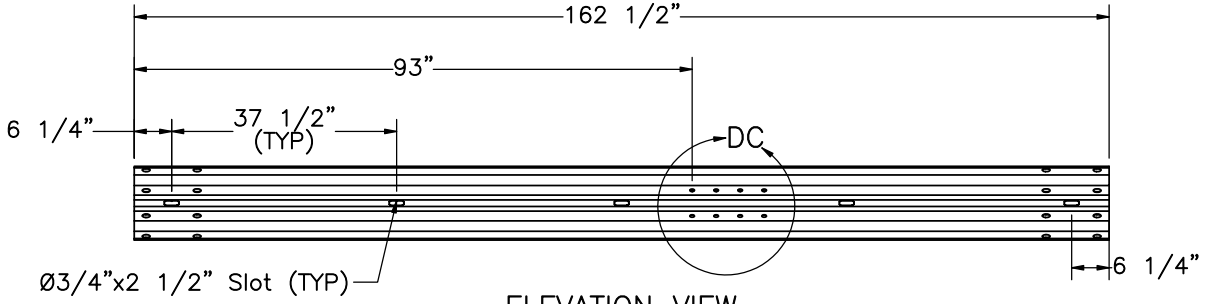



PROFILE VIEW

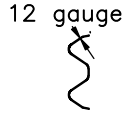



DETAIL DD
SCALE 1 : 16

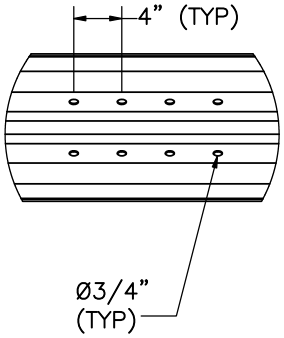
Part a1




ELEVATION VIEW

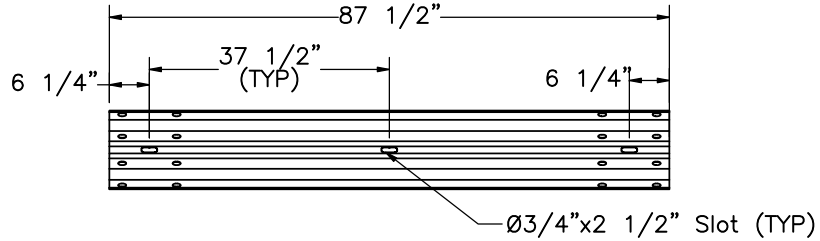



PROFILE VIEW




DETAIL DC
SCALE 1 : 16

Part a2

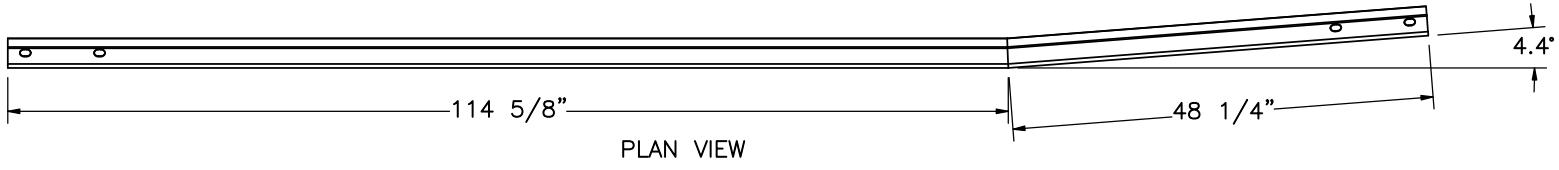



ELEVATION VIEW

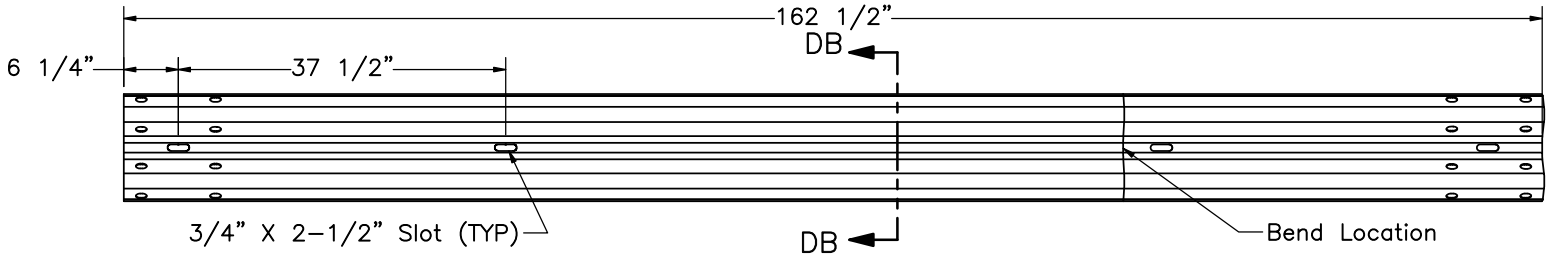

PROFILE VIEW

Part a3

| | | | |
|---|---|---|---|
| Midwest Roadside Safety Facility | Hawaii Buried in Backslope Test No. HBIB–3 | | SHEET: 24 of 32 |
| | Guardrail Section Details | | DATE: 5/15/2025 |
| | | | DRAWN BY: JJO/TJC |
| | DWG. NAME. HBIB–3_R6 | SCALE: 1:30 UNITS: in. | REV. BY: KAL/AML |

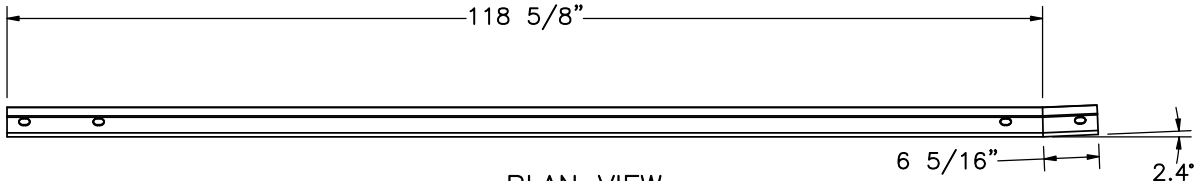



PLAN VIEW

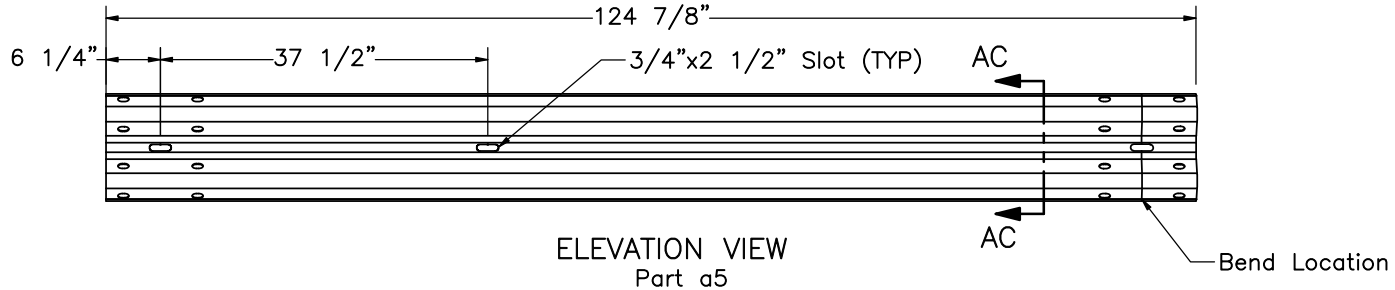



ELEVATION VIEW
Part a4


SECTION DB-DB



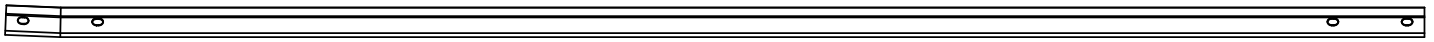

PLAN VIEW



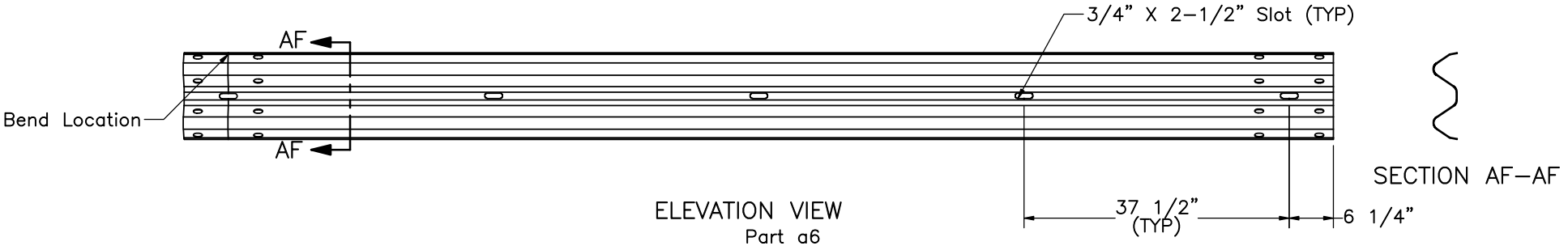

ELEVATION VIEW
Part a5


SECTION AC-AC

| | | |
|---|---|---|
| Midwest Roadside Safety Facility | Hawaii Buried in Backslope Test No. HBIB-3 | SHEET: 25 of 32 |
| | | DATE: 5/15/2025 |
| | Guardrail Section Details | DRAWN BY: JJO/TJC |
| | DWG. NAME. HBIB-3_R6 / SCALE: 1:22 / UNITS: in. | REV. BY: KAL/AML |



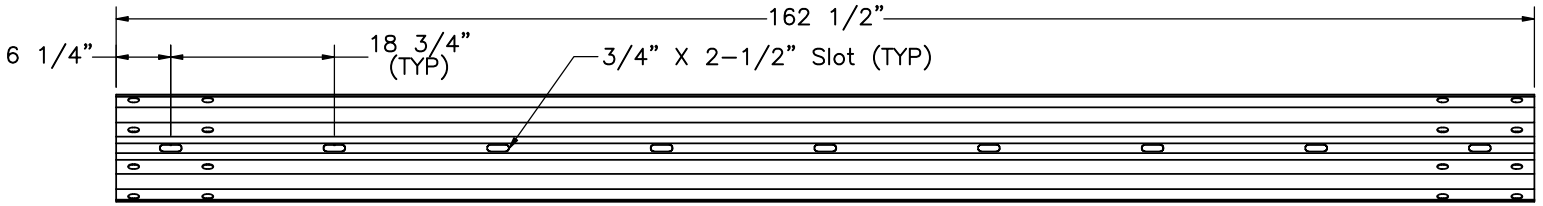
PLAN VIEW




ELEVATION VIEW
Part a6

SECTION AF–AF

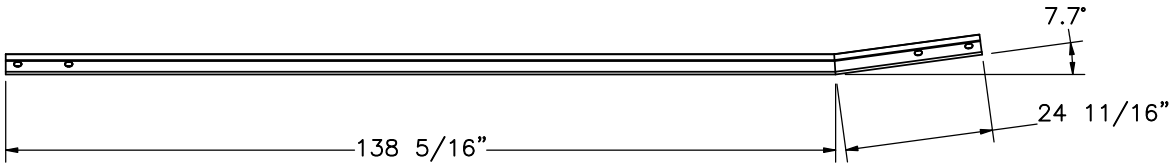
PLAN VIEW



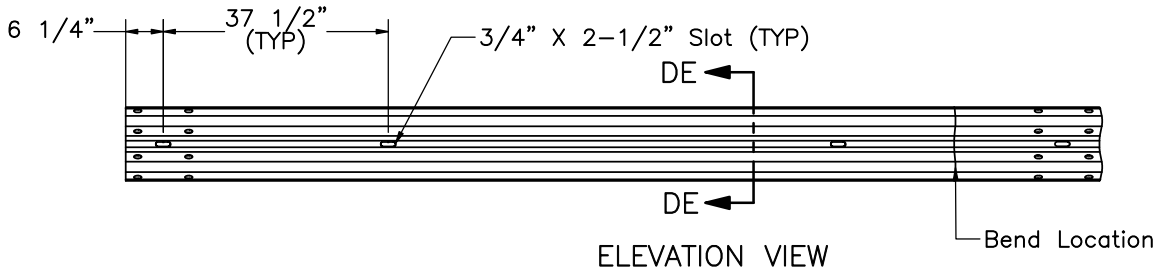

ELEVATION VIEW
Part a7


PROFILE VIEW

| | | |
|---|---|---|
| Midwest Roadside Safety Facility | Hawaii Buried in Backslope Test No. HBIB–3 | SHEET: 26 of 32 |
| | | DATE: 5/15/2025 |
| | Guardrail Section Details | DRAWN BY: JJO/TJC |
| | DWG. NAME. HBIB–3_R6 / SCALE: 1:22 / UNITS: in. | REV. BY: KAL/AML |



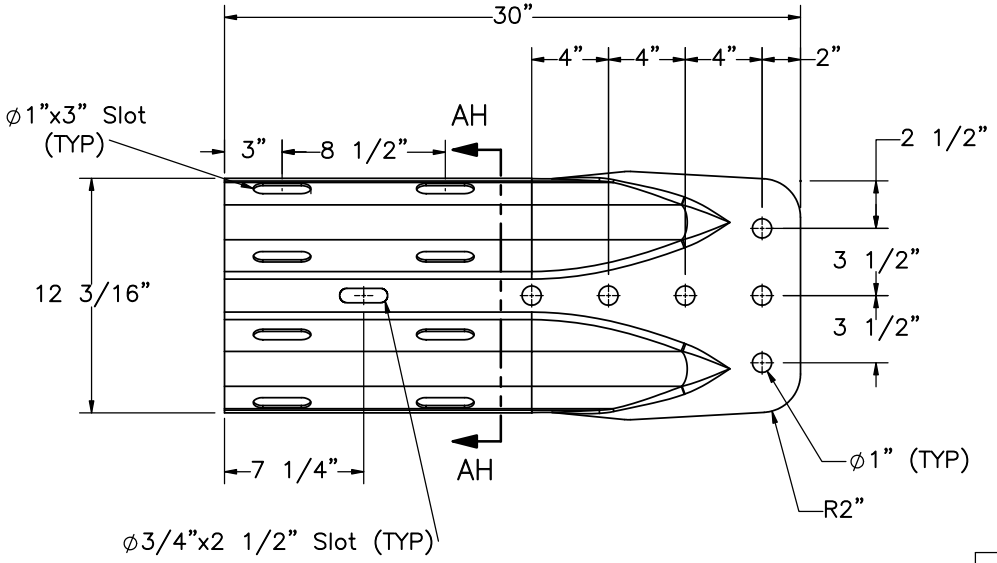

PLAN VIEW




ELEVATION VIEW

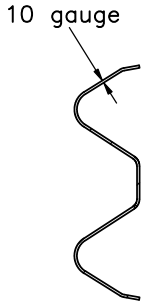
Part a9


SECTION DE-DE




ELEVATION VIEW
SCALE 1:10

Part a8



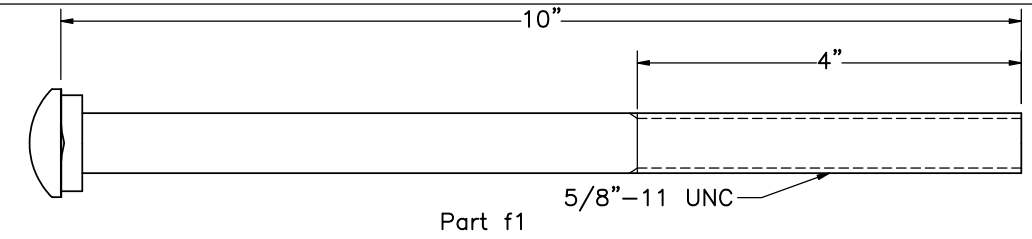

SECTION AH-AH

Midwest Roadside Safety Facility

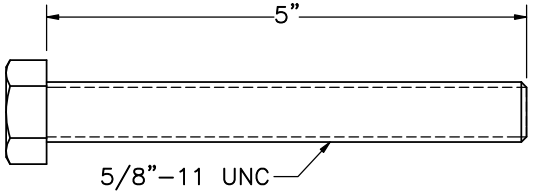
Hawaii Buried in Backslope
Test No. HBIB-3

Terminal Connector Details

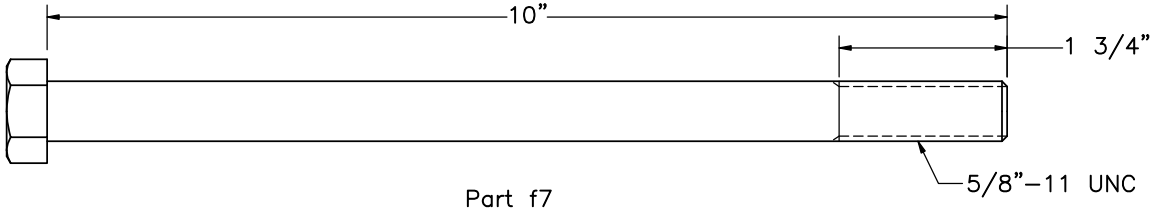
| | |
|---|---|
| SHEET: | 27 of 32 |
| DATE: | 5/15/2025 |
| DRAWN BY: | JJO/TJC |
| DWG. NAME. | HBIB-3_R6 |
| SCALE: | 1:32 |
| UNITS: | in. |
| REV. BY: | KAL/AML |



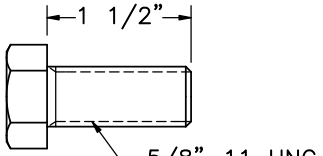

Part f1



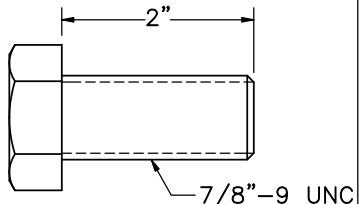

Part f2



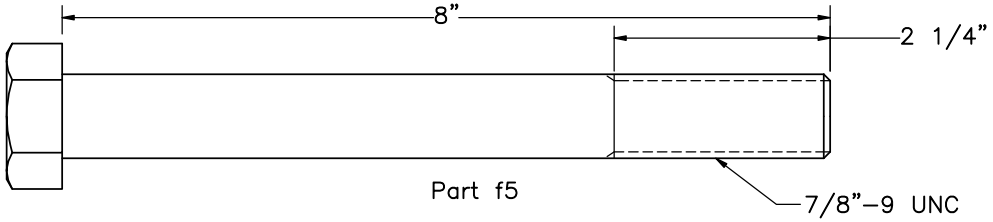

Part f7



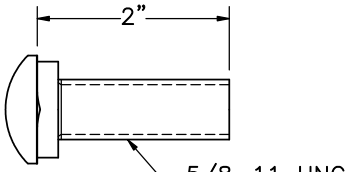

Part f8



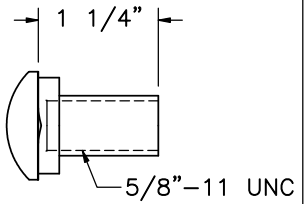

Part f6



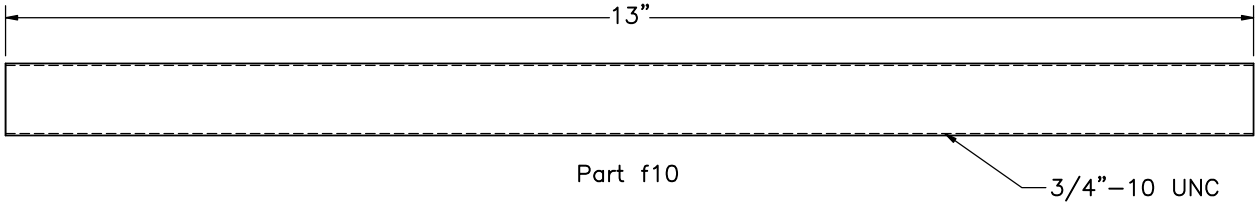

Part f5



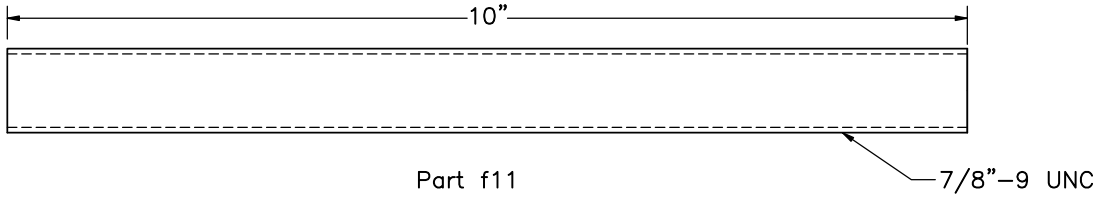

Part f3



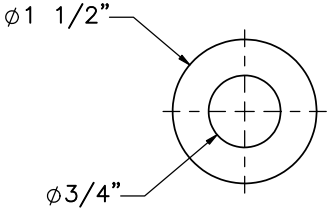

Part f4

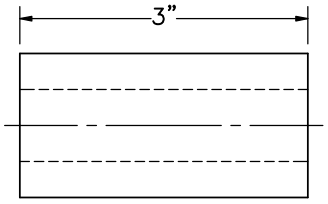



Part f10



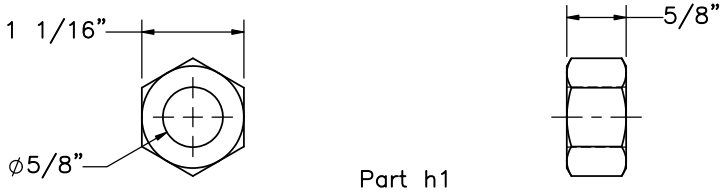

Part f11



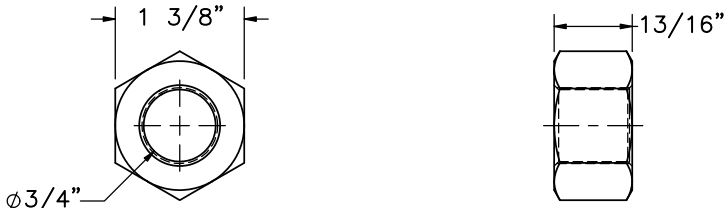

Part f9

| | | | |
|---|---|---|---|
| Midwest Roadside Safety Facility | Hawaii Buried in Backslope Test No. HBIB–3<br>Hardware | | SHEET: 28 of 32<br>DATE: 5/15/2025<br>DRAWN BY: JJO/TJC |
| | DWG. NAME. HBIB–3_R6 | SCALE: 1:2<br>UNITS: in. | REV. BY: KAL/AML |

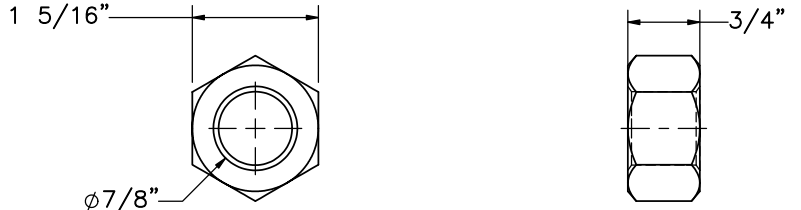



Part h1

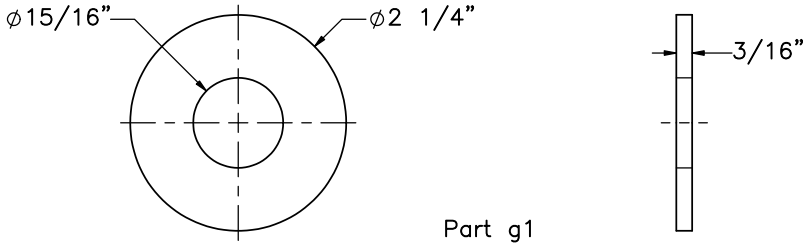

Part h2



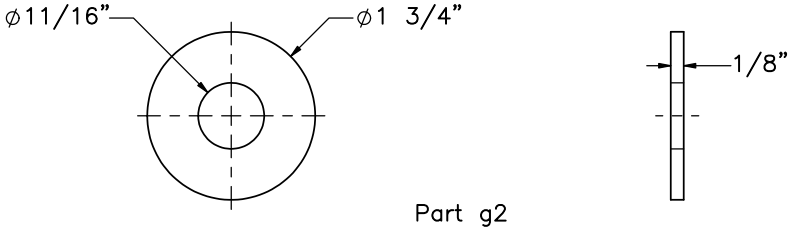

Part h3




Part h4




Part g1




Part g2

| | | | |
|---|---|---|---|
| Midwest Roadside Safety Facility | Hawaii Buried in Backslope Test No. HBIB–3<br>Hardware | | SHEET: 29 of 32 |
| | | | DATE: 5/15/2025 |
| | | | DRAWN BY: JJO/TJC |
| | DWG. NAME. HBIB–3_R6 | SCALE: 1:2<br>UNITS: in. | REV. BY: KAL/AML |

| 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 Bent W–Beam [2.4 deg] | 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'x3' Concrete Block Anchor | Min. f'c = 4,000 psi | – | – |
| c1 | 2 | BCT Timber Post – MGS Height | SYP Grade 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 | 1 | 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,Wahser & 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 |

Midwest Roadside Safety Facility

Hawaii Buried in Backslope

Test No. HBIB–3

Bill of Materials

SHEET: 30 of 32

DATE: 5/15/2025

DRAWN BY: JJO/TJC

DWG. NAME. HBIB–3_R6

SCALE: None

UNITS: in.

REV. BY: KAL/AML

| Item No. | QTY. | Description | Material Specification | Treatment Specification | Hardware Guide |
|---|---|---|---|---|---|
| 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 |
| d3 | 3 | W6x15, 120" Long Steel Post | ASTM A992 Gr. 50 | ASTM A123 | – |
| d4 | 38 | 14 3/16"x8"x5 1/8" Composite Recycled Blockout | Mondo Polymer GB14SH2 or Equivalent | – | – |
| d5 | 27 | 13 5/8" [346] Long, 8"x6"x1/4" [203x152x6] Steel Blockout | ASTM A500 Gr. B | ASTM A123 | – |
| d6 | 2 | 16D Double Head Nail | – | – | – |
| e1 | 3 | 170" Unbent Length #4 Rebar | ASTM A615 Gr. 60 | Epoxy Coated (ASTM A775 or A934) | – |
| e2 | 4 | 30" Long #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 A449 Gr. 5 or equivalent | ASTM A153 or B695 Class 55 or F2329 | FBX16a |
| f3 | 1 | 5/8" Dia. UNC, 2" Long Hex Head Bolt | ASTM A307 Gr. A or equivalent | 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 | 2 | 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 |
| f10 | 6 | 3/4" Dia. UNC, 13" Long Fully Threaded Rod | ASTM A193 Gr. B7 | ASTM A153 of B695 Class 55 or F2329 | – |
| f11 | 6 | 7/8" Dia. UNC, 10" Long Fully Threaded Rod | ASTM A307 Gr. A or equivalent | ASTM A153 of B695 Class 55 or F2329 | – |


Midwest Roadside Safety Facility

Hawaii Buried in Backslope
Test No. HBIB–3

Bill of Materials

SHEET: 31 of 32
DATE: 5/15/2025
DRAWN BY: JJO/TJC
REV. BY: KAL/AML
DWG. NAME. HBIB–3_R6
SCALE: None
UNITS: in.

| Item No. | QTY. | Description | Material Specification | Treatment Specification | Hardware Guide |
|---|---|---|---|---|---|
| g1 | 4 | 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 |
| h1 | 317 | 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 | 2 | 5/8" Dia. UNC Hex Nut | ASTM A563A | ASTM A153 (AASHTO M232) for Class C or ASTM B695 (AASHTO M298) for Class 50 | FNX16a |
| h3 | 6 | 3/4" Dia. UNC Heavy Hex Nut | ASTM A563DH or equivalent | ASMT A153 or B695 Class 55 or F2329 | FNX20b |
| h4 | 8 | 7/8" Dia. UNC Hex Nut | ASTM A563A or equivalent | ASTM A153 (AASHTO M232) for Class C or ASTM B695 (AASHTO M298) for Class 50 | – |
| i1 | 4 | 3/4" 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 | – | – | – |
| j1 | – | Epoxy Adhesive | Min. Bond Strength = 1,450 psi | – | – |
| k1 | – | Soil | – | – | – |

Midwest Roadside Safety Facility

Hawaii Buried in Backslope
Test No. HBIB–3

Bill of Materials

SHEET: 32 of 32
DATE: 5/15/2025
DRAWN BY: JJO/TJC
REV. BY: KAL/AML
DWG. NAME. HBIB–3_R6
SCALE: 1:768
UNITS: in.

System: Hawaii Buried in Backslope

Drawing: HBIB–3

Revision History

| REV. | DATE OF ISSUE | Page | NATURE OF CHANGES | REVIEWER | REVISED BY |
|---|---|---|---|---|---|
| 0 | 10/10/2023 | – | Original drawing created based off of HBIB–2 | – | MM |
| 1 | 10/25/2023 | 8 | Updated elevation view assembly | JCH | MM |
| | | 9 | Updated detail K annotations | | |
| | | 15 | Updated elvation view dimensions | | |
| | | BOM | Moved part d1 to BOM2 | | |
| | | BOM2 | Moved part g1 and h2 to BOM3. Updated part f6 quantity | | |
| | | BOM3 | Organized BOM | | |
| 2 | 10/27/2023 | 1 | Added note 6 and 7. Updated elevation view annotations. | JJO | MM |
| 3 | 11/6/2023 | ALL | Corrected hardware and removed extra parts from folders. | KAL | JJO |
| 4 | 8/21/2024 | 27 | Updated end shoe to reflect correct profile | JJO | JJO |
| 5 | 3/7/2025 | BOM | Updated part b1, d5, f2, f3, f9, f10, f11, h2, h3, and h4 description and material specifications. | AML | TJC |
| 6 | 5/15/2025 | 27 | 10 gauge was 12 gauge | KAL | JJO |
| | | 30 | W–Beam Terminal Connector hardware guide RWE02b was RWE02a | | |