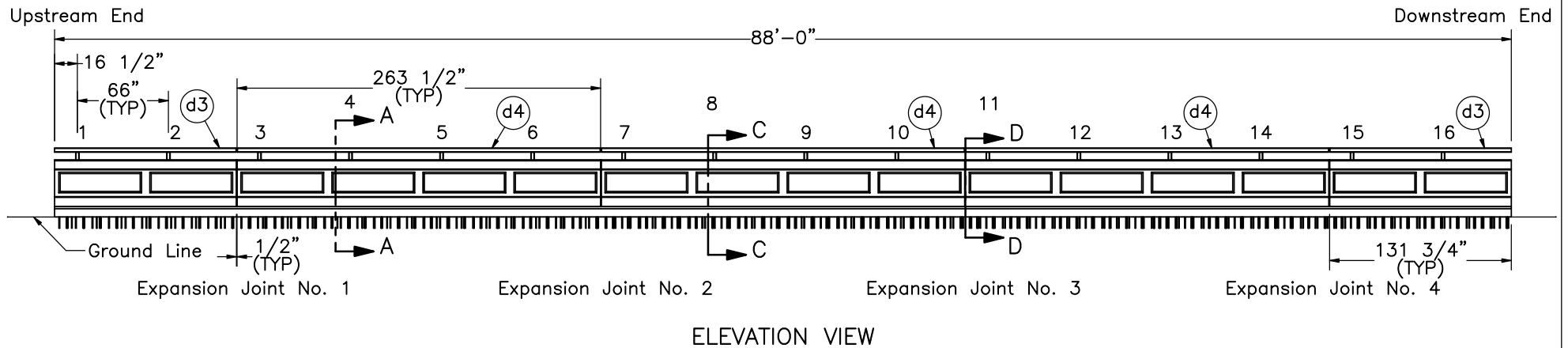
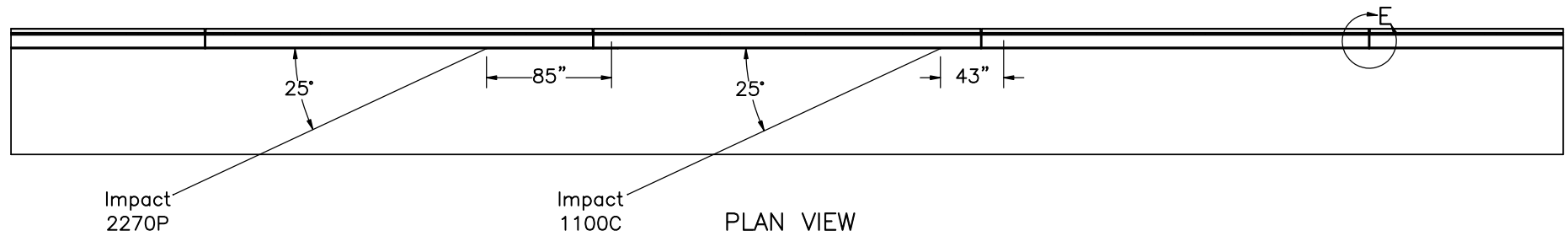




- Notes: (1) Test no. HP34S-1 shall be performed according to test designation no. 3-11 of MASH 2016 criteria.
- (2) The impact location for test no. HP34S-1 is located 85" upstream from the upstream face of post no. 7.
- (3) Test no. HP34S-2 shall be performed according to test designation no. 3-10 of MASH 2016 criteria.
- (4) The impact location for test no. HP34S-2 is located 43" upstream from the upstream face of post no. 11.



Midwest Roadside
Safety Facility

Hawaii 34" Aesthetic
Concrete Bridge Rail with
Sidewalk

Test Nos. HP34S-1-2

System Layout

DWG. NAME.
HP34S_R8

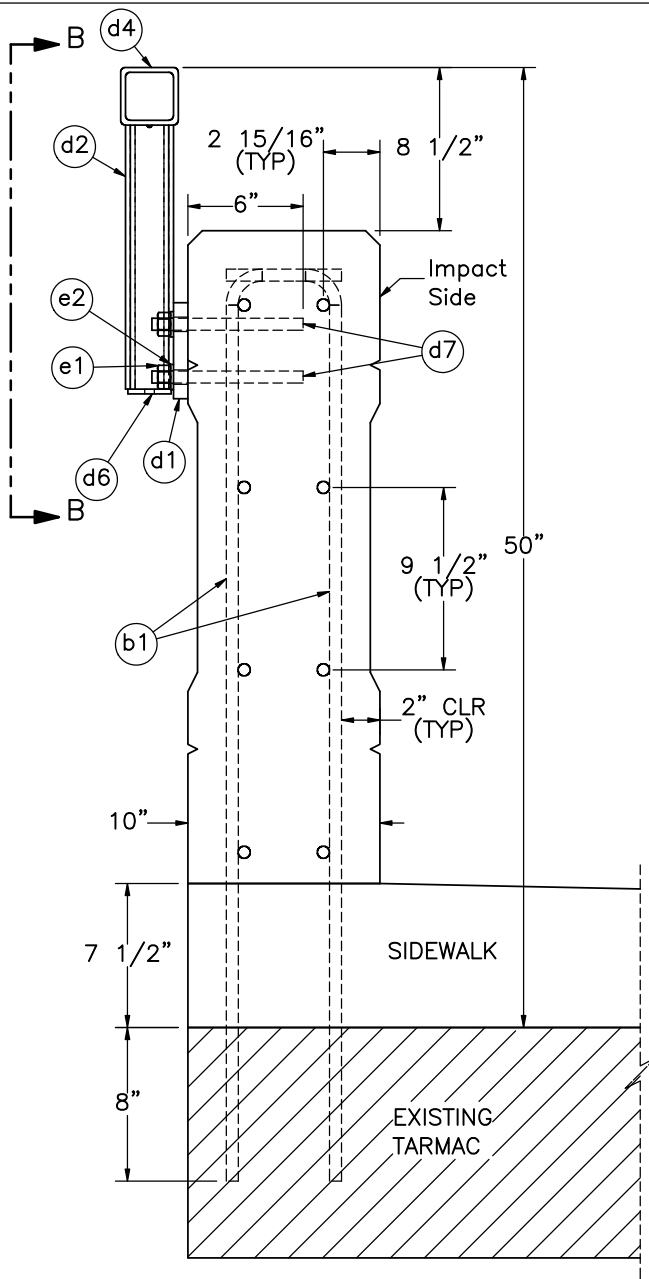
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SHEET:
1 of 17

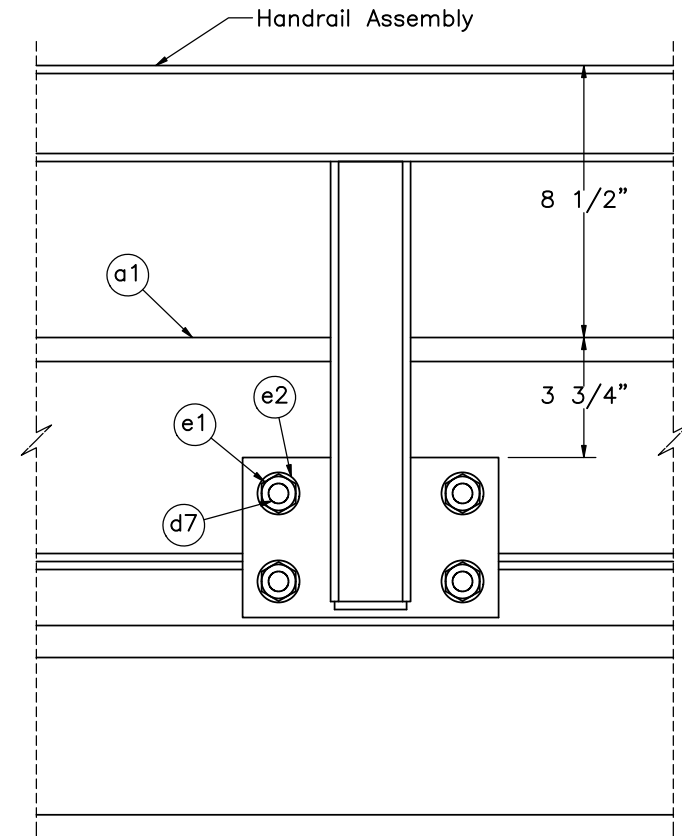
DATE:
11/3/2021

DRAWN BY:
GHR/LJP/KA
L/SBW

REV. BY:
CSS/KAL



SECTION A-A



SECTION B-B
SCALE 1 : 6

- Notes: (1) Drill $\varnothing 3/4$ " holes for threaded rods (part d7). Secure with epoxy adhesive (part c4).
(2) Sidewalk rebar hidden in section A.



Midwest Roadside
Safety Facility

Hawaii 34" Aesthetic
Concrete Bridge Rail with
Sidewalk

Test Nos. HP34S-1-2

Handrail Details

DWG. NAME.
HP34S_R8

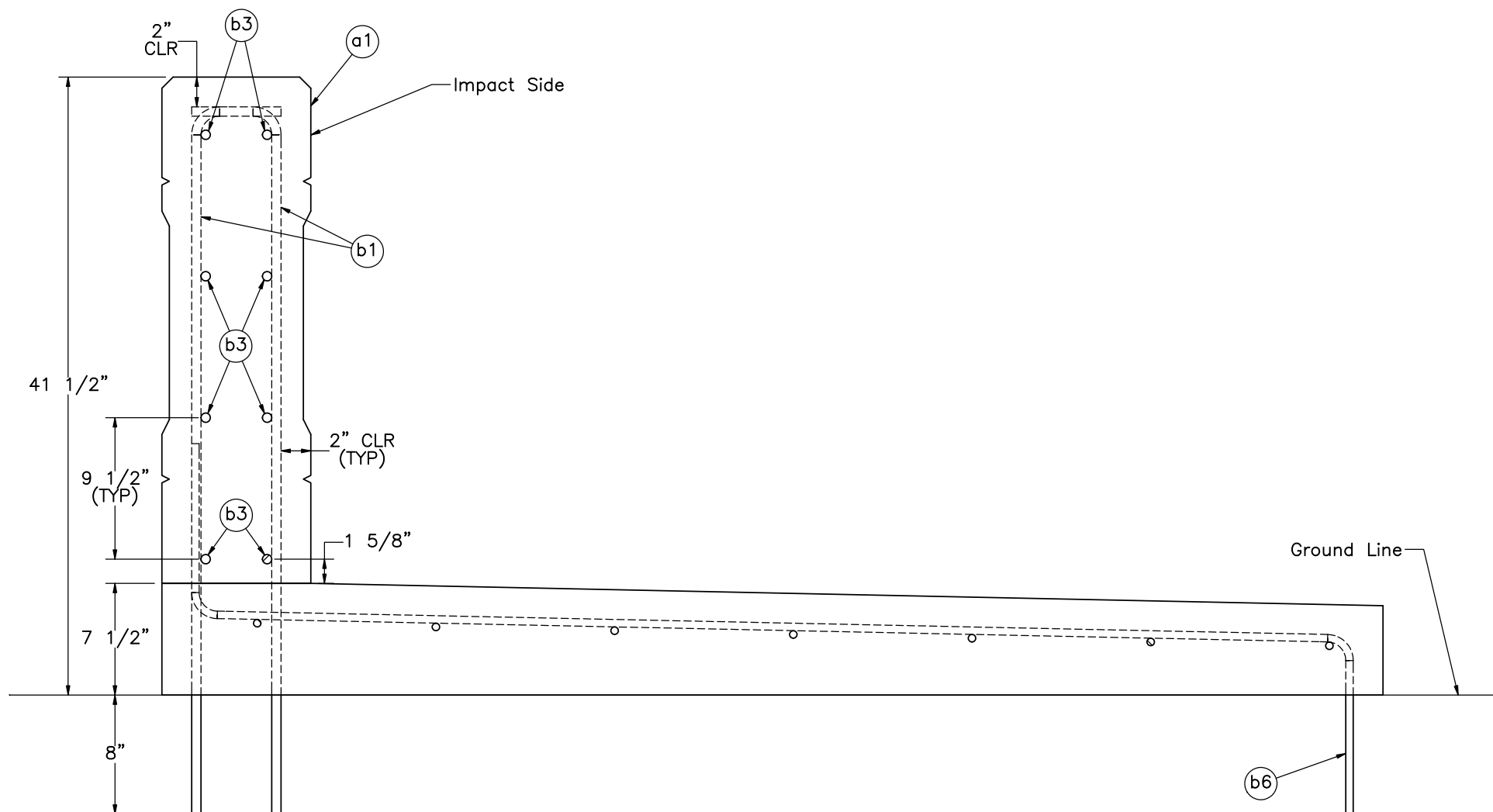
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UNITS: in.

SHEET:
2 of 17

DATE:
11/3/2021

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L/SBW

REV. BY:
CSS/KAL



SECTION C-C
Combined Parapet and Sidewalk Reinforcement

- Notes:
- (1) Handrail not shown.
 - (2) Reinforcement bars no. b1 and b6 is to be anchored into the existing tarmac with Hilti HIT RE-500 V3 (part c4).
 - (3) The lap length is 18" for longitudinal bars.



Midwest Roadside
Safety Facility

Hawaii 34" Aesthetic
Concrete Bridge Rail with
Sidewalk

Test Nos. HP34S-1-2

Parapet Reinforcement Details

DWG. NAME.
HP34S_R8

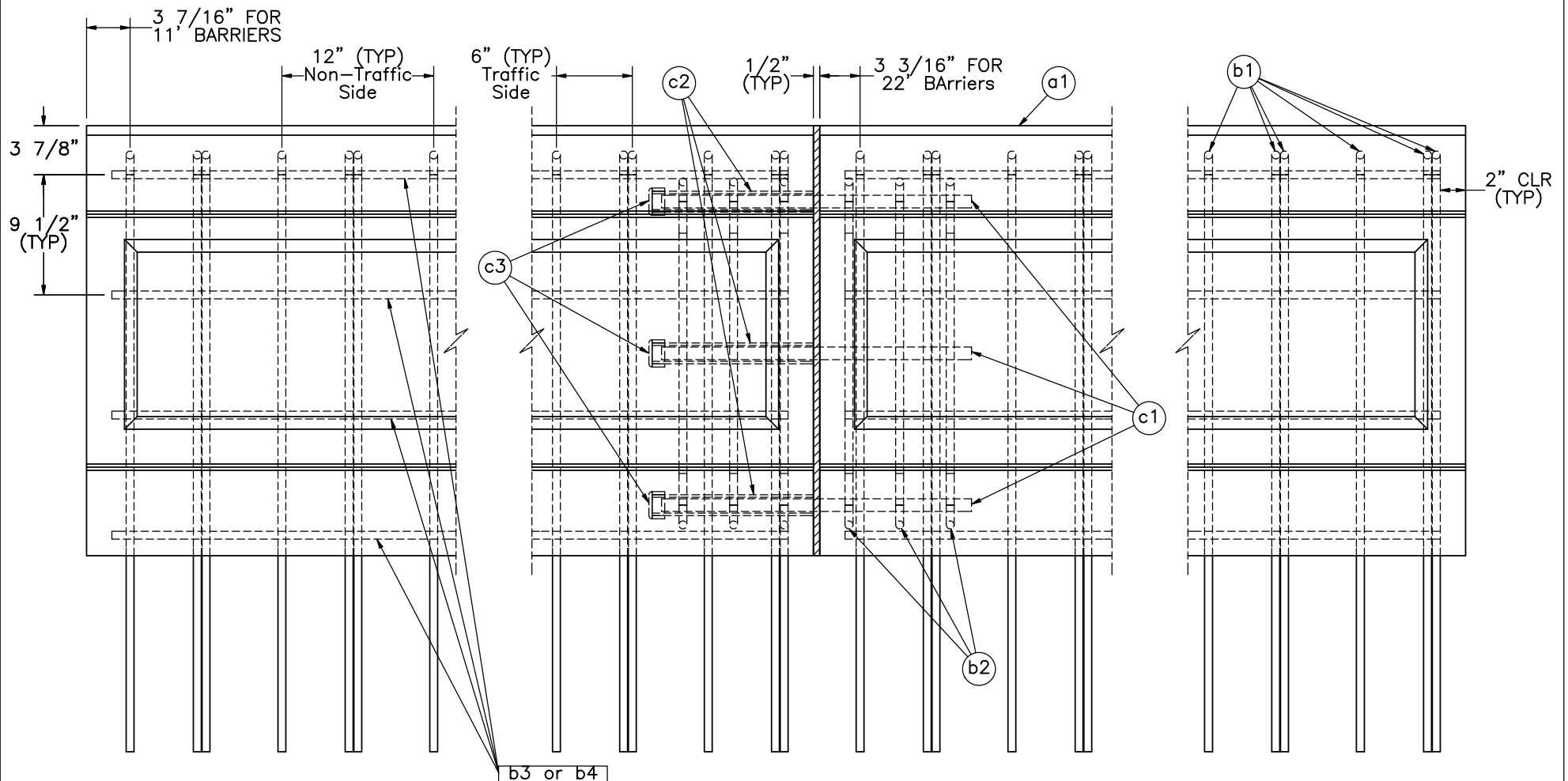
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UNITS: in.

SHEET:
3 of 17

DATE:
11/3/2021

DRAWN BY:
GHR/LJP/KA
L/SBW

REV. BY:
CSS/KAL



ELEVATION VIEW
(Handrail and Sidewalk Hidden from View)

- Notes
- (1) Expansion joint rebar, sidewalk, sidewalk rebar, and handrail not shown.
 - (2) Expansion joint details are shown on page 5.
 - (3) 1/2" expansion joints to be bonded together by premolded joint filler (part c5) and joint sealer (part c6) according to specifications.
 - (4) PVC tubes (parts c2 and c3) are to be cast on the upstream side of expansion joints for testing purposes.



Hawaii 34" Aesthetic Concrete Bridge Rail with Sidewalk

Test Nos. HP34S-1-2

Parapet Reinforcement Detail

DWG. NAME.
HP34S_R8

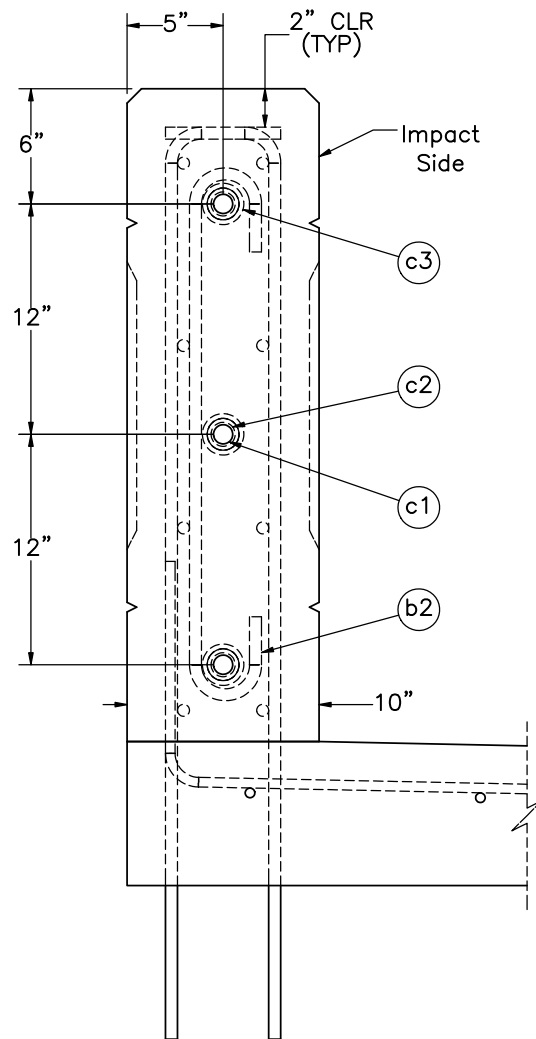
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SHEET:
4 of 17

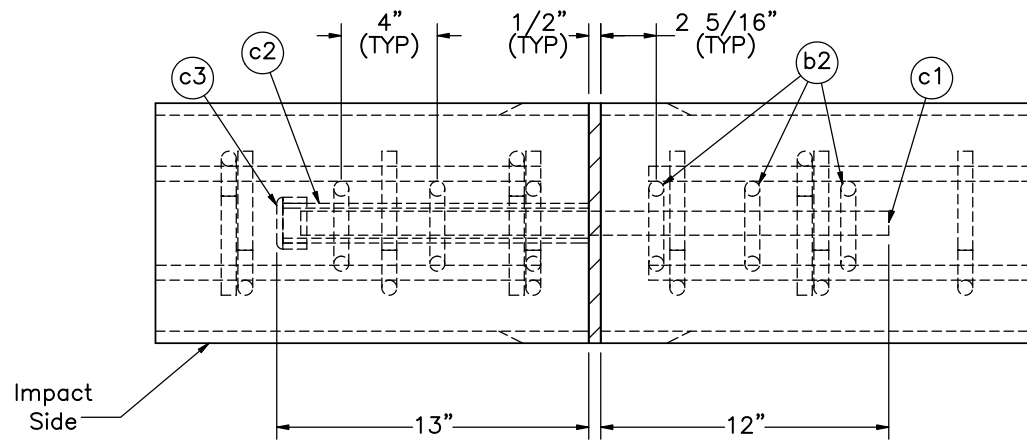
DATE:
11/3/2021

DRAWN BY:
GHR/LJP/KA
L/SBW

REV. BY:
CSS/KAL



SECTION D-D



DETAIL E
(Handrail Hidden From View)
SCALE 1 : 8

- Notes:
- (1) Smooth dowels (part c1) are cast in place on one side of the expansion joint, and inserted into plastic sleeves (part c2), which are cast into the barrier on the other side of the expansion joint.
 - (2) 1/2" expansion joints to be bonded together by premolded joint filler (part c5) and joint sealer (part c6) according to specifications.
 - (3) PVC tubes (parts c2 and c3) are to cast on the upstream side of expansion joints for testing purposes.
 - (4) Handrail not shown.



Midwest Roadside
Safety Facility

Hawaii 34" Aesthetic
Concrete Bridge Rail with
Sidewalk

Test Nos. HP34S-1-2

Expansion Joint Detail

DWG. NAME.
HP34S_R8

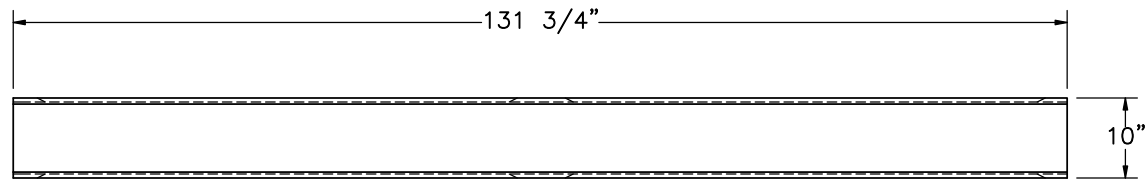
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SHEET:
5 of 17

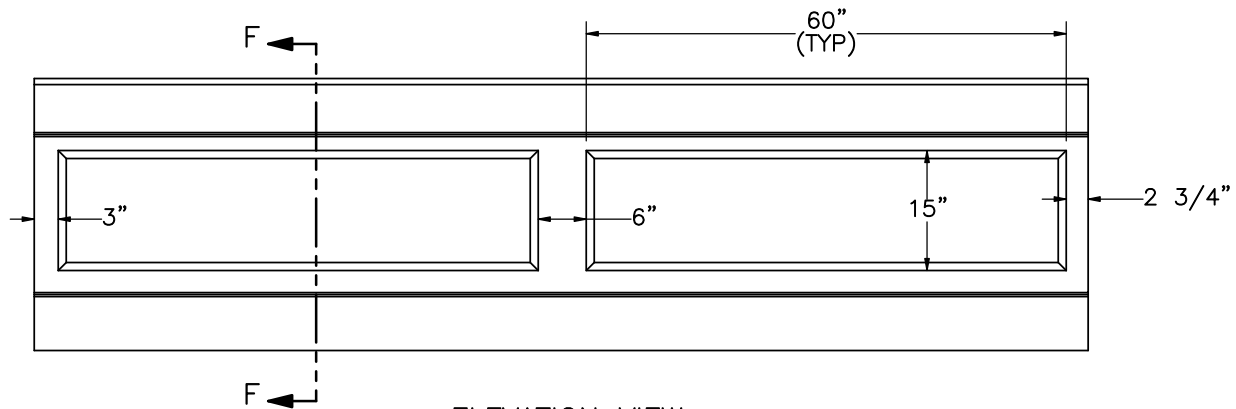
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11/3/2021

DRAWN BY:
GHR/LJP/KA
L/SBW

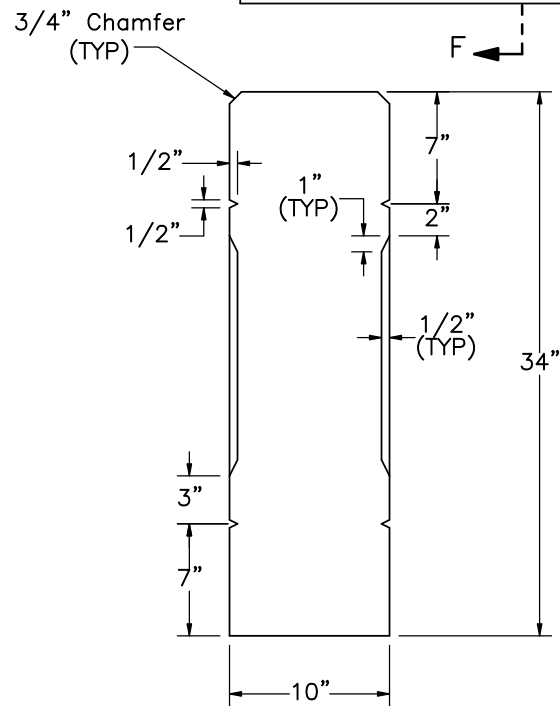
REV. BY:
CSS/KAL



PLAN VIEW



ELEVATION VIEW



SECTION F-F
SCALE 1 : 12



Midwest Roadside
Safety Facility

Hawaii 34" Aesthetic
Concrete Bridge Rail with
Sidewalk

Test Nos. HP34S-1-2

11' Concrete Parapet Details

DWG. NAME.
HP34S_R8

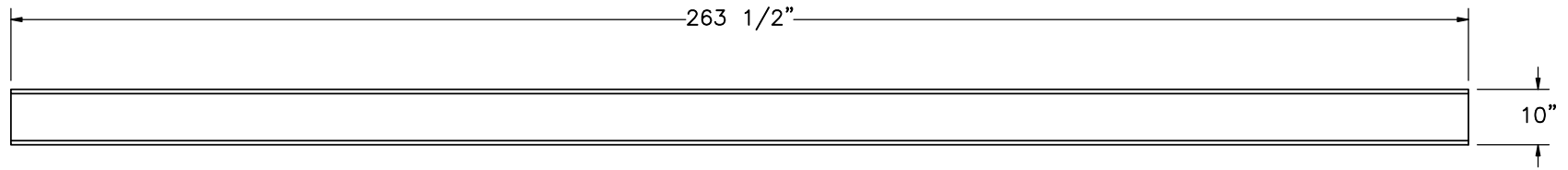
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SHEET:
6 of 17

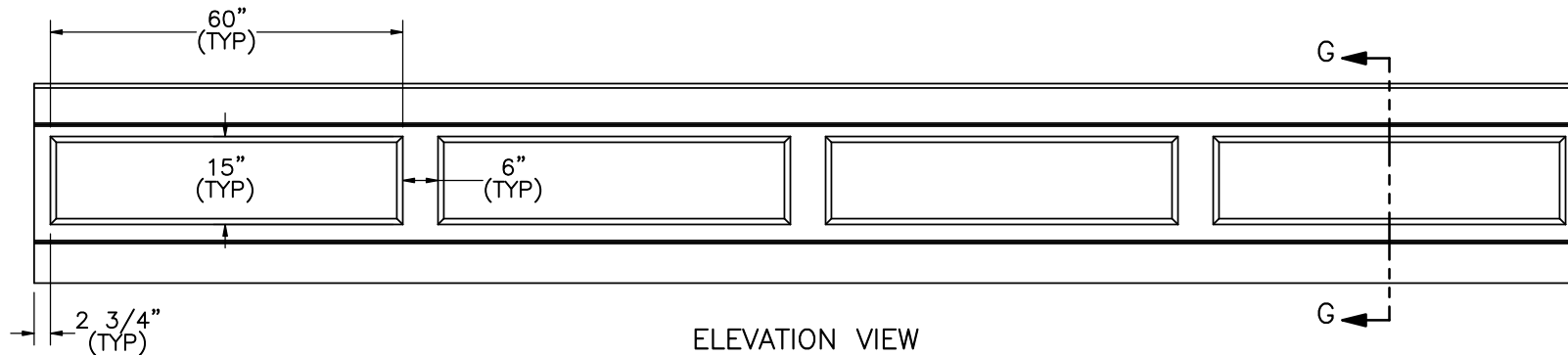
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11/3/2021

DRAWN BY:
GHR/LJP/KA
L/SBW

REV. BY:
CSS/KAL

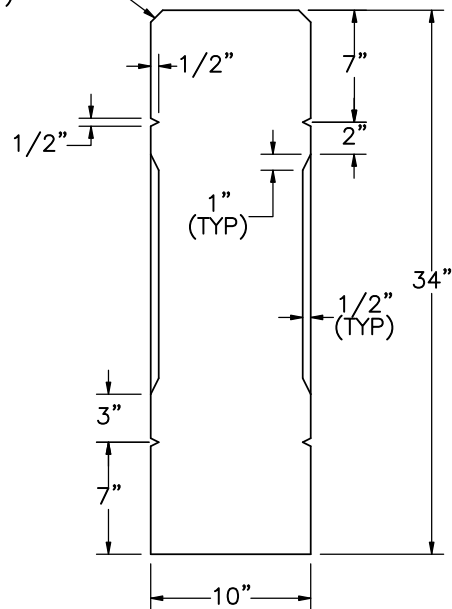


PLAN VIEW



ELEVATION VIEW

3/4" Chamfer (TYP)



SECTION G-G
SCALE 1:12



Midwest Roadside
Safety Facility

Hawaii 34" Aesthetic
Concrete Bridge Rail with
Sidewalk

Test Nos. HP34S-1-2

22' Concrete Parapet Details

DWG. NAME.
HP34S_R8

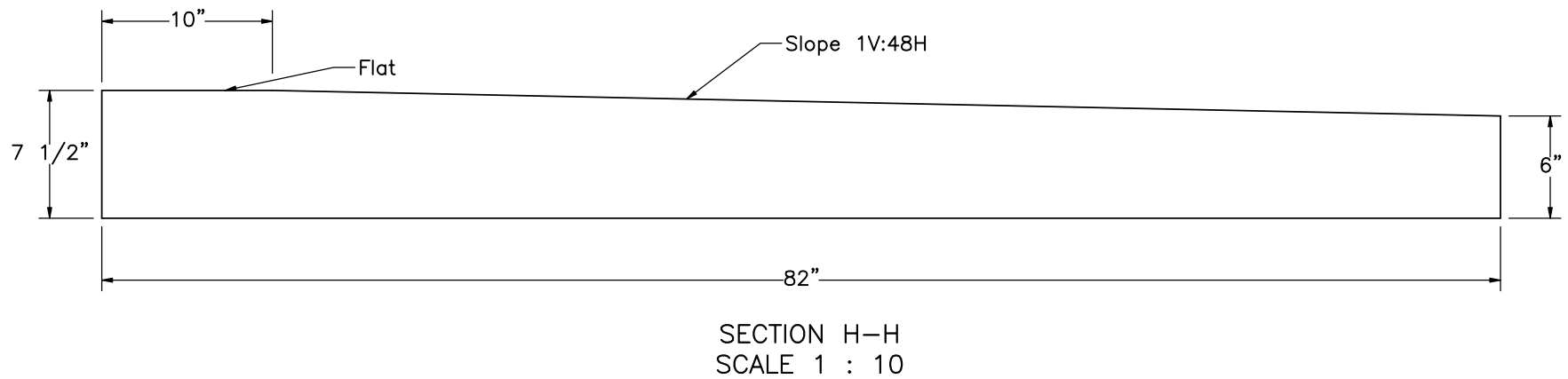
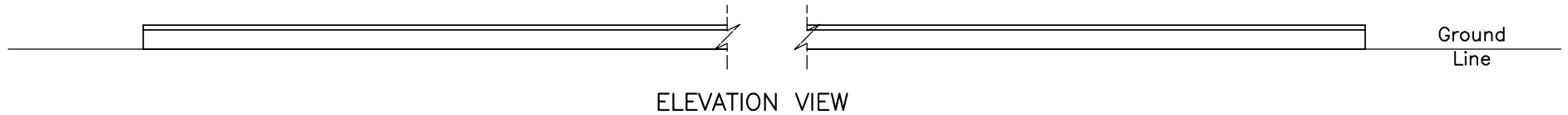
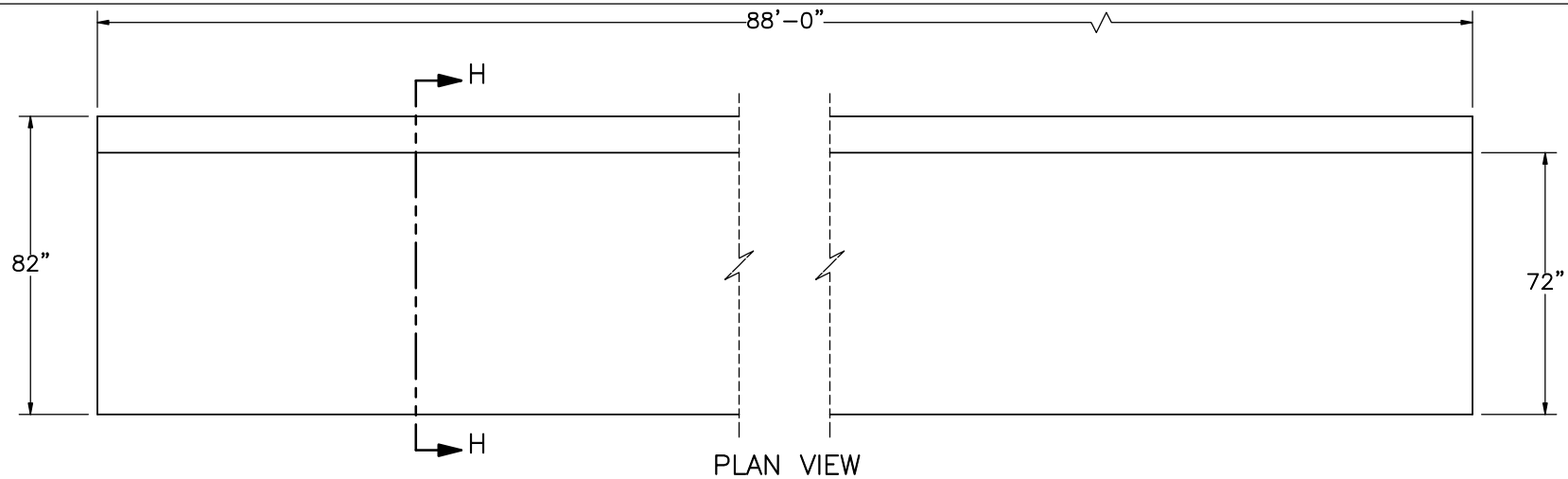
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SHEET:
7 of 17

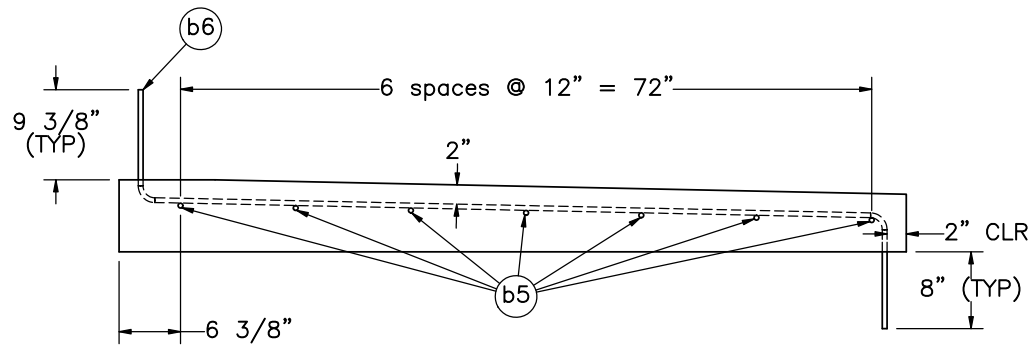
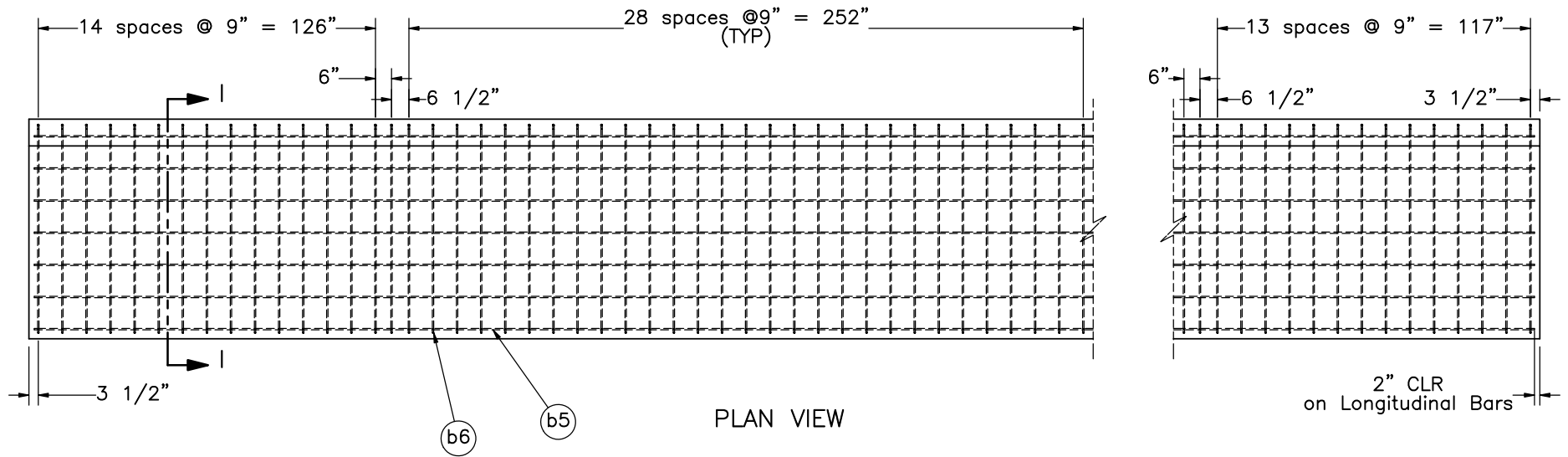
DATE:
11/3/2021

DRAWN BY:
GHR/LJP/KA
L/SBW

REV. BY:
CSS/KAL



	Hawaii 34" Aesthetic Concrete Bridge Rail with Sidewalk		SHEET: 8 of 17
	Test Nos. HP34S-1-2 Sidewalk Details		DATE: 11/3/2021
Midwest Roadside Safety Facility	DWG. NAME: HP34S_R8		DRAWN BY: GHR/LJP/KA L/SBW
	SCALE: 1:50 UNITS: in.		REV. BY: CSS/KAL



Notes: (1) The lap length is 18" for longitudinal bars, and 12" for embedded rebar.



Midwest Roadside
Safety Facility

Hawaii 34" Aesthetic
Concrete Bridge Rail with
Sidewalk

Test Nos. HP34S-1-2

Sidewalk Reinforcement Details

DWG. NAME.
HP34S_R8

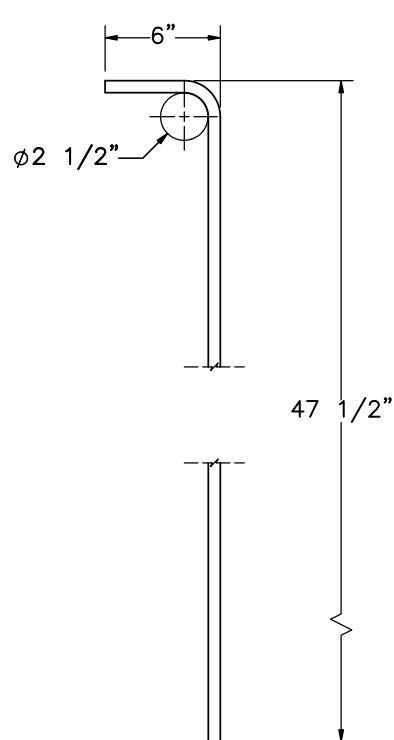
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9 of 17

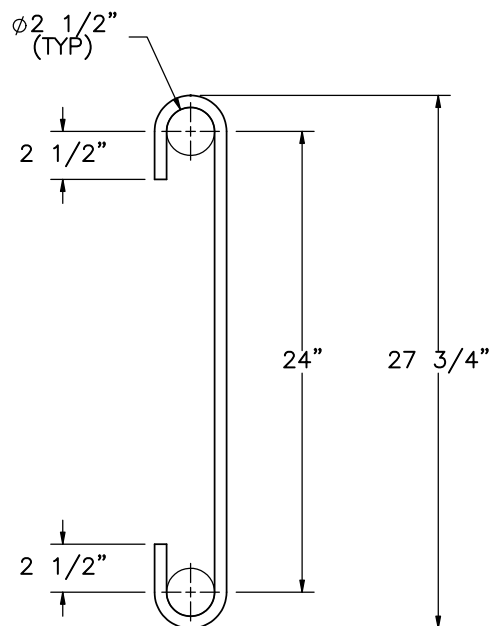
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11/3/2021

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GHR/LJP/KA
L/SBW

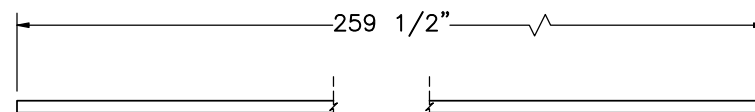
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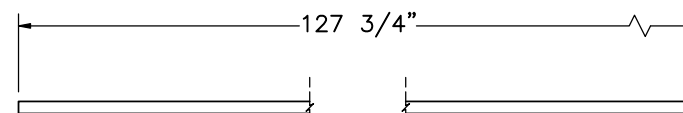
Part b1



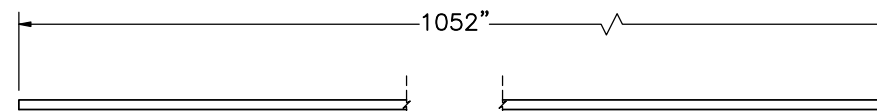
Part b2



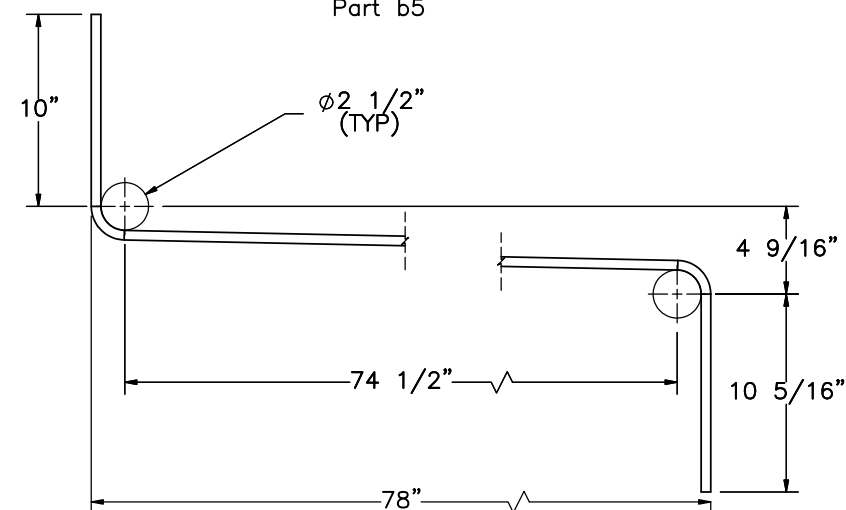
Part b3



Part b4



Part b5



Part b6

- Notes: (1) Reinforced Steel: Deformed and plain carbon steel bars for concrete reinforcement shall meet the requirements of AASHTO M31M/M31-07 Grade 60 (ASTM A615-15a Grade 60).
- (2) Steel reinforcing shall be supported, bent and placed as per AASHTO LRFD Bridge Design Specifications, 7th Edition, 2014 including all interim revisions.

Bill of Bars

Part No.	Bar Size	Qty.	Unbent Length	Material Specification
b1	#5	264	52 1/4"	ASTM A615 Gr. 60
b2	#5	24	38 7/8"	ASTM A615 Gr. 60
b3	#5	24	259 1/2"	ASTM A615 Gr. 60
b4	#5	16	127 3/4"	ASTM A615 Gr. 60
b5	#4	7	1052"	ASTM A615 Gr. 60
b6	#4	122	99 9/16"	ASTM A615 Gr. 60



Midwest Roadside
Safety Facility

Hawaii 34" Aesthetic
Concrete Bridge Rail with
Sidewalk

Test Nos. HP34S-1-2

Rebar Details

DWG. NAME.
HP34S_R8

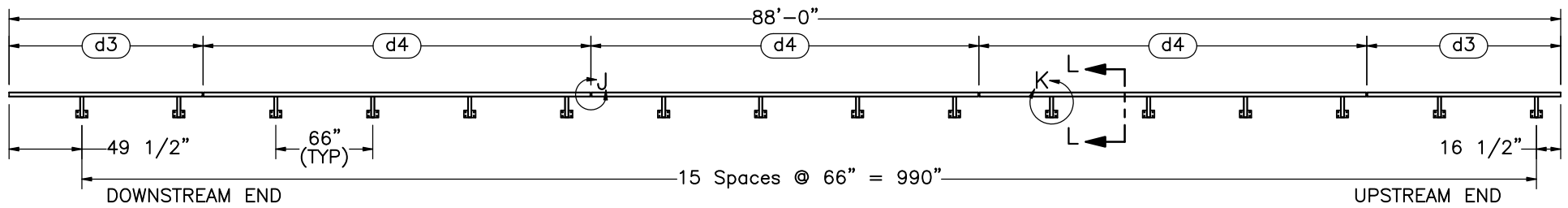
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SHEET:
10 of 17

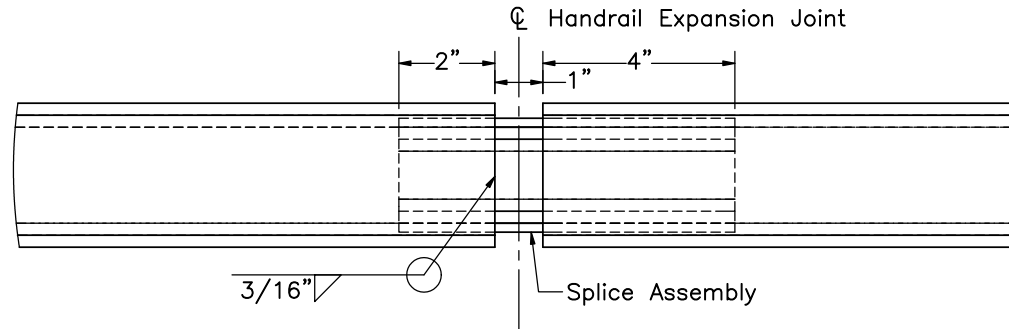
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11/3/2021

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GHR/LJP/KA
L/SBW

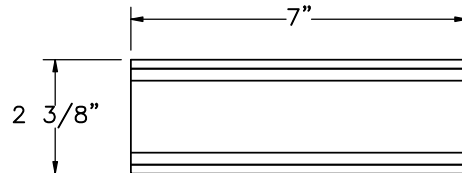
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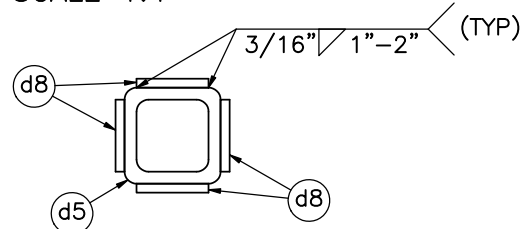
BACKSIDE VIEW



DETAIL J
(TYPICAL SPLICE)
SCALE 1:4



ELEVATION VIEW



PROFILE VIEW

Splice Assembly
SCALE 1:4

- Note: (1) Handrail tubes (parts d3 and d4) should be welded directly to shims (part d8) before galvanization.
(2) Handrail assemblies shall be galvanized according to ASTM A123 after welding.

Item No.	QTY.	Description	Material Specification	Treatment Specification
—	1	Handrail Assembly	—	ASTM A123
d1	16	8"x5"x3/4" Steel Plate	ASTM A36	—
d2	16	HSS 2 1/2"x2 1/2"x1/4", 13 3/4" Long	ASTM A500 Gr. B	—
d3	2	HSS 3"x3"x1/4", 131 1/2" Long	ASTM A500 Gr. B	—
d4	3	HSS 3"x3"x1/4", 263" Long	ASTM A500 Gr. B	—
d5	4	HSS 2"x2"x1/4", 7" Long	ASTM A500 Gr. B	—
d6	16	2 1/4"x2 1/4"x1/4" Steel Plate	ASTM A36	—
d8	16	7"x1 1/2"x3/16" Shim	ASTM A36	—



Midwest Roadside
Safety Facility

Hawaii 34" Aesthetic
Concrete Bridge Rail with
Sidewalk

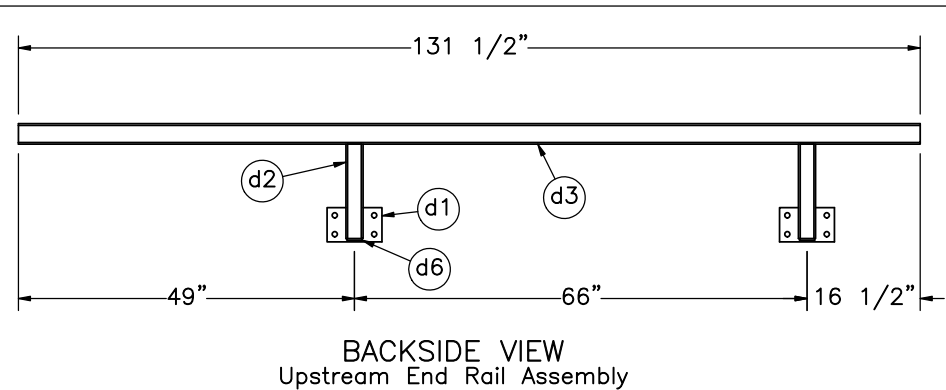
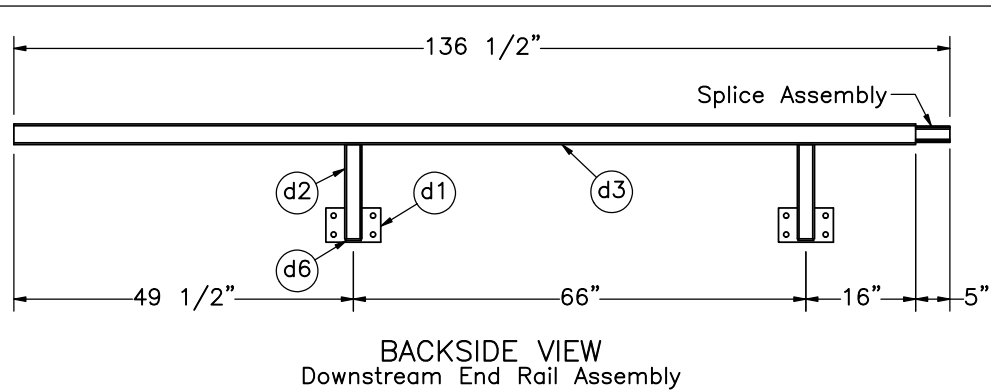
Test Nos. HP34S-1-2

Handrail Assembly

DWG. NAME.
HP34S_R8

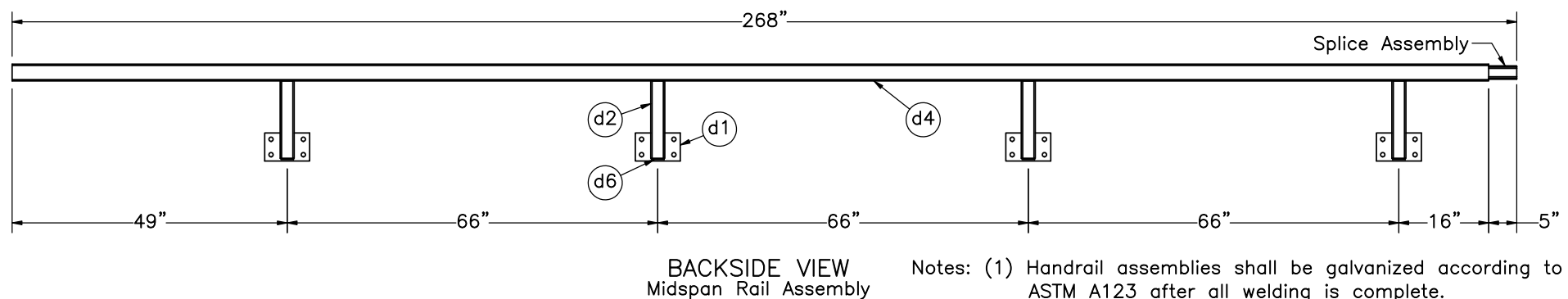
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UNITS: in.

SHEET:
11 of 17
DATE:
11/3/2021
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REV. BY:
CSS/KAL



Item No.	QTY.	Description	Material Specification	Treatment Specification
—	1	Downstream End Rail Assembly	—	ASTM A123
d1	2	8"x5"x3/4" Steel Plate	ASTM A36	—
d2	2	HSS 2 1/2"x2 1/2"x1/4", 13 3/4" Long	ASTM A500 Gr. B	—
d3	1	HSS 3"x3"x1/4", 131 1/2" Long	ASTM A500 Gr. B	—
d5	1	HSS 2"x2"x1/4", 7" Long	ASTM A500 Gr. B	—
d6	2	2 1/4"x2 1/4"x1/4" Steel Plate	ASTM A36	—
d8	4	7"x1 1/2"x3/16" Shim	ASTM A36	—

Item No.	QTY.	Description	Material Specification	Treatment Specification
—	1	Upstream End Rail Assembly	—	ASTM A123
d1	2	8"x5"x3/4" Steel Plate	ASTM A36	—
d2	2	HSS 2 1/2"x2 1/2"x1/4", 13 3/4" Long	ASTM A500 Gr. B	—
d3	1	HSS 3"x3"x1/4", 131 1/2" Long	ASTM A500 Gr. B	—
d6	2	2 1/4"x2 1/4"x1/4" Steel Plate	ASTM A36	—



- Notes: (1) Handrail assemblies shall be galvanized according to ASTM A123 after all welding is complete.
 (2) These Assemblies make up the handrail assembly on sheet 11.

Item No.	QTY.	Description	Material Specification	Treatment Specification
—	3	Midspan Rail Assembly	—	ASTM A123
d4	1	HSS 3"x3"x1/4", 263" Long	ASTM A500 Gr. B	—
d1	4	8"x5"x3/4" Steel Plate	ASTM A36	—
d2	4	HSS 2 1/2"x2 1/2"x1/4", 13 3/4" Long	ASTM A500 Gr. B	—
d6	4	2 1/4"x2 1/4"x1/4" Steel Plate	ASTM A36	—
d5	1	HSS 2"x2"x1/4", 7" Long	ASTM A500 Gr. B	—
d8	4	7"x1 1/2"x3/16" Shim	ASTM A36	—



Midwest Roadside
Safety Facility

Hawaii 34" Aesthetic
Concrete Bridge Rail with
Sidewalk

Test Nos. HP34S-1-2

Handrail Assembly Details

DWG. NAME.
HP34S_R8

SCALE: 1:28
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SHEET:
12 of 17

DATE:
11/3/2021

DRAWN BY:
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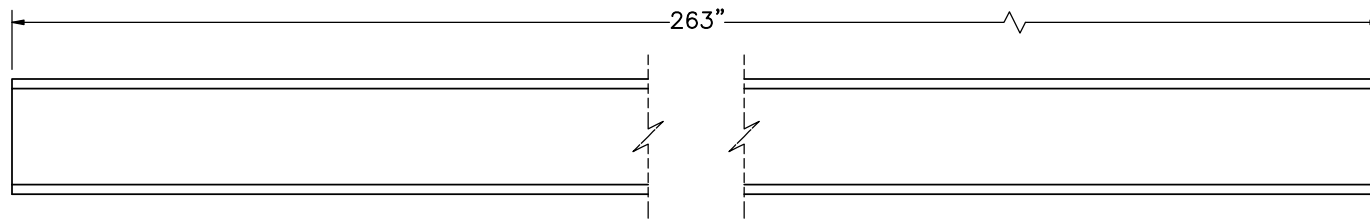
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Test Nos. HP34S-1-2
Handrail Assembly Details

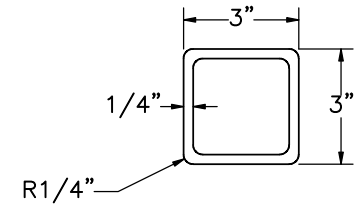
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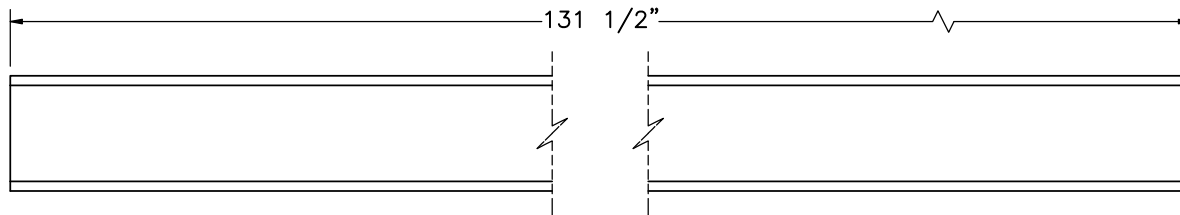


ELEVATION VIEW

Part d4

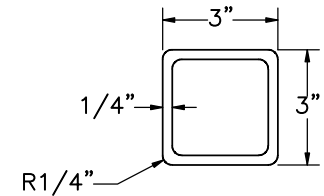


PROFILE VIEW

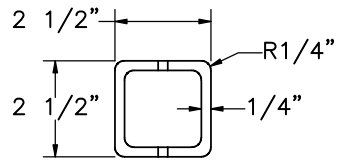


ELEVATION VIEW

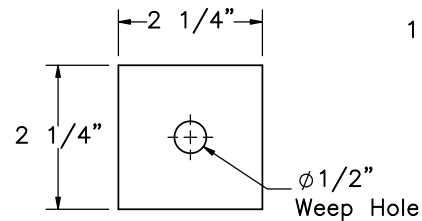
Part d3



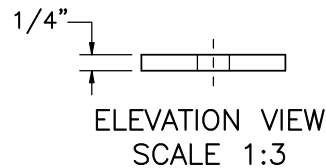
PROFILE VIEW



PLAN VIEW



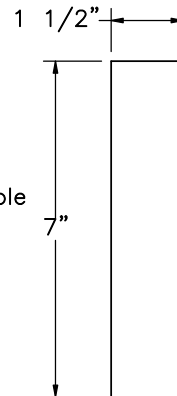
PLAN VIEW



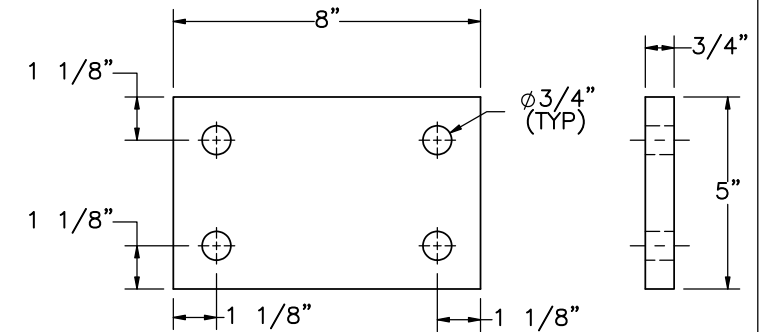
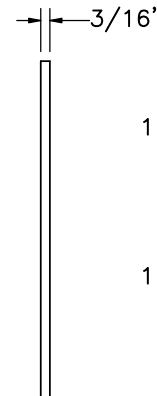
ELEVATION VIEW

SCALE 1:3

Part d6



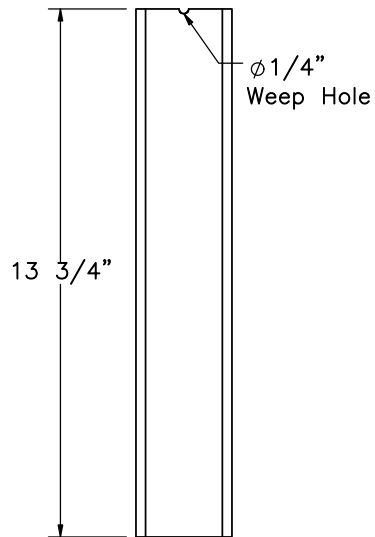
Part d8



ELEVATION VIEW

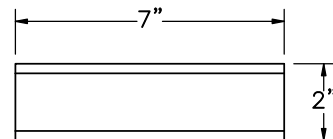
PROFILE VIEW

Part d1



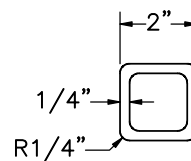
ELEVATION VIEW

Part d2



ELEVATION VIEW

Part d5



PROFILE VIEW



Midwest Roadside
Safety Facility

Hawaii 34" Aesthetic
Concrete Bridge Rail with
Sidewalk

Test Nos. HP34S-1-2

Handrail Components

DWG. NAME.
HP34S_R8

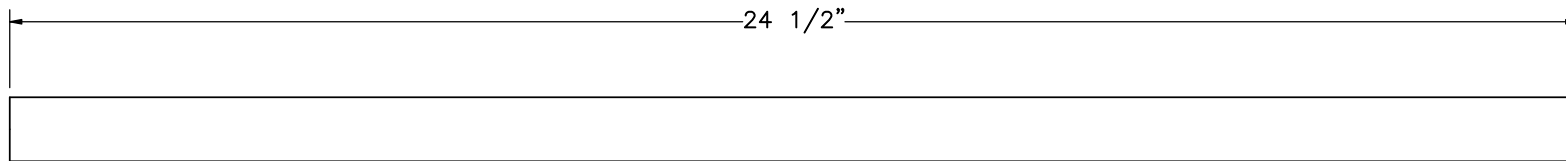
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SHEET:
14 of 17

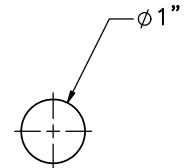
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11/3/2021

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L/SBW

REV. BY:
CSS/KAL

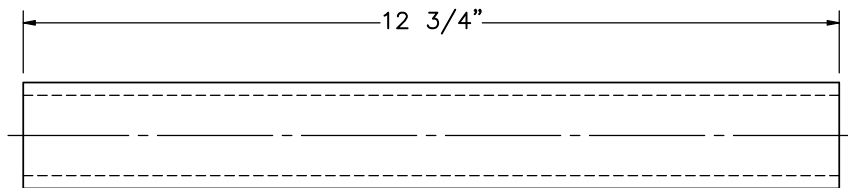


ELEVATION VIEW

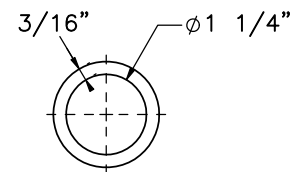


PROFILE VIEW

Part c1

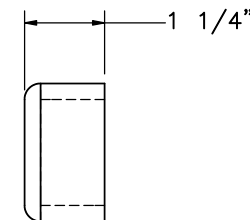


ELEVATION VIEW

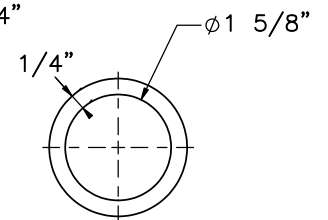


PROFILE VIEW

Part c2



ELEVATION VIEW



PROFILE VIEW

Part c3



Midwest Roadside
Safety Facility

Hawaii 34" Aesthetic
Concrete Bridge Rail with
Sidewalk

Test Nos. HP34S-1-2

Concrete Parapet Expansion
Joint Components

DWG. NAME:
HP34S_R8

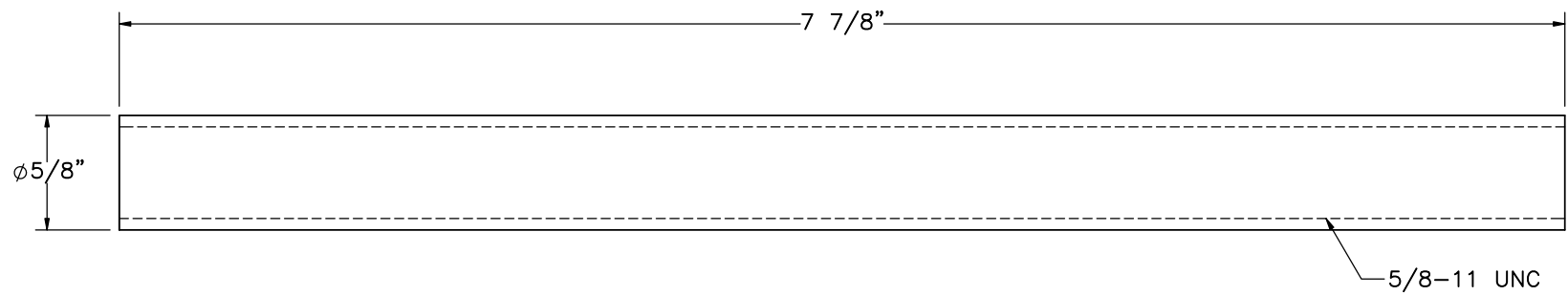
SCALE: 1:3
UNITS: in.

SHEET:
15 of 17

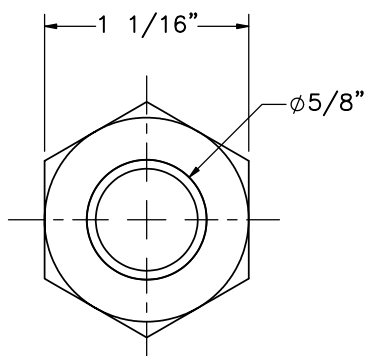
DATE:
11/3/2021

DRAWN BY:
GHR/LJP/KA
L/SBW

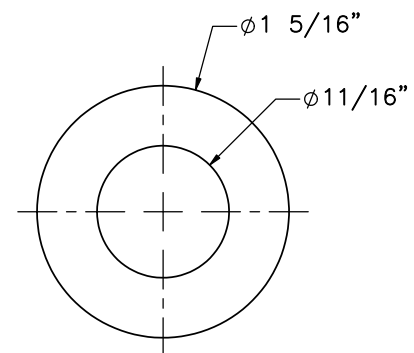
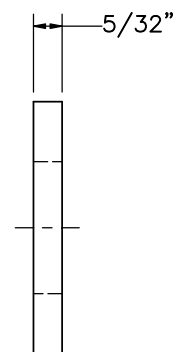
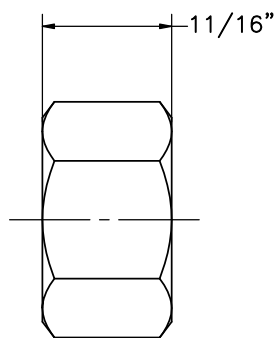
REV. BY:
CSS/KAL



Part d7



Part e1



Part e2



Midwest Roadside
Safety Facility

Hawaii 34" Aesthetic
Concrete Bridge Rail with
Sidewalk

Test Nos. HP34S-1-2

Hardware

DWG. NAME.
HP34S_R8

SCALE: 1:1
UNITS: in.

SHEET:
16 of 17

DATE:
11/3/2021

DRAWN BY:
GHR/LJP/KA
L/SBW

REV. BY:
CSS/KAL

Item No.	QTY.	Description	Material Specification	Treatment Specification	Hardware Guide
a1	—	Concrete*	Min. f'c = 4,000 psi	—	—
b1	264	#5 Rebar, 52 1/4" Total Unbent Length	ASTM A615 Gr. 60	Epoxy Coated (ASTM A775 or A934)	—
b2	24	#5 Rebar, 38 7/8" Total Unbent Length	ASTM A615 Gr. 60	Epoxy Coated (ASTM A775 or A934)	—
b3	24	#5 Rebar, 259 1/2" Total Length	ASTM A615 Gr. 60	Epoxy Coated (ASTM A775 or A934)	—
b4	16	#5 Rebar, 127 3/4" Total Length	ASTM A615 Gr. 60	Epoxy Coated (ASTM A775 or A934)	—
b5	7	#4 Rebar, 1095 1/2" Total Length	ASTM A615 Gr. 60	Epoxy-Coated (ASTM A775 or A934)	—
b6	122	#4 Rebar, 99 9/16" Unbent Length	ASTM A615 Gr. 60	Epoxy-Coated (ASTM A775 or A934)	—
c1	12	#8 Smooth Rebar, 24 1/2" Long	ASTM A615 Gr. 60	Epoxy Coated (ASTM A775 or A934)	—
c2	12	1 1/4" Dia. PVC Pipe	Schedule 80 PVC Gr. 12454	—	—
c3	12	1 1/4" Dia. PVC End Cap	Schedule 80 PVC Gr. 12454	—	—
c4	—	Epoxy Adhesive	Hilti HIT RE-500 V3	—	—
c5	—	Expansion Joint Filler	AASHTO M33, M153, or M213	—	—
c6	—	Expansion Joint Sealant	AASHTO M173, M282, M301, ASTM D3581, or ASTM D5893	—	—
d1	16	8"x5"x3/4" Steel Plate	ASTM A36	—	—
d2	16	HSS 2 1/2"x2 1/2"x1/4", 13 3/4" Long	ASTM A500 Gr. B	—	—
d3	2	HSS 3"x3"x1/4", 131 1/2" Long	ASTM A500 Gr. B	—	—
d4	3	HSS 3"x3"x1/4", 263" Long	ASTM A500 Gr. B	—	—
d5	4	HSS 2"x2"x1/4", 7" Long	ASTM A500 Gr. B	—	—
d6	16	2 1/4"x2 1/4"x1/4" Steel Plate	ASTM A36	—	—
d7	64	5/8"-11 UNC, 7 7/8" Long Threaded Rod	ASTM F1554-15 Gr. 105	ASTM F2329	—
d8	16	7"x1 1/2"x3/16" Shim	ASTM A36	—	—
e1	64	5/8"-11 UNC Heavy Hex Nut	ASTM A563-15 Grade DH	ASTM F2329	FNX16b
e2	64	5/8" Dia. Hardened Washer	ASTM F436	ASTM F2329	FWC16b

* NE Mix 47BIS/1PF4000 HW was used for testing purposes.



Midwest Roadside
Safety Facility

Hawaii 34" Aesthetic
Concrete Bridge Rail with
Sidewalk

Test Nos. HP34S-1-2

Bill of Materials

DWG. NAME.
HP34S_R8

SCALE: None
UNITS: in.

SHEET:
17 of 17

DATE:
11/3/2021

DRAWN BY:
GHR/LJP/KA
L/SBW

REV. BY:
CSS/KAL

REV.	DATE OF ISSUE	Page	NATURE OF CHANGES	REVIEWER	REVISED BY
0	12/7/2020	—	Drawing created from HP34 system. Sidewalk was added, using HP42S as a model.	—	GHR
1	12/8/2020	2	Added: handrail note.		GHR
		3&4	Moved pages 3&4 to after page 8. Renamed pages.		
		6	Re-dimensioned Section E.		
		10	Unhid rebar in Section H & Detail I. Hid handrail plate in Detail I. Removed note on hiding rebar. Added dimension for joint stirrup rebar placement.		
		11	Renamed sheet. Fixed part numbers.		
		12 to 16	Changed font size for part descriptions.		
		13	Corner filets measured in radii, not diameters.		
		14	Rescaled Rebar.		
2	12/11/2020	2	Handrail height changed to 50".	CSS	LJP
		5	Reduced parapet height from 36" to 34".		
		6	Reduced parapet height from 36" to 34".		
		8	Some dimensions changed due to change in parapet height.		
		14	Shortened bars b1 and b6 by 2".		
4	2/17/2021	9	Fixed upstream/downstream assembly labels.	CSS/JCH	LJP
		11	Added views of new splice assembly with shims. Added notes 1 and 2.		
		12	Added galvanization specification to rail assemblies. Added note 1.		
		13	Edited splice tube dimensions. Added views of new shims (part d8).		
		BOM	Fixed part c1 description.		
5	3/10/2021	11	Fixed stitch weld note. Added "before galvanization" to note 1. Added section L.	CSS	LJP
		12	New sheet showing handrail weld details and weep holes. Added new welds to top and bottom of plate.		
		14	Added weep holes to parts d2 and d6.		

System: Hawaii 34" Aesthetic Concrete BR
with Sidewalk
Drawing: HP34S

Revision History

6	5/21/2021	1	Corrected Post Label Fonts	CSS/KAL	GHR
		2,5,6,10	Added Width Dimension to concrete barrier		
7	10/6/2021	1	Added second test. Added labels to concrete sections in plan view, Labeled expansion joints. Added notes for Test no. 2	CSS	SBW
		7, 9, 11, 13	Added notes to detail the upstream and downstream ends of the assemblies.		
		BOM	Added concrete note. Updated Material spec for part a1.		
8	11/3/2021	All	Reordered pages. Removed page detailing backside view of parapet-rail assembly. Reorder detail and section views	JCH/RN/KAL	SBW
		1	Removed section detailing on plan view. Added dimensions to elevation view, moved detail F to plan view.		
		2	Added dimensions and labels to section A, detailed tarmac.		
		4	Changed views to look like page 3 of H34BR-1-2. Added notes 3-4.		
		5	Added note 3, renamed previous note 3 to note 4. Changed detail I to look like detail F of H34BR-1-2, added additional dimensions and details to section E.		
		11	Added dimensions and removed arrows from notation in backside view. Edited notation on Detail L and backside view of handrail.		
		12	Removed Upstream/Downstream notation from all views. Added part bubbles to midspan rail assembly. Added note 2. Changed sheet label.		
		15	Changed sheet label.		