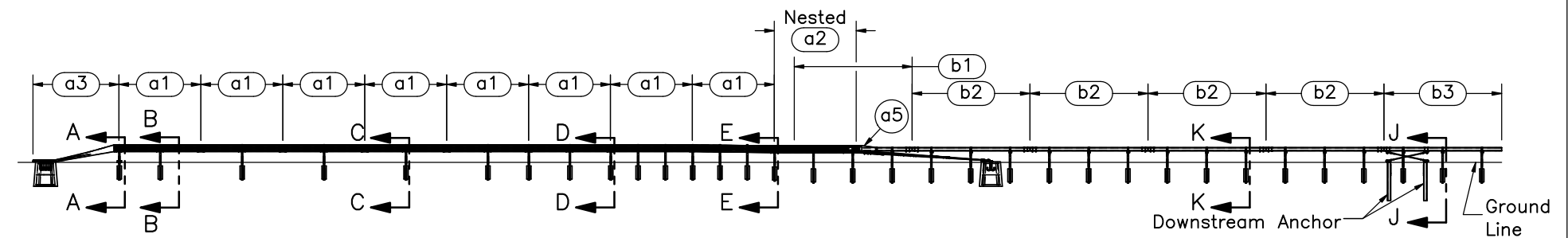


PLAN VIEW



ELEVATION VIEW

- Notes: (1) Test shall be performed according to test designation no. 3-21 using MASH 2016 criteria.
 (2) The impact location is 8' [2,438] upstream from the leading edge of the box beam.
 (3) Critical region is located between post nos. 7 and 24.
 (4) Downstream anchor posts are placed in $\phi 3'$ [914] holes, then backfilled and tamped with soil.



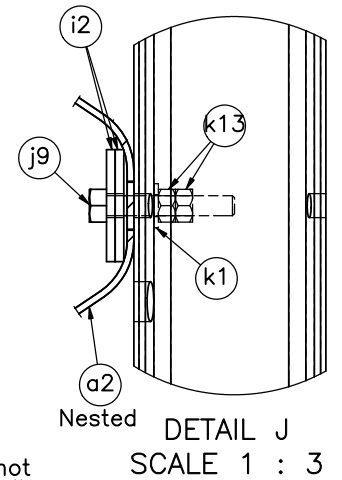
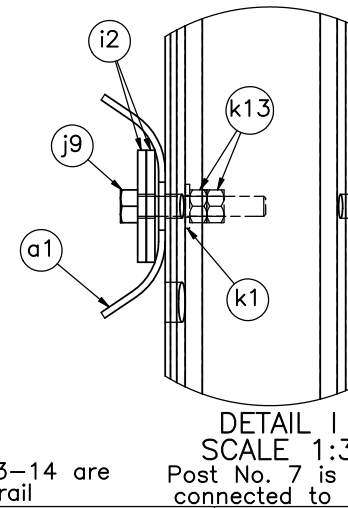
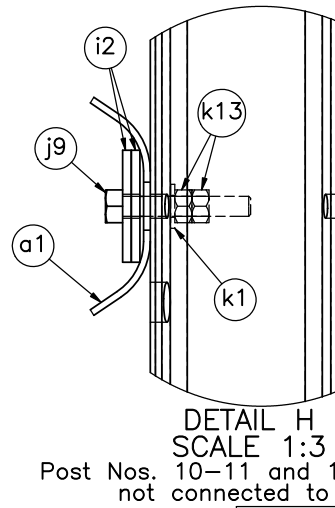
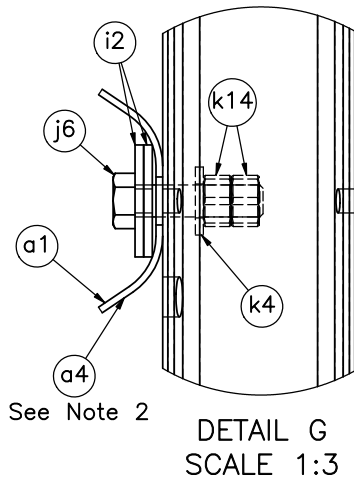
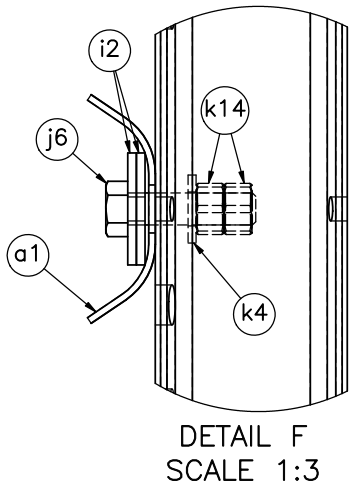
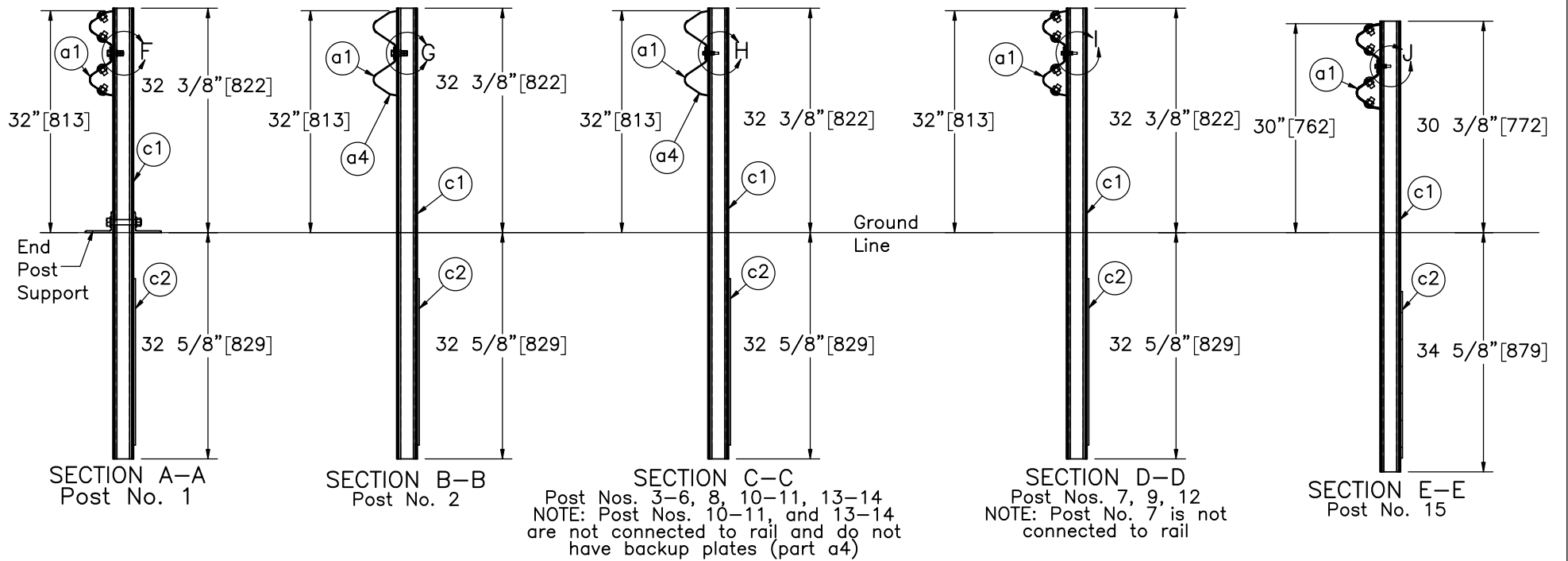
Midwest Roadside Safety Facility

NY Box Beam to Weak Post
 W-Beam Transition
 Test No. NYBWT-3
 System Layout

DWG. NAME:
 NYBWT-3_R2

SCALE: 1:280
 UNITS: in.[mm]

SHEET:
 1 of 34
 DATE:
 10/31/2023
 DRAWN BY:
 GRL/JRD/JJ
 O
 REV. BY:
 KAL



Note: (1) Guardrail bolts (parts j6 and j9) on the upstream side of the web.
(2) W-Beam back up plate (part no. a4) used on Posts 26, 28-32.



Midwest Roadside Safety Facility

NY Box Beam to Weak Post

W-Beam Transition

Test No. NYBWT-3

W-Beam Post Sections

DWG. NAME:
NYBWT-3_R2

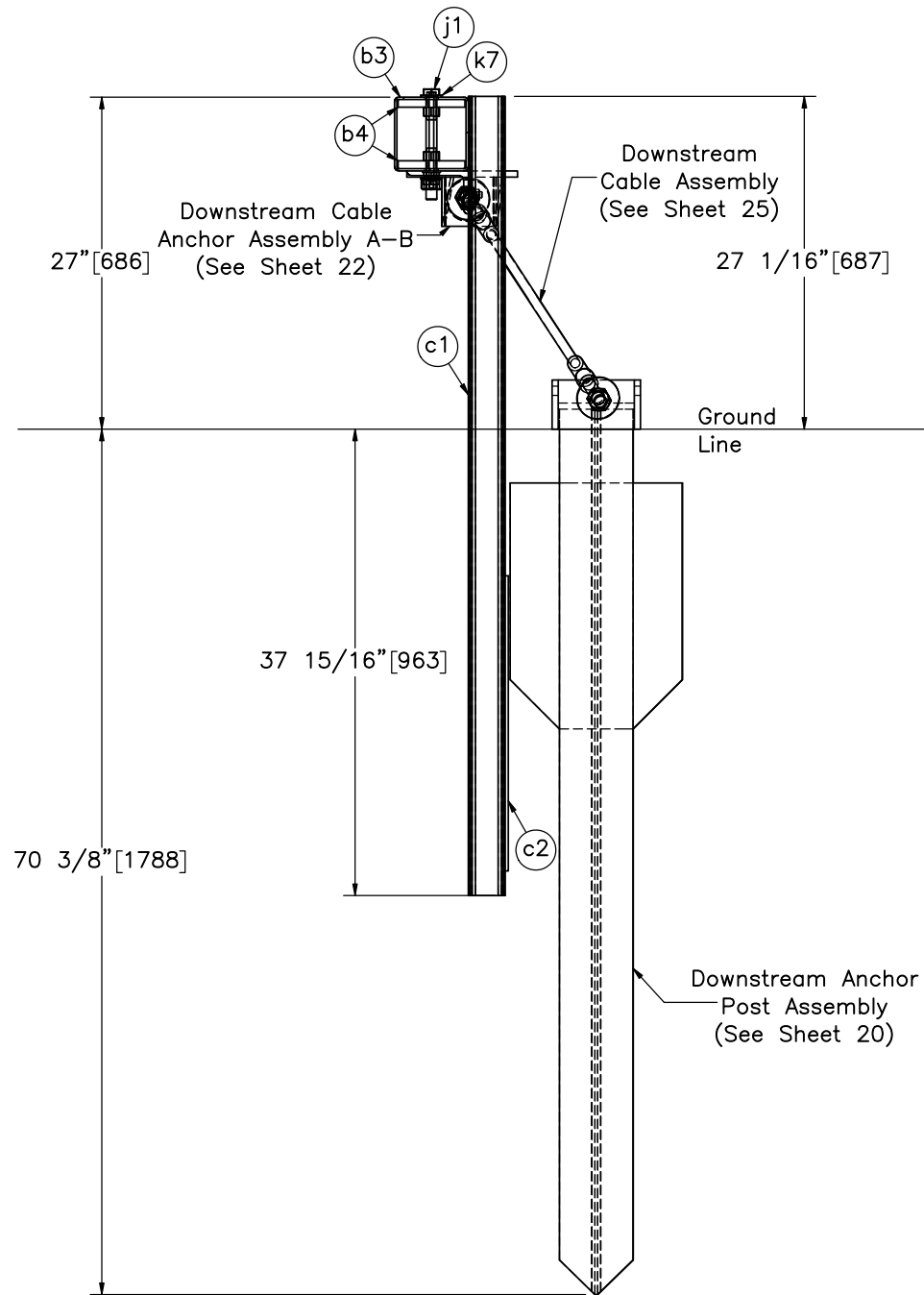
SCALE: 1:22
UNITS: in.[mm]

SHEET:
2 of 34

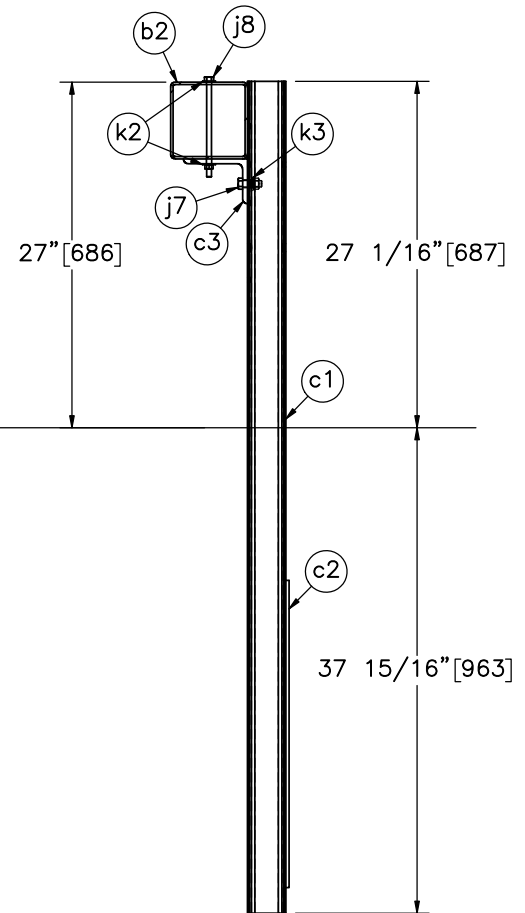
DATE:
10/31/2023

DRAWN BY:
GRL/JRD/JJ
O

REV. BY:
KAL




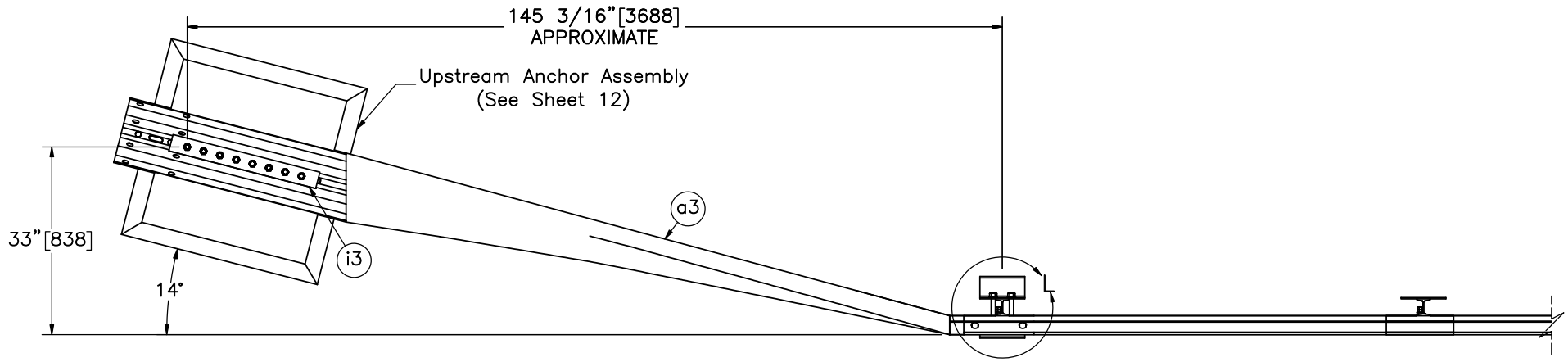
SECTION J-J



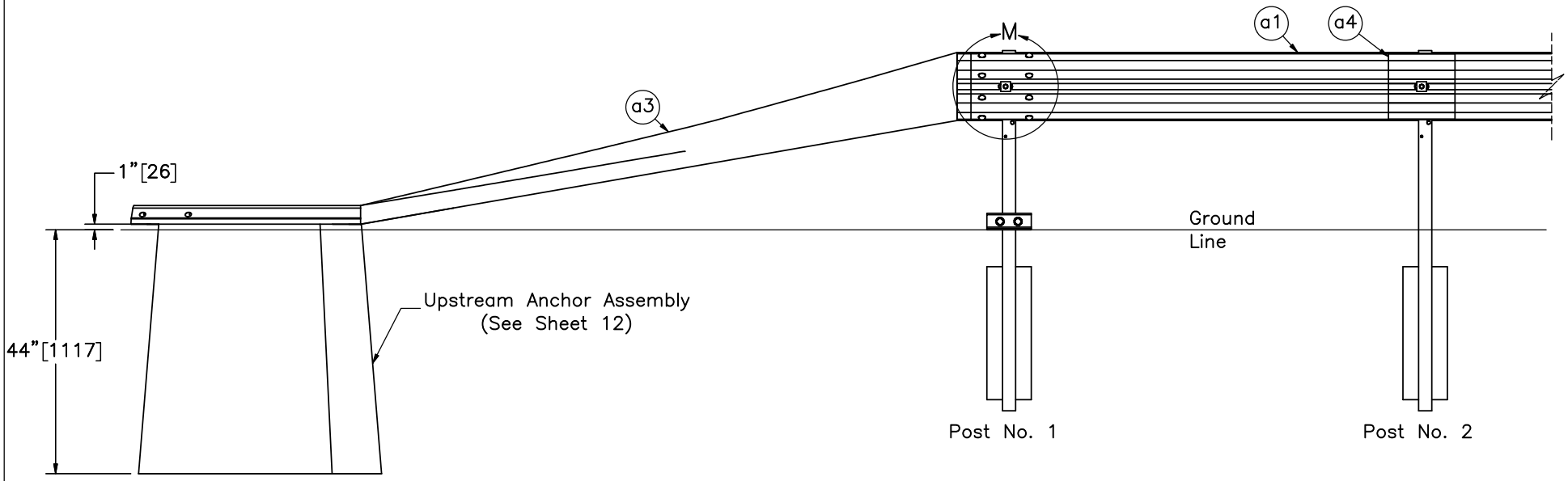
SECTION K-K

Note: (1) Box beam post bolts (part j7) on the upstream side of the web.

	NY Box Beam to Weak Post W-Beam Transition Test No. NYBWT-3		SHEET: 3 of 34
	Box Beam Post Sections		DATE: 10/31/2023
Midwest Roadside Safety Facility		DWG. NAME: NYBWT-3_R2	DRAWN BY: GRL/JRD/JJ O
		SCALE: 1:15 UNITS: in.[mm]	REV. BY: KAL



PLAN VIEW



ELEVATION VIEW



Midwest Roadside
Safety Facility

NY Box Beam to Weak Post
W-Beam Transition
Test No. NYBWT-3

Upstream Anchorage Details

DWG. NAME:
NYBWT-3_R2

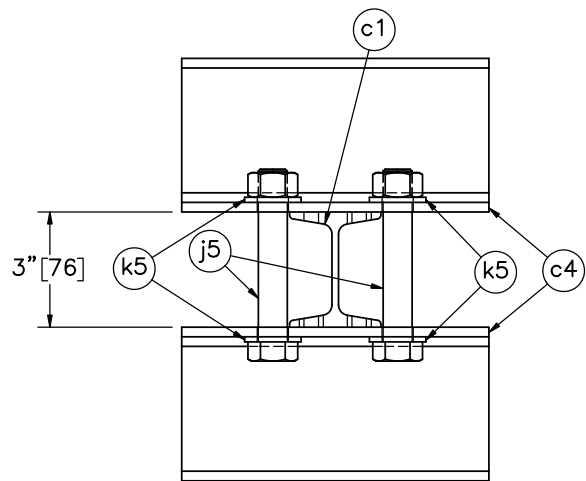
SCALE: 1:28
UNITS: in.[mm]

SHEET:
4 of 34

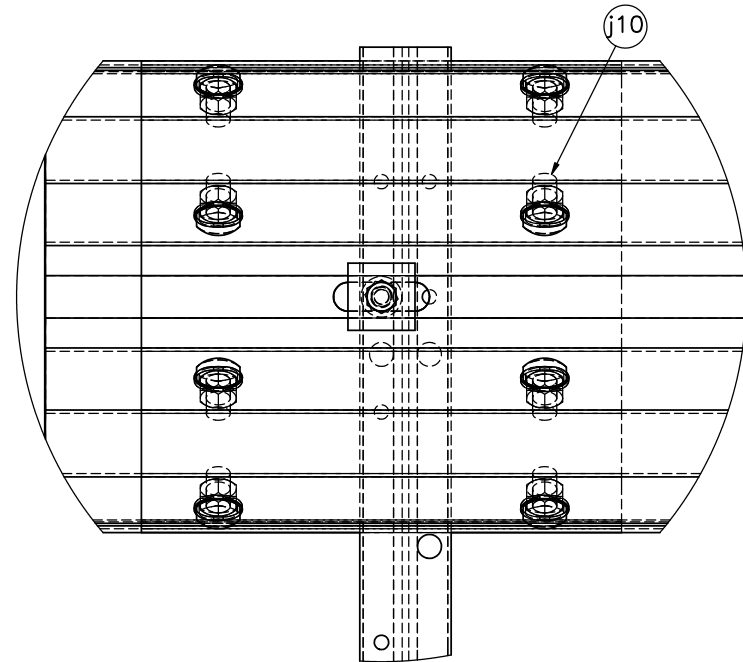
DATE:
10/31/2023

DRAWN BY:
GRL/JRD/JJ
O

REV. BY:
KAL



DETAIL L
 END POST SUPPORT
 Post No. 1



DETAIL M

- Notes: (1) Rail and attachment hardware hidden in Detail L for clarity.
 (2) Bolts on the end post support should be torqued to 100 ft-lb (+20, -0) [135.6 Nm (+27.1, -0)] after post is driven.



Midwest Roadside
 Safety Facility

NY Box Beam to Weak Post
 W-Beam Transition
 Test No. NYBWT-3

End Post Support and W-Beam
 Splice Detail

DWG. NAME:
 NYBWT-3_R2

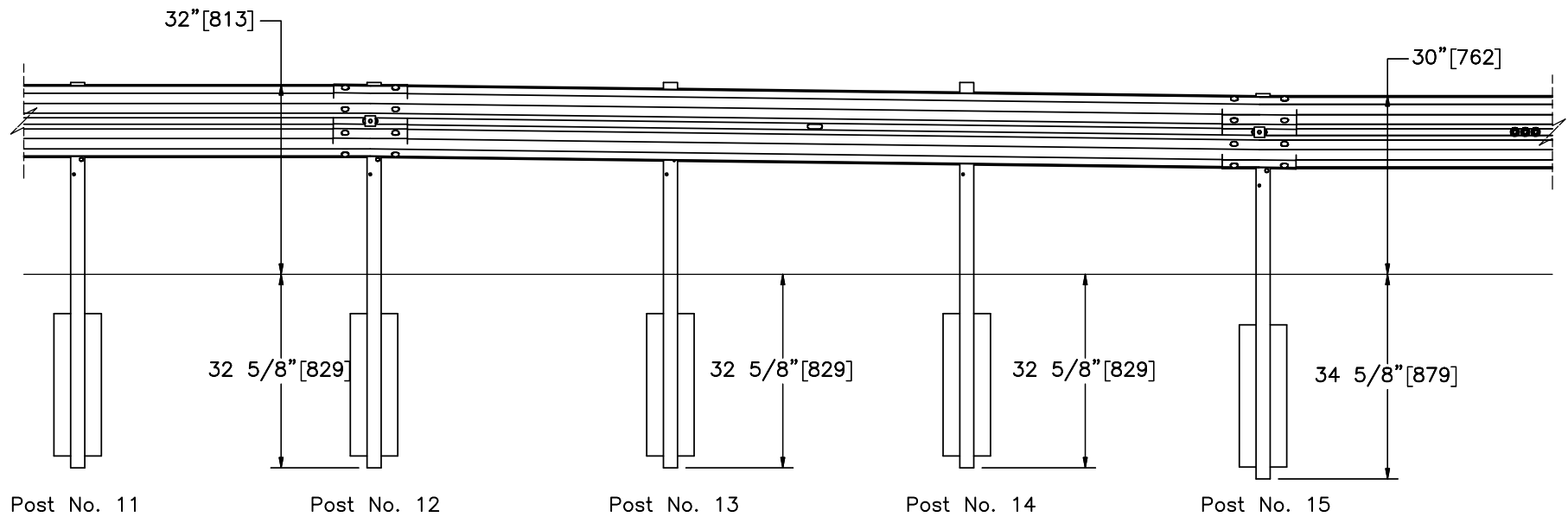
SCALE: 1:5
 UNITS: in.[mm]

SHEET:
 5 of 34

DATE:
 10/31/2023

DRAWN BY:
 GRL/JRD/JJ
 O

REV. BY:
 KAL



ELEVATION VIEW



Midwest Roadside
Safety Facility

NY Box Beam to Weak Post
W-Beam Transition
Test No. NYBWT-3

Rail Elevation Transition Details

DWG. NAME:
NYBWT-3_R2

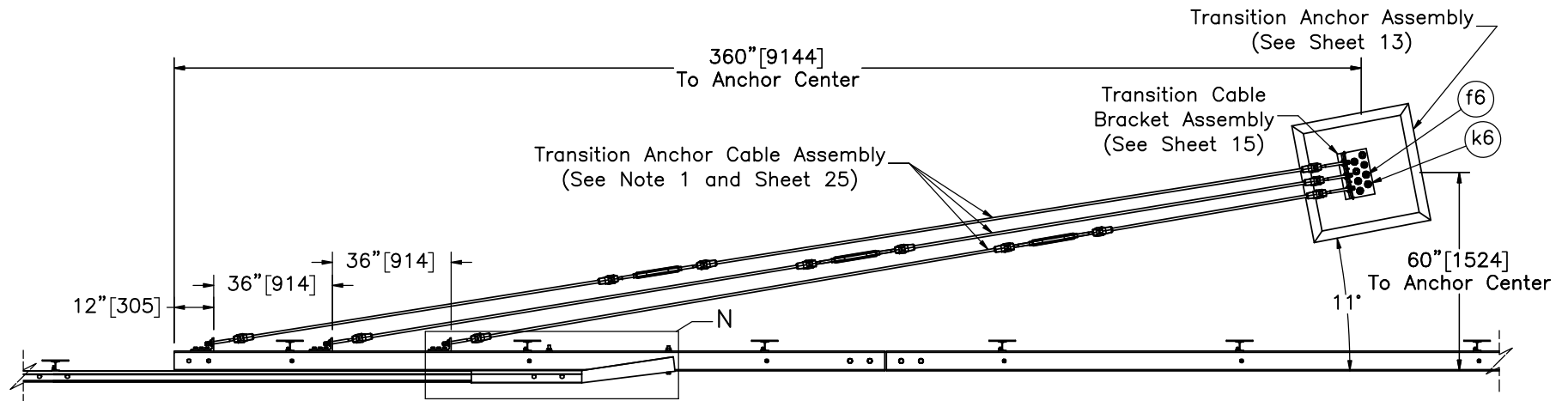
SCALE: 1:28
UNITS: in.[mm]

SHEET:
6 of 34

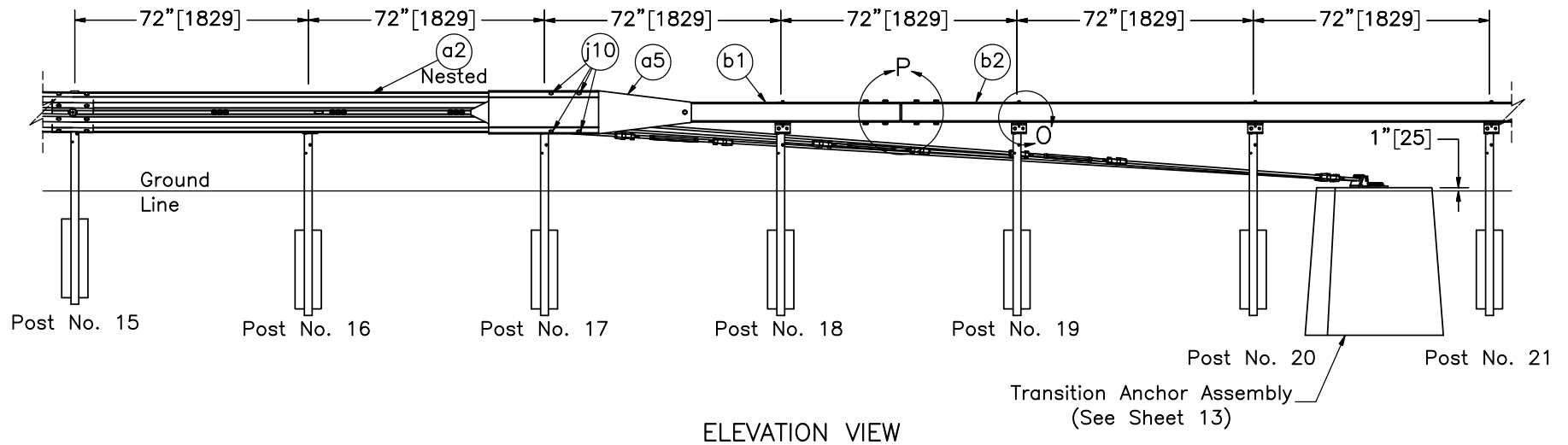
DATE:
10/31/2023

DRAWN BY:
GRL/JRD/JJ
O

REV. BY:
KAL



PLAN VIEW



ELEVATION VIEW

Note: (1) The turnbuckles in the transition anchor cable assemblies should be approximately 5' [1.5m], 10' [3.0m], and 15' [4.6m] from the transition cable bracket assembly, with the 5' [1.5m] spacing on the cable nearest the travelway.



Midwest Roadside Safety Facility

NY Box Beam to Weak Post
W-Beam Transition
Test No. NYBWT-3

Transition Layout

DWG. NAME:
NYBWT-3_R2

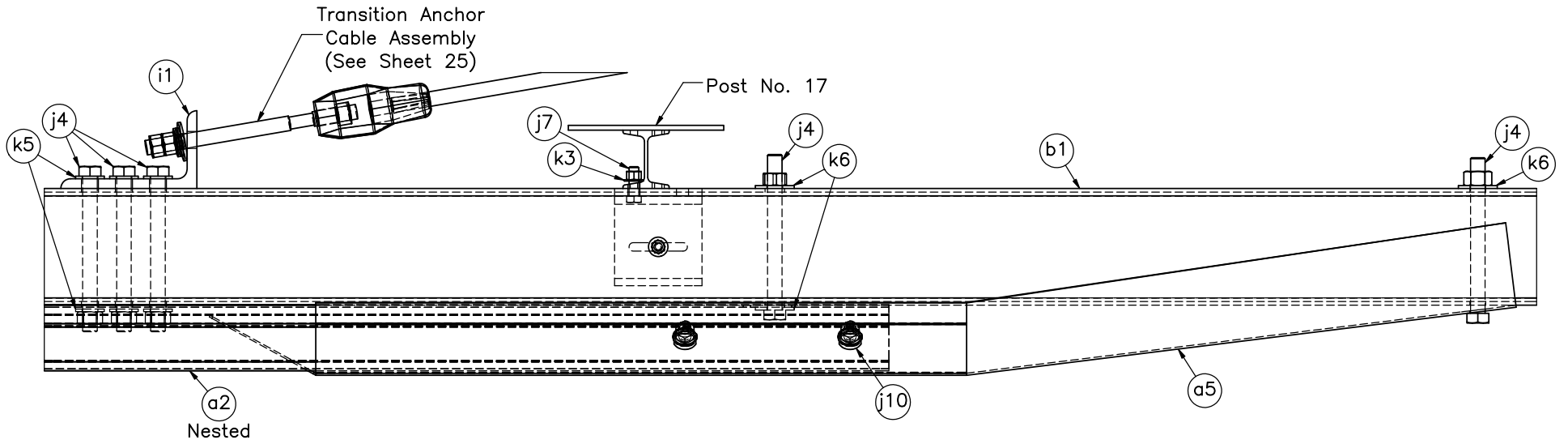
SCALE: 1:50
UNITS: in.[mm]

SHEET:
7 of 34

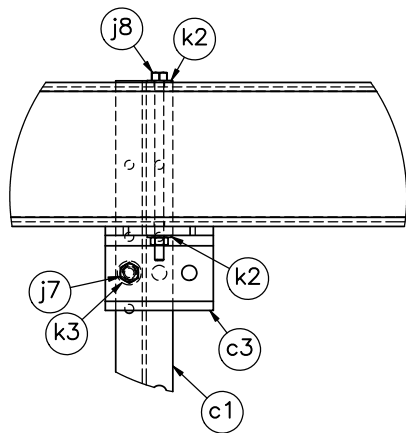
DATE:
10/31/2023

DRAWN BY:
GRL/JRD/JJ
O

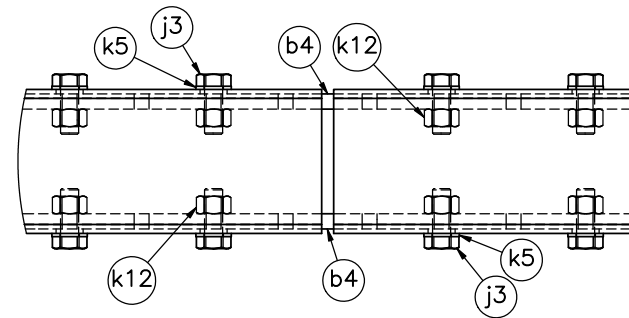
REV. BY:
KAL



DETAIL N



DETAIL O



DETAIL P

Note: (1) Splice plate with tack welded nuts used for testing purposes. A splice plate with tapped holes may be used instead as noted on sheet 30.



Midwest Roadside Safety Facility

NY Box Beam to Weak Post
W-Beam Transition
Test No. NYBWT-3

Transition, Post Attachment,
and Box Splice Details

DWG. NAME:
NYBWT-3_R2

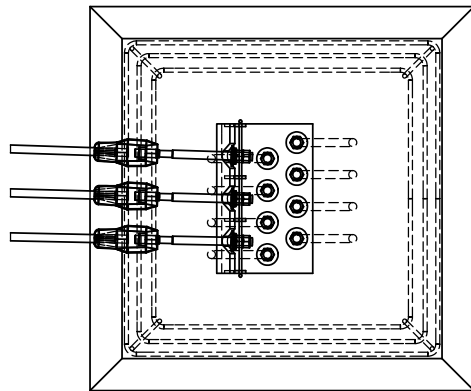
SCALE: 1:8
UNITS: in.[mm]

SHEET:
8 of 34

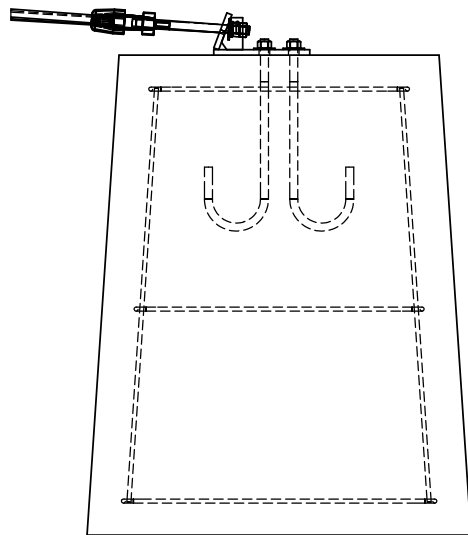
DATE:
10/31/2023

DRAWN BY:
GRL/JRD/JJ
O

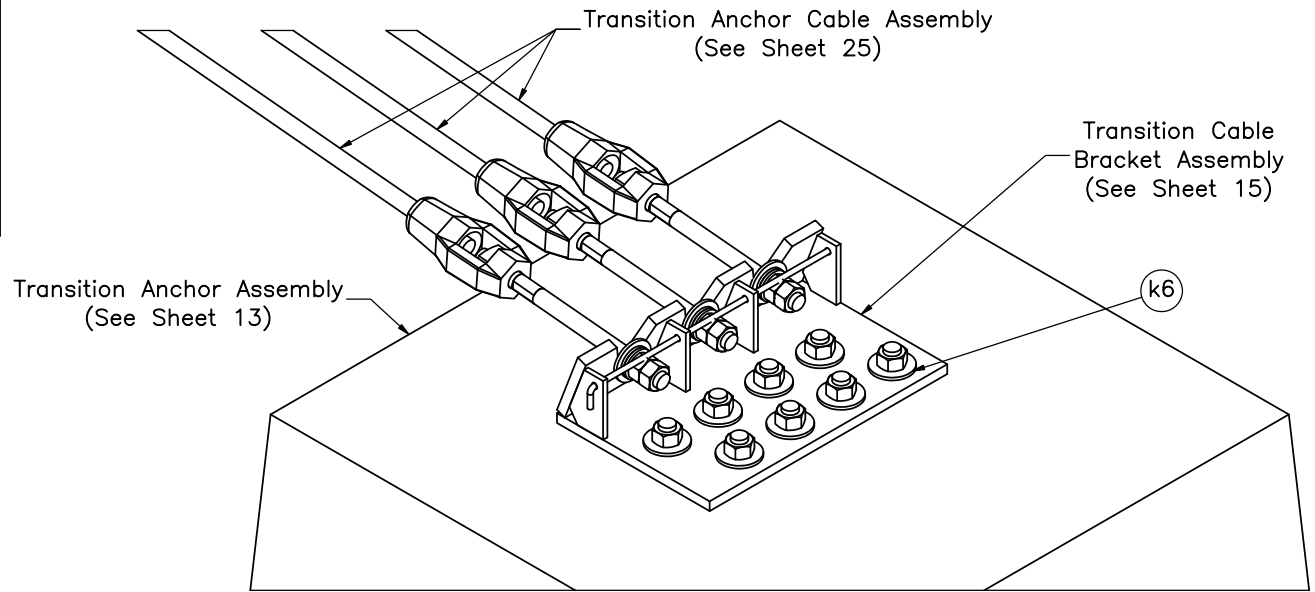
REV. BY:
KAL



PLAN VIEW



ELEVATION VIEW



ISOMETRIC CROP VIEW
SCALE 1:8

Note: (1) When constructed, the threaded rods on the Transition Anchor Cable Assembly should have a nearly perpendicular bearing on the Transition Cable Bracket Assembly.



Midwest Roadside
Safety Facility

NY Box Beam to Weak Post
W-Beam Transition
Test No. NYBWT-3

Cable Bracket Connection
Details

DWG. NAME:
NYBWT-3_R2

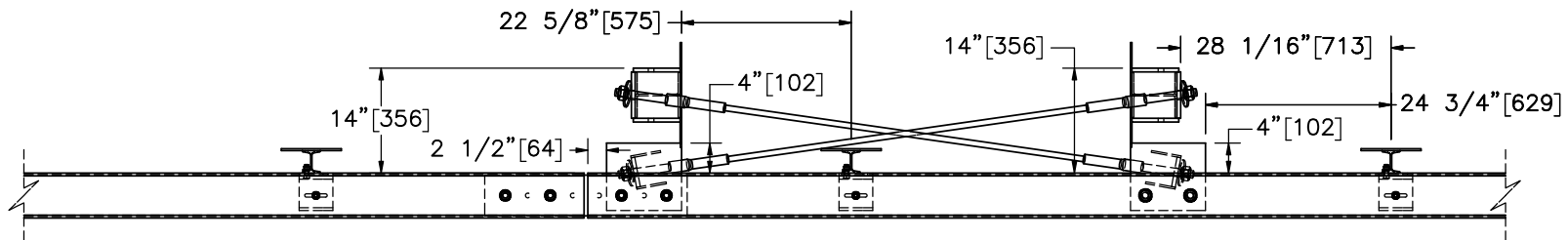
SCALE: 1:18
UNITS: in./mm

SHEET:
9 of 34

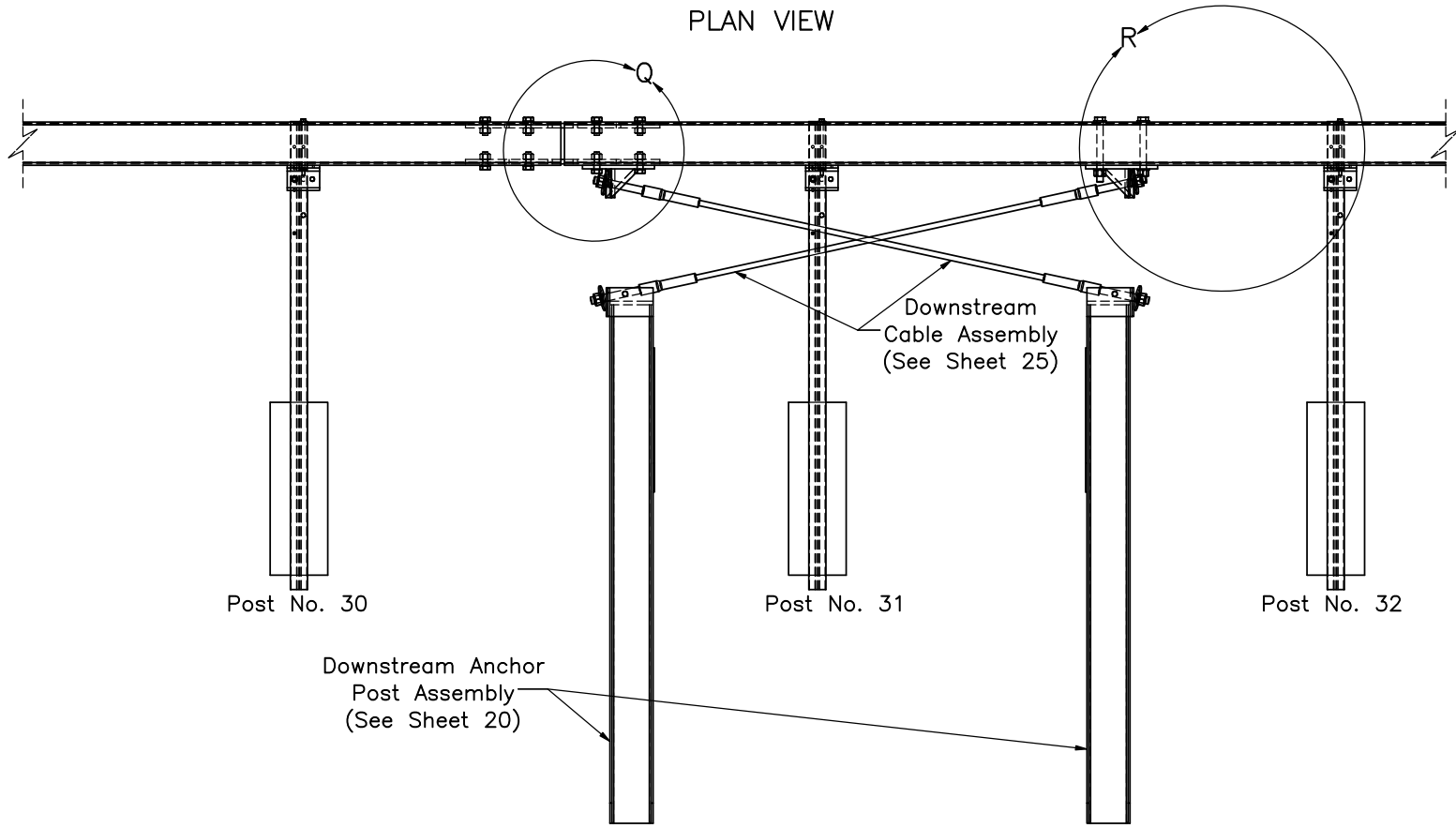
DATE:
10/31/2023

DRAWN BY:
GRL/JRD/JJ
O

REV. BY:
KAL



PLAN VIEW



ELEVATION VIEW



Midwest Roadside Safety Facility

NY Box Beam to Weak Post W-Beam Transition
Test No. NYBWT-3

Downstream Anchorage Details

DWG. NAME:
NYBWT-3_R2

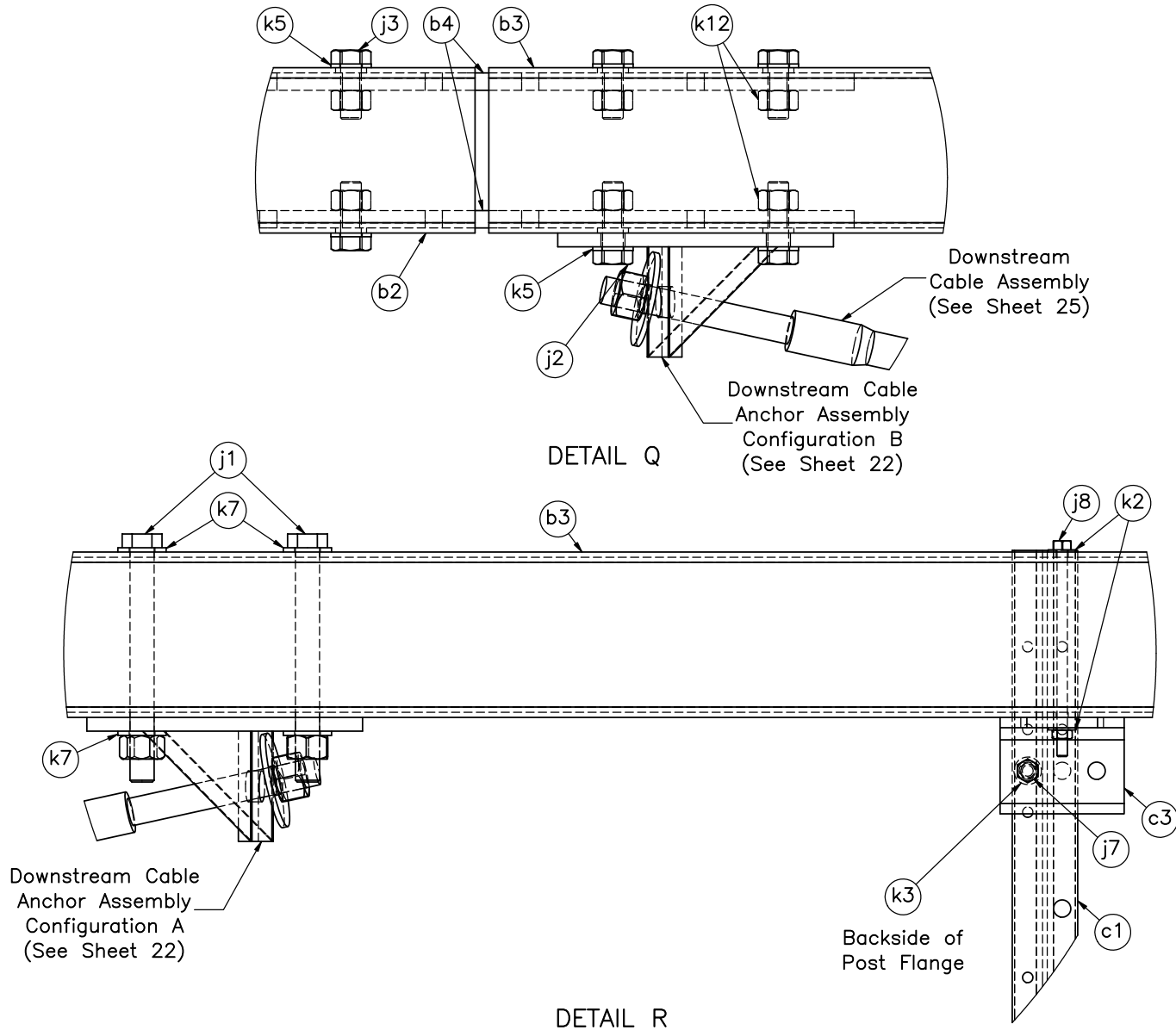
SCALE: 1:25
UNITS: in.[mm]

SHEET:
10 of 34

DATE:
10/31/2023

DRAWN BY:
GRL/JRD/JJ
O

REV. BY:
KAL



DETAIL Q

DETAIL R



Midwest Roadside Safety Facility

NY Box Beam to Weak Post W-Beam Transition
Test No. NYBWT-3

Downstream Anchor Mounting Details

DWG. NAME:
NYBWT-3_R2

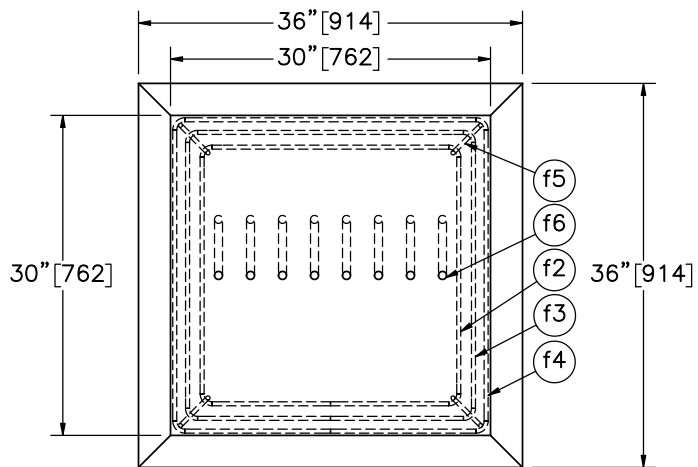
SCALE: 1:6
UNITS: in.[mm]

SHEET:
11 of 34

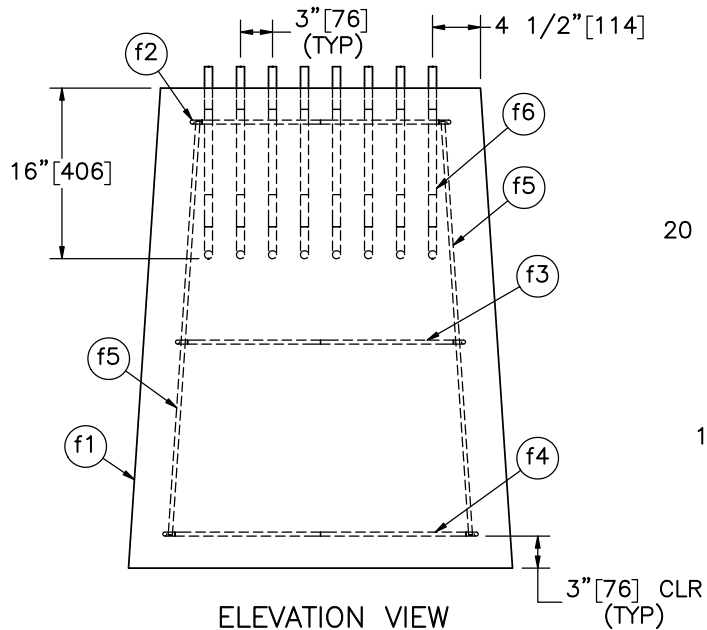
DATE:
10/31/2023

DRAWN BY:
GRL/JRD/JJ
O

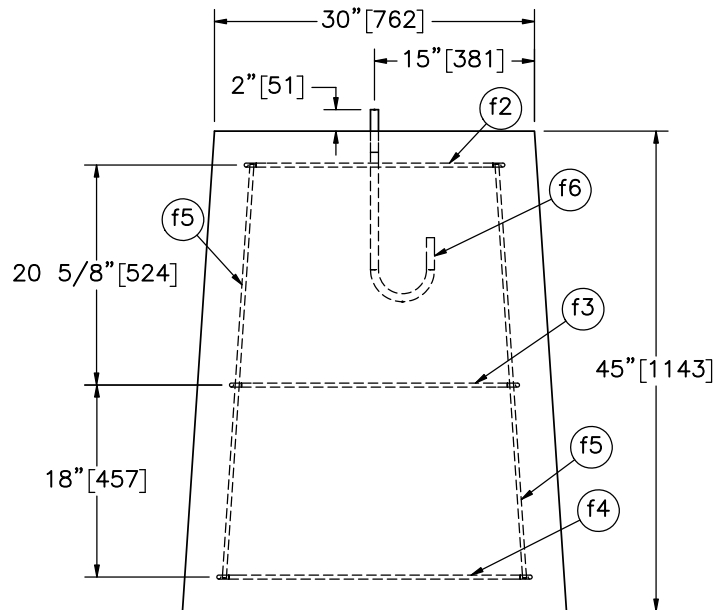
REV. BY:
KAL



PLAN VIEW



ELEVATION VIEW



PROFILE VIEW

Item No.	QTY.	Description	Material Specification	Treatment Specification
-	1	Upstream Anchor Assembly	-	-
f1	1	Concrete	Pre-Cast Class A* Min. $f'_c = 3,000$ psi [20.7 MPa] NE Mix 47BD	-
f2	1	#3 [10] Bar, 106 5/8" [2,708] Long Unbent	ASTM A615 Gr. 60 or A996 Gr. 60	Epoxy-Coated (ASTM A775 or A934) **
f3	1	#3 [10] Bar, 117 5/8" [2,988] Long Unbent	ASTM A615 Gr. 60 or A996 Gr. 60	Epoxy-Coated (ASTM A775 or A934) **
f4	1	#3 [10] Bar, 127 1/8" [3,229] Long Unbent	ASTM A615 Gr. 60 or A996 Gr. 60	Epoxy-Coated (ASTM A775 or A934) **
f5	4	#3 [10] Bar, 39" [991] Long	ASTM A615 Gr. 60 or A996 Gr. 60	Epoxy-Coated (ASTM A775 or A934) **
f6	8	3/4" [19] Dia. UNC, Hooked Anchor J-Bolt and Nut	J-Bolt - ASTM A307 Gr. C Nut - ASTM A563DH	ASTM A153 or B695 Class 55 or F2329

* If cast in place, follow Section 501 - Portland Cement Concrete - General of the NY state standards.

** Epoxy-coating not necessary for testing purposes.



Midwest Roadside Safety Facility

NY Box Beam to Weak Post
W-Beam Transition
Test No. NYBWT-3

Upstream Anchor Assembly

DWG. NAME:
NYBWT-3_R2

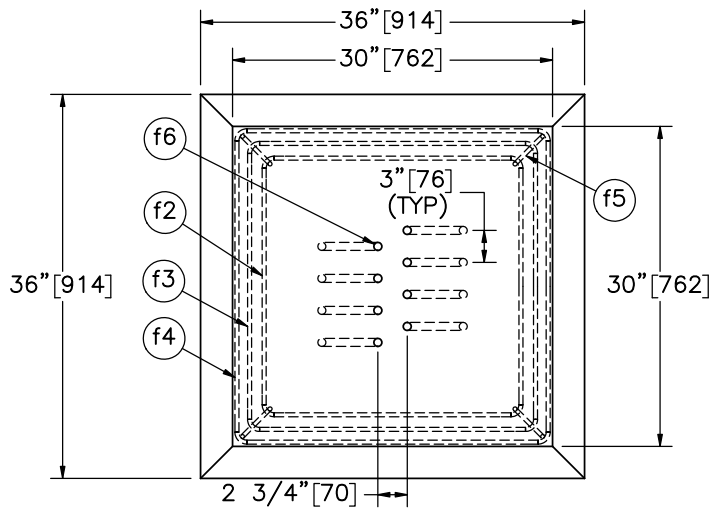
SCALE: 1:18
UNITS: in.[mm]

SHEET:
12 of 34

DATE:
10/31/2023

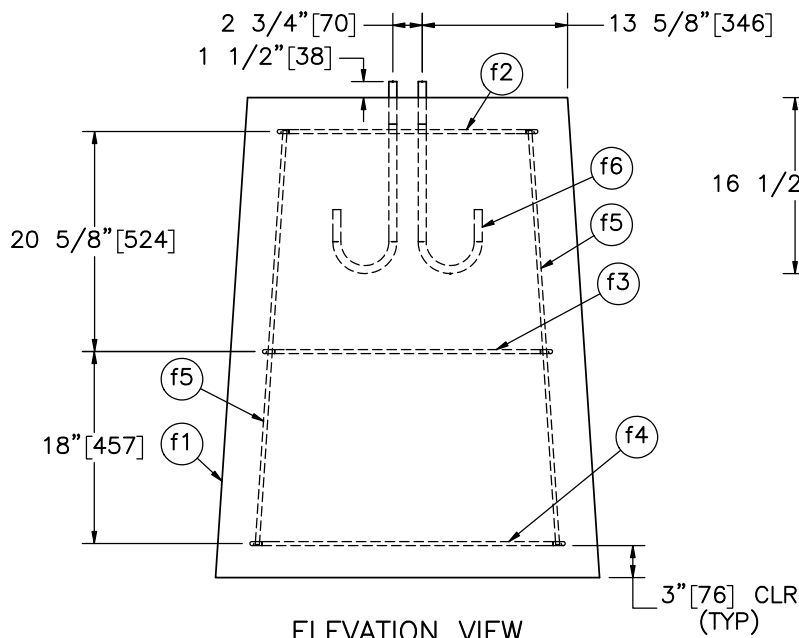
DRAWN BY:
GRL/JRD/JJO

REV. BY:
KAL

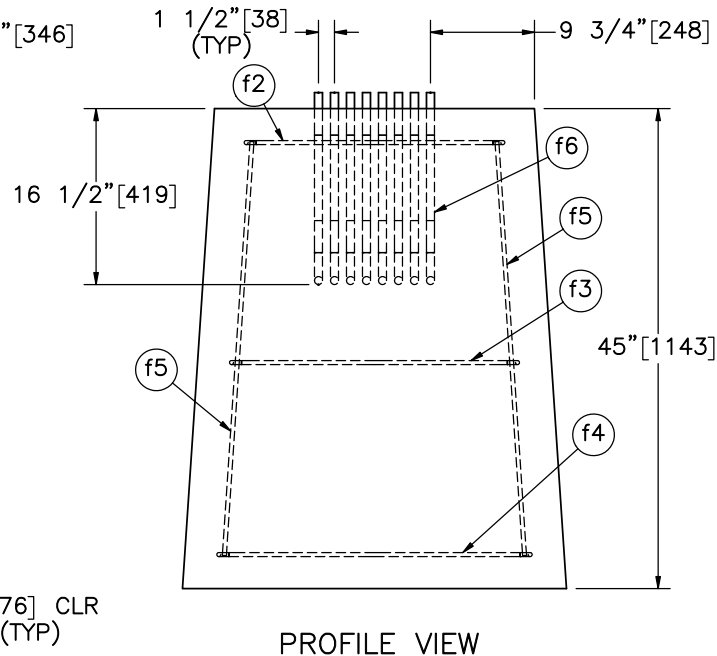


PLAN VIEW

Item No.	QTY.	Description	Material Specification	Treatment Specification
-	1	Transition Anchor Assembly	-	-
f1	1	Concrete	Pre-Cast Class A* Min. $f'_c = 3,000$ psi [20.7 MPa] NE Mix 47BD	-
f2	1	#3 [10] Bar, 106 5/8" [2,708] Long Unbent	ASTM A615 Gr. 60 or A996 Gr. 60	Epoxy-Coated (ASTM A775 or A934) **
f3	1	#3 [10] Bar, 117 5/8" [2,988] Long Unbent	ASTM A615 Gr. 60 or A996 Gr. 60	Epoxy-Coated (ASTM A775 or A934) **
f4	1	#3 [10] Bar, 127 1/8" [3,229] Long Unbent	ASTM A615 Gr. 60 or A996 Gr. 60	Epoxy-Coated (ASTM A775 or A934) **
f5	4	#3 [10] Bar, 39" [991] Long	ASTM A615 Gr. 60 or A996 Gr. 60	Epoxy-Coated (ASTM A775 or A934) **
f6	8	3/4" [19] Dia. UNC, Hooked Anchor J-Bolt and Nut	J-Bolt - ASTM A307 Gr. C Nut - ASTM A563DH	ASTM A153 or B695 Class 55 or F2329



ELEVATION VIEW



PROFILE VIEW

* If cast in place, follow Section 501 - Portland Cement Concrete - General of the NY state standards.

** Epoxy-coating not necessary for testing purposes.



Midwest Roadside Safety Facility

NY Box Beam to Weak Post
W-Beam Transition
Test No. NYBWT-3

Transition Anchor Assembly

DWG. NAME.
NYBWT-3_R2

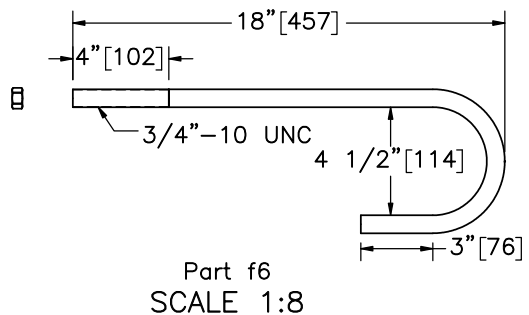
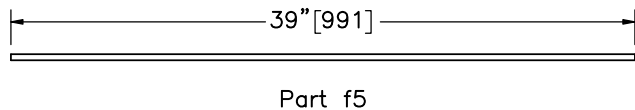
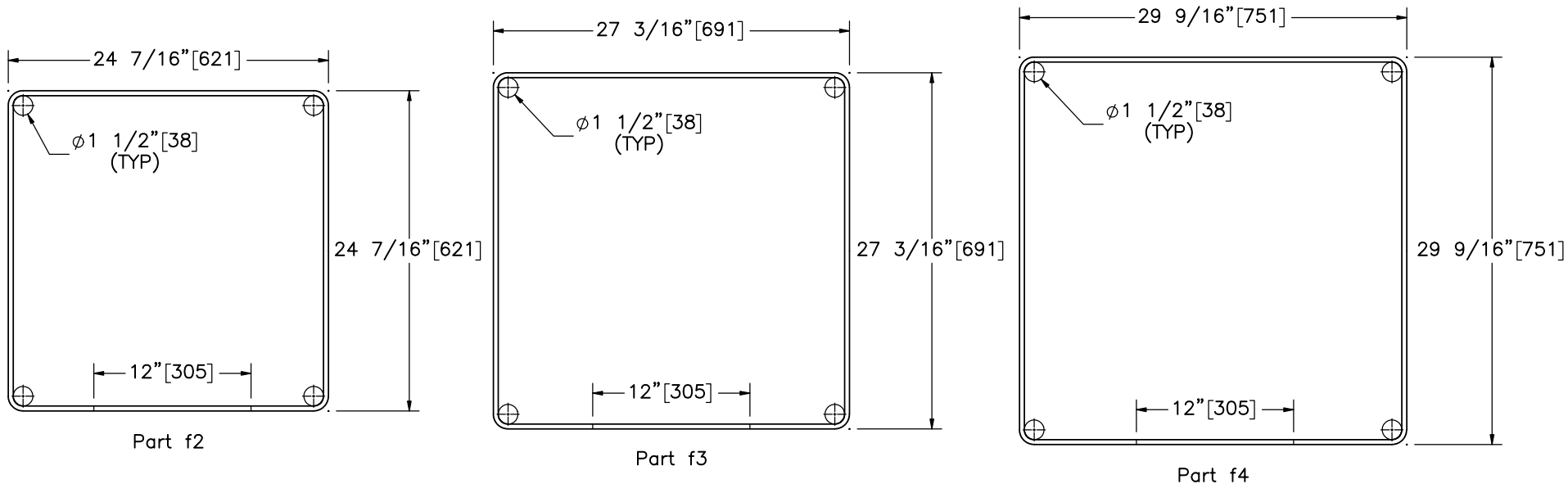
SCALE: 1:18
UNITS: in.[mm]

SHEET:
13 of 34

DATE:
10/31/2023

DRAWN BY:
GRL/JRD/JJ
O

REV. BY:
KAL



Note: (1) Epoxy-coating not necessary for testing purposes.

Bill of Bars					
Bar	QTY. (Per Anchor)	Size	Total Unbent Length	Material	Treatment
f2	1	#3 [10]	106 5/8"[2,708]	ASTM A615 Gr. 60 or A996 Gr. 60	Epoxy-Coated (ASTM A775 or A934)
f3	1	#3 [10]	117 5/8"[2,988]	ASTM A615 Gr. 60 or A996 Gr. 60	Epoxy-Coated (ASTM A775 or A934)
f4	1	#3 [10]	127 1/8"[3,229]	ASTM A615 Gr. 60 or A996 Gr. 60	Epoxy-Coated (ASTM A775 or A934)
f5	4	#3 [10]	39"[991]	ASTM A615 Gr. 60 or A996 Gr. 60	Epoxy-Coated (ASTM A775 or A934)



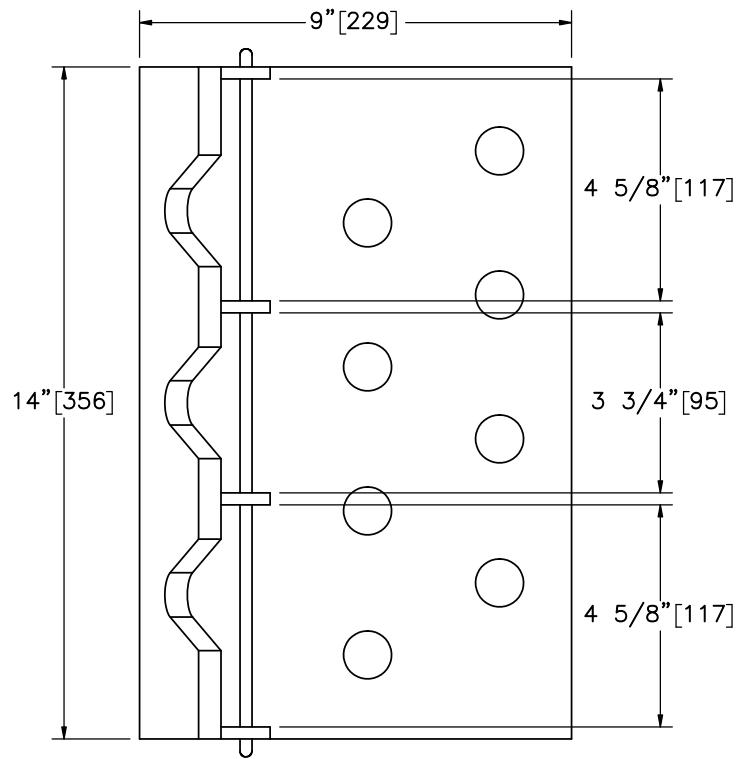
Midwest Roadside Safety Facility

NY Box Beam to Weak Post
W-Beam Transition
Test No. NYBWT-3
Concrete Anchor Components

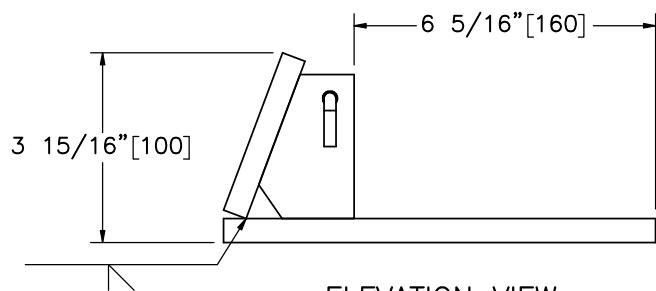
DWG. NAME:
NYBWT-3_R2

SCALE: 1:12
UNITS: in.[mm]

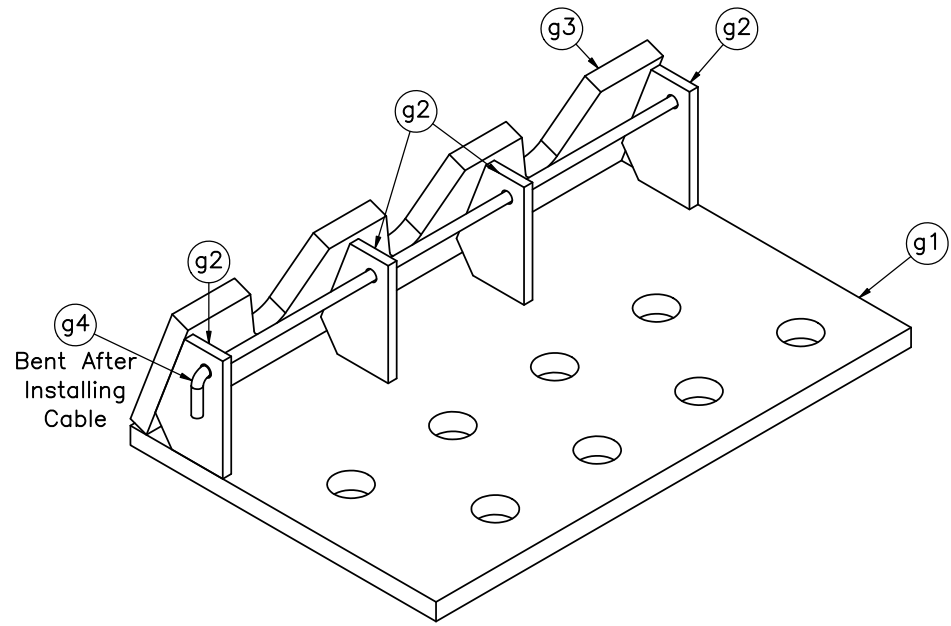
SHEET:
14 of 34
DATE:
10/31/2023
DRAWN BY:
GRL/JRD/JJO
REV. BY:
KAL



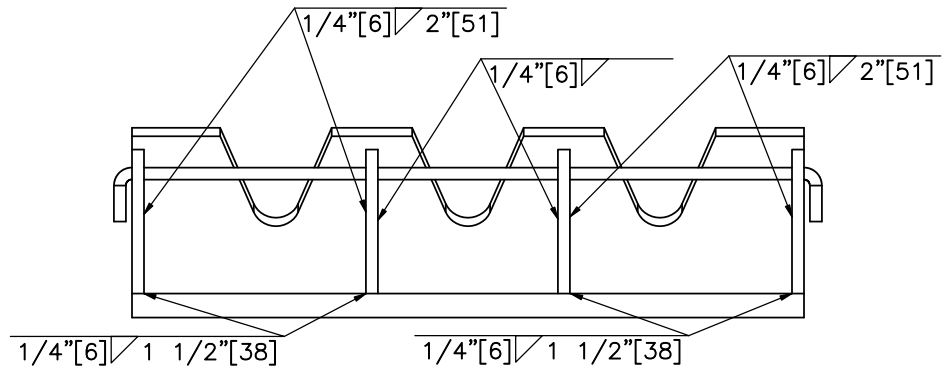
PLAN VIEW




ELEVATION VIEW

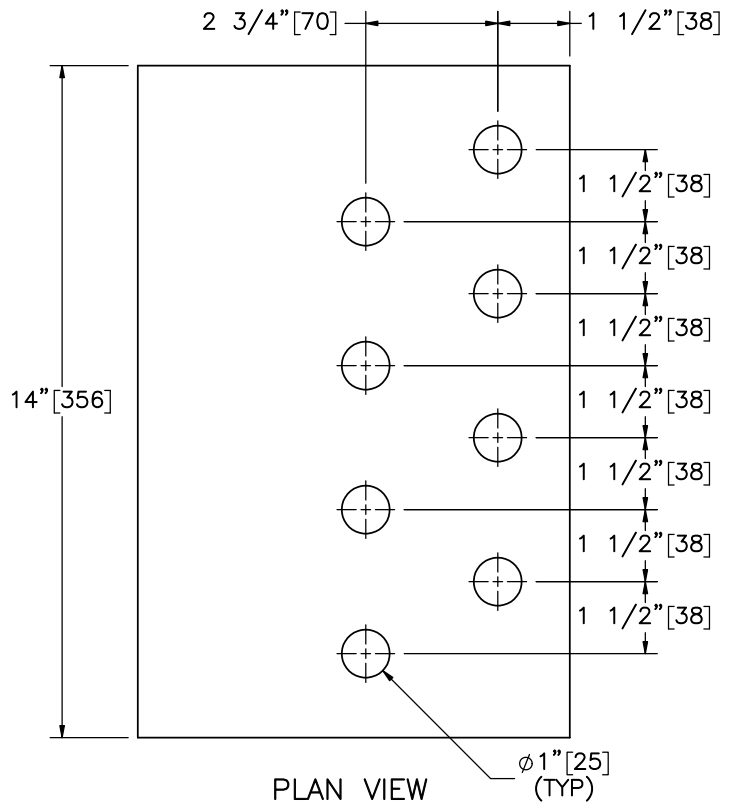


ISOMETRIC VIEW

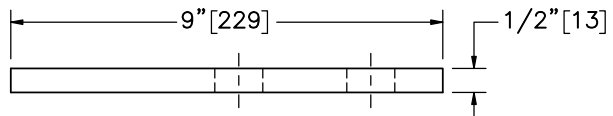


PROFILE VIEW

Item No.	QTY.	Description	Material Specification	Treatment Specification			SHEET: 15 of 34
-	1	Transition Cable Bracket Assembly	-	ASTM A123		NY Box Beam to Weak Post	DATE: 10/31/2023
g1	1	14"x9"x1/2" [356x229x13] Cable Anchor Base Plate	ASTM A36	-		W-Beam Transition	Test No. NYBWT-3
g2	4	3"x2"x1/4" [76x51x6] Cable Anchor Gusset	ASTM A36	-	Midwest Roadside Safety Facility	Transition Cable Bracket Assembly	DRAWN BY: GRL/JRD/JJO
g3	1	14"x3 1/2"x1/2" [356x89x13] Cable Anchor Top Plate	ASTM A36	-		DWG. NAME: NYBWT-3_R2	SCALE: 1:4 UNITS: in.[mm]

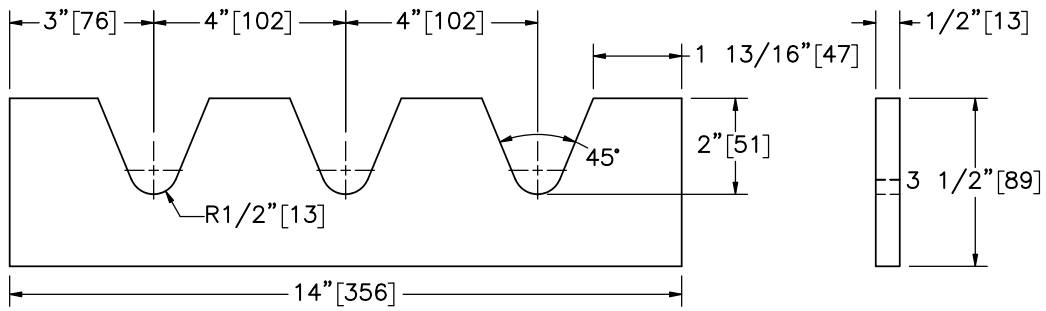


PLAN VIEW



ELEVATION VIEW

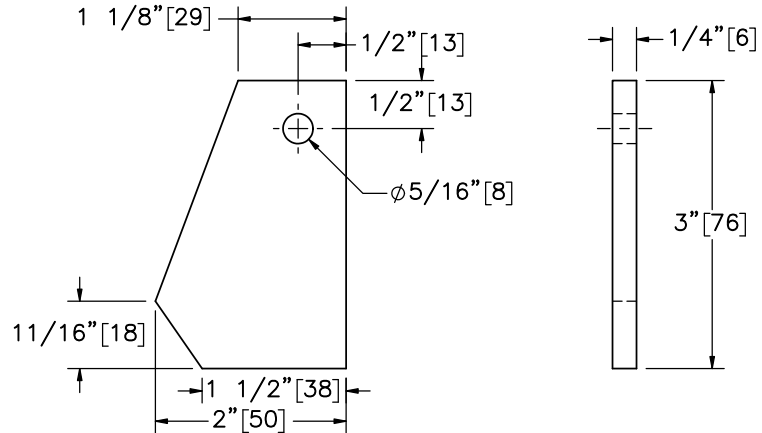
Part g1



ELEVATION VIEW

PROFILE VIEW

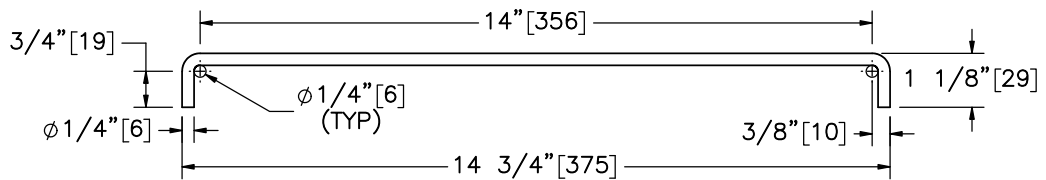
Part g3



ELEVATION VIEW

PROFILE VIEW

Part g2
SCALE 1:2



Part g4

Note: (1) Part g4 total unbent length is 16 3/8" [416]. Bend after installation.



Midwest Roadside Safety Facility

NY Box Beam to Weak Post
W-Beam Transition
Test No. NYBWT-3

Transition Cable Bracket Components

DWG. NAME:
NYBWT-3_R2

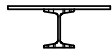
SCALE: 1:4
UNITS: in.[mm]

SHEET:
16 of 34

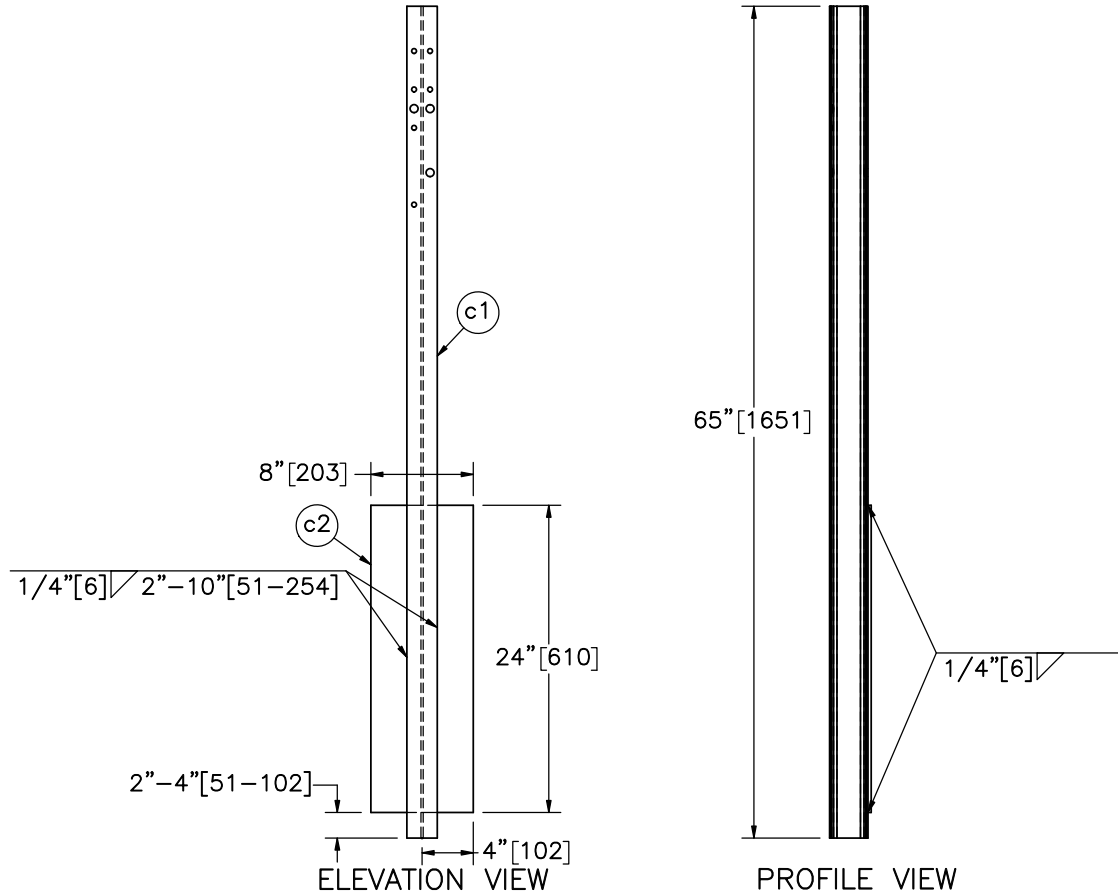
DATE:
10/31/2023

DRAWN BY:
GRL/JRD/JJO

REV. BY:
KAL



PLAN VIEW



Post Assembly

Item No.	QTY.	Description	Material Specification	Treatment Specification
-	33	Post Assembly	-	ASTM A123
c2	1	24"x8"x1/4" [610x203x6] Soil Plate	ASTM A36	-
c1	1	S3x5.7 [S75x8.5], 65" [1,651] Long Post	ASTM A36	-



Midwest Roadside Safety Facility

NY Box Beam to Weak Post
 W-Beam Transition
 Test No. NYBWT-3
 Post Assemblies

DWG. NAME:
 NYBWT-3_R2

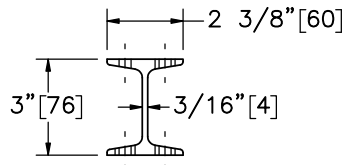
SHEET:
 17 of 34

DATE:
 10/31/2023

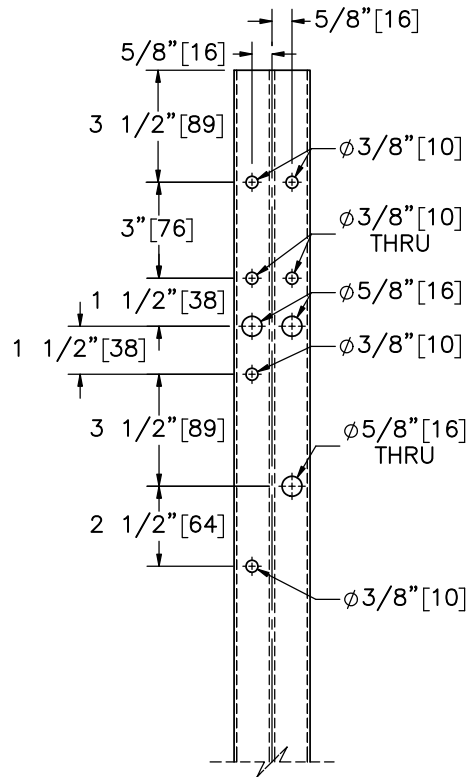
DRAWN BY:
 GRL/JRD/JJ
 O

REV. BY:
 KAL

SCALE: 1:15
 UNITS: in.[mm]

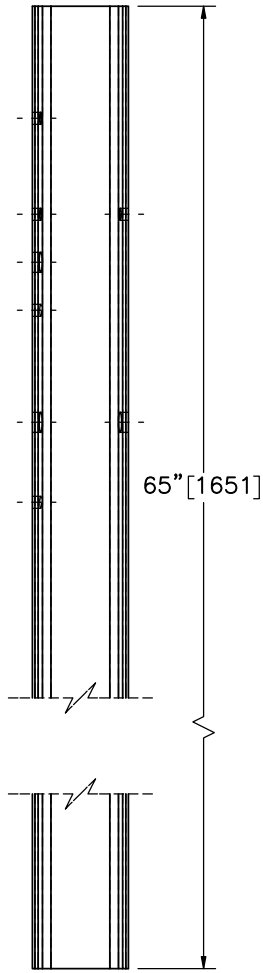


PLAN VIEW

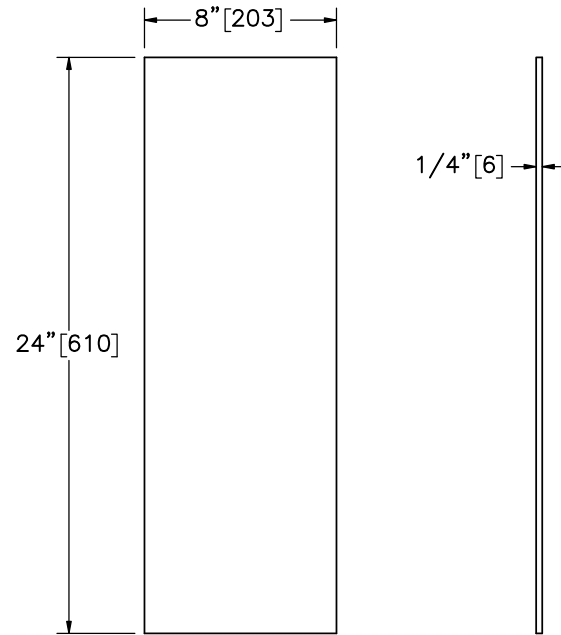


ELEVATION VIEW

Part c1



PROFILE VIEW



ELEVATION VIEW

PROFILE VIEW

Part c2
SCALE 1:8



Midwest Roadside
Safety Facility

NY Box Beam to Weak Post
W-Beam Transition
Test No. NYBWT-3

Post Components

DWG. NAME:
NYBWT-3_R2

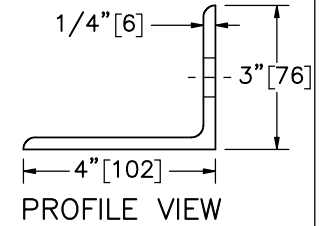
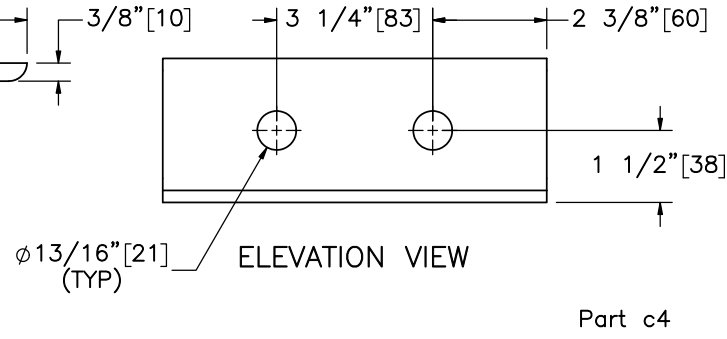
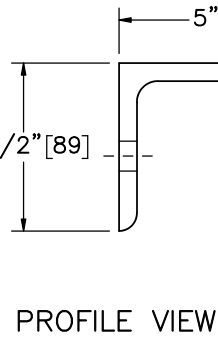
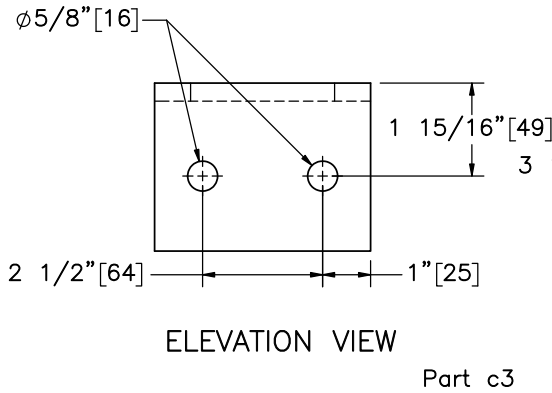
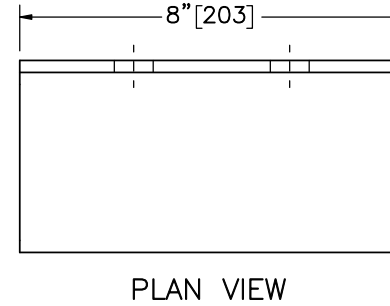
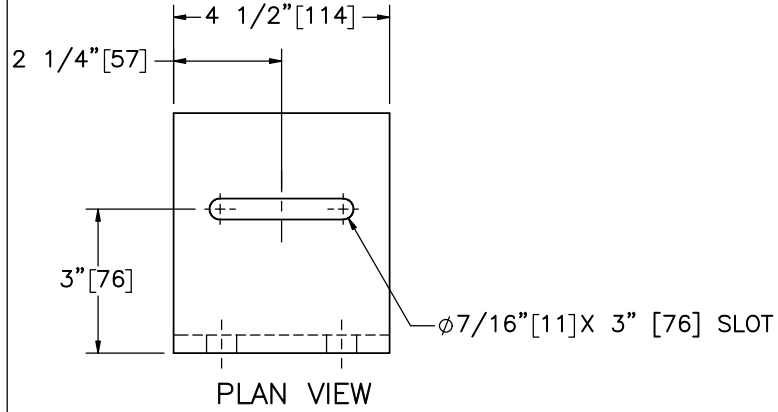
SCALE: 1:6
UNITS: in.[mm]

SHEET:
18 of 34

DATE:
10/31/2023

DRAWN BY:
GRL/JRD/JJ
O

REV. BY:
KAL



Midwest Roadside
Safety Facility

NY Box Beam to Weak Post
W-Beam Transition
Test No. NYBWT-3

Post Components

DWG. NAME:
NYBWT-3_R2

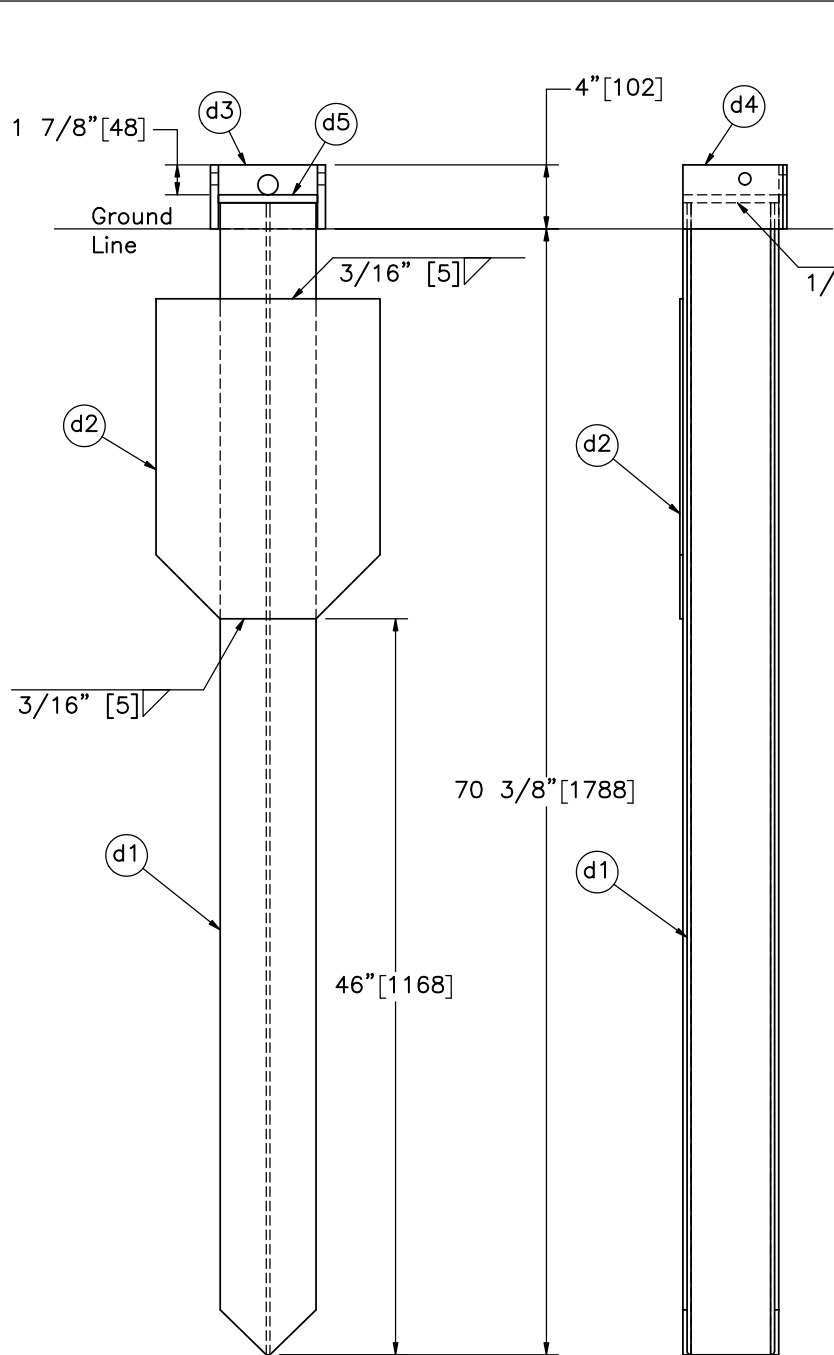
SCALE: 1:4
UNITS: in.[mm]

SHEET:
19 of 34

DATE:
10/31/2023

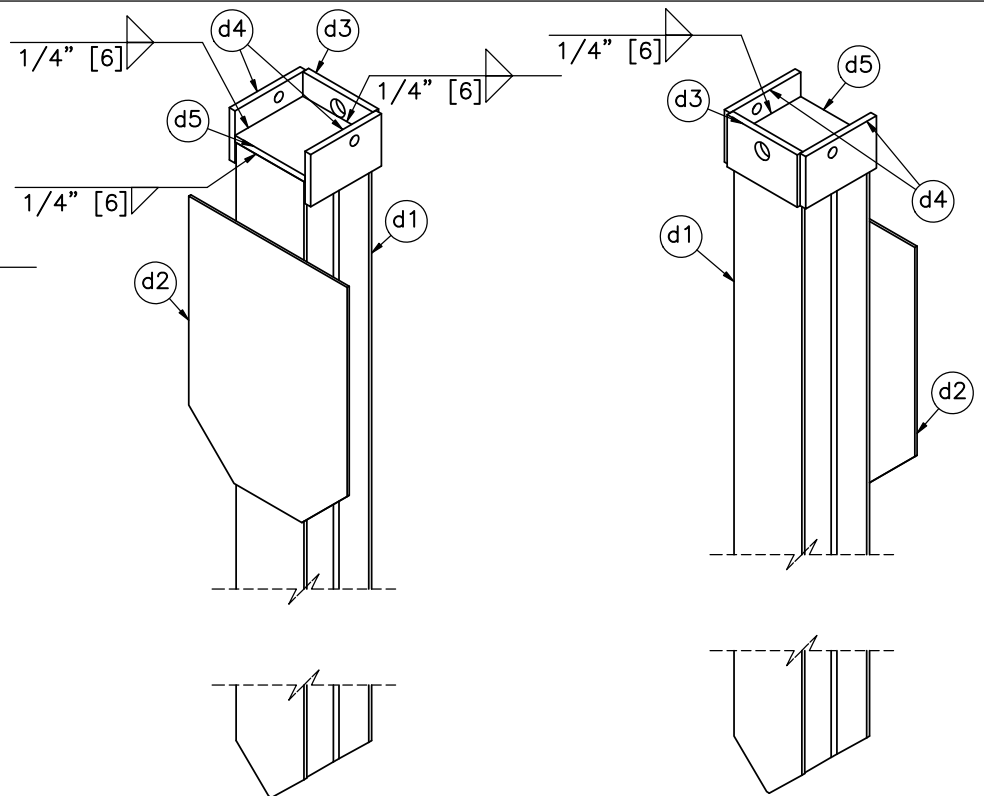
DRAWN BY:
GRL/JRD/JJ
O

REV. BY:
KAL



ELEVATION VIEW

PROFILE VIEW



ISOMETRIC VIEWS

Item No.	QTY.	Description	Material Specification	Treatment Specification
-	2	Downstream Anchor Post Assembly	-	-
d1	1	W6x15 [W152x22.3], 72" [1,829] Long Post	ASTM A992 or ASTM A572 Gr. 50	-
d2	1	20"x14"x3/16" [508x356x5] Plate	ASTM A36	-
d3	1	6 3/16"x4"x1/2" [157x102x13] Plate	ASTM A36	-
d4	2	6 1/4"x4"x1/2" [159x102x13] Plate	ASTM A36	-
d5	1	6 3/16"x6"x1/2" [157x152x13] Plate	ASTM A36	-



Midwest Roadside Safety Facility

NY Box Beam to Weak Post
W-Beam Transition
Test No. NYBWT-3

Downstream Anchor Post Assembly

DWG. NAME:
NYBWT-3_R2

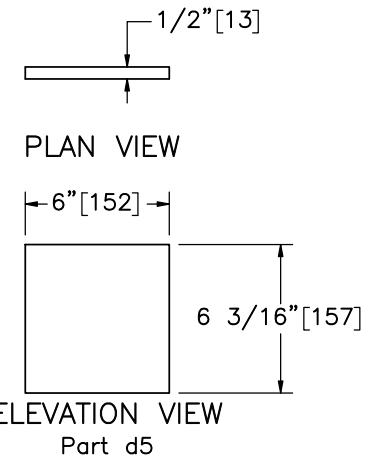
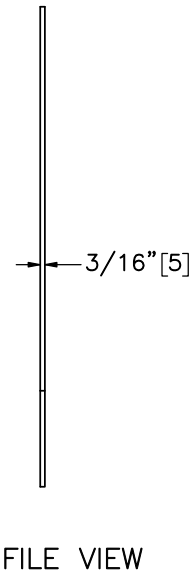
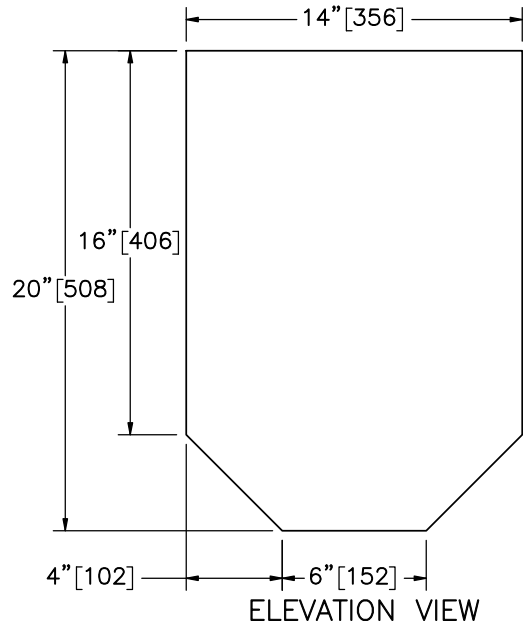
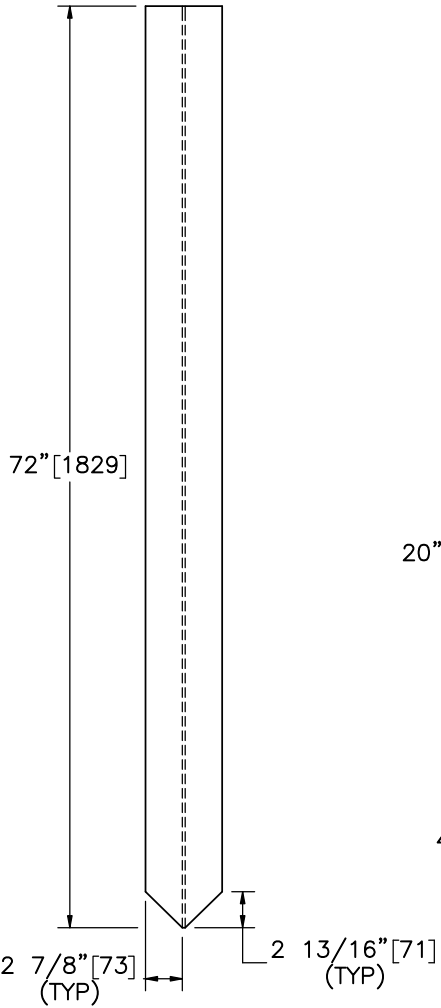
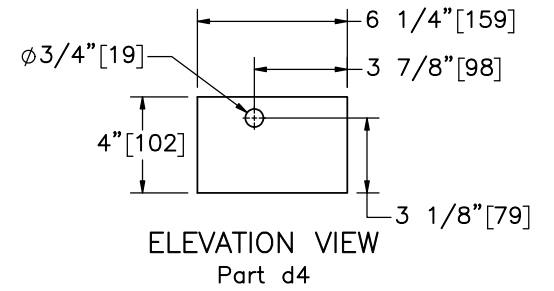
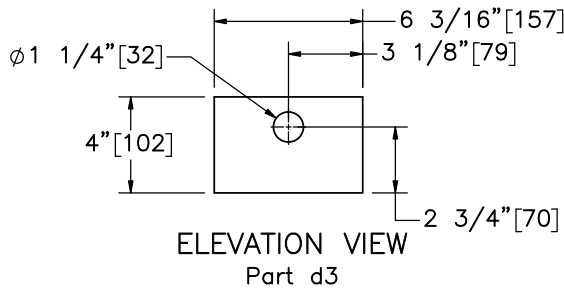
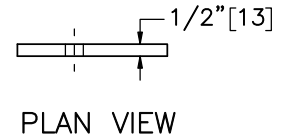
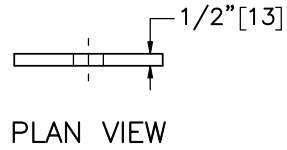
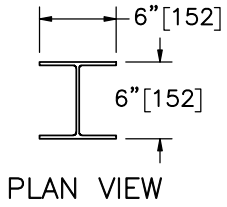
SCALE: 1:12
UNITS: in.[mm]

SHEET:
20 of 34

DATE:
10/31/2023

DRAWN BY:
GRL/JRD/JJ
O

REV. BY:
KAL



Midwest Roadside
Safety Facility

NY Box Beam to Weak Post
W-Beam Transition
Test No. NYBWT-3

Downstream Anchor Post
Components

DWG. NAME:
NYBWT-3_R2

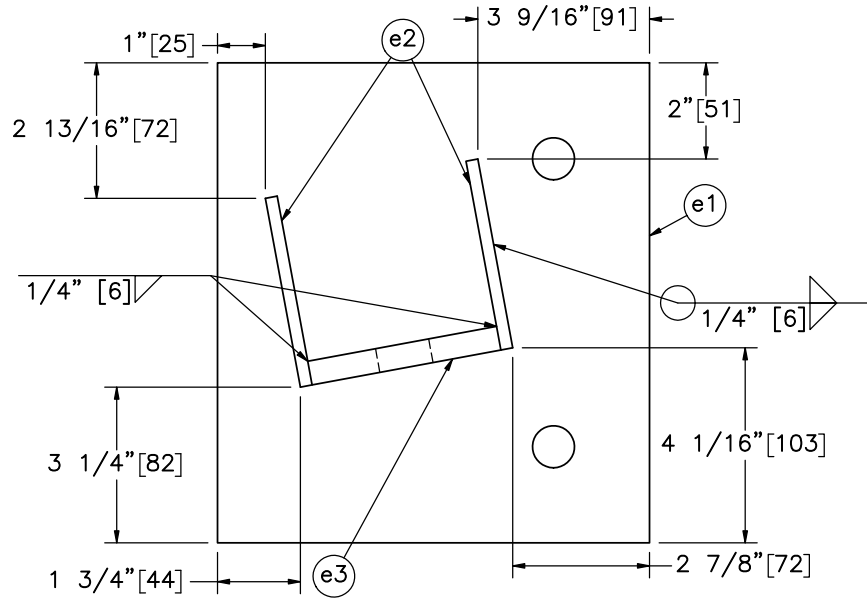
SCALE: 1:8
UNITS: in.[mm]

SHEET:
21 of 34

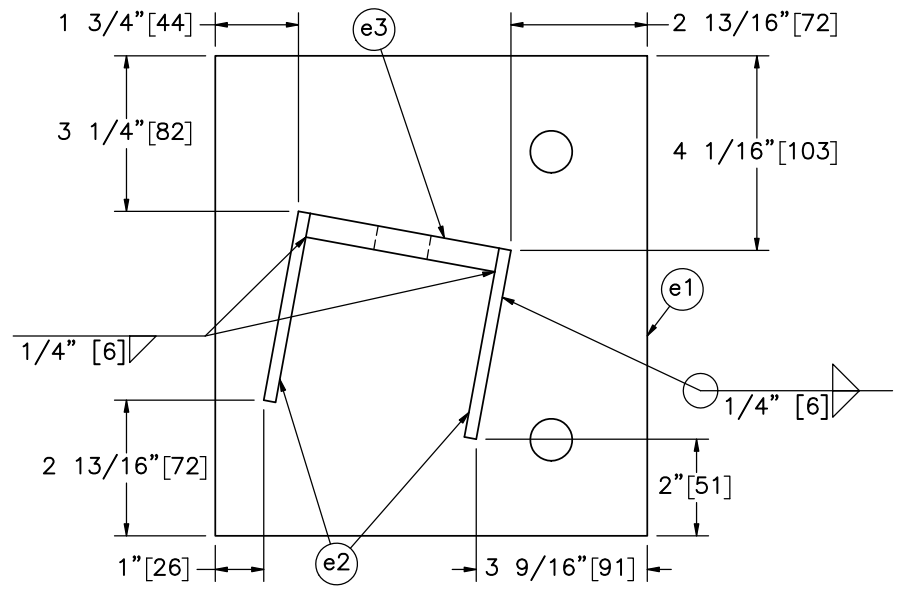
DATE:
10/31/2023

DRAWN BY:
GRL/JRD/JJ
O

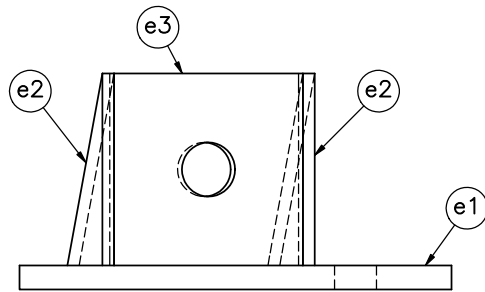
REV. BY:
KAL



PLAN VIEW

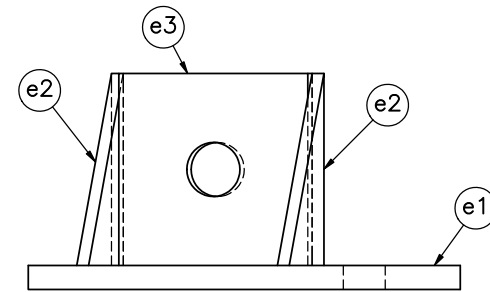


PLAN VIEW



ELEVATION VIEW


Downstream Cable Anchor Assembly Configuration A

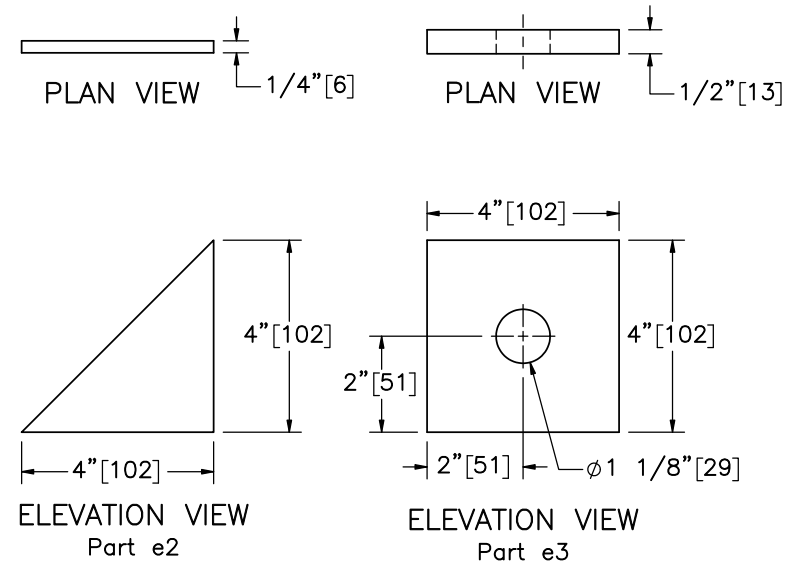
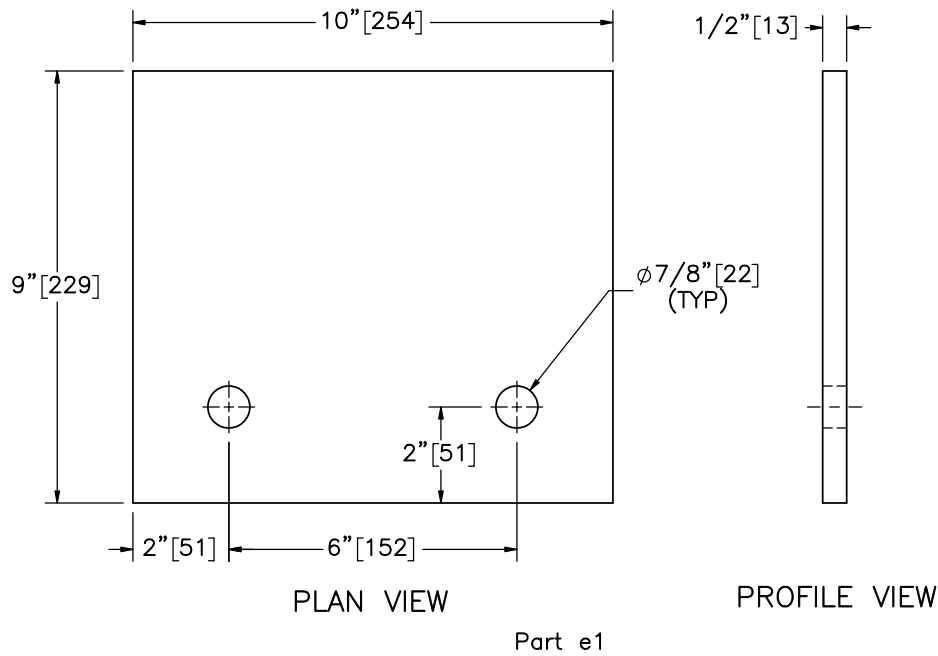


ELEVATION VIEW

Downstream Cable Anchor Assembly Configuration B

* Galvanization not necessary for testing purposes. Can be painted or spray galvanized if desired.

Item No.	QTY.	Description	Material Specification	Treatment Specification	 Midwest Roadside Safety Facility	NY Box Beam to Weak Post W-Beam Transition Test No. NYBWT-3	SHEET: 22 of 34
-	1 each	Downstream Cable Anchor Assembly Configuration A-B	-	ASTM A123*			DATE: 10/31/2023
e1	1	10"x9"x1/2" [254x229x13] Box Beam Cable Anchor Base Plate	ASTM A36	-			DRAWN BY: GRL/JRD/JJO
e2	2	4"x4"x1/4" [102x102x6] Box Beam Cable Anchor Gusset	ASTM A36	-			REV. BY: KAL
e3	1	4"x4"x1/2" [102x102x13] Box Beam Cable Anchor Mounting Plate	ASTM A36	-			SCALE: 1:4 UNITS: in.[mm]



Midwest Roadside
Safety Facility

NY Box Beam to Weak Post
W-Beam Transition
Test No. NYBWT-3

Downstream Cable Anchor
Components

DWG. NAME:
NYBWT-3_R2

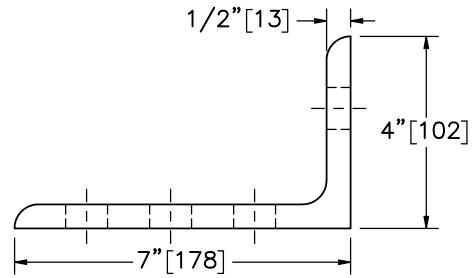
SCALE: 1:4
UNITS: in.[mm]

SHEET:
23 of 34

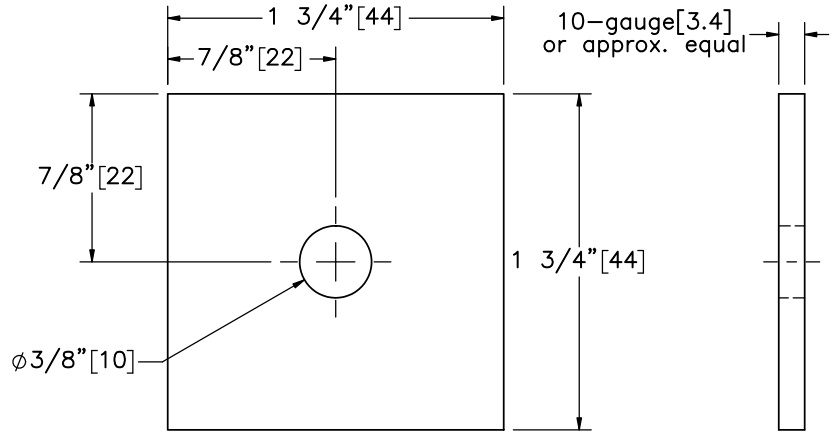
DATE:
10/31/2023

DRAWN BY:
GRL/JRD/JJ
O

REV. BY:
KAL



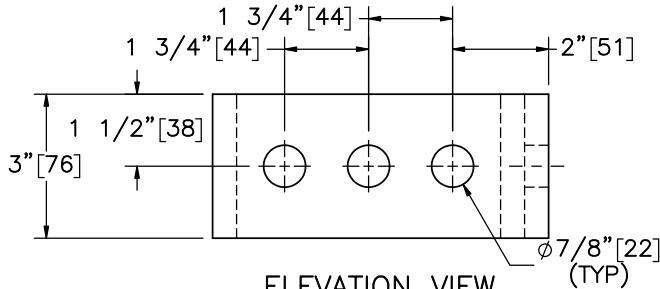
PLAN VIEW



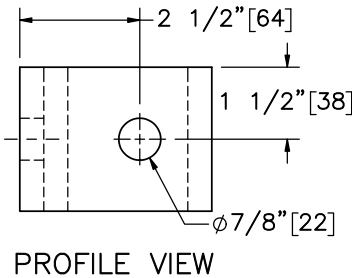
ELEVATION VIEW

PROFILE VIEW

Part i2
SCALE 1:1

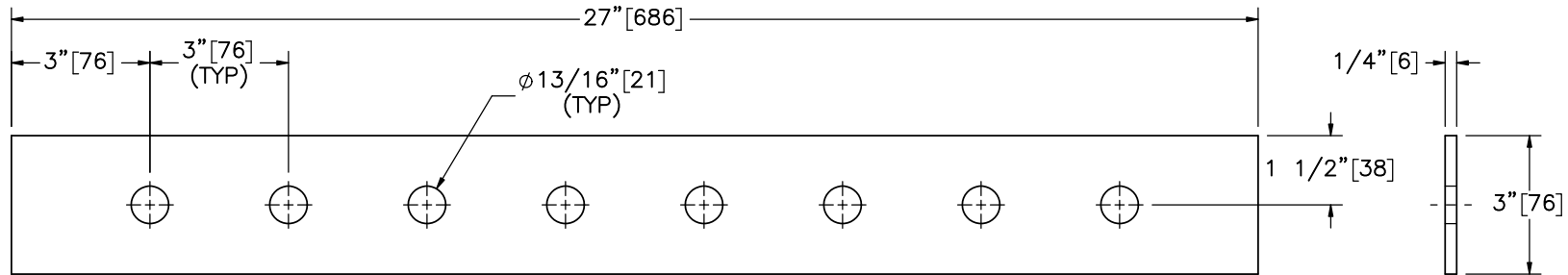


ELEVATION VIEW



PROFILE VIEW

Part i1



PLAN VIEW

PROFILE VIEW

Part i3



Midwest Roadside
Safety Facility

NY Box Beam to Weak Post
W-Beam Transition
Test No. NYBWT-3

Component Details

DWG. NAME:
NYBWT-3_R2

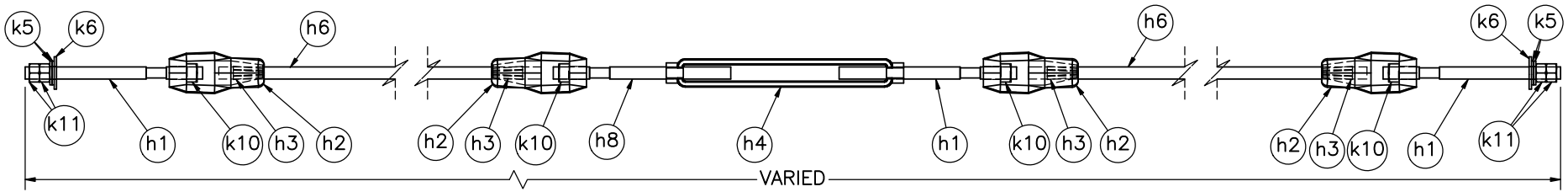
SCALE: 1:4
UNITS: in.[mm]

SHEET:
24 of 34

DATE:
10/31/2023

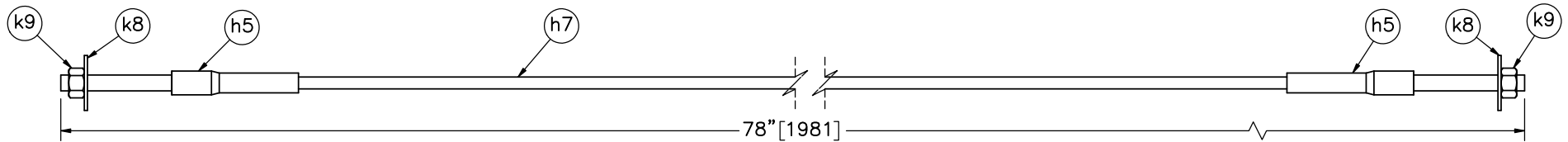
DRAWN BY:
GRL/JRD/JJ
O

REV. BY:
KAL



Transition Anchor Cable Assembly

Item No.	QTY.	Description	Material Specification	Treatment Specification	Hardware Guide
-	3	Transition Anchor Cable Assembly	-	-	-
h1	3	3/4" [19] Dia. UNC, 11" [279] Long Threaded Rod	ASTM A307 Gr. A or equivalent	ASTM A153 or B695 Class 55 or F2329	RCE03
h2	4	Cable End Fitting	ASTM A27 Gr. 70-40 Class 1	ASTM A153 or B695	RCE03
h3	4	Cable Wedge	ASTM A47 Gr. 32510	-	FMM01
h4	1	Crosby Threaded Turnbuckle	Stock No. 1034115	As Supplied	-
h6	2	3/4" [19] Dia. 3x7 IWRC IPS Wire Rope - Various Lengths	ASTM A741 Type 1	Class A Coating	RCM01
h8	1	3/4" [19] Dia. UNC-LH THD, 11" [279] Long Threaded Rod	ASTM A307 Gr. A or equivalent	ASTM A153 or B695 Class 55 or F2329	RCE03
k5	4	3/4" [19] Dia. Hardened Flat Washer	ASTM F436	ASTM A153 or B695 Class 55 or F1136 Gr. 3 or F2329	FWC20b
k6	2	3/4" [19] Dia. Plain Round Washer	ASTM F844	ASTM A123 or A153 or F2329	FWC20a
k10	4	3/4" [19] Dia. UNC Square Nut	ASTM A563A or equivalent	ASTM A153 or B695 Class 55 or F2329	FNS20
k11	4	3/4" [19] Dia. UNC Hex Nut	ASTM A563A or equivalent	ASTM A153 or B695 Class 55 or F2329	FNX20a



Downstream Cable Assembly

Item No.	QTY.	Description	Material Specification	Treatment Specification	Hardware Guide
-	2	Downstream Cable Assembly	-	-	-
h5	2	BCT Anchor Cable End Swaged Fitting	Fitting - ASTM A576 Gr. 1035 Stud - ASTM F568 Class C	Fitting - ASTM A153 Stud - ASTM A153 or B695	-
k9	2	1" [25] Dia. UNC Heavy Hex Nut	ASTM A563DH or equivalent	ASTM A153 or B695 Class 55 or F2329	FNX24b
k8	2	1" [25] Dia. Plain Round Washer	ASTM F844	ASTM A123 or A153 or F2329	FWC24a
h7	1	3/4" [19] Dia. 6x19 IWRC IPS Wire Rope	ASTM A741 Type 2	Class A Coating	-

Notes: (1) Total lengths of the three transition anchor cable assemblies are approximately 282" [7,163], 317" [8,052], and 352" [8,941].



Midwest Roadside Safety Facility

NY Box Beam to Weak Post
W-Beam Transition
Test No. NYBWT-3

Anchor Cable Details

DWG. NAME:
NYBWT-3_R2

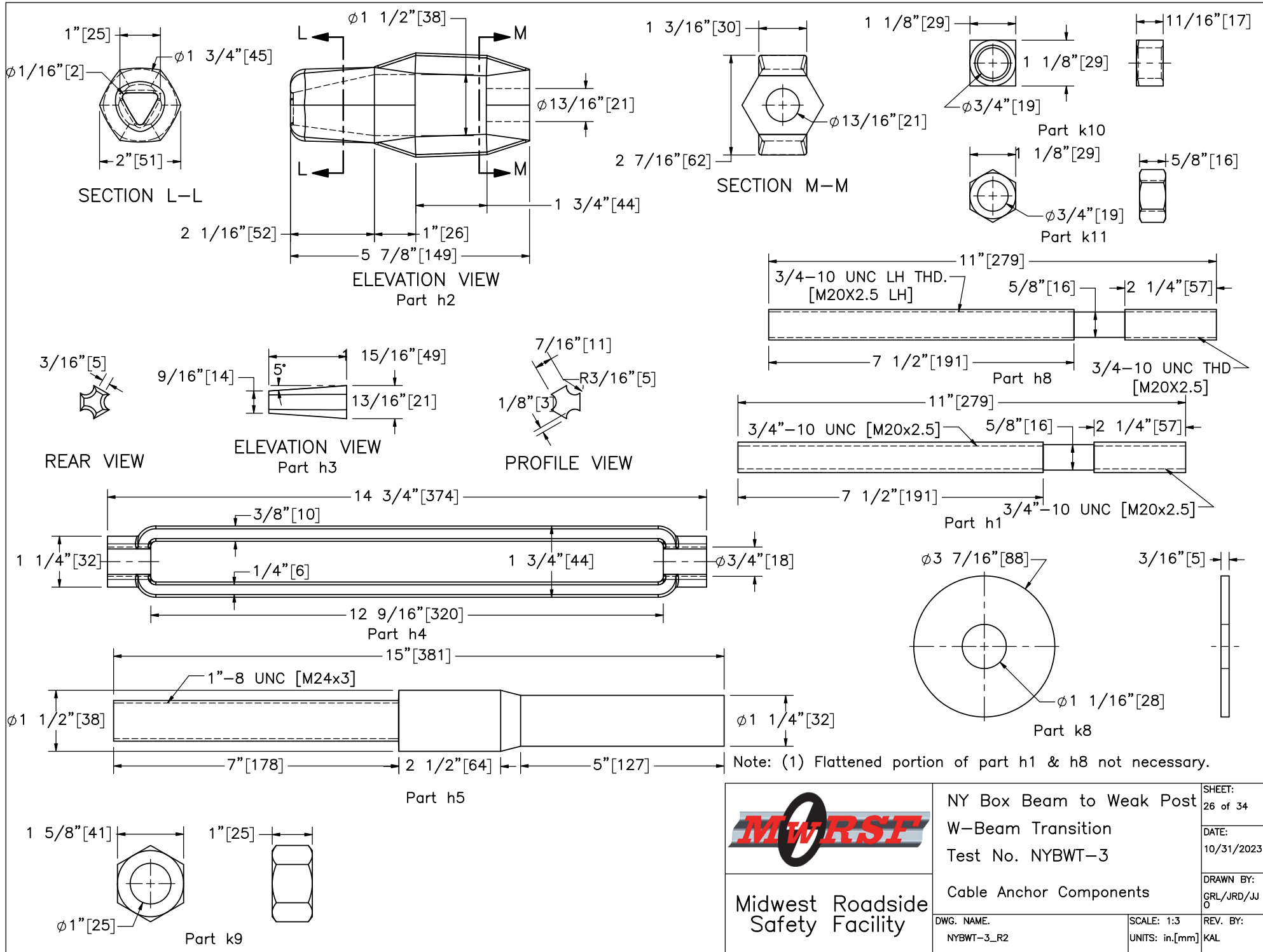
SCALE: 1:10
UNITS: in.[mm]

SHEET:
25 of 34

DATE:
10/31/2023

DRAWN BY:
GRL/JRD/JJ
O

REV. BY:
KAL



Midwest Roadside Safety Facility

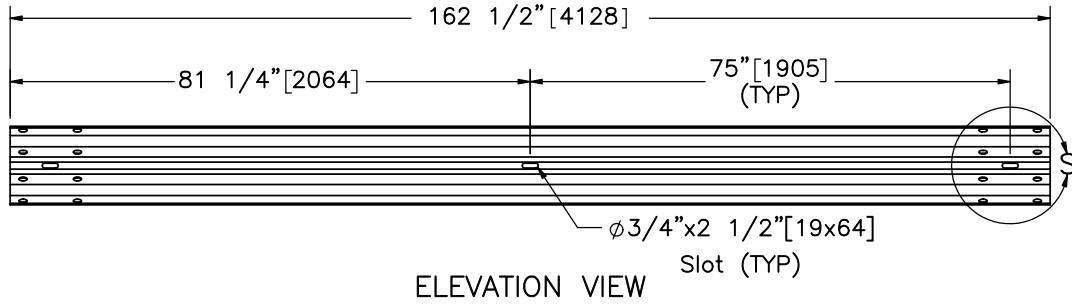
NY Box Beam to Weak Post
W-Beam Transition
Test No. NYBWT-3

Cable Anchor Components

DWG. NAME:
NYBWT-3_R2

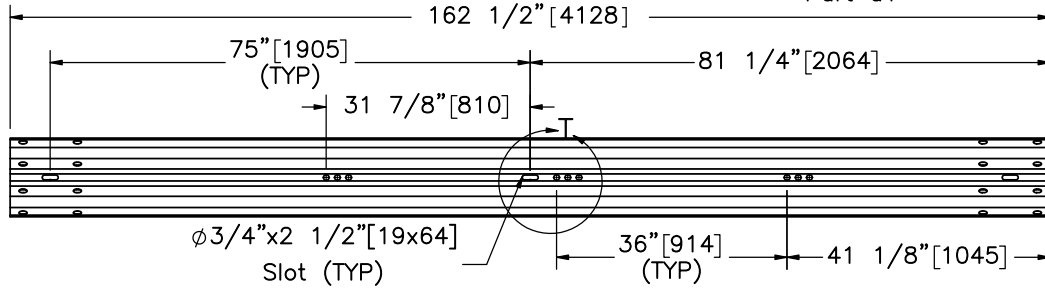
SCALE: 1:3
UNITS: in.[mm]

SHEET:
26 of 34
DATE:
10/31/2023
DRAWN BY:
GRL/JRD/JJ
O
REV. BY:
KAL



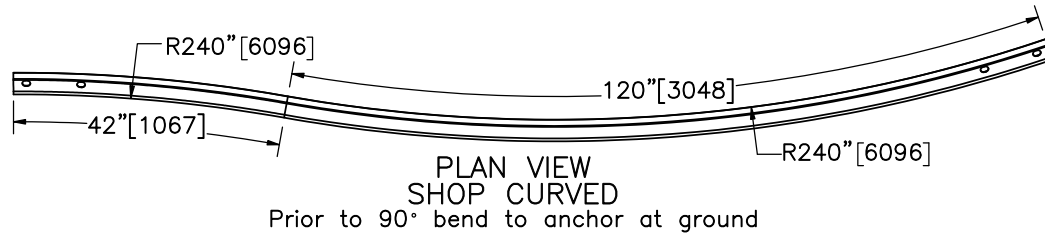
ELEVATION VIEW

Part a1

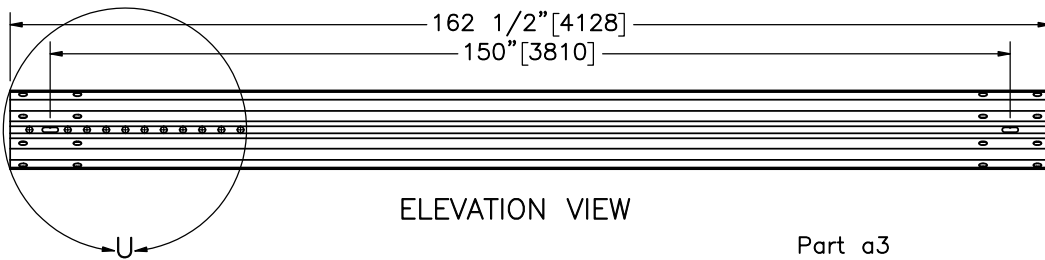


ELEVATION VIEW

Part a2

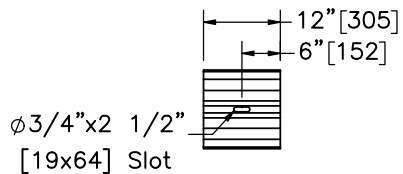


PLAN VIEW
SHOP CURVED
Prior to 90° bend to anchor at ground



ELEVATION VIEW

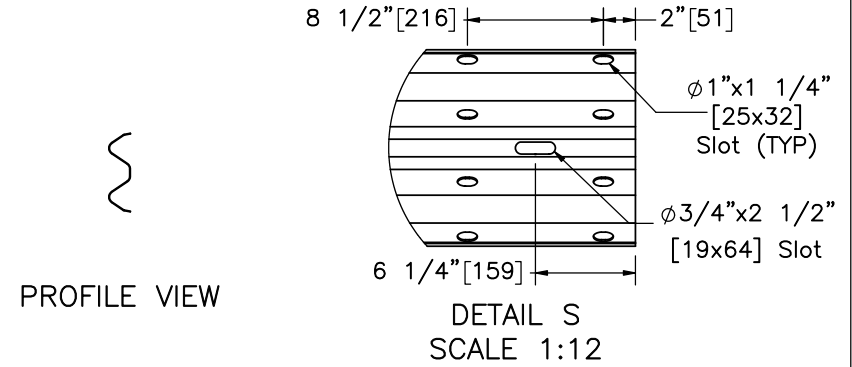
Part a3



ELEVATION VIEW

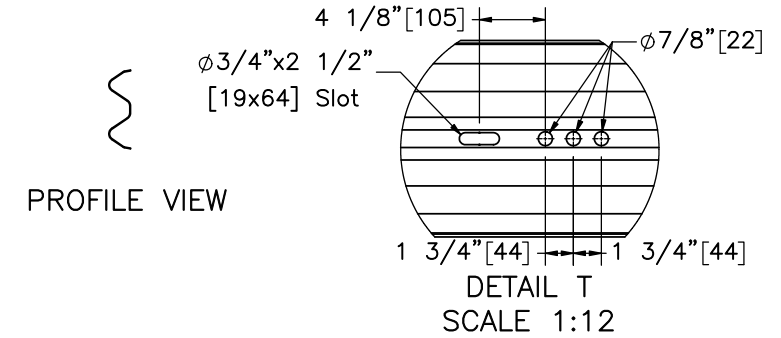
PROFILE VIEW

Part a4



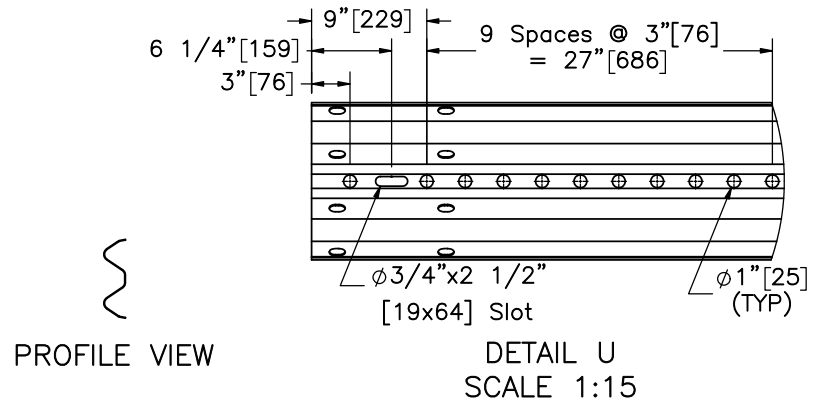
PROFILE VIEW

DETAIL S
SCALE 1:12



PROFILE VIEW

DETAIL T
SCALE 1:12



PROFILE VIEW

DETAIL U
SCALE 1:15



Midwest Roadside
Safety Facility

NY Box Beam to Weak Post

W-Beam Transition

Test No. NYBWT-3

W-Beam Rail Sections

DWG. NAME.
NYBWT-3_R2

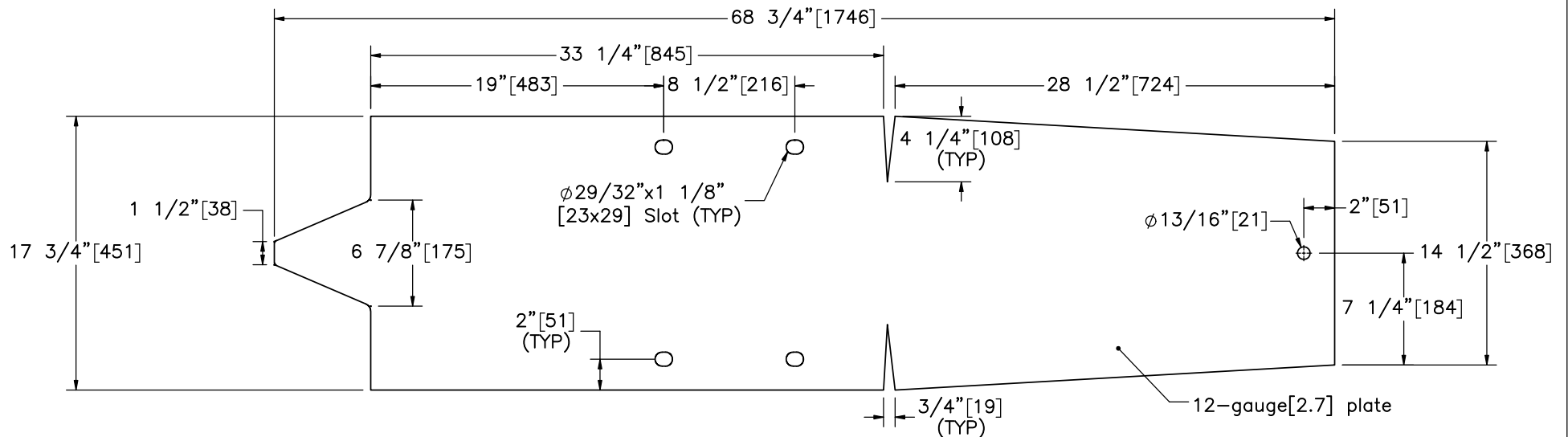
SCALE: 1:30
UNITS: in.[mm]

SHEET:
27 of 34

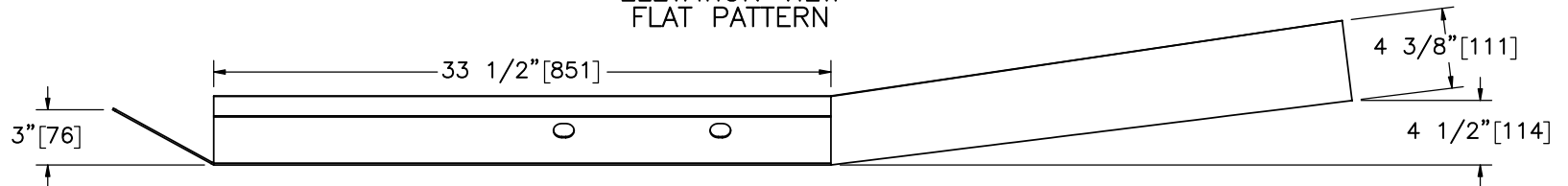
DATE:
10/31/2023

DRAWN BY:
GRL/JRD/JJ
O

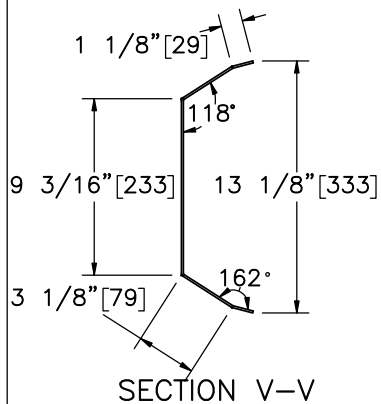
REV. BY:
KAL



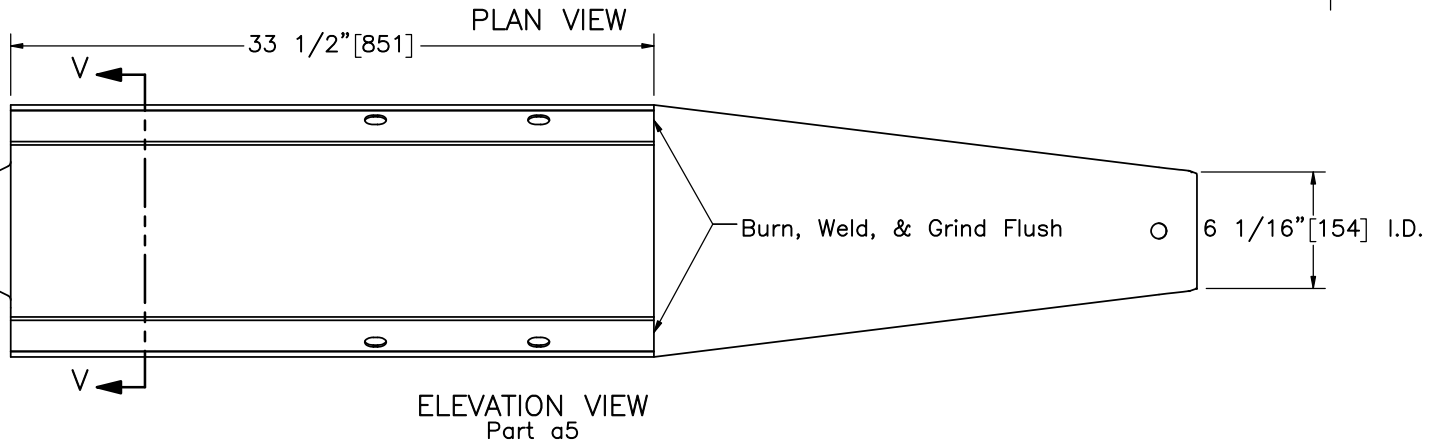
ELEVATION VIEW
FLAT PATTERN



PLAN VIEW



SECTION V-V



ELEVATION VIEW
Part a5



Midwest Roadside
Safety Facility

NY Box Beam to Weak Post
W-Beam Transition
Test No. NYBWT-3

W-Beam to Box Beam
Transition Cover

DWG. NAME:
NYBWT-3_R2

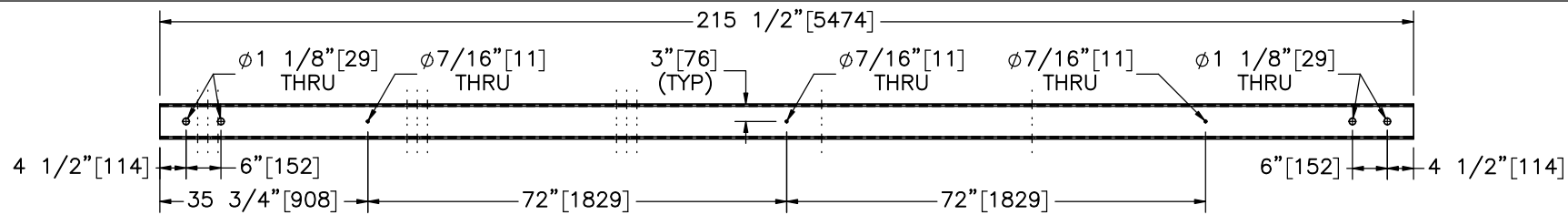
SCALE: 1:10
UNITS: in.[mm]

SHEET:
28 of 34

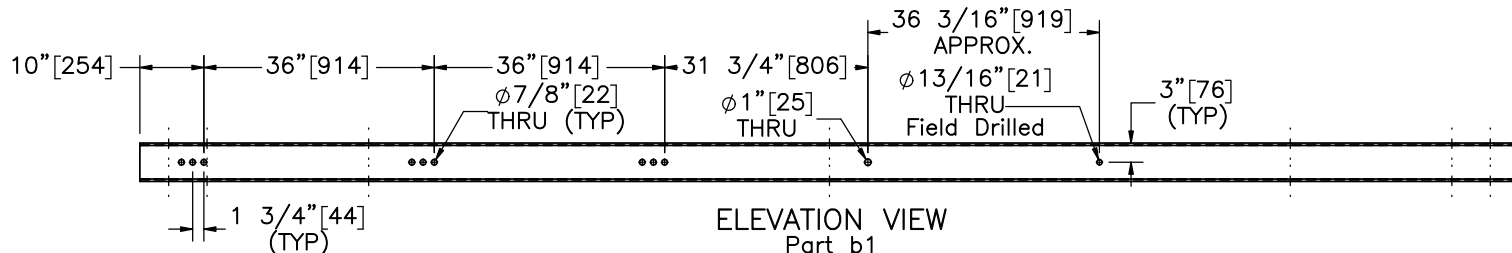
DATE:
10/31/2023

DRAWN BY:
GRL/JRD/JJ
O

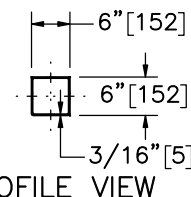
REV. BY:
KAL



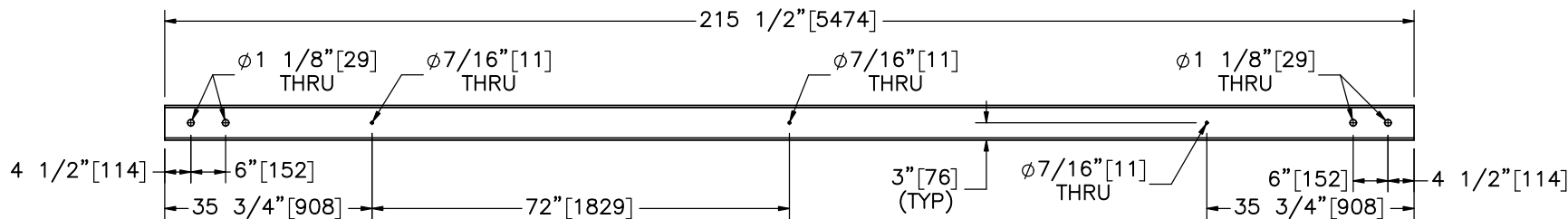
PLAN VIEW



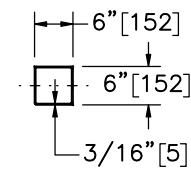
ELEVATION VIEW
Part b1



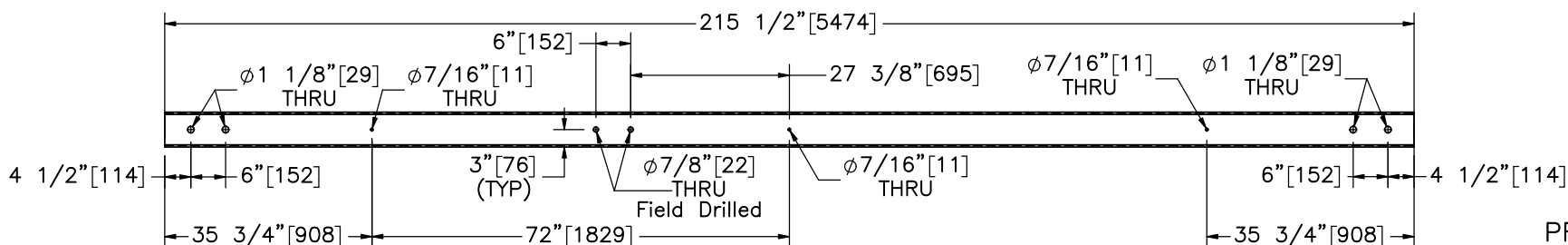
PROFILE VIEW



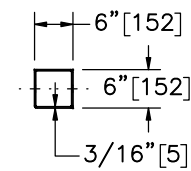
PLAN VIEW
Part b2



PROFILE VIEW



PLAN VIEW
Part b3



PROFILE VIEW



Midwest Roadside
Safety Facility

NY Box Beam to Weak Post
W-Beam Transition
Test No. NYBWT-3

Box Beam Rail Sections

DWG. NAME:
NYBWT-3_R2

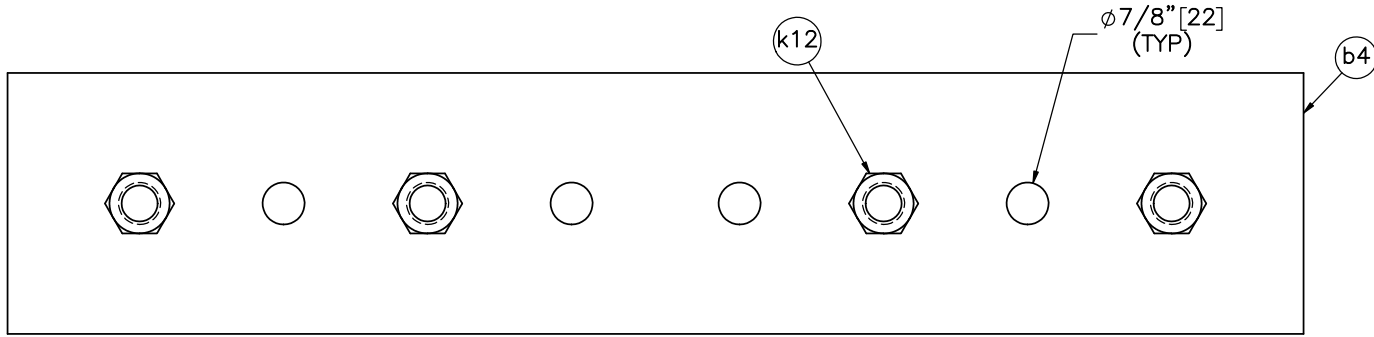
SCALE: 1:30
UNITS: in.[mm]

SHEET:
29 of 34

DATE:
10/31/2023

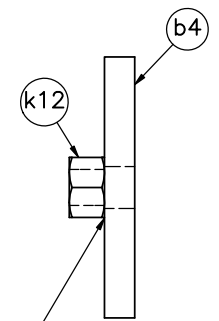
DRAWN BY:
GRL/JRD/JJ
O

REV. BY:
KAL



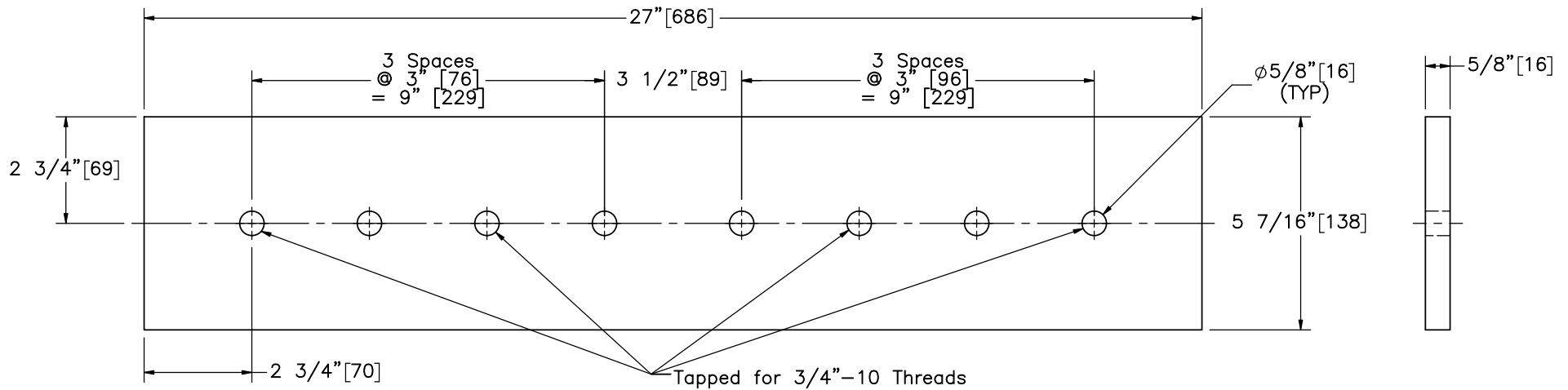
ELEVATION VIEW

Assembled Splice Plate and Nuts



PROFILE VIEW

Tack weld all nuts to splice plates prior to assembly.



ELEVATION VIEW

Alternative Splice Plate With Tapped Holes

PROFILE VIEW

Note: Splice plate with tapped holes may be used instead of splice plate with tack welded nuts.

Item No.	QTY.	Description	Material Specification	Treatment Specification	Hardware Guide
-	10	Splice Plate with Tack Welded Nuts	-	ASTM A123	-
b4	1	27"x5 7/16"x5/8" [686x138x16] Splice Plate	ASTM A36	-	-
k12	4	3/4" [19] Dia. UNC Heavy Hex Nut	ASTM A563DH or equivalent	-	FNX20b



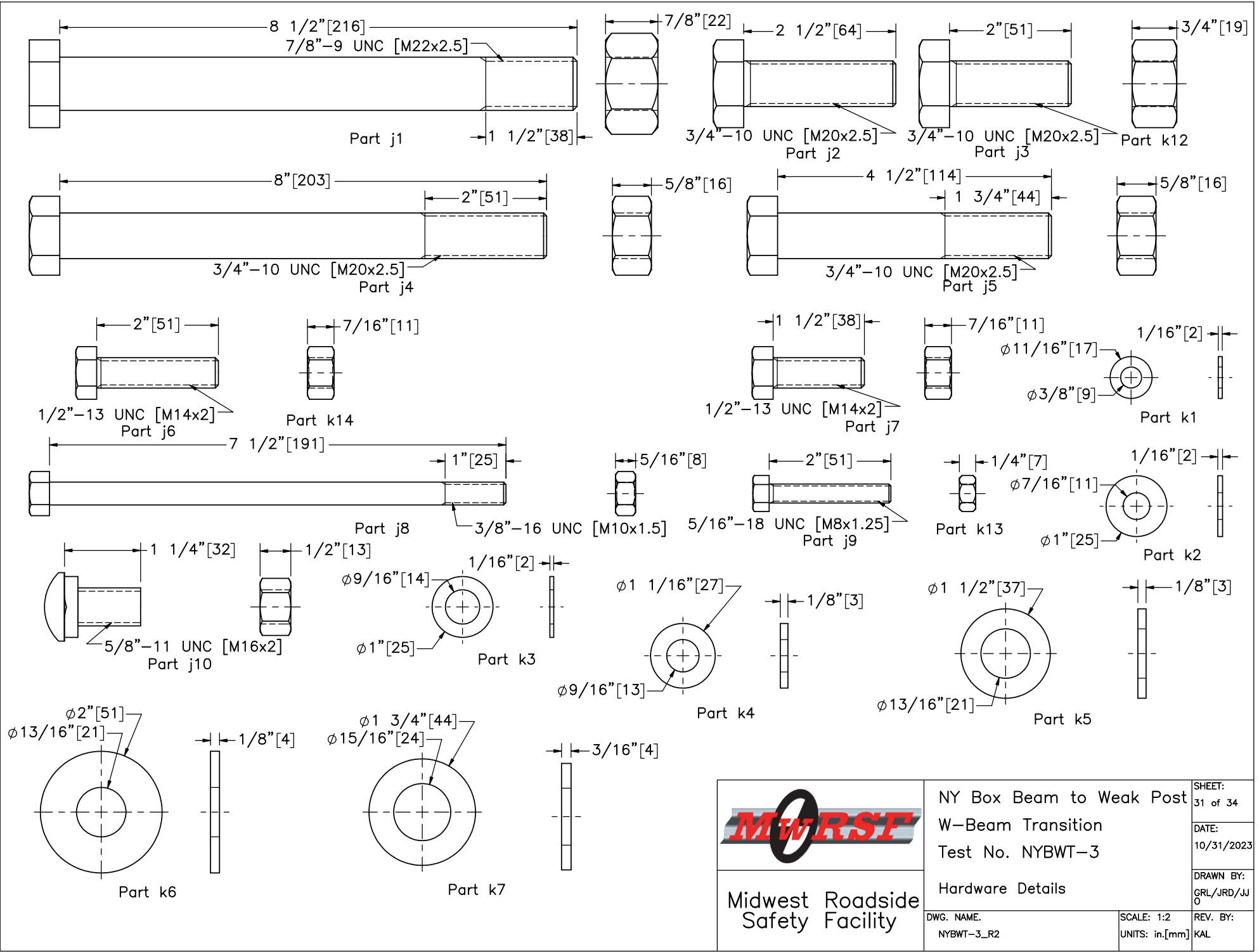
Midwest Roadside Safety Facility

NY Box Beam to Weak Post
W-Beam Transition
Test No. NYBWT-3
Box Beam Splice Plate Details

DWG. NAME:
NYBWT-3_R2

SCALE: 1:4
UNITS: in.[mm]

SHEET:
30 of 34
DATE:
10/31/2023
DRAWN BY:
GRL/JRD/JJ
O
REV. BY:
KAL



Midwest Roadside Safety Facility

NY Box Beam to Weak Post
W-Beam Transition
Test No. NYBWT-3

Hardware Details

DWG. NAME:
NYBWT-3_R2

SCALE: 1:2
UNITS: in.[mm]

SHEET:
31 of 34

DATE:
10/31/2023

DRAWN BY:
GRL/JRD/JJ
O

REV. BY:
KAL

Item No.	QTY.	Description	Material Specification	Treatment Specification	Hardware Guide
a1	8	12'-6" [3,810] 12-gauge [2.7] W-Beam Section	AASHTO M180	ASTM A123 or A653	RWM02a
a2	2	12'-6" [3,810] 12-gauge [2.7] W-Beam Section	AASHTO M180	ASTM A123 or A653	-
a3	1	12'-6" [3,810] 12-gauge [2.7] W-Beam Curved Section	AASHTO M180	ASTM A123 or A653	RWM11a
a4	6	12" [305] 12-gauge [2.7] W-Beam Backup Plate	AASHTO M180	ASTM A123 or A653	RWB01a
a5	1	W-Beam to Box Beam Transition Cover, 12-gauge [2.7]	ASTM A36	ASTM A123 or A653	-
b1	1	TS6"x6"x3/16" [152x152x5], 215 1/2" [5,474] Long Box Beam	ASTM A500 Gr. B	ASTM A123	-
b2	4	TS6"x6"x3/16" [152x152x5], 215 1/2" [5,474] Long Box Beam	ASTM A500 Gr. B	ASTM A123	-
b3	1	TS6"x6"x3/16" [152x152x5], 215 1/2" [5,474] Long Box Beam	ASTM A500 Gr. B	ASTM A123	-
b4	10	27"x5 7/16"x5/8" [686x138x16] Splice Plate	ASTM A36	-	-
c1	33	S3x5.7 [S75x8.5], 65" [1,651] Long Post	ASTM A36	-	-
c2	33	24"x8"x1/4" [610x203x6] Soil Plate	ASTM A36	-	-
c3	18	5"x3 1/2"x3/8" [127x89x10], 4 1/2" [114] Long L-Bracket	ASTM A36	ASTM A123	-
c4	2	4"x3"x1/4" [102x76x6], 8" [203] Long L-Bracket	ASTM A36	ASTM A123	-
d1	2	W6x15 [W152x22.3], 72" [1,829] Long Post	ASTM A992 or ASTM A572 Gr. 50	-	-
d2	2	20"x14"x3/16" [508x356x5] Plate	ASTM A36	-	-
d3	2	6 3/16"x4"x1/2" [157x102x13] Plate	ASTM A36	-	-
d4	4	6 1/4"x4"x1/2" [159x102x13] Plate	ASTM A36	-	-
d5	2	6 3/16"x6"x1/2" [157x152x13] Plate	ASTM A36	-	-
e1	2	10"x9"x1/2" [254x229x13] Box Beam Cable Anchor Base Plate	ASTM A36	-	-
e2	4	4"x4"x1/4" [102x102x6] Box Beam Cable Anchor Gusset	ASTM A36	-	-
e3	2	4"x4"x1/2" [102x102x13] Box Beam Cable Anchor Mounting Plate	ASTM A36	-	-
f1	2	Concrete	Pre-Cast Class A* Min. f'c = 3,000 psi [20.7 MPa] NE Mix 47BD	-	-
f2	2	#3 [10] Bar, 106 5/8" [2,708] Long Unbent	ASTM A615 Gr. 60 or A996 Gr. 60	Epoxy-Coated (ASTM A775 or A934) **	-
f3	2	#3 [10] Bar, 117 5/8" [2,988] Long Unbent	ASTM A615 Gr. 60 or A996 Gr. 60	Epoxy-Coated (ASTM A775 or A934) **	-
f4	2	#3 [10] Bar, 127 1/8" [3,229] Long Unbent	ASTM A615 Gr. 60 or A996 Gr. 60	Epoxy-Coated (ASTM A775 or A934) **	-

* If cast in place, follow Section 501 – Portland Cement Concrete – General of the NY state standards.

** Epoxy-coating not necessary for testing purposes.



Midwest Roadside
Safety Facility

NY Box Beam to Weak Post
W-Beam Transition
Test No. NYBWT-3

Bill of Materials

DWG. NAME.
NYBWT-3_R2

SCALE: None
UNITS: in.[mm]

SHEET:
32 of 34

DATE:
10/31/2023

DRAWN BY:
GRL/JRD/JJ
O

REV. BY:
KAL

Item No.	QTY.	Description	Material Specification	Treatment Specification	Hardware Guide
f5	8	#3 [10] Bar, 39" [991] Long	ASTM A615 Gr. 60 or A996 Gr. 60	Epoxy-Coated (ASTM A775 or A934) **	-
f6	16	3/4" [19] Dia. UNC, Hooked Anchor J-Bolt and Nut	J-Bolt - ASTM A307 Gr. C Nut - ASTM A563DH	ASTM A153 or B695 Class 55 or F2329	FRH20a
g1	1	14"x9"x1/2" [356x229x13] Cable Anchor Base Plate	ASTM A36	-	-
g2	4	3"x2"x1/4" [76x51x6] Cable Anchor Gusset	ASTM A36	-	-
g3	1	14"x3 1/2"x1/2" [356x89x13] Cable Anchor Top Plate	ASTM A36	-	-
g4	1	1/4" [6] Dia., 16 3/8" [416] Long Brass Rod	ASTM B16-00	-	-
h1	9	3/4" [19] Dia. UNC, 11" [279] Long Threaded Rod	ASTM A307 Gr. A or equivalent	ASTM A153 or B695 Class 55 or F2329	RCE03
h2	12	Cable End Fitting	ASTM A27 Gr. 70-40 Class 1	ASTM A153 or B695	RCE03
h3	12	Cable Wedge	ASTM A47 Gr. 32510	-	FMM01
h4	3	Crosby Threaded Turnbuckle	Stock No. 1034115	As Supplied	-
h5	4	BCT Anchor Cable End Swaged Fitting	Fitting - ASTM A576 Gr. 1035 Stud - ASTM F568 Class C	Fitting - ASTM A153 Stud - ASTM A153 or B695	-
h6	6	3/4" [19] Dia. 3x7 IWRC IPS Wire Rope - Various Lengths	ASTM A741 Type 1	Class A Coating	RCM01
h7	2	3/4" [19] Dia. 6x19 IWRC IPS Wire Rope - Various Lengths	ASTM A741 Type 2	Class A Coating	-
h8	3	3/4" [19] Dia. UNC-LH THD, 11" [279] Long Threaded Rod	ASTM A307 Gr. A or equivalent	ASTM A153 or B695 Class 55 or F2329	RCE03
i1	3	7"x4"x1/2" [178x102x13], 3" [76] Long L-Bracket	ASTM A36	ASTM A123	-
i2	20	1 3/4"x1 3/4"x10-gauge [44x44x3.4] Square Washer	ASTM A36	ASTM A123	-
i3	1	27"x3"x1/4" [686x76x6] Washer Plate	ASTM A36	ASTM A123	-
j1*	2	7/8"-9 UNC [M22x2.5], 8 1/2" [216] Long Heavy Hex Head Bolt and Nut	Bolt - ASTM F3125 Gr. A325 Type 1 or equivalent Nut - ASTM A563DH or equivalent	ASTM A153 or B695 Class 55 or F1136 Gr. 3 or F2329 or F2833 Gr. 1	FBX22b
j2*	2	3/4"-10 UNC [M20x2.5], 2 1/2" [64] Long Fully Threaded Heavy Hex Head Bolt	Bolt - ASTM F3125 Gr. A325 Type 1 or equivalent Nut - ASTM A563DH or equivalent	ASTM A153 or B695 Class 55 or F1136 Gr. 3 or F2329 or F2833 Gr. 1	FBX20b
j3	38	3/4"-10 UNC [M20x2.5], 2" [51] Long Fully Threaded Heavy Hex Head Bolt	Bolt - ASTM F3125 Gr. A325 Type 1 or equivalent Nut - ASTM A563DH or equivalent	ASTM A153 or B695 Class 55 or F1136 Gr. 3 or F2329 or F2833 Gr. 1	FBX20b
j4	11	3/4"-10 UNC [M20x2.5], 8" [203] Long Hex Head Bolt and Nut	Bolt - ASTM A307 Gr. A or equivalent Nut - ASTM A563A or equivalent	ASTM A153 or B695 Class 55 or F2329	FBX20a
j5	2	3/4"-10 UNC [M20x2.5], 4 1/2" [114] Long Hex Head Bolt and Nut	Bolt - ASTM A307 Gr. A or equivalent Nut - ASTM A563A or equivalent	ASTM A153 or B695 Class 55 or F2329	FBX20a
j6	2	1/2"-13 UNC [M14x2], 2" [51] Fully Threaded Long Hex Head Bolt	ASTM A307 Gr. A or equivalent	ASTM A153 or B695 Class 55 or F2329	FBX14a

* If using the alternate splice plates with tapped holes, these hex bolts can be 1/2" [13] shorter.



Midwest Roadside Safety Facility

NY Box Beam to Weak Post
W-Beam Transition
Test No. NYBWT-3

Bill of Materials

DWG. NAME:
NYBWT-3_R2

SCALE: None
UNITS: in.[mm]

SHEET:
33 of 34

DATE:
10/31/2023

DRAWN BY:
GRL/JRD/JJ
O

REV. BY:
KAL

Item No.	QTY.	Description	Material Specification	Treatment Specification	Hardware Guide
j7	18	1/2"-13 UNC [M14x2], 1 1/2" [38] Long Fully Threaded Hex Head Bolt and Nut	Bolt - ASTM A307 Gr. A or equivalent Nut - ASTM A563A or equivalent	ASTM A153 or B695 Class 55 or F2329	FBX14a
j8	18	3/8"-16 UNC [M10x1.5], 7 1/2" [191] Long Hex Head Bolt and Nut	Bolt - ASTM A307 Gr. A or equivalent Nut - ASTM A563A or equivalent	ASTM A153 or B695 Class 55 or F2329	FBX10a
j9	8	5/16"-18 UNC [M8x1.25], 2" [51] Long Fully Threaded Hex Head Bolt	Bolt - ASTM A307 Gr. A or equivalent Nut - ASTM A563A or equivalent	ASTM A153 or B695 Class 55 or F2329	FBX08a
j10	76	5/8"-11 UNC [M16x2], 1 1/4" [32] Long Guardrail Bolt and Nut	Bolt - ASTM A307 Gr. A Nut - ASTM A563A	ASTM A153 or B695 Class 55 or F2329	FBB01
k1	8	5/16" [8] Dia. Hardened Flat Washer	ASTM F436	ASTM A153 or B695 Class 55 or F1136 Gr. 3 or F2329	-
k2	36	3/8" [10] Dia. Plain Round Washer	ASTM F844	ASTM A123 or A153 or F2329	FWC10a
k3	18	1/2" [13] Dia. Plain Narrow Round Washer	SAE Low Carbon Gr. 2	ASTM A153 or B695 Class 55 or F1136 Gr. 3 or F2329	-
k4	2	1/2" [13] Dia. Hardened Flat Washer	ASTM F436	ASTM A153 or B695 Class 55 or F1136 Gr. 3 or F2329	FWC14b
k5	74	3/4" [19] Dia. Hardened Flat Washer	ASTM F436	ASTM A153 or B695 Class 55 or F1136 Gr. 3 or F2329	FWC20b
k6	17	3/4" [19] Dia. Plain Round Washer	ASTM F844	ASTM A123 or A153 or F2329	FWC20a
k7	4	7/8" [22] Dia. Hardened Flat Washer	ASTM F436	ASTM A153 or B695 Class 55 or F1136 Gr. 3 or F2329	FWC22b
k8	4	1" [25] Dia. Plain Round Washer	ASTM F844	ASTM A123 or A153 or F2329	FWC24a
k9	4	1" [25] Dia. UNC Heavy Hex Nut	ASTM A563DH or equivalent	ASTM A153 or B695 Class 55 or F2329	FNX24b
k10	12	3/4" [19] Dia. UNC Square Nut	ASTM A563A or equivalent	ASTM A153 or B695 Class 55 or F2329	FNS20
k11	12	3/4" [19] Dia. UNC Hex Nut	ASTM A563A or equivalent	ASTM A153 or B695 Class 55 or F2329	FNX20a
k12*	40	3/4" [19] Dia. UNC Heavy Hex Nut	ASTM A563DH or equivalent	-	FNX20b
k13	16	5/16" [8] Dia. UNC Hex Nut	ASTM A563A or equivalent	ASTM A153 or B695 Class 55 or F2329	FNX08a
k14	4	1/2" [13] Dia. UNC Hex Nut	ASTM A563A or equivalent	ASTM A153 or B695 Class 55 or F2329	FNX14a

* If using the alternate splice plates with tapped holes, these additional hex nuts are not required.

Washer	Washer Series	Inside Diameter			Outside Diameter			Thickness		
		Basic	Tolerance		Basic	Tolerance		Basic	Max.	Min.
			Plus	Minus		Plus	Minus			
3/4"	Regular (k5)	0.812"	0.03"	0.007"	1.469"	0.03"	0.007"	0.134"	0.16"	0.108"
	Wide (k6)	0.812"	0.03"	0.007"	2"	0.03"	0.007"	0.165"	0.192"	0.136"



Midwest Roadside Safety Facility

NY Box Beam to Weak Post
W-Beam Transition
Test No. NYBWT-3

Bill of Materials

DWG. NAME:
NYBWT-3_R2

SCALE: None
UNITS: in.[mm]

SHEET:
34 of 34
DATE:
10/31/2023
DRAWN BY:
GRL/JRD/JJ
O
REV. BY:
KAL

REV.	DATE OF ISSUE	Page	NATURE OF CHANGES	REVIEWER	REVISED BY
0	6/14/2018	-	Created from NYBWT-2_0.	-	GRL
1	8/23/2019	-	Renamed HFT anchor assembly to downstream anchor post assembly.	KAL	JRD
		1	Edited downstream anchor annotation and note 4.		
		3	Edited downstream anchor post assembly annotation.		
		10	Edited downstream anchor post assembly annotation.		
		20	Renamed sheet and BOM to downstream anchor post assembly.		
		21	Renamed sheet to downstream anchor post components.		
2	10/31/2023	All	Changed description to NY Box Beam to Weak Post.	KAL	JJO
		2	Corrected a4 backing plate location, updated detail views I & J		
		8	Added splice plate note.		
		25	Updated transition anchor cable to show correct LH threaded part in turnbuckle.		
		26	Added threaded rod detail part no h8.		
		BOM	Updated BOM with part no h8.		