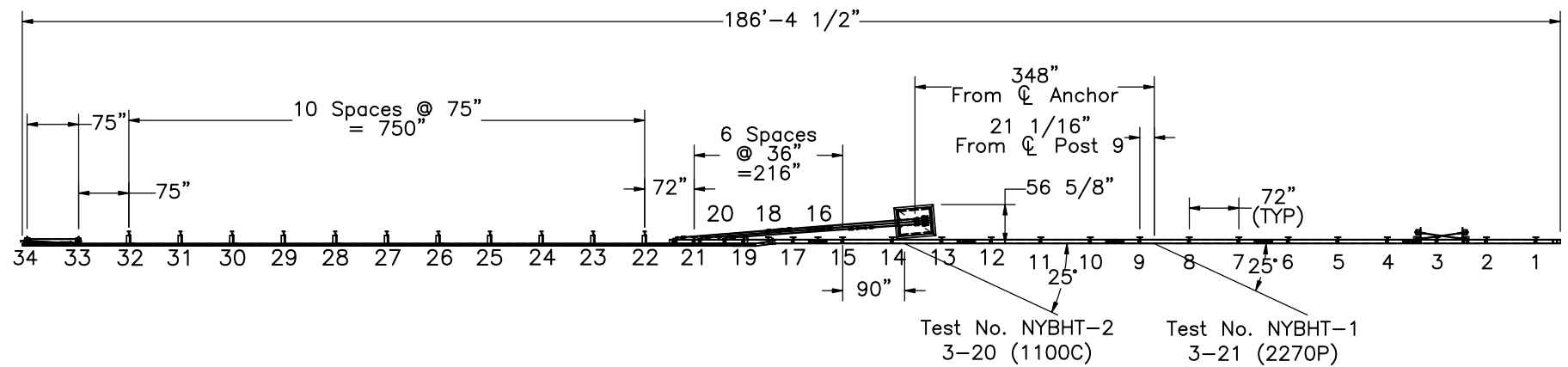
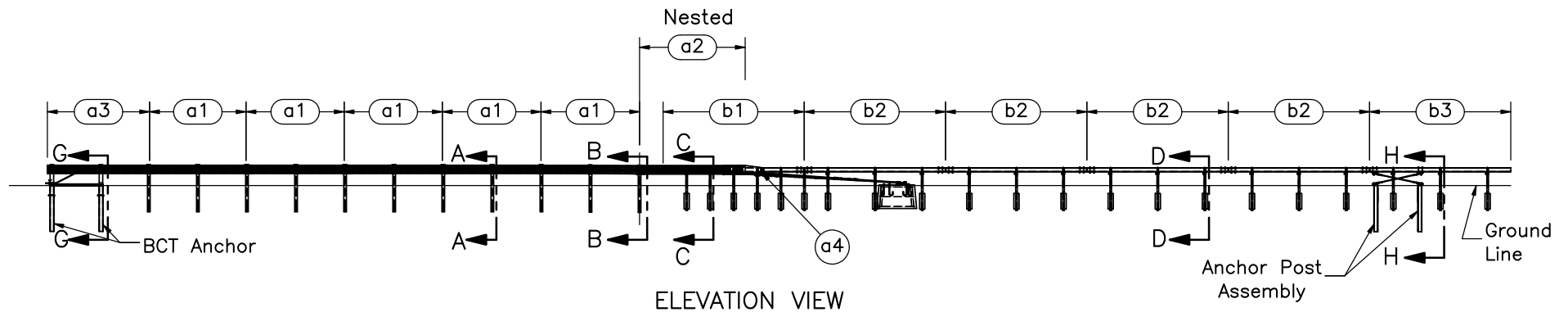




PLAN VIEW



ELEVATION VIEW

- Notes: (1) Test shall be performed according to test designation no. 3-20 and 3-21 using MASH 2016 criteria.
 (2) The impact location for the first test is 29' upstream from the centerpoint of cable anchor.
 (3) The impact location for the second test is 90" upstream from the centerline of post no. 15.
 (3) Critical region is located between post nos. 6 and 25.
 (4) Anchor posts are placed in $\phi 3'$ holes, then backfilled and tamped with soil.



Midwest Roadside
Safety Facility

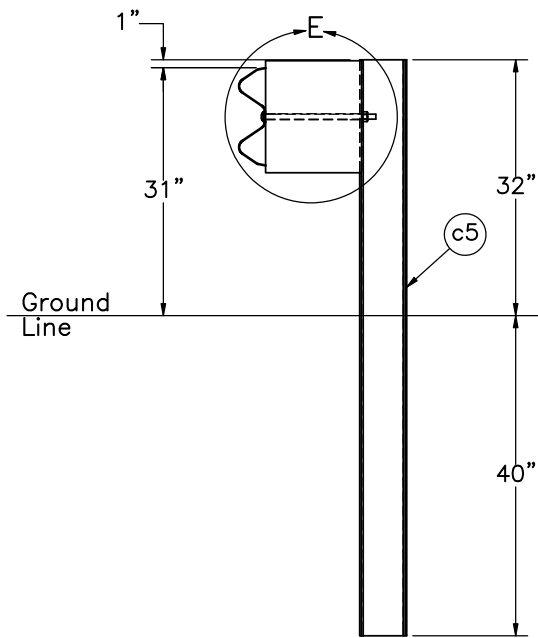
NY Box Beam to HPBO
W-Beam Transition
Test Series NYBHT

System Layout

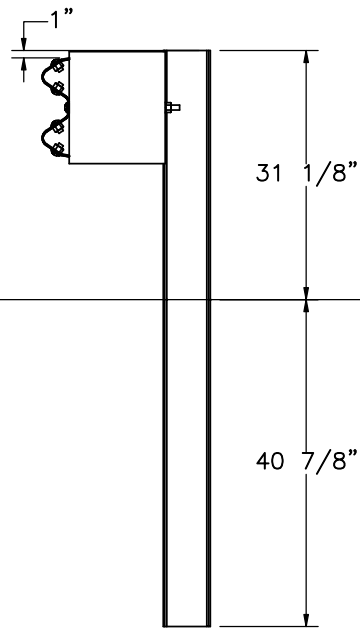
DWG. NAME.
NYBHT-1-2_R7

SCALE: 1:240
UNITS: in.

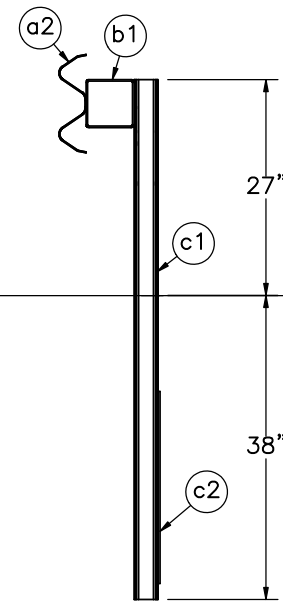
SHEET:
1 of 37
DATE:
8/6/2021
DRAWN BY:
JEK/SBW/G
HR
REV. BY:
KAL/JCH/JR
R



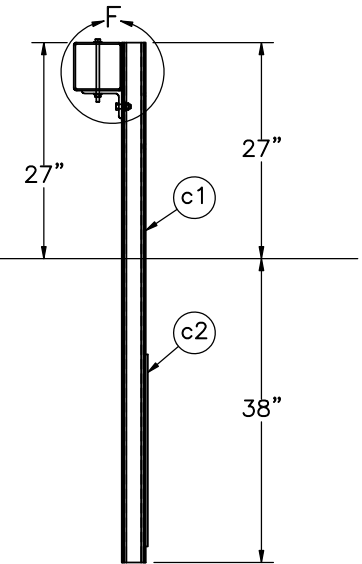
SECTION A-A
Post Nos. 24-32



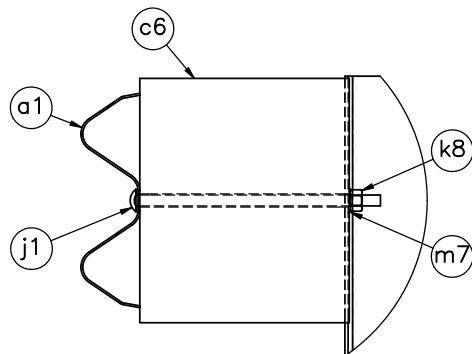
SECTION B-B
Post No. 22



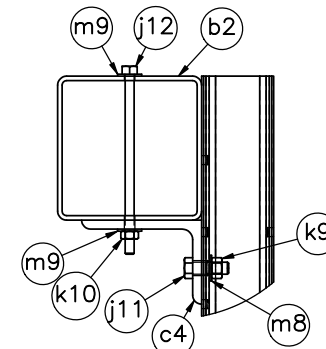
SECTION C-C
Post Nos. 16, 18, and 20
Posts not connected to rail



SECTION D-D
Post Nos. 1-15, 17,
19, and 21



DETAIL E
SCALE 1:11



DETAIL F
SCALE 1:8

- Notes: (1) Guardrail bolts (part j1) on the upstream side of the web.
(2) Box beam post bolts (part j12) on the upstream side of the web.
(3) HPBO system may have routed blockouts or may use nails to prevent blockout rotation.



Midwest Roadside
Safety Facility

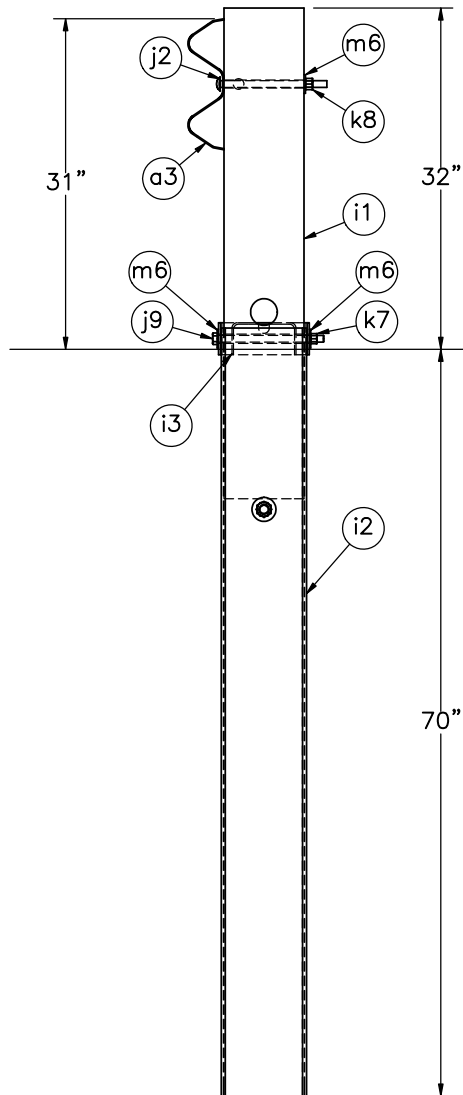
NY Box Beam to HPBO
W-Beam Transition
Test Series NYBHT

Post Sections

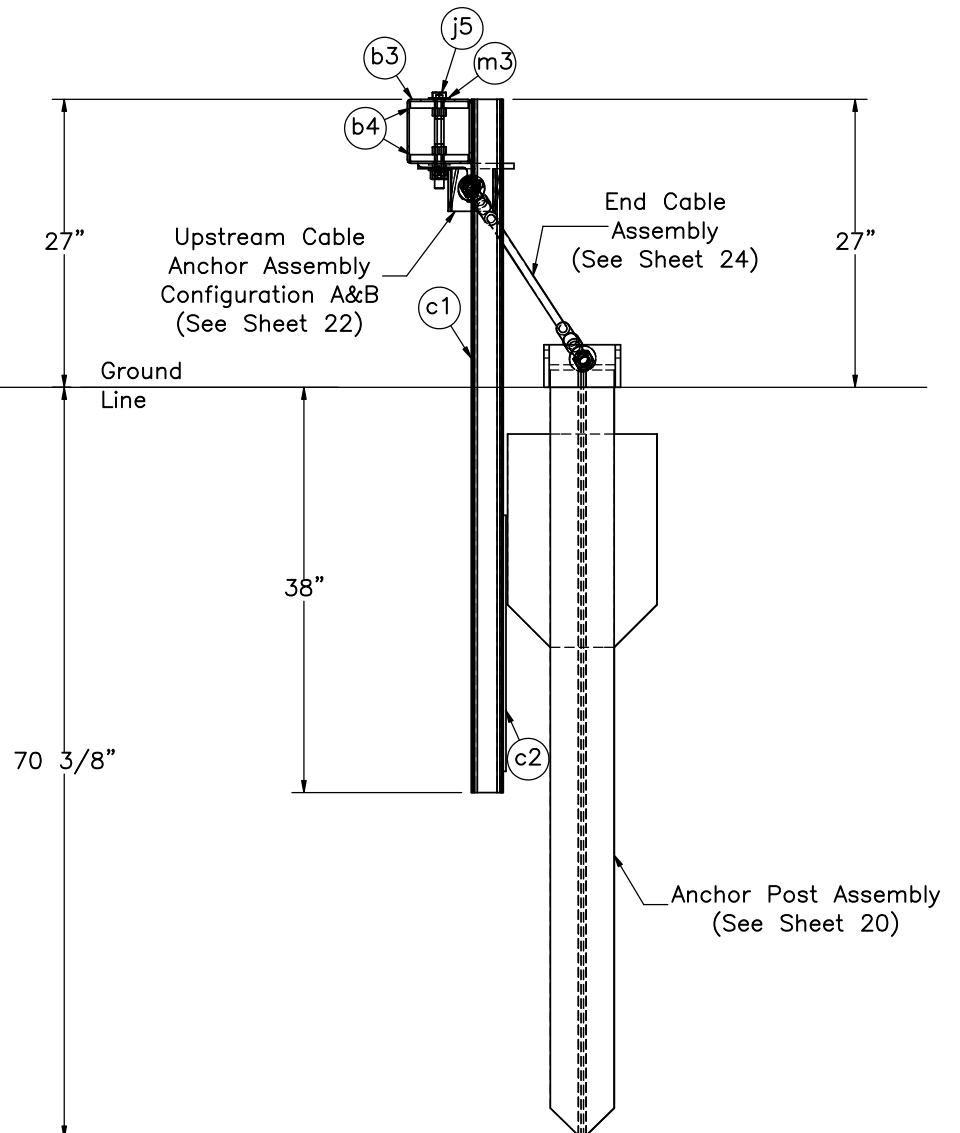
DWG. NAME.
NYBHT-1-2_R7

SCALE: 1:24
UNITS: in.

SHEET:
2 of 37
DATE:
8/6/2021
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JEK/SBW/G
HR
REV. BY:
KAL/JCH/JR
R



SECTION G-G
Post Nos. 33 and 34



SECTION H-H



Midwest Roadside
Safety Facility

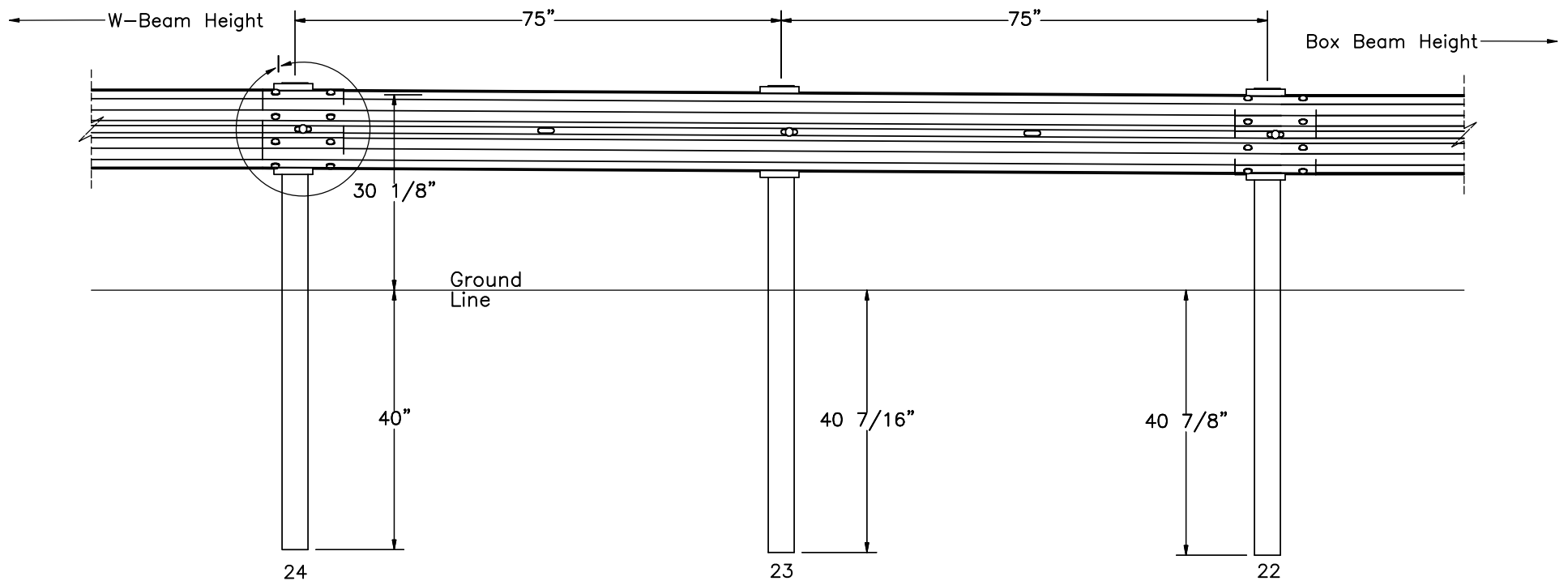
NY Box Beam to HPBO
W-Beam Transition
Test Series NYBHT

Anchor Post Sections

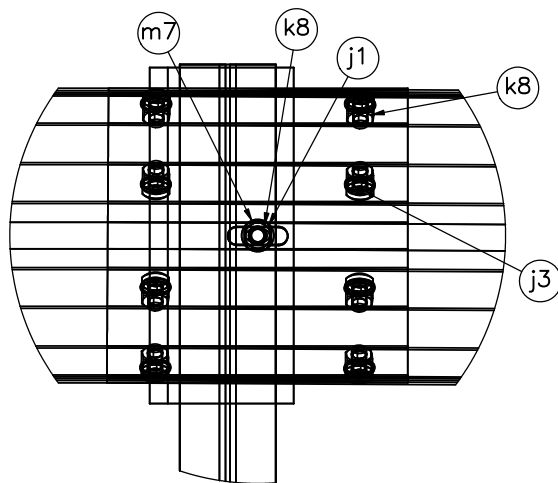
DWG. NAME:
NYBHT-1-2_R7

SCALE: 1:18
UNITS: in.

SHEET:
3 of 37
DATE:
8/6/2021
DRAWN BY:
JEK/SBW/G
HR
REV. BY:
KAL/JCH/JR
R



ELEVATION VIEW



DETAIL I
SCALE 1:8



Midwest Roadside
Safety Facility

NY Box Beam to HPBO
W-Beam Transition
Test Series NYBHT

Rail Elevation Transition Details

DWG. NAME.
NYBHT-1-2_R7

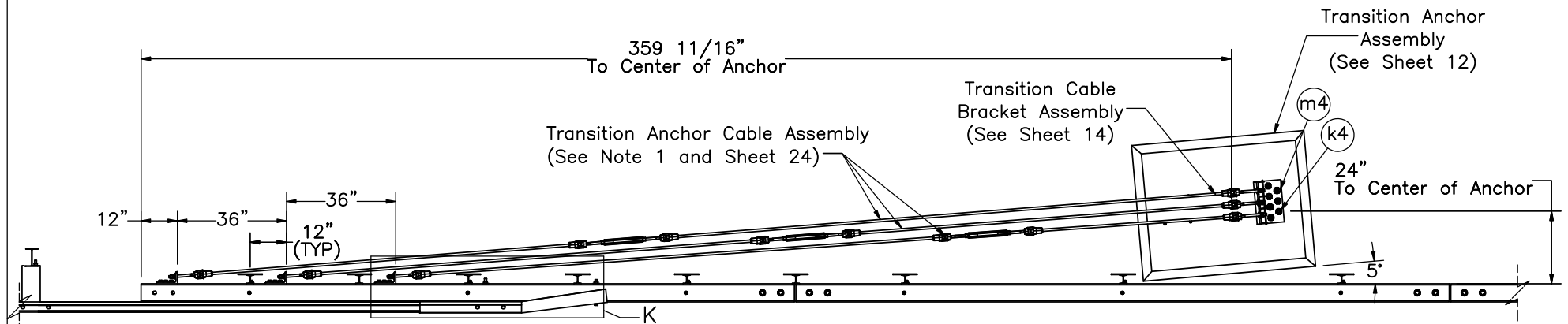
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SHEET:
4 of 37

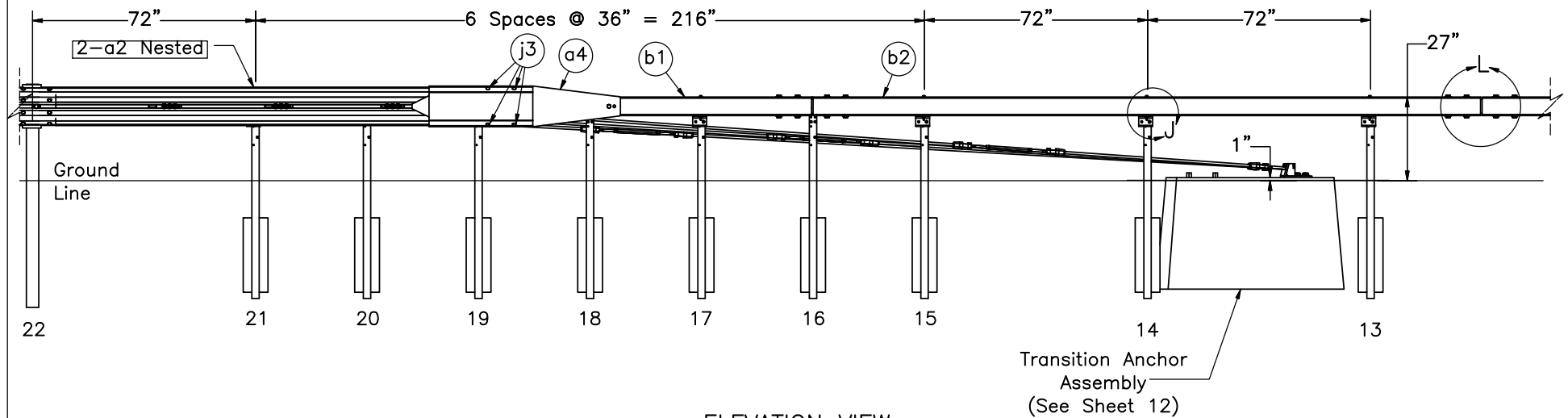
DATE:
8/6/2021

DRAWN BY:
JEK/SBW/G
HR

REV. BY:
KAL/JCH/JR
R



PLAN VIEW



ELEVATION VIEW

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



Midwest Roadside
Safety Facility

NY Box Beam to HPBO
W-Beam Transition
Test Series NYBHT

Transition Layout

DWG. NAME:
NYBHT-1-2_R7

SCALE: 1:50
UNITS: in.

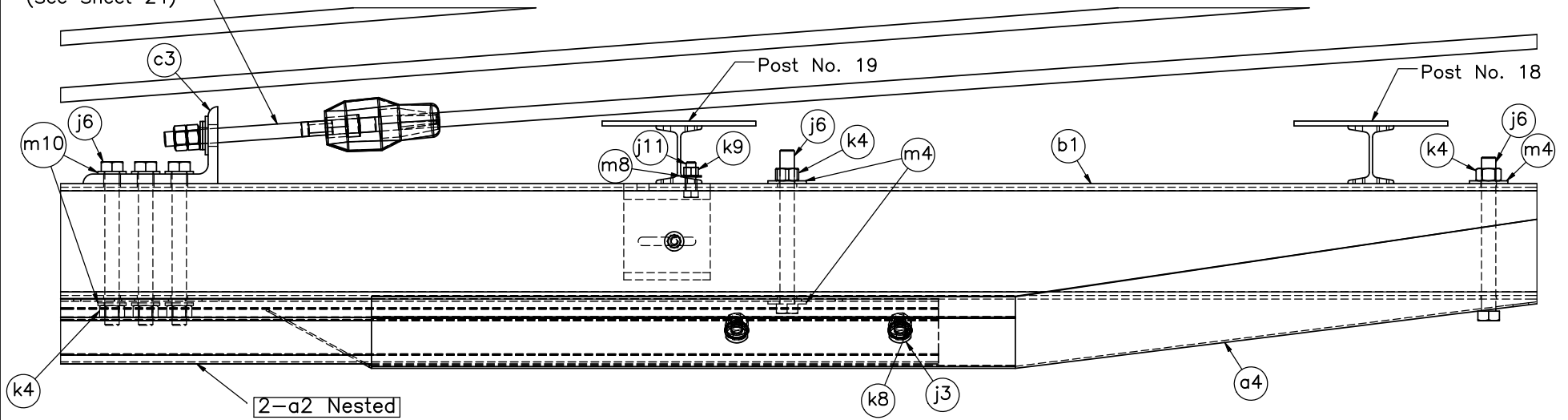
SHEET:
5 of 37

DATE:
8/6/2021

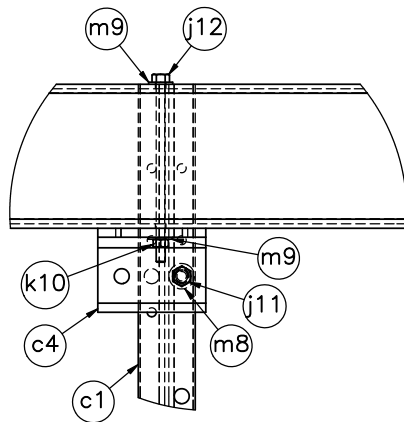
DRAWN BY:
JEK/SBW/G
HR

REV. BY:
KAL/JCH/JR
R

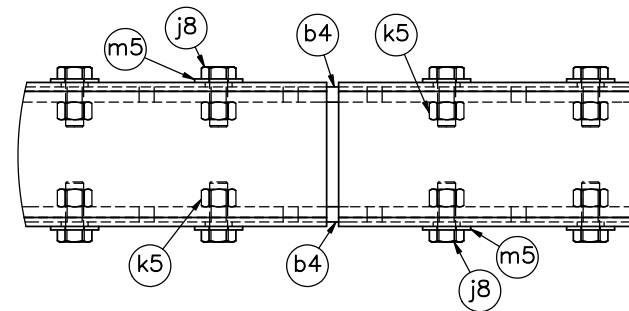
Transition Anchor
Cable Assembly
(See Sheet 24)



DETAIL K



DETAIL J



DETAIL L



Midwest Roadside
Safety Facility

NY Box Beam to HPBO
W-Beam Transition
Test Series NYBHT

Transition, Post Attachment,
and Box Splice Details

DWG. NAME:
NYBHT-1-2_R7

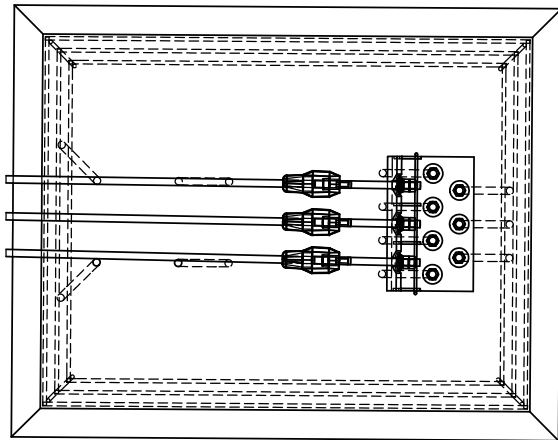
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UNITS: in.

SHEET:
6 of 37

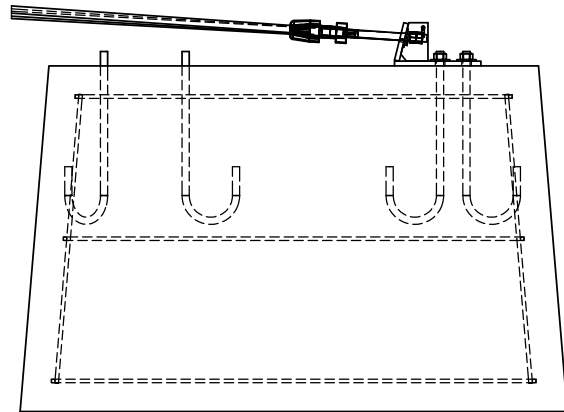
DATE:
8/6/2021

DRAWN BY:
JEK/SBW/G
HR

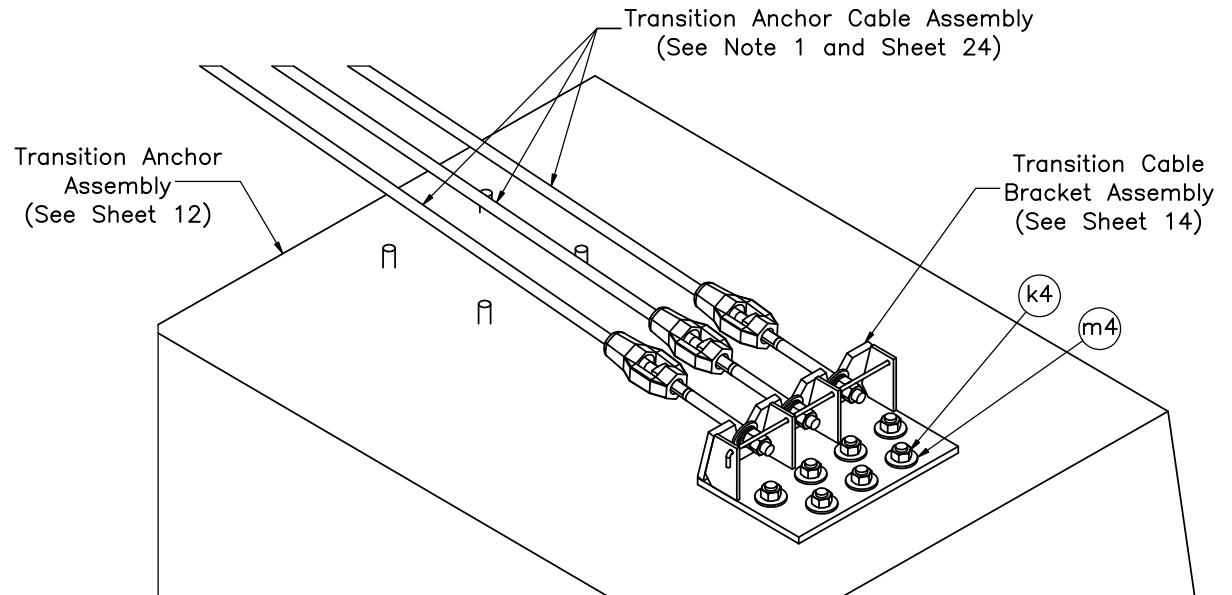
REV. BY:
KAL/JCH/JR
R



PLAN VIEW



ELEVATION VIEW



ISOMETRIC CROP VIEW
SCALE 1:12

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 HPBO
W-Beam Transition
Test Series NYBHT

Cable Bracket Connection
Details

DWG. NAME:
NYBHT-1-2_R7

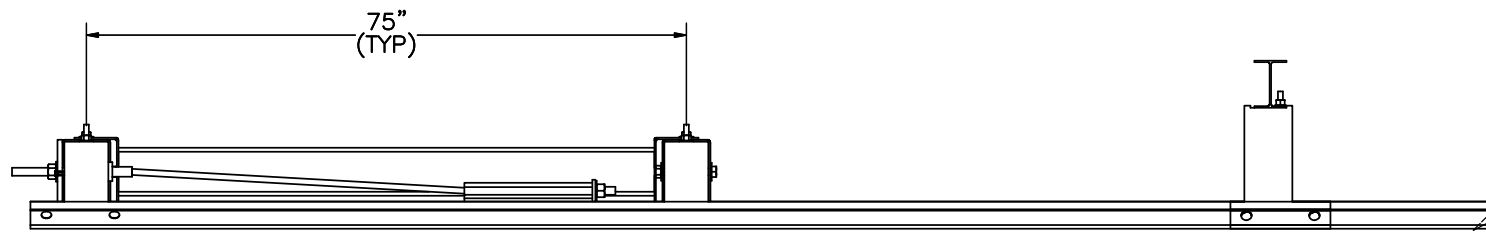
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SHEET:
7 of 37

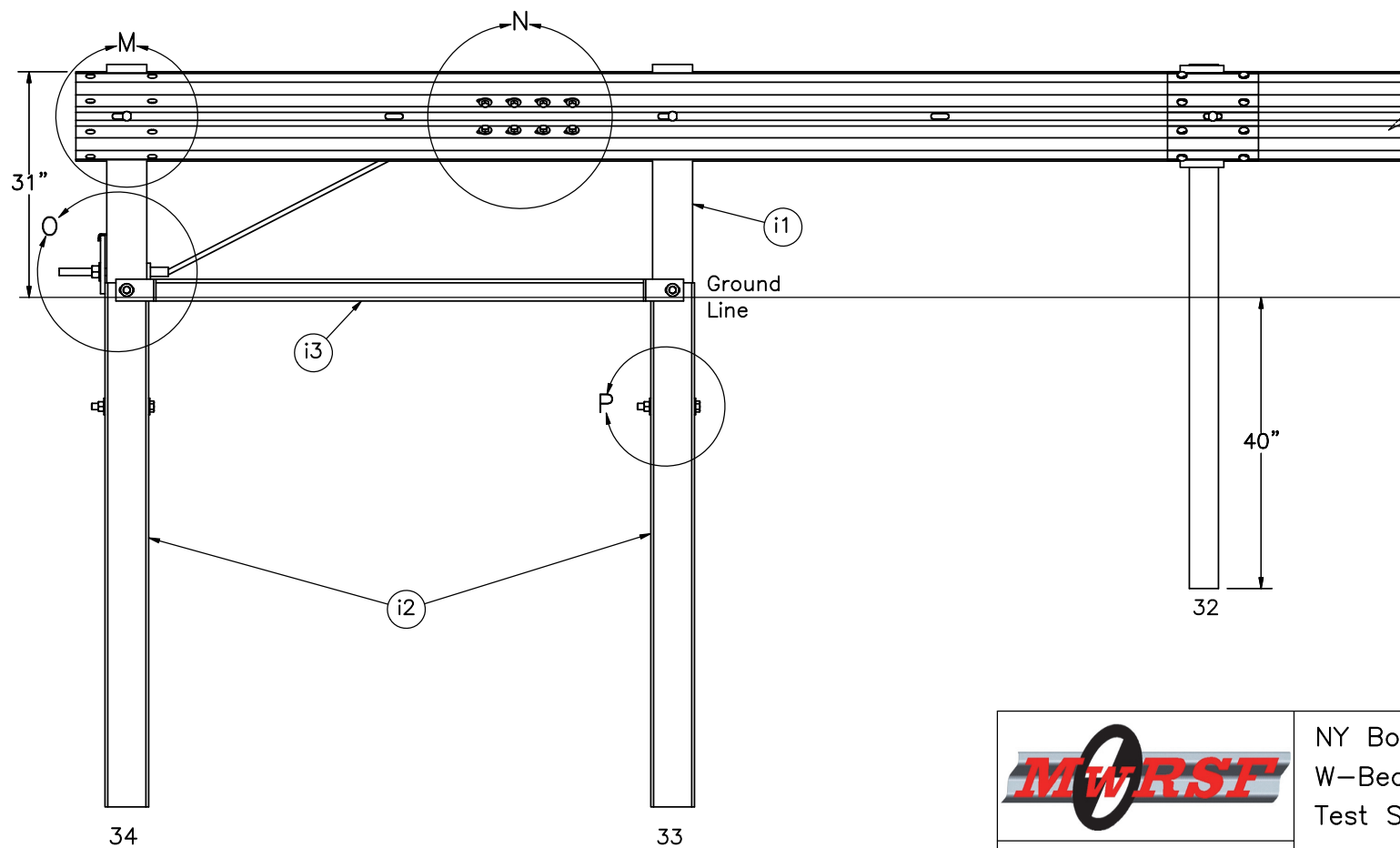
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8/6/2021

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PLAN VIEW



ELEVATION VIEW



Midwest Roadside
Safety Facility

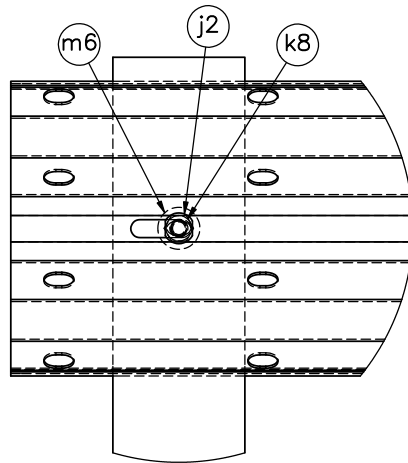
NY Box Beam to HPBO
W-Beam Transition
Test Series NYBHT

Downstream Anchorage

DWG. NAME.
NYBHT-1-2_R7

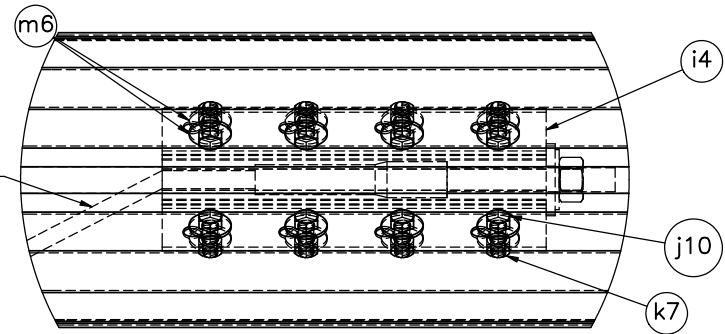
SCALE: 1:24
UNITS: in.

SHEET:
8 of 37
DATE:
8/6/2021
DRAWN BY:
JEK/SBW/G
HR
REV. BY:
KAL/JCH/JR
R

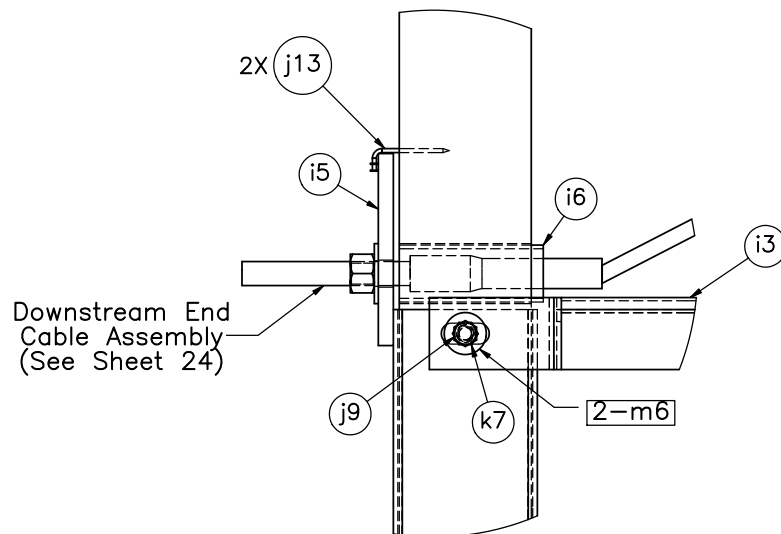


DETAIL M

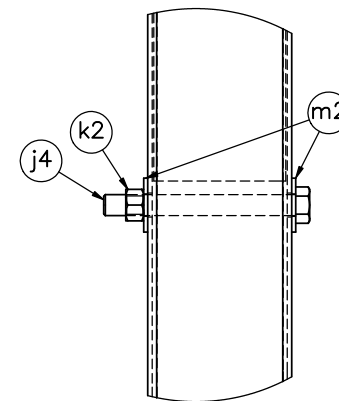
Downstream
End Cable
Assembly
(See Sheet 24)



DETAIL N



DETAIL O



DETAIL P



Midwest Roadside
Safety Facility

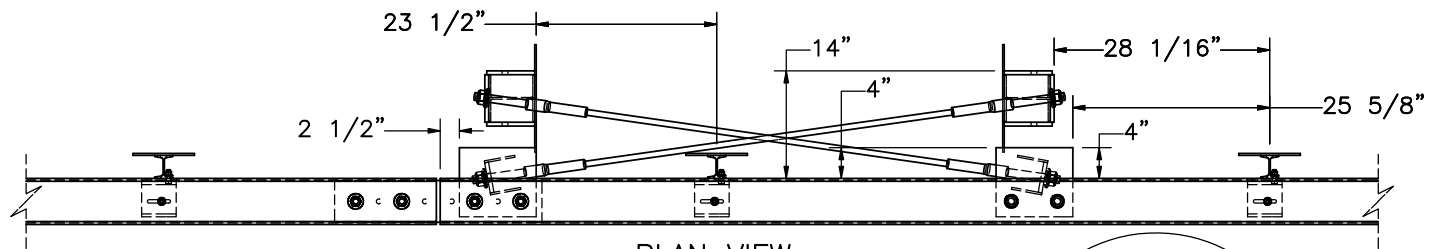
NY Box Beam to HPBO
W-Beam Transition
Test Series NYBHT

Downstream Anchorage Details

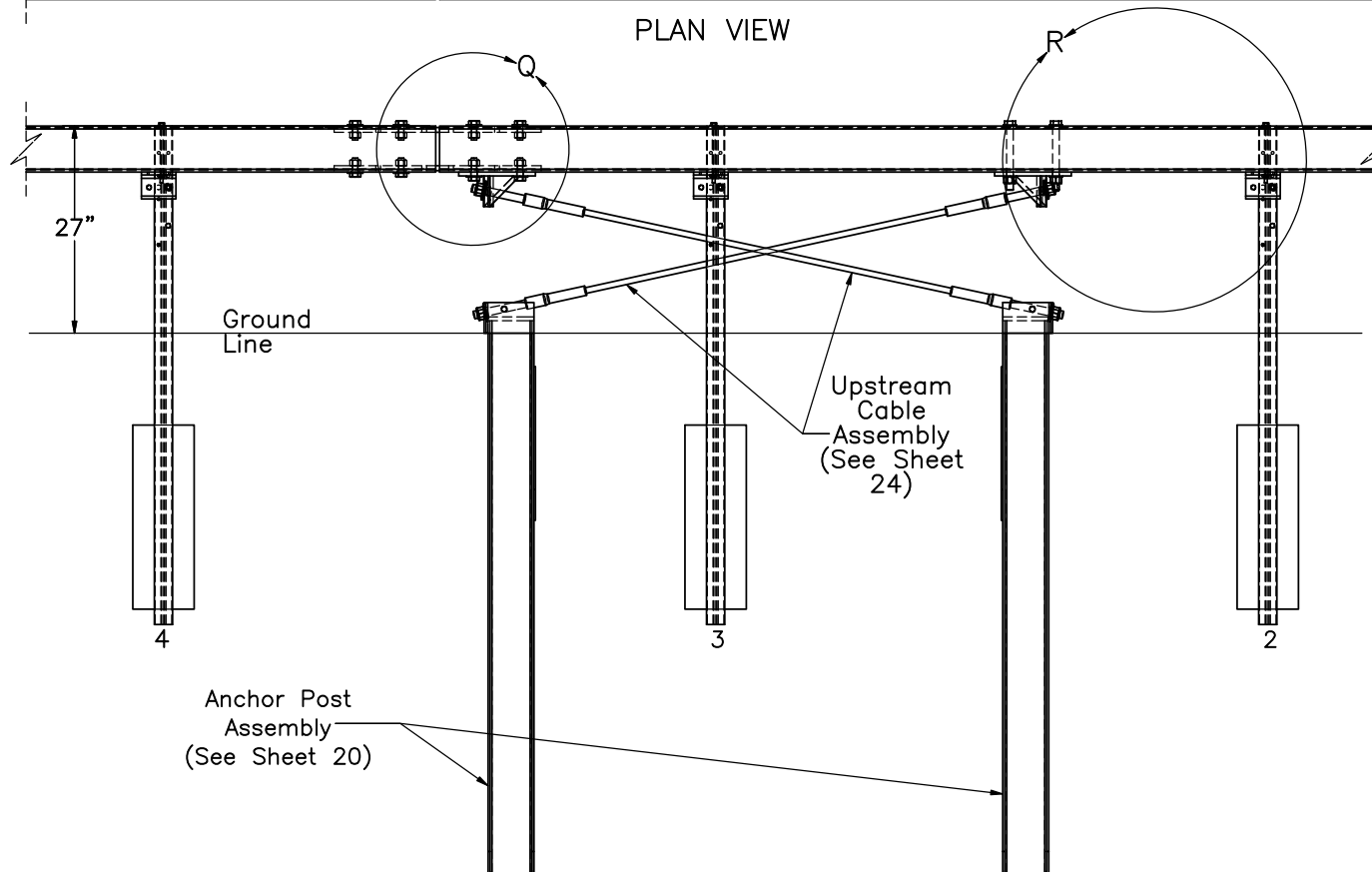
DWG. NAME.
NYBHT-1-2_R7

SCALE: 1:8
UNITS: in.

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HR
REV. BY:
KAL/JCH/JR
R



PLAN VIEW



ELEVATION VIEW



Midwest Roadside
Safety Facility

NY Box Beam to HPBO
W-Beam Transition
Test Series NYBHT

Upstream Anchorage Details

DWG. NAME.
NYBHT-1-2_R7

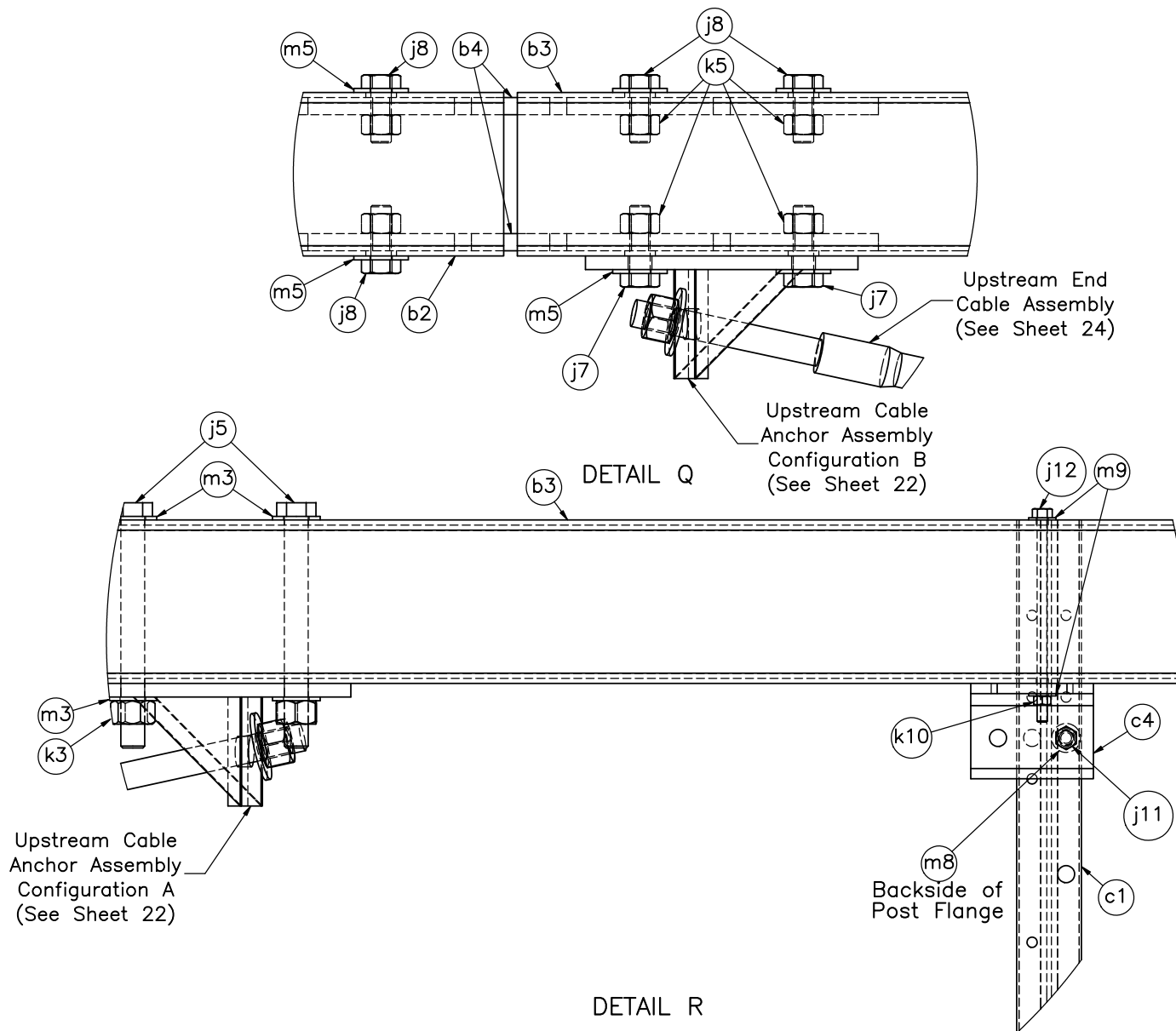
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SHEET:
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DATE:
8/6/2021

DRAWN BY:
JEK/SBW/G
HR

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KAL/JCH/JR
R



Midwest Roadside
Safety Facility

NY Box Beam to HPBO
W-Beam Transition
Test Series NYBHT

Upstream Anchor Mounting
Details

DWG. NAME:
NYBHT-1-2_R7

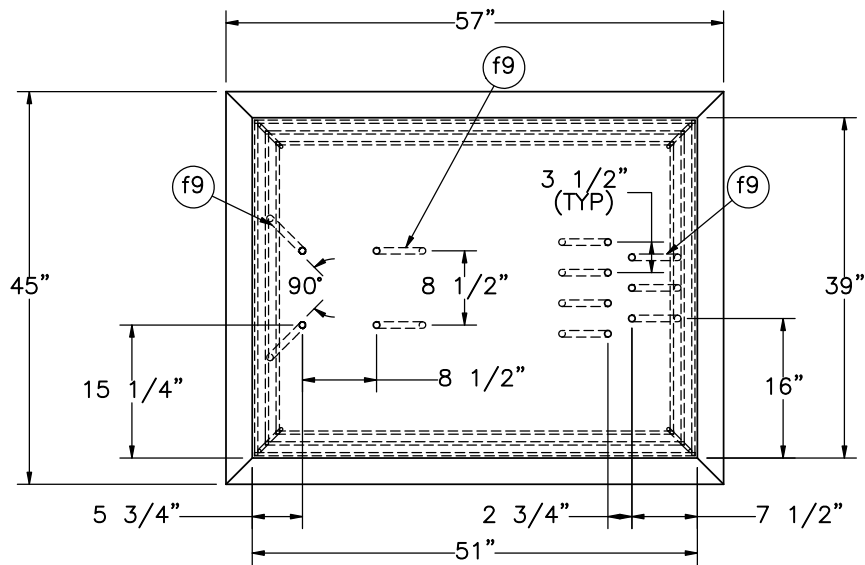
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SHEET:
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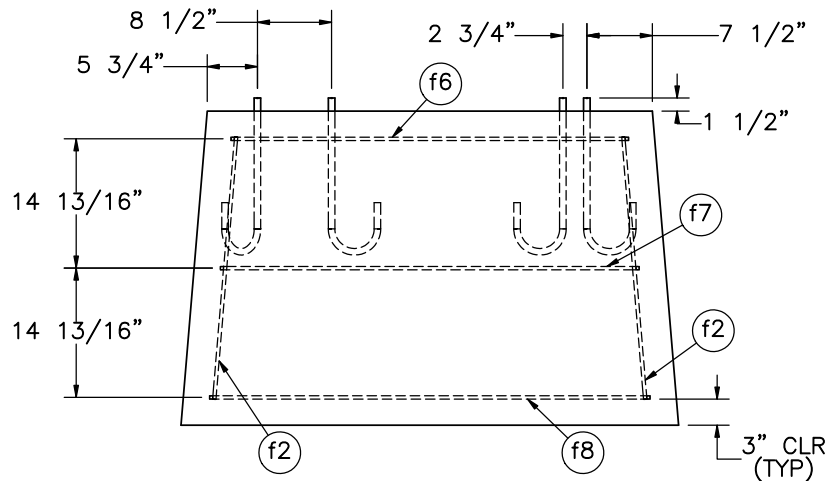
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8/6/2021

DRAWN BY:
JEK/SBW/G
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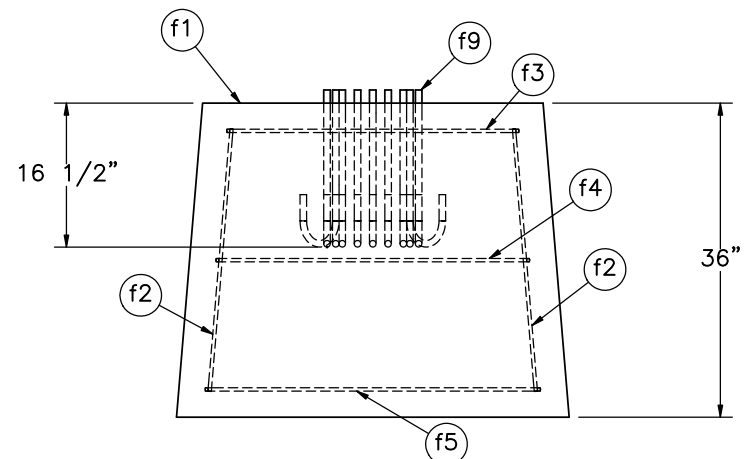
REV. BY:
KAL/JCH/JR
R



PLAN VIEW



ELEVATION VIEW



PROFILE VIEW

Item No.	QTY.	Description	Material Specification	Treatment Specification
f1	1	Concrete	Pre-Cast Class A* Min. $f'_c = 3,000$ psi NE Mix 47BD	—
f2	4	#3 Bar, 30 1/4" Long	ASTM A615 Gr. 60 or A996 Gr. 60	Epoxy-Coated (ASTM A775 or A934) **
f3	2	#3 Bar, 33 7/16" Long	ASTM A615 Gr. 60 or A996 Gr. 60	Epoxy-Coated (ASTM A775 or A934) **
f4	2	#3 Bar, 35 7/8" Long	ASTM A615 Gr. 60 or A996 Gr. 60	Epoxy-Coated (ASTM A775 or A934) **
f5	2	#3 Bar, 38 3/8" Long	ASTM A615 Gr. 60 or A996 Gr. 60	Epoxy-Coated (ASTM A775 or A934) **
f6	2	#3 Bar, 45 9/16" Long	ASTM A615 Gr. 60 or A996 Gr. 60	Epoxy-Coated (ASTM A775 or A934) **
f7	2	#3 Bar, 48" Long	ASTM A615 Gr. 60 or A996 Gr. 60	Epoxy-Coated (ASTM A775 or A934) **
f8	2	#3 Bar, 50 1/2" Long	ASTM A615 Gr. 60 or A996 Gr. 60	Epoxy-Coated (ASTM A775 or A934) **
f9	11	3/4" Dia. UNC, Hooked Anchor J-Bolt	ASTM F1554 Gr. 36	ASTM A153 or B695 Class 55 or F2329

Note: (1) Anchor is the same as was used in NYC1 series testing.

* 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 HPBO
W-Beam Transition
Test Series NYBHT

Transition Anchor Assembly

DWG. NAME.
NYBHT-1-2_R7

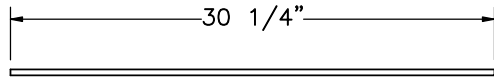
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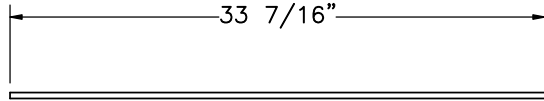
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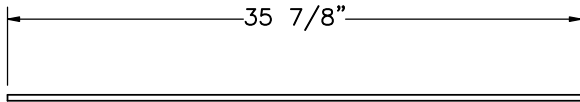
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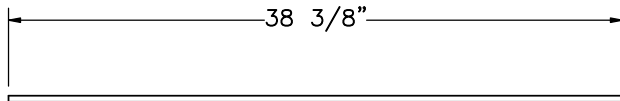
Part f2



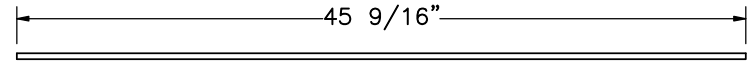
Part f3



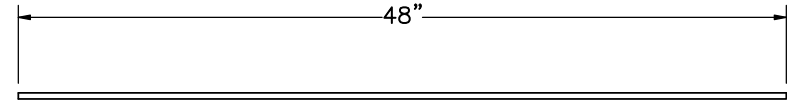
Part f4



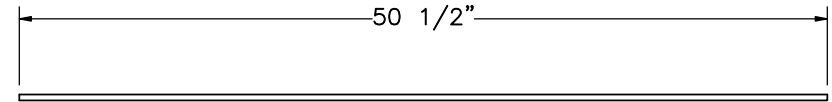
Part f5



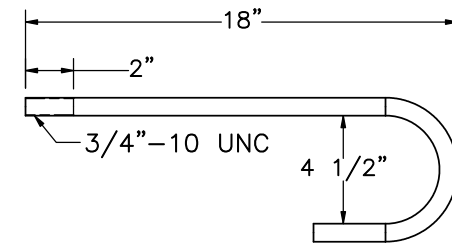
Part f6



Part f7



Part f8



Part f9
SCALE 1:8

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

Bill of Bars

Bar	QTY. (Per Anchor)	Size	Total Unbent Length	Material	Treatment
f2	4	#3	30 1/4"	ASTM A615 Gr. 60 or A996 Gr. 60	Epoxy-Coated (ASTM A775 or A934)
f3	2	#3	33 7/16"	ASTM A615 Gr. 60 or A996 Gr. 60	Epoxy-Coated (ASTM A775 or A934)
f4	2	#3	35 7/8"	ASTM A615 Gr. 60 or A996 Gr. 60	Epoxy-Coated (ASTM A775 or A934)
f5	2	#3	38 3/8"	ASTM A615 Gr. 60 or A996 Gr. 60	Epoxy-Coated (ASTM A775 or A934)
f6	2	#3	45 9/16"	ASTM A615 Gr. 60 or A996 Gr. 60	Epoxy-Coated (ASTM A775 or A934)
f7	2	#3	48"	ASTM A615 Gr. 60 or A996 Gr. 60	Epoxy-Coated (ASTM A775 or A934)
f8	2	#3	50 1/2"	ASTM A615 Gr. 60 or A996 Gr. 60	Epoxy-Coated (ASTM A775 or A934)



Midwest Roadside
Safety Facility

NY Box Beam to HPBO
W-Beam Transition
Test Series NYBHT

Concrete Anchor Components

DWG. NAME:
NYBHT-1-2_R7

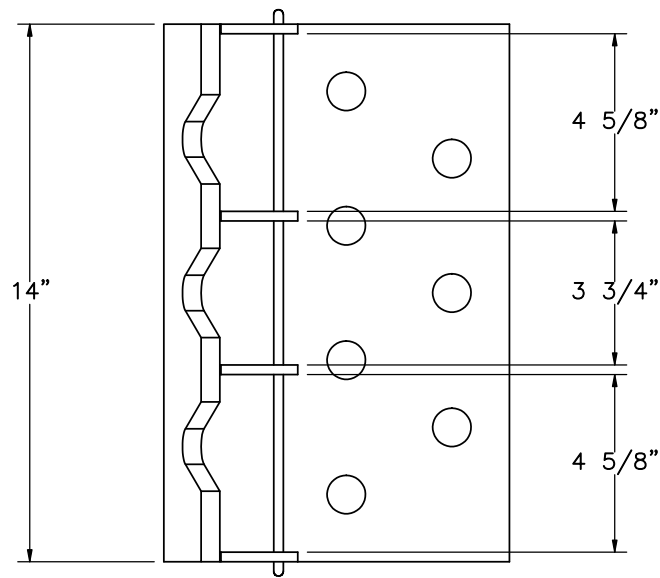
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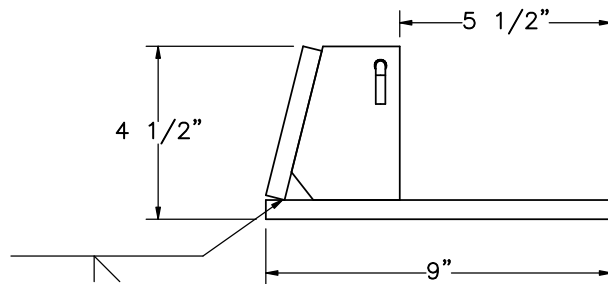
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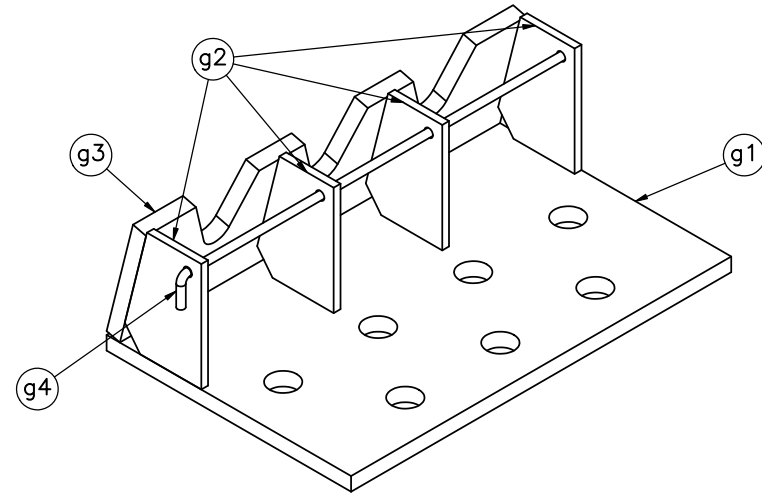
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KAL/JCH/JR
R



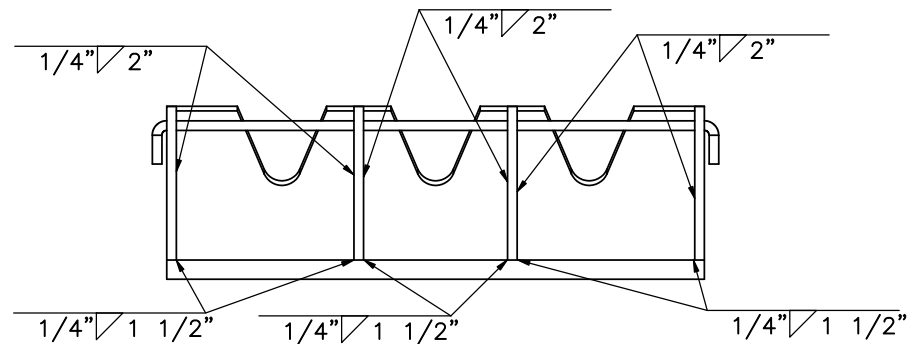
PLAN VIEW



ELEVATION VIEW



ISOMETRIC VIEW



PROFILE VIEW

Item No.	QTY.	Description	Material Specification	Treatment Specification
—	1	Transition Cable Bracket Assembly	—	ASTM A123
g1	1	14"x9"x1/2" Plate	ASTM A36	See Assembly
g2	4	4"x2 13/16"x1/4" Cable Anchor Gusset	ASTM A36	See Assembly
g3	1	14"x3 1/2"x1/2" Cable Anchor Top Plate	ASTM A36	See Assembly
g4	1	1/4" Dia., 16 3/8" Long Brass Rod	ASTM B16-00	—



Midwest Roadside
Safety Facility

NY Box Beam to HPBO
W-Beam Transition
Test Series NYBHT

Transition Cable Bracket
Assembly

DWG. NAME:
NYBHT-1-2_R7

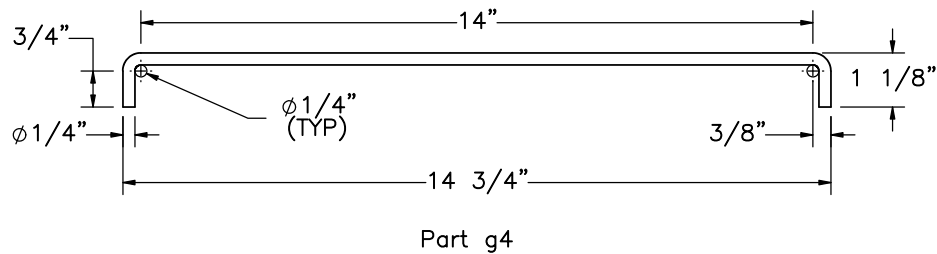
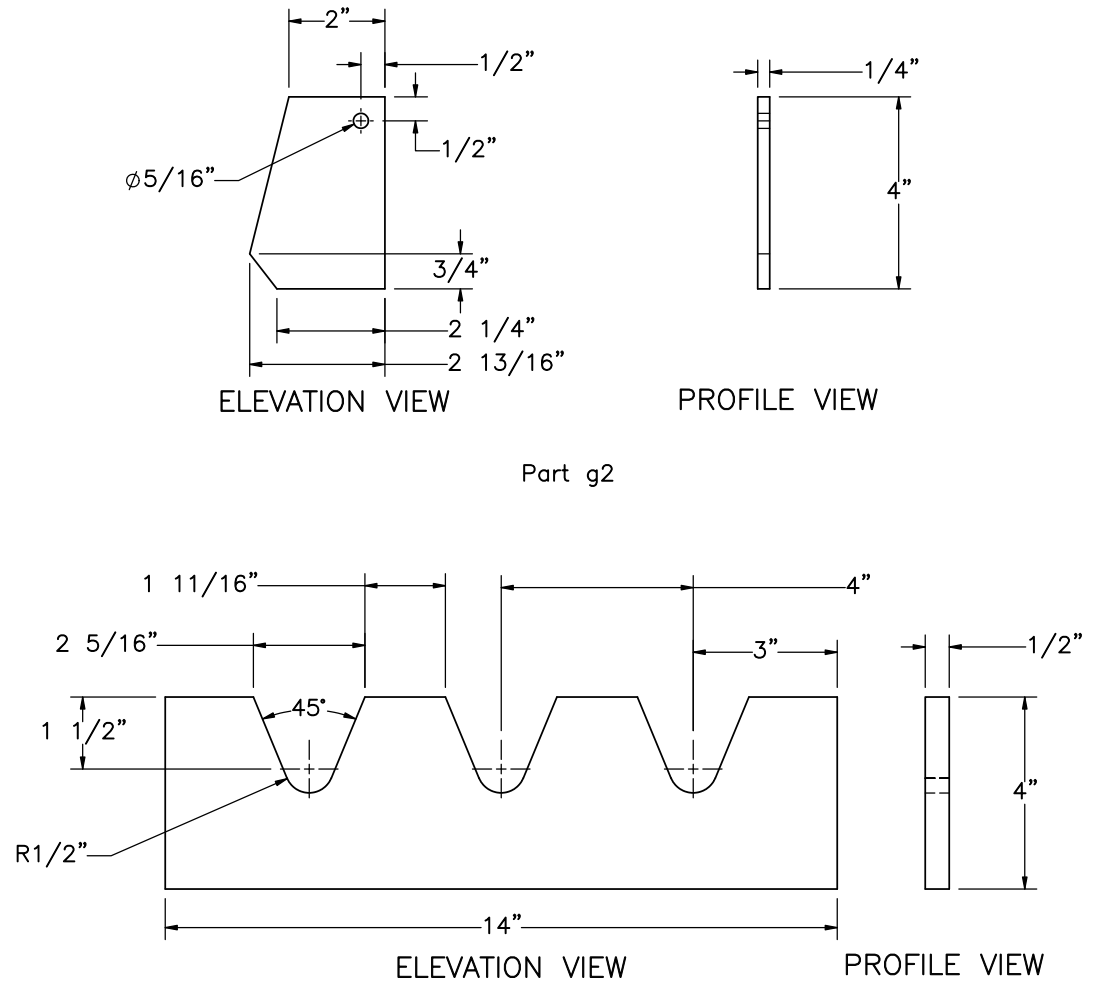
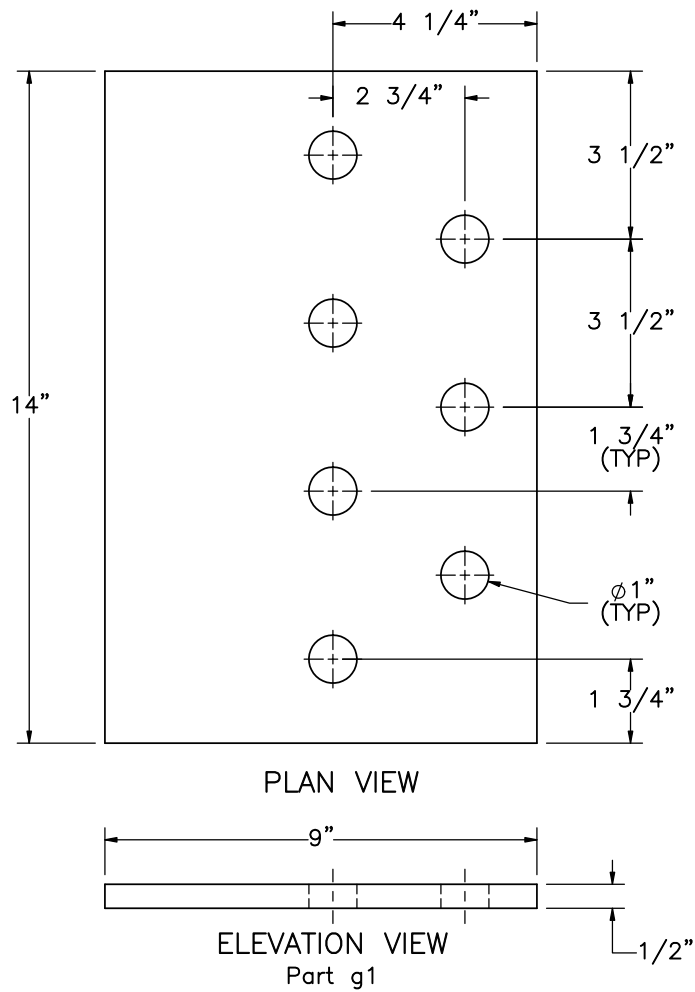
SCALE: 1:5
UNITS: in.

SHEET:
14 of 37

DATE:
8/6/2021

DRAWN BY:
JEK/SBW/G
HR

REV. BY:
KAL/JCH/JR
R



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



Midwest Roadside
Safety Facility

NY Box Beam to HPBO
W-Beam Transition
Test Series NYBHT

Transition Cable Bracket
Components

DWG. NAME:
NYBHT-1-2_R7

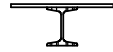
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SHEET:
15 of 37

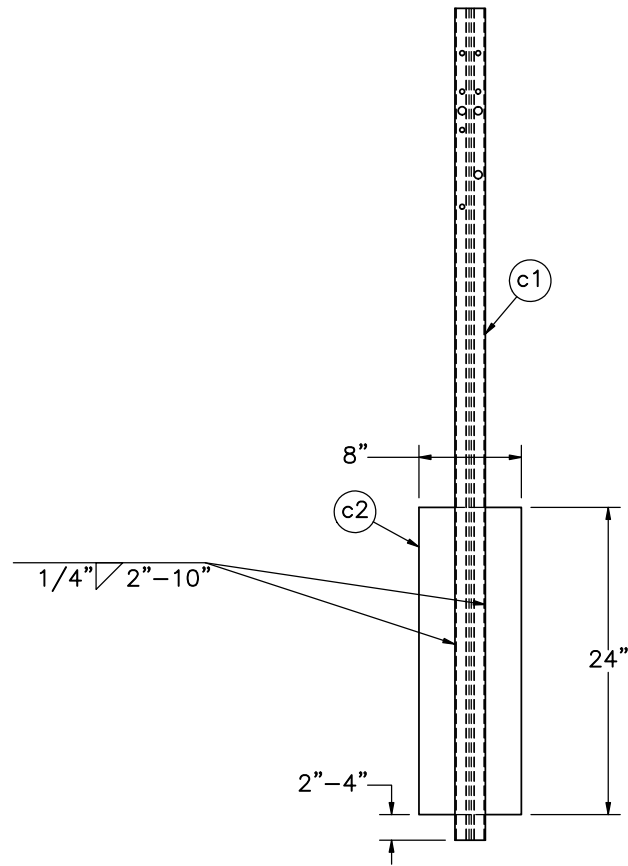
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8/6/2021

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JEK/SBW/G
HR

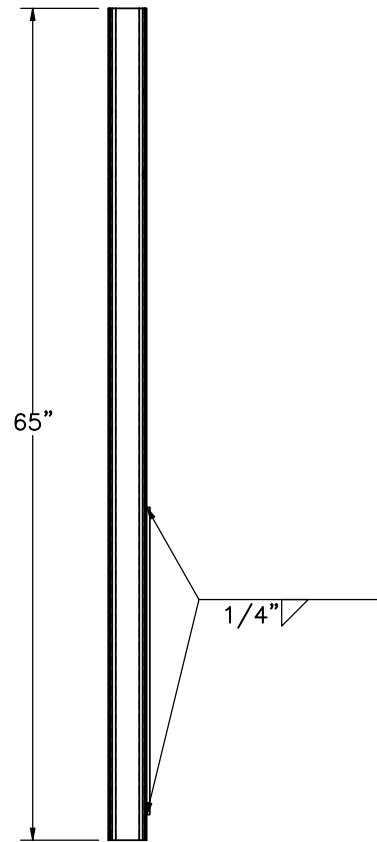
REV. BY:
KAL/JCH/JR
R



PLAN VIEW



ELEVATION VIEW



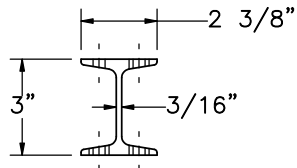
PROFILE VIEW

Item No.	QTY.	Description	Material Specification	Treatment Specification
—	21	Box Beam Post Assembly	—	ASTM A123
c1	1	S3x5.7, 65" Long Post	ASTM A36	See Assembly
c2	1	24"x8"x1/4" Soil Plate	ASTM A36	See Assembly

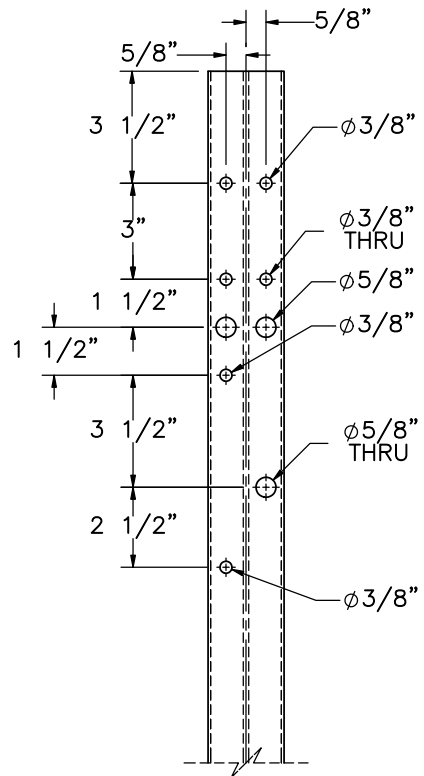


**Midwest Roadside
Safety Facility**

NY Box Beam to HPBO W-Beam Transition Test Series NYBHT Box Beam Post Assembly		SHEET: 16 of 37
		DATE: 8/6/2021
		DRAWN BY: JEK/SBW/G HR
DWG. NAME: NYBHT-1-2_R7	SCALE: 1:15 UNITS: in.	REV. BY: KAL/JCH/JR R

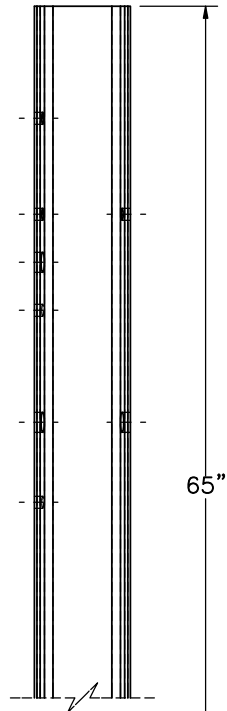


PLAN VIEW

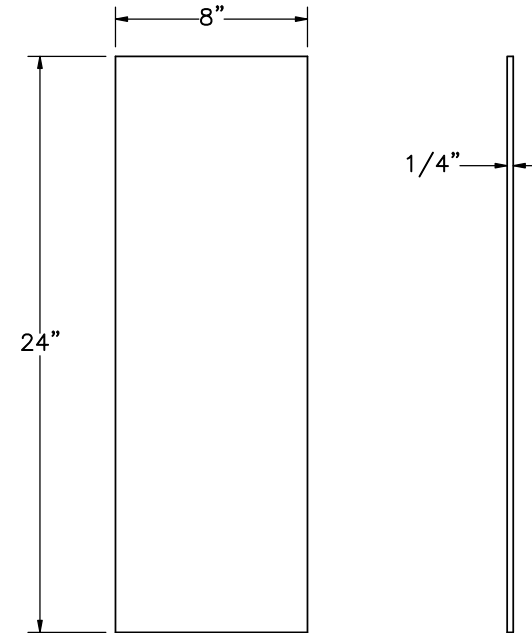


ELEVATION VIEW

Part c1



PROFILE VIEW



ELEVATION VIEW

PROFILE VIEW

Part c2
SCALE 1:8



Midwest Roadside
Safety Facility

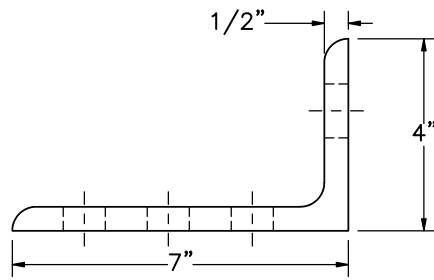
NY Box Beam to HPBO
W-Beam Transition
Test Series NYBHT

Box Beam Post Components

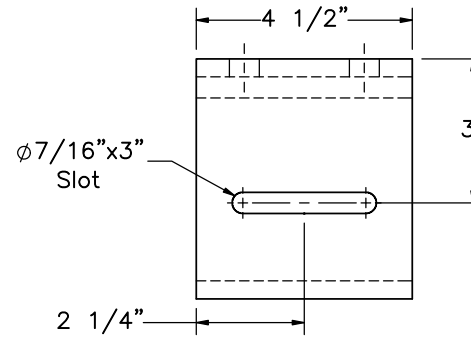
DWG. NAME.
NYBHT-1-2_R7

SCALE: 1:6
UNITS: in.

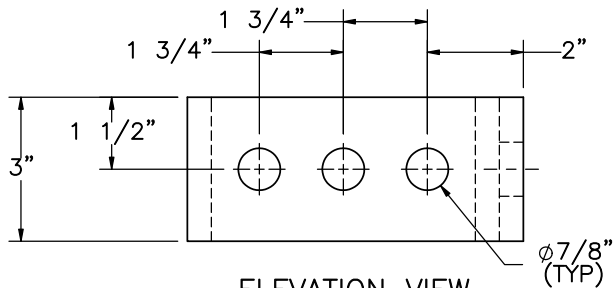
SHEET:
17 of 37
DATE:
8/6/2021
DRAWN BY:
JEK/SBW/G
HR
REV. BY:
KAL/JCH/JR
R



PLAN VIEW

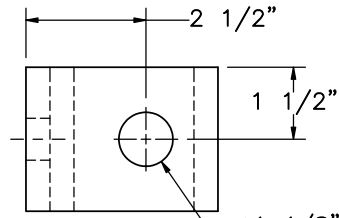


PLAN VIEW

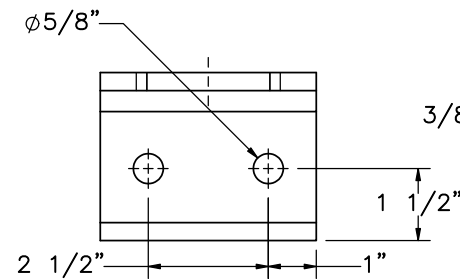


ELEVATION VIEW

$\phi 7/8"$
(TYP)
Part c3

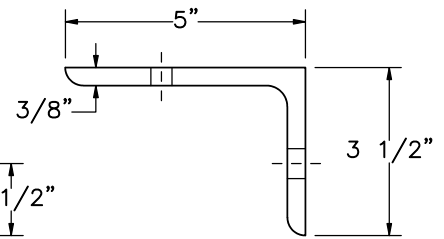


PROFILE VIEW



ELEVATION VIEW

Part c4



PROFILE VIEW



Midwest Roadside
Safety Facility

NY Box Beam to HPBO
W-Beam Transition
Test Series NYBHT

Box Beam Component Details

DWG. NAME.
NYBHT-1-2_R7

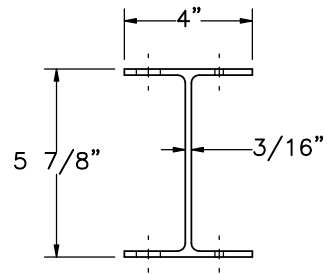
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UNITS: in.

SHEET:
18 of 37

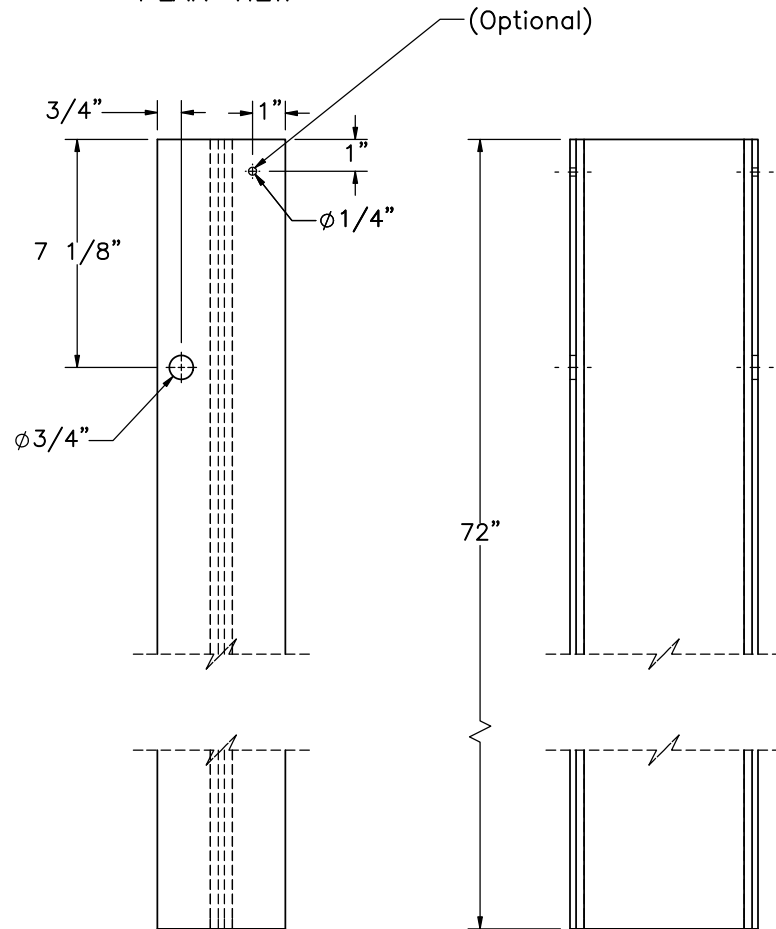
DATE:
8/6/2021

DRAWN BY:
JEK/SBW/G
HR

REV. BY:
KAL/JCH/JR
R



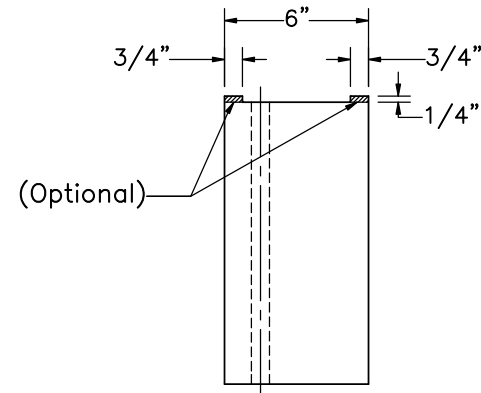
PLAN VIEW



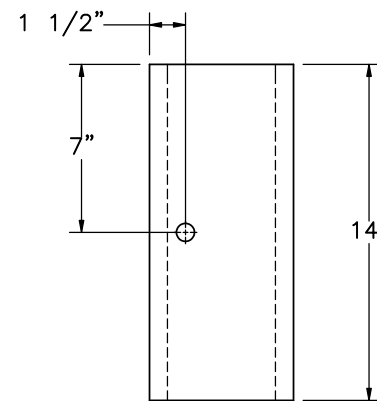
ELEVATION VIEW

Part c5

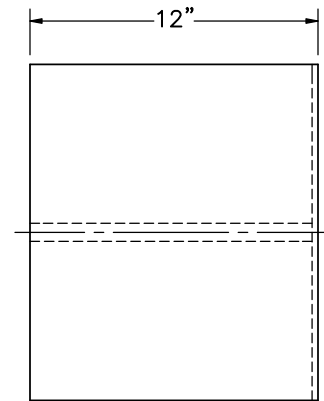
PROFILE VIEW



PLAN VIEW



ELEVATION VIEW



PROFILE VIEW

Part c6

Note: (1) According to NY standards, blockouts may be wood, plastic, or synthetic.



Midwest Roadside
Safety Facility

NY Box Beam to HPBO
W-Beam Transition
Test Series NYBHT

W-Beam Post Components

DWG. NAME.
NYBHT-1-2_R7

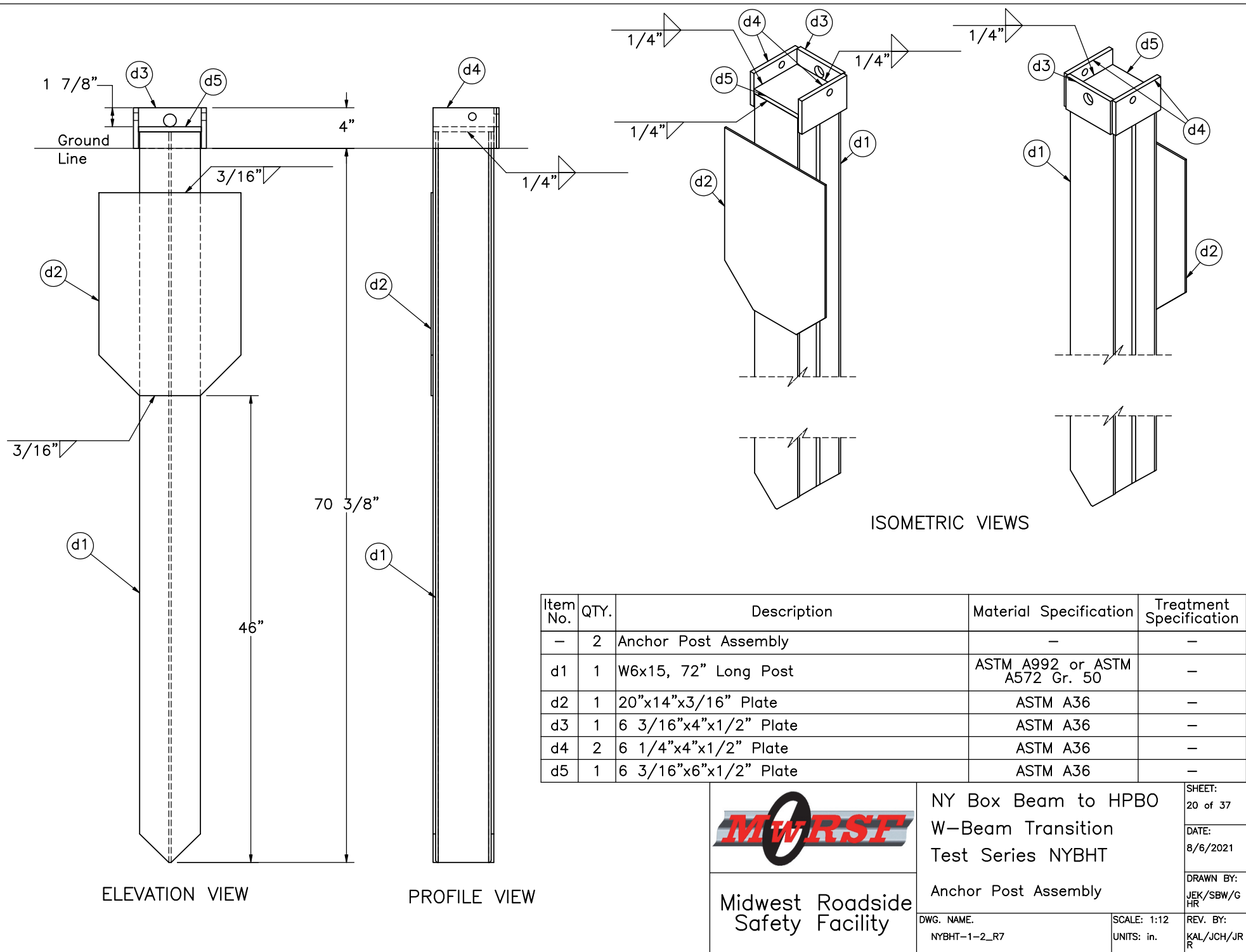
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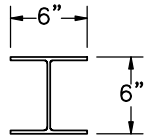
SHEET:
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DATE:
8/6/2021

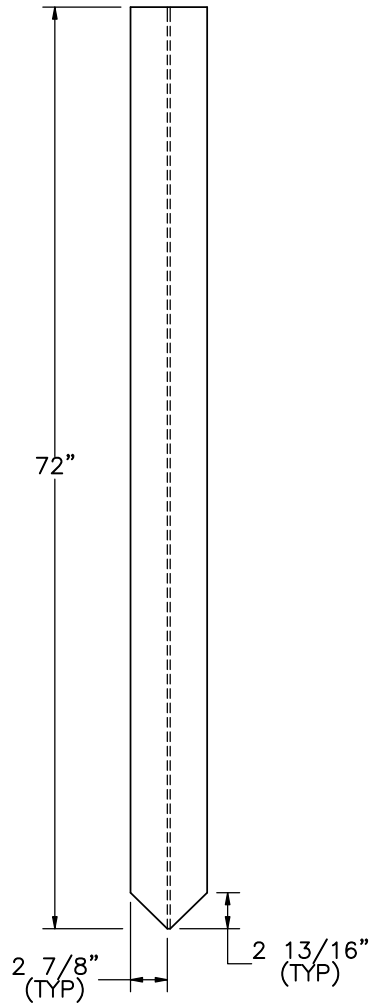
DRAWN BY:
JEK/SBW/G
HR

REV. BY:
KAL/JCH/JR
R



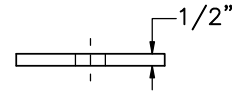


PLAN VIEW

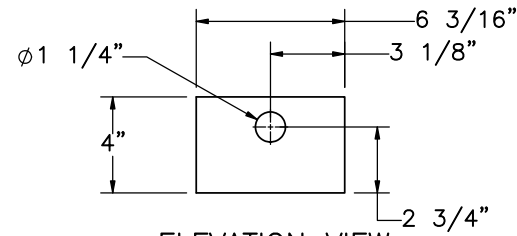


ELEVATION VIEW

Part d1
SCALE 1:15

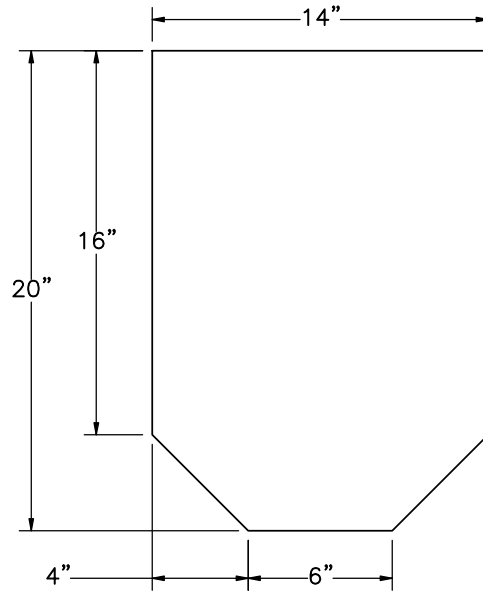


PLAN VIEW



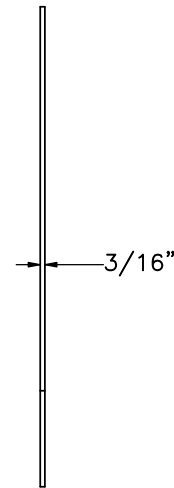
ELEVATION VIEW

Part d3

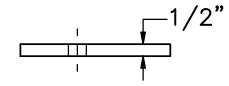


ELEVATION VIEW

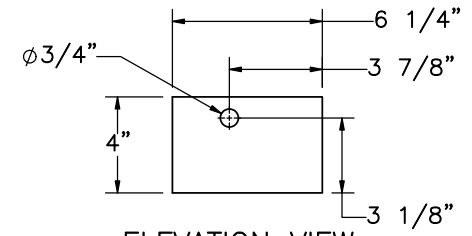
Part d2



PROFILE VIEW

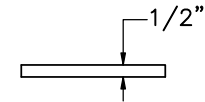


PLAN VIEW

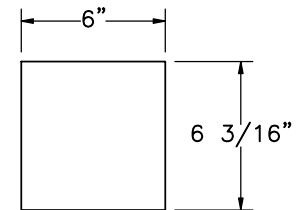


ELEVATION VIEW

Part d4



PLAN VIEW



ELEVATION VIEW

Part d5



Midwest Roadside
Safety Facility

NY Box Beam to HPBO
W-Beam Transition
Test Series NYBHT

Anchor Post Components

DWG. NAME.
NYBHT-1-2_R7

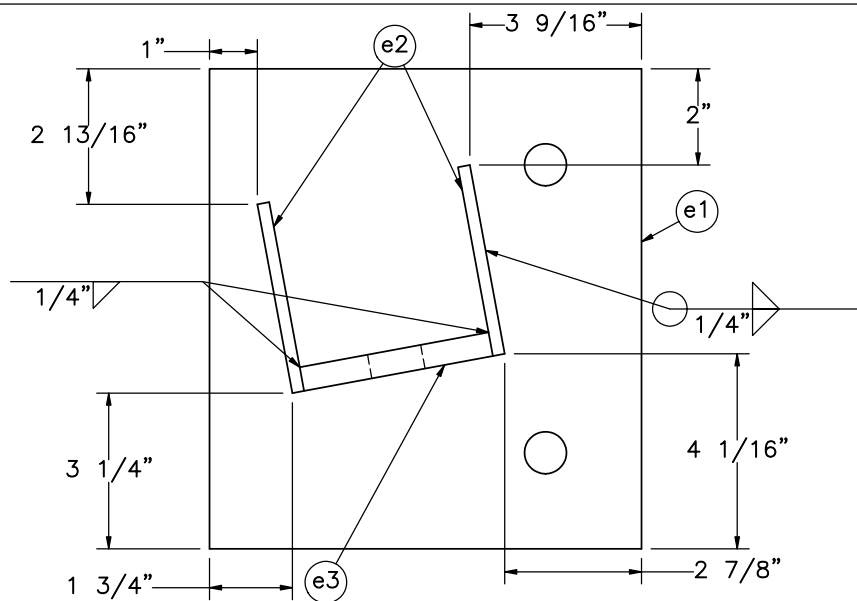
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UNITS: in.

SHEET:
21 of 37

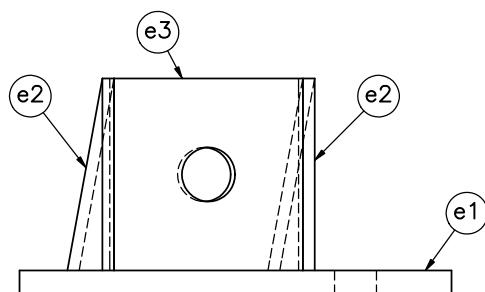
DATE:
8/6/2021

DRAWN BY:
JEK/SBW/G
HR

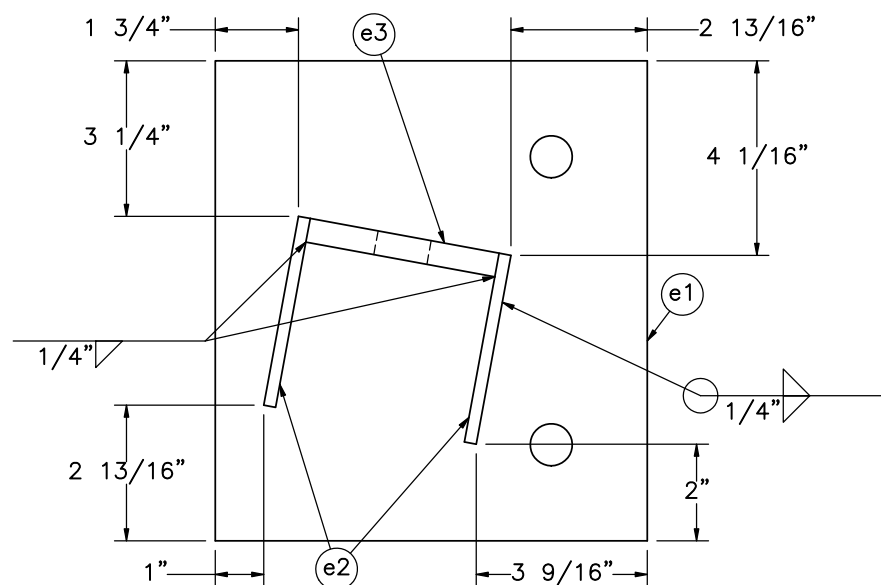
REV. BY:
KAL/JCH/JR
R



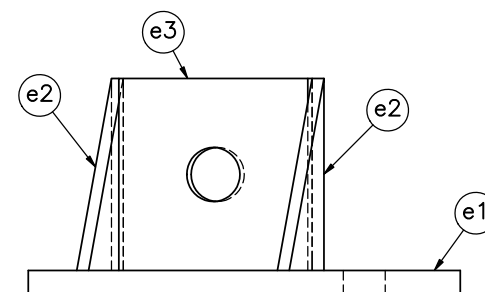
PLAN VIEW



ELEVATION VIEW
Upstream Cable Anchor Assembly
Configuration A



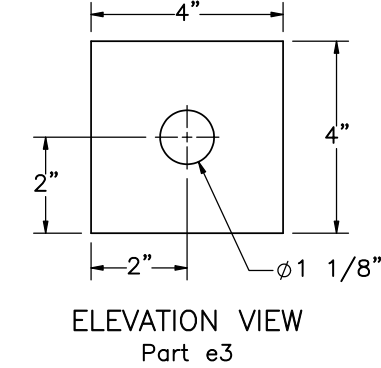
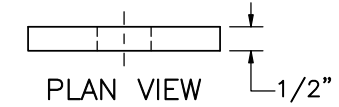
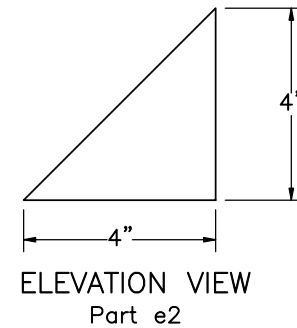
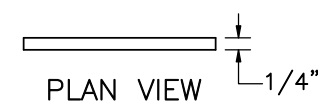
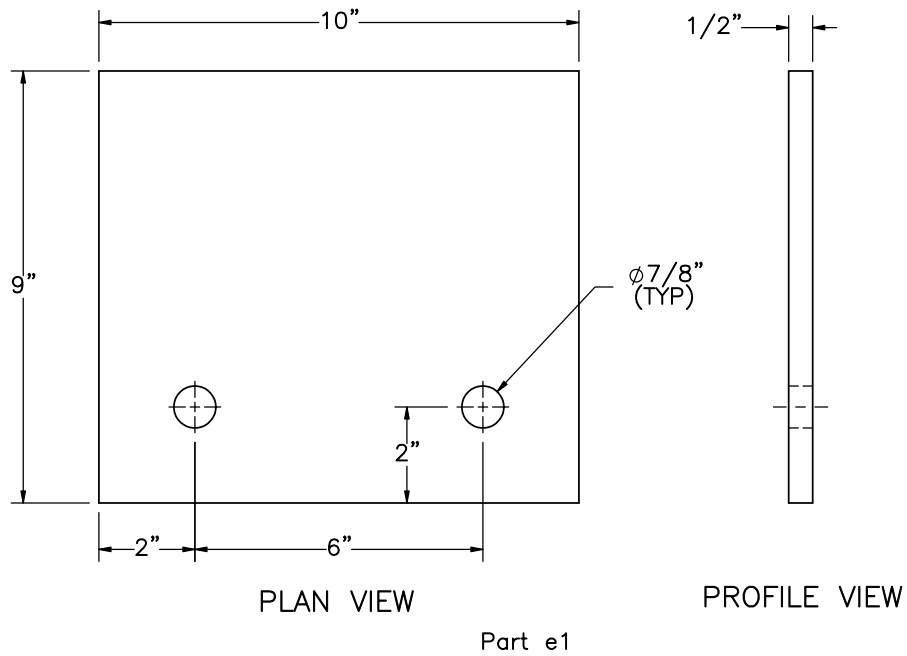
PLAN VIEW



ELEVATION VIEW
Upstream 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 HPBO W-Beam Transition Test Series NYBHT		SHEET: 22 of 37
—	1 each	Upstream Cable Anchor Assembly Configuration A&B	—	ASTM A123*		Upstream Cable Anchor Assembly Details		DATE: 8/6/2021
e1	1	10"x9"x1/2" Box Beam Cable Anchor Base Plate	ASTM A36	See Assembly		DWG. NAME: NYBHT-1-2_R7	SCALE: 1:4 UNITS: in.	DRAWN BY: JEK/SBW/GHR
e2	2	4"x4"x1/4" Box Beam Cable Anchor Gusset	ASTM A36	See Assembly				REV. BY: KAL/JCH/JFR
e3	1	4"x4"x1/2" Box Beam Cable Anchor Mounting Plate	ASTM A36	See Assembly				




Midwest Roadside
Safety Facility

NY Box Beam to HPBO
W-Beam Transition
Test Series NYBHT

Upstream Cable Anchor
Components

DWG. NAME:
NYBHT-1-2_R7

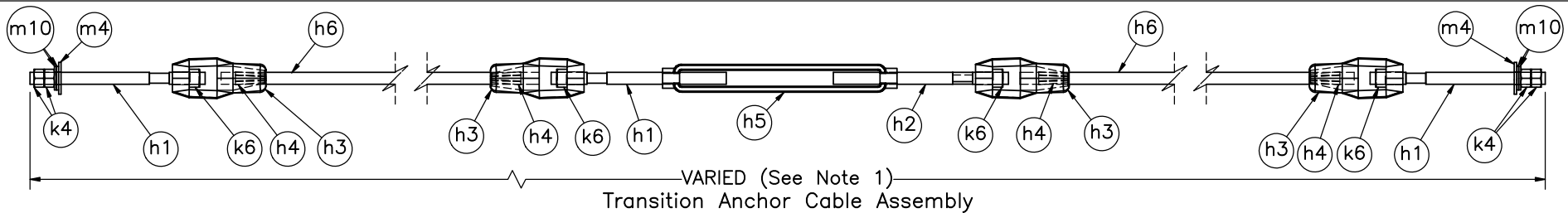
SCALE: 1:4
UNITS: in.

SHEET:
23 of 37

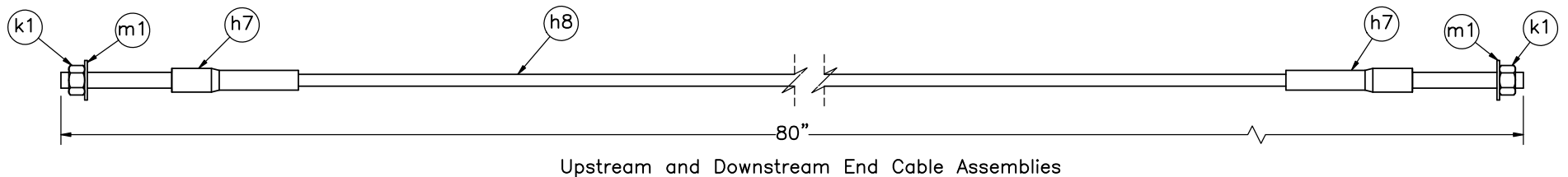
DATE:
8/6/2021

DRAWN BY:
JEK/SBW/G
HR

REV. BY:
KAL/JCH/JR
R



Item No.	QTY.	Description	Material Specification	Treatment Specification	Hardware Guide
—	3	Transition Anchor Cable Assembly	—	—	—
h1	3	3/4" Dia. UNC, 11" Long Threaded Rod	ASTM A307 Gr. A or equivalent	ASTM A153 or B695 Class 55 or F2329	RCE03
h2	1	3/4" Dia. UNC, 11" Long Left-Hand Threaded Rod	ASTM A307 Gr. A or equivalent	ASTM A153 or B695 Class 55 or F2329	RCE03
h3	4	Cable End Fitting	ASTM A27 Gr. 70-40 Class 1	ASTM A153 or B695	RCE03
h4	4	Cable Wedge	ASTM A47 Gr. 32510	—	FMM01
h5	1	Standard Turnbuckle	ASTM F1145	ASTM A153 or B633	—
h6	2	3/4" Dia. 3x7 IWRC IPS Wire Rope – Various Lengths	ASTM A741 Type 1	Class A Coating	RCM01
k4	4	3/4"-10 UNC Hex Nut	ASTM A563A or equivalent	ASTM A153 or B695 Class 55 or F2329	FNX20a
k6	4	3/4"-10 UNC Square Nut	ASTM A563A or equivalent	ASTM A153 or B695 Class 55 or F2329	FNS20
m4	2	3/4" Dia. Plain USS Washer	ASTM F844	ASTM A123 or A153 or F2329	FWC20a
m10	4	3/4" Dia. Hardened SAE Washer	ASTM F436	ASTM A153 or B695 Class 55 or F1136 Gr. 3 or F2329	FWC20b



Item No.	QTY.	Description	Material Specification	Treatment Specification	Hardware Guide
—	3	Upstream and Downstream End Cable Assemblies	—	—	FCA01
h7	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	—
h8	1	3/4" Dia. 6x19 IWRC IPS Wire Rope	ASTM A741 Type 2	Class A Coating	—
k1	2	1"-8 UNC Heavy Hex Nut	ASTM A563DH or equivalent	ASTM A153 or B695 Class 55 or F2329	FNX24b
m1	2	1" Dia. Plain USS Washer	ASTM F844	ASTM A123 or A153 or F2329	FWC24a

Notes: (1) Total lengths of the three transition anchor cable assemblies are approximately 282", 317", and 352".



Midwest Roadside
Safety Facility

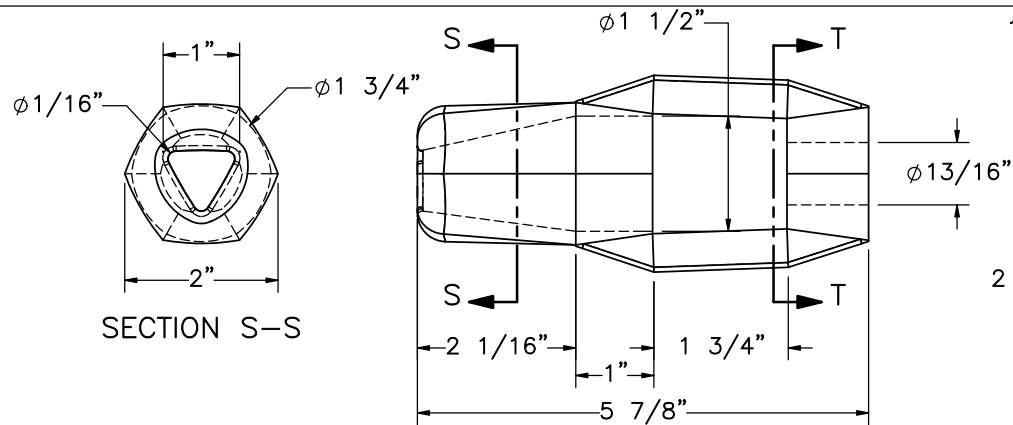
NY Box Beam to HPBO
W-Beam Transition
Test Series NYBHT

Anchor Cable Details

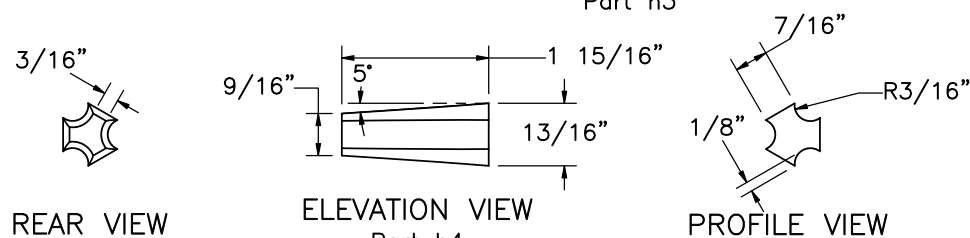
DWG. NAME.
NYBHT-1-2_R7

SCALE: 1:10
UNITS: in.

SHEET:
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DATE:
8/6/2021
DRAWN BY:
JEK/SBW/G
HR
REV. BY:
KAL/JCH/JR
R

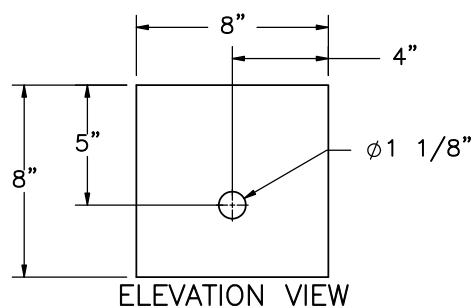


ELEVATION VIEW
Part h3



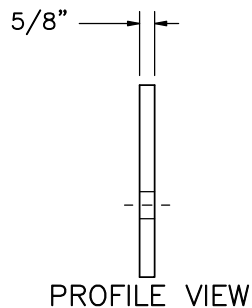
ELEVATION VIEW
Part h4

PROFILE VIEW

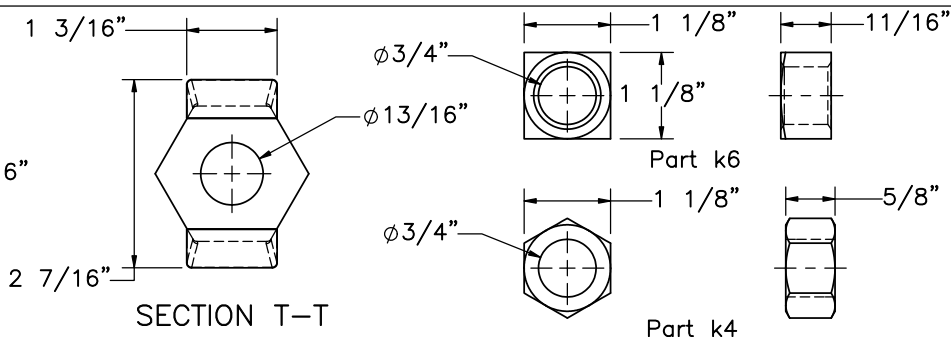


ELEVATION VIEW

Part i5
SCALE 1:8

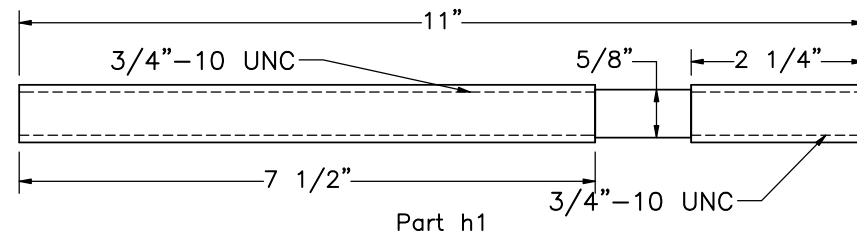


PROFILE VIEW

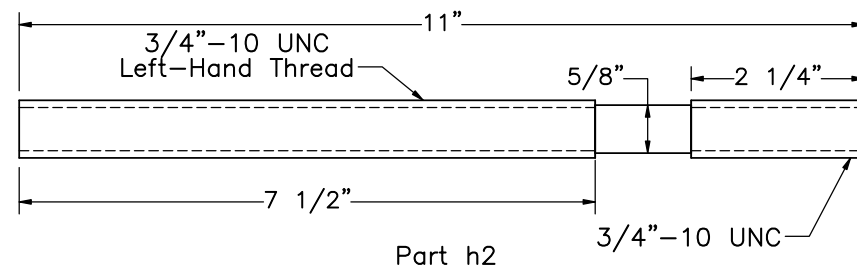


SECTION T-T

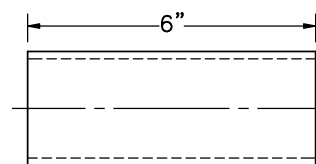
Part k4



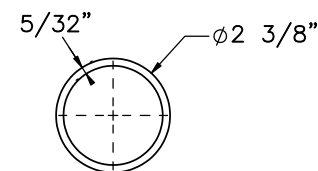
Part h1



Part h2



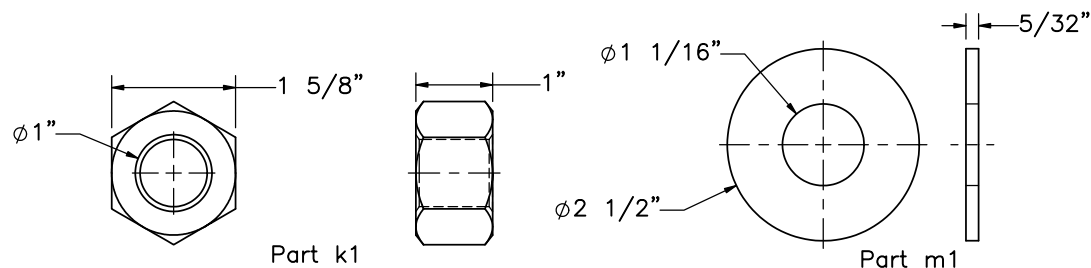
ELEVATION VIEW



PROFILE VIEW

Part i6
SCALE 1:4

Note: (1) Flattened portion of part h1 and h2 not necessary.



Part k1

Part m1



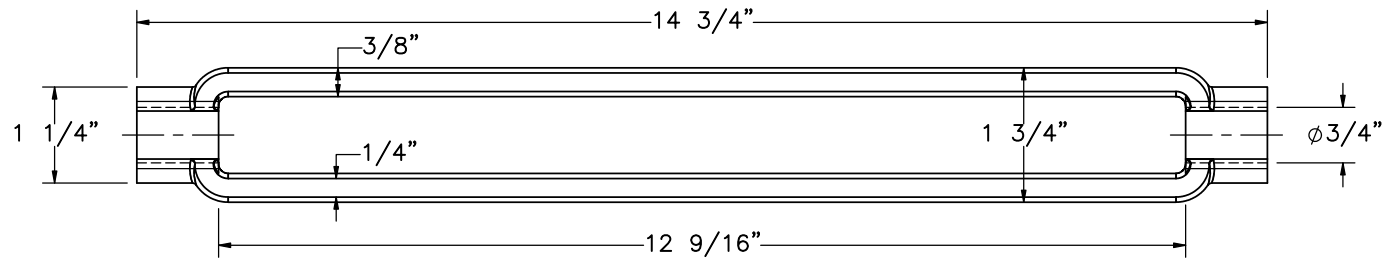
NY Box Beam to HPBW-
W-Beam Transition
Test Series NYBHT

Cable Anchor Components

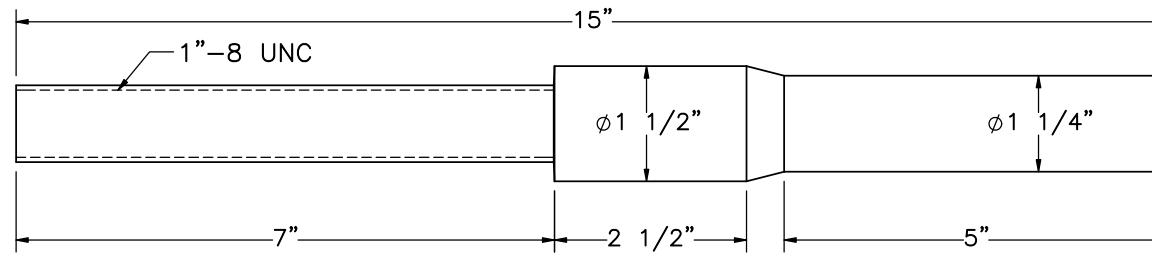
DWG. NAME:
NYBHT-1-2_R7

SCALE: 2:5
UNITS: in.

SHEET:
25 of 37
DATE:
8/6/2021
DRAWN BY:
JEK/SBW/G
HR
REV. BY:
KAL/JCH/JR
R



Part h5



Part h7



Midwest Roadside
Safety Facility

NY Box Beam to HPBO
W-Beam Transition
Test Series NYBHT

Cable Anchor Components

DWG. NAME.
NYBHT-1-2_R7

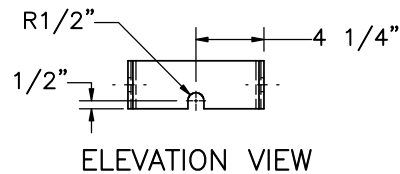
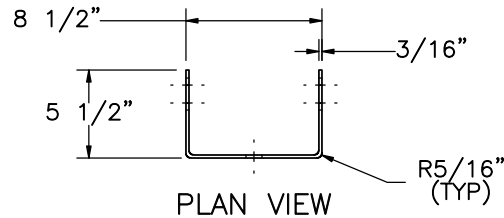
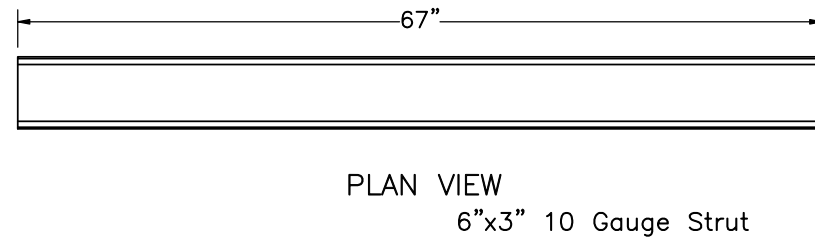
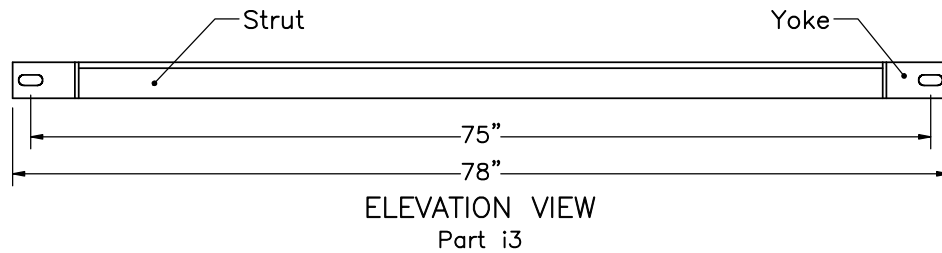
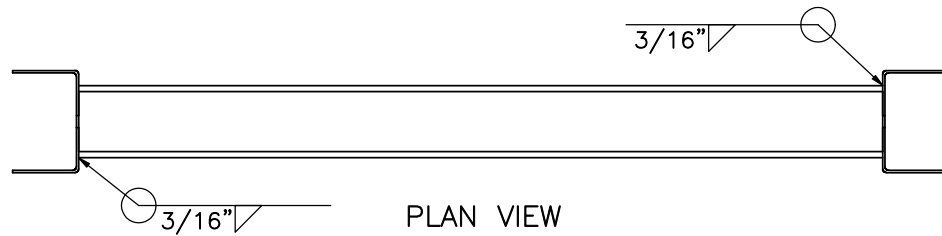
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UNITS: in.

SHEET:
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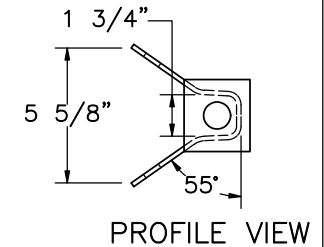
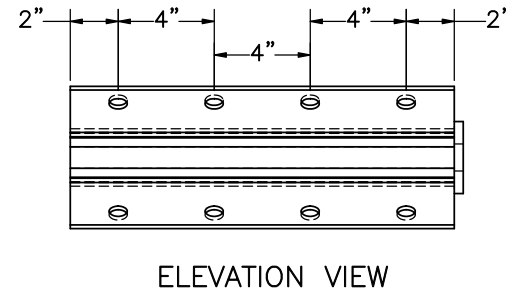
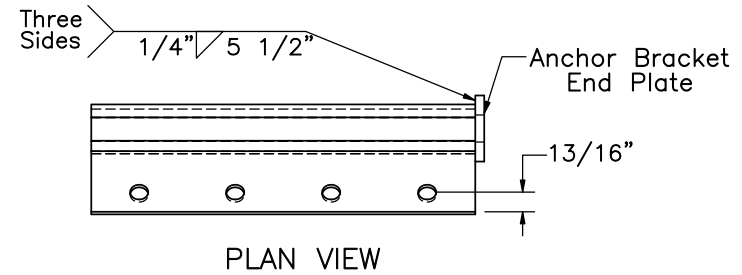
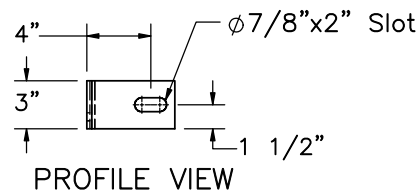
DATE:
8/6/2021

DRAWN BY:
JEK/SBW/G
HR

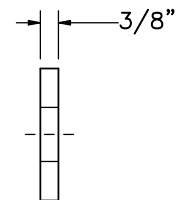
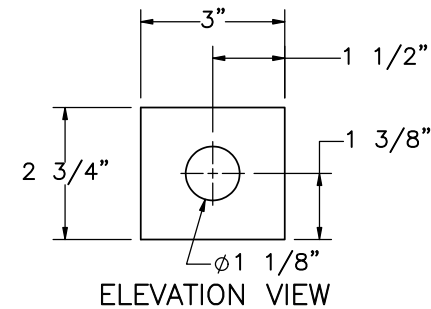
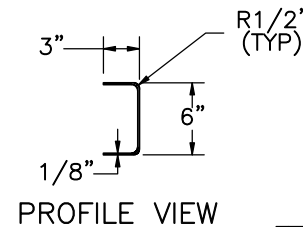
REV. BY:
KAL/JCH/JR
R



Yoke
SCALE 1:12



Part i4
SCALE 1:8



Anchor Bracket End Plate
SCALE 1:4



Midwest Roadside
Safety Facility

NY Box Beam to HPBO
W-Beam Transition
Test Series NYBHT

Ground Strut and Anchor
Bracket Details

DWG. NAME:
NYBHT-1-2_R7

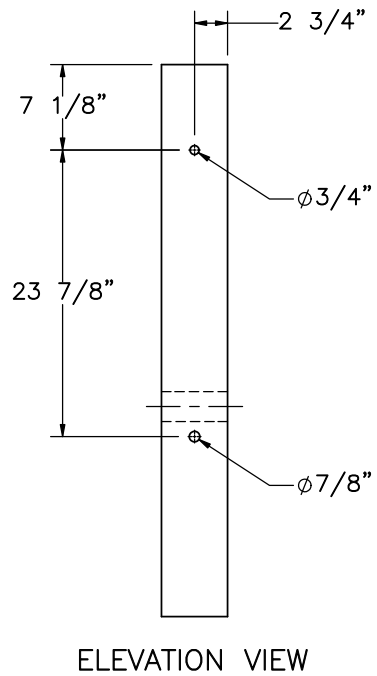
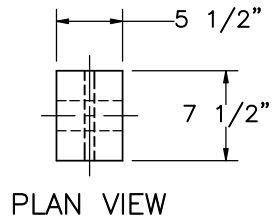
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UNITS: in.

REV. BY:
KAL/JCH/JR
R

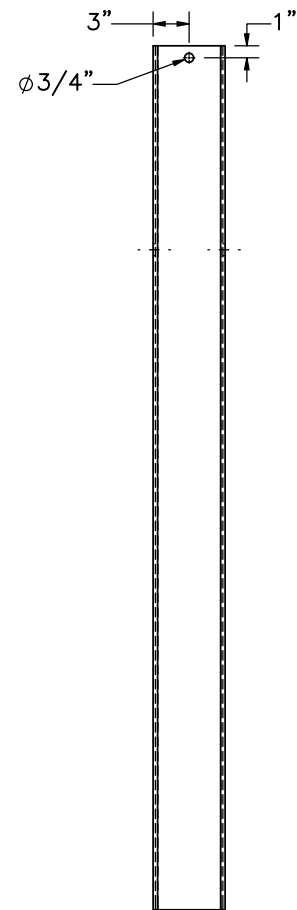
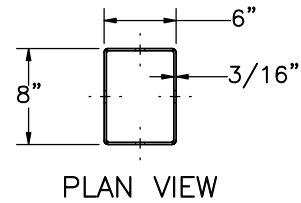
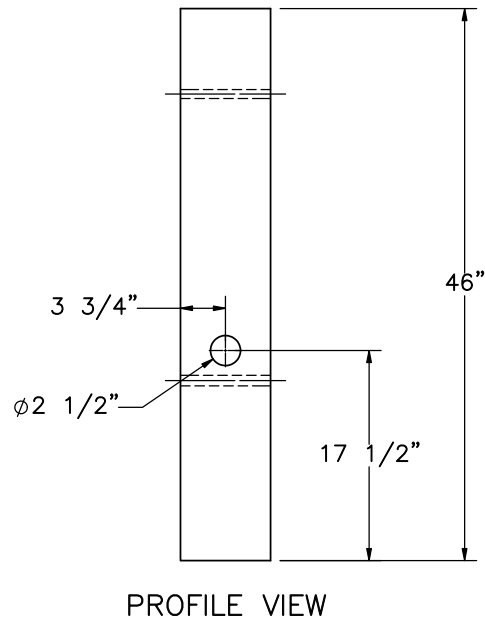
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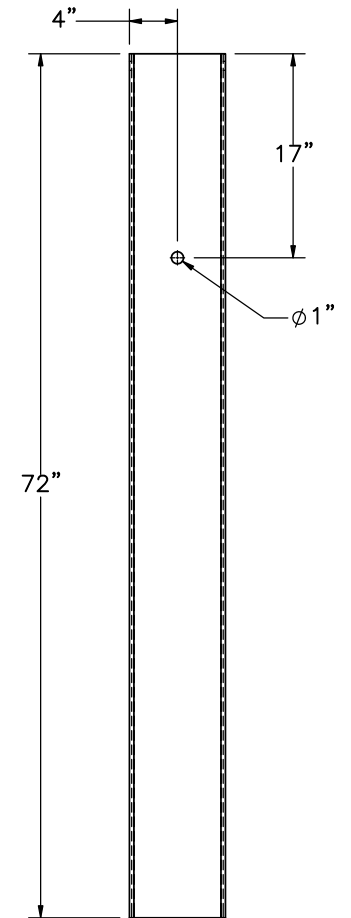
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HR



Part i1



Part i2



Midwest Roadside
Safety Facility

NY Box Beam to HPBO
W-Beam Transition
Test Series NYBHT

BCT Timber Post and
Foundation Tube Details

DWG. NAME.
NYBHT-1-2_R7

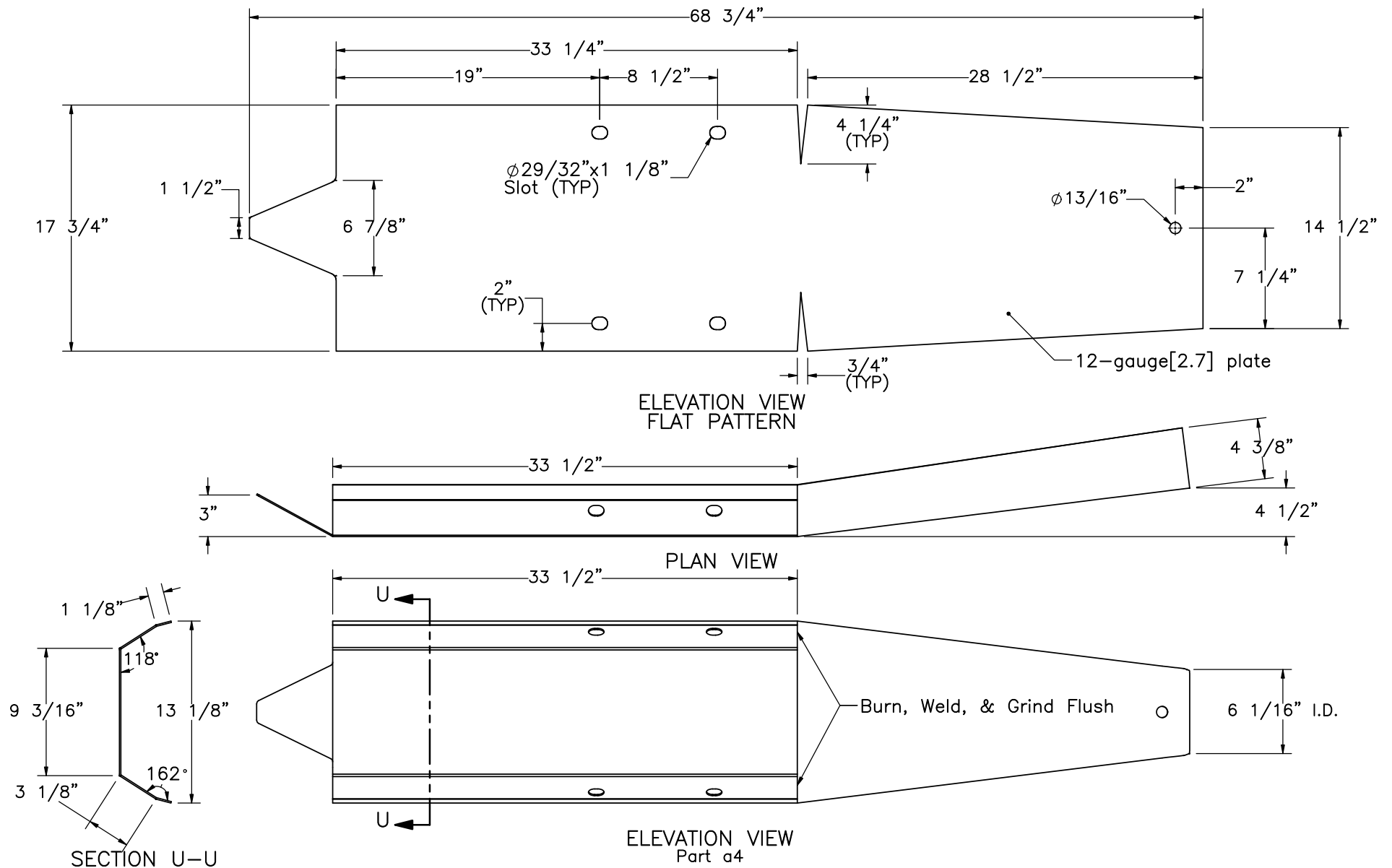
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REV. BY:
KAL/JCH/JR
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Note: (1) Transition cover is the same as used in NYBWT testing series.



Midwest Roadside
Safety Facility

NY Box Beam to HPBO
W-Beam Transition
Test Series NYBHT

W-Beam to Box Beam
Transition Cover

DWG. NAME:
NYBHT-1-2_R7

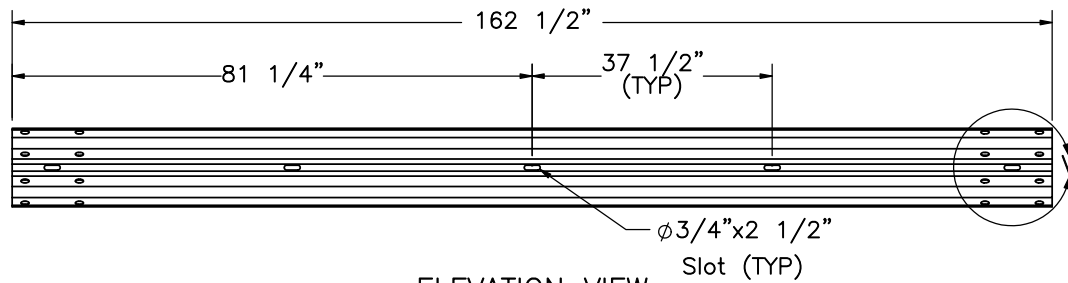
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8/6/2021

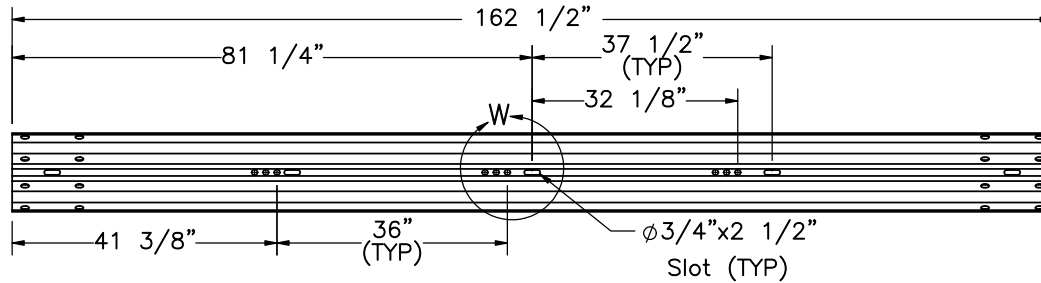
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JEK/SBW/G
HR

REV. BY:
KAL/JCH/JR
R



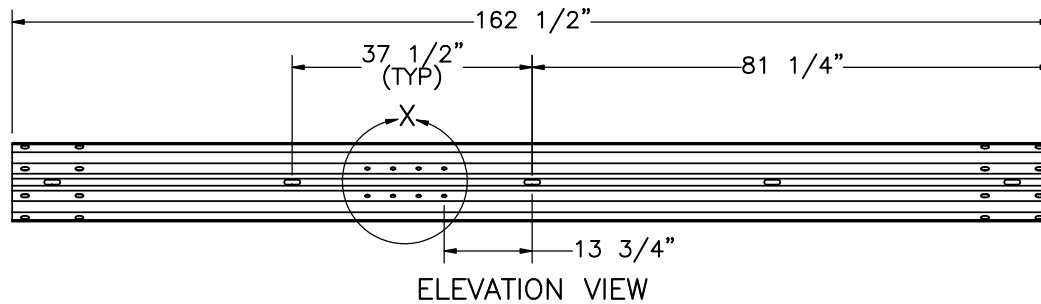
ELEVATION VIEW

Part a1



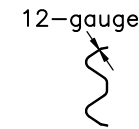
ELEVATION VIEW

Part a2

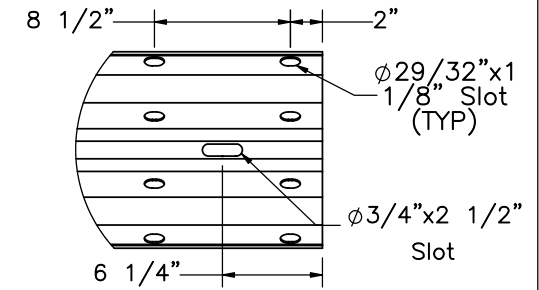


ELEVATION VIEW

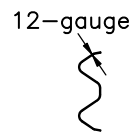
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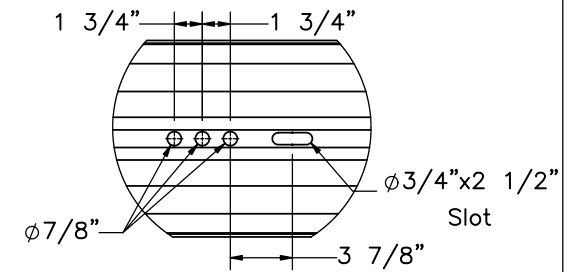
PROFILE VIEW



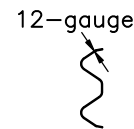
DETAIL V
SCALE 1:12



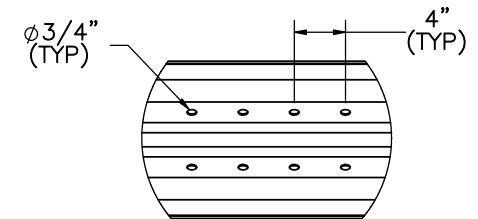
PROFILE VIEW



DETAIL W
SCALE 1:12



PROFILE VIEW



DETAIL X
SCALE 1:15



Midwest Roadside
Safety Facility

NY Box Beam to HPBO
W-Beam Transition
Test Series NYBHT

W-Beam Rail Sections

DWG. NAME.
NYBHT-1-2_R7

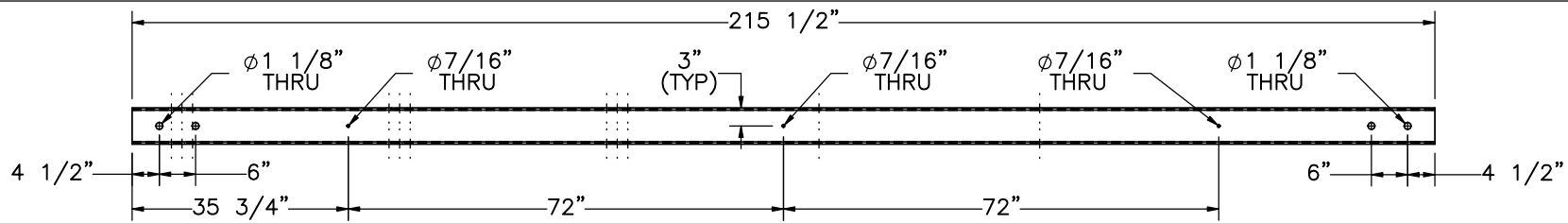
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30 of 37

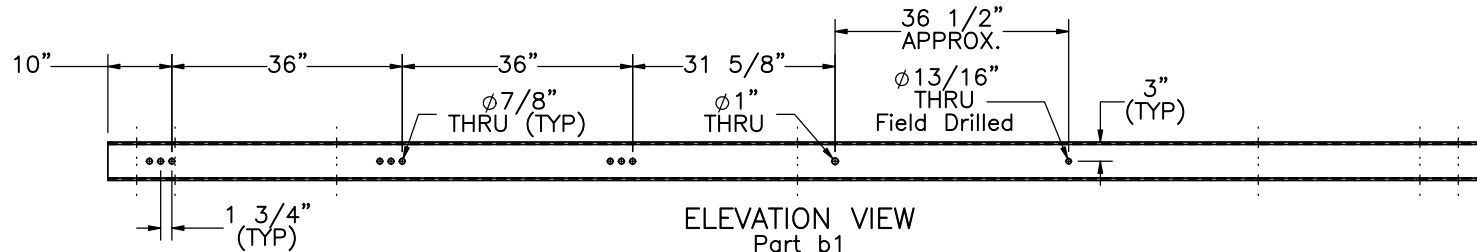
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8/6/2021

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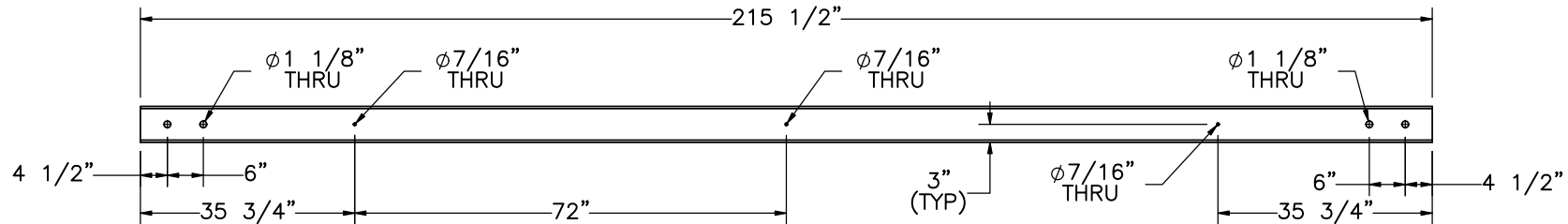
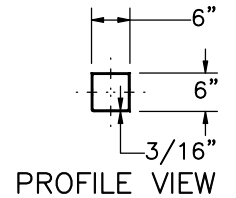
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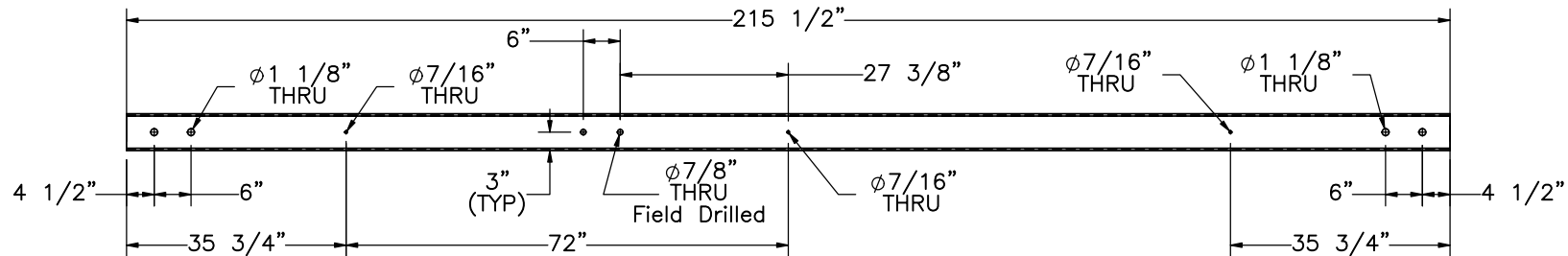
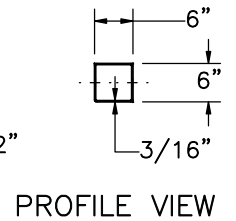
PLAN VIEW



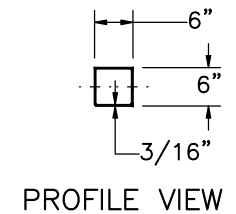
ELEVATION VIEW
Part b1



PLAN VIEW
Part b2



PLAN VIEW
Part b3



Midwest Roadside
Safety Facility

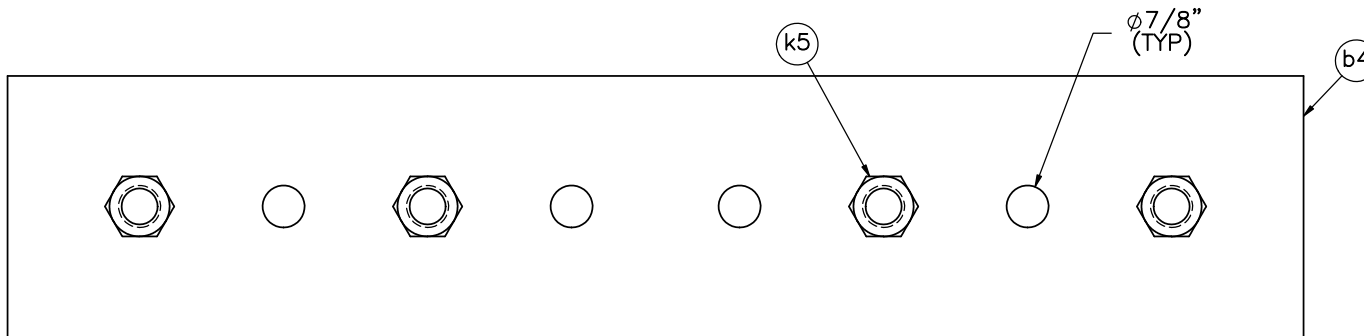
NY Box Beam to HPBO
W-Beam Transition
Test Series NYBHT

Box Beam Rail Sections

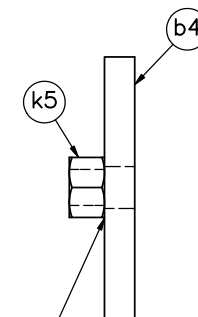
DWG. NAME:
NYBHT-1-2_R7

SCALE: 1:30
UNITS: in.

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8/6/2021
DRAWN BY:
JEK/SBW/G
HR
REV. BY:
KAL/JCH/JR
R

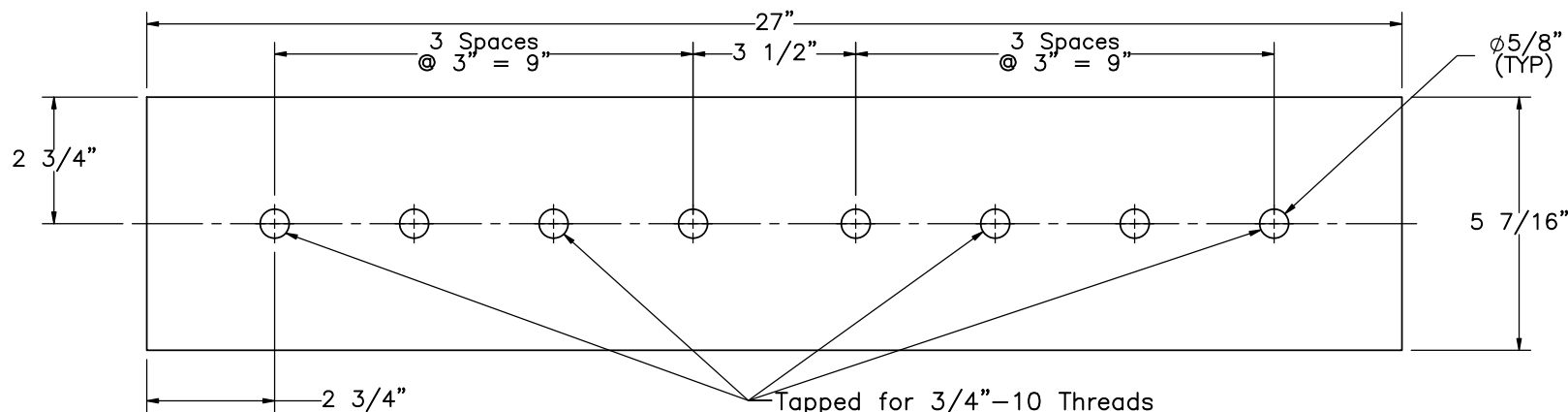


ELEVATION VIEW
Assembled Splice Plate and Nuts

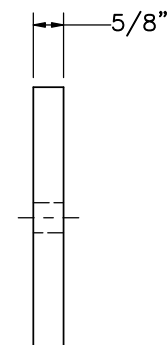


Tack weld all nuts to splice plates prior to assembly.

PROFILE VIEW



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. Welded nut splice plate is preferred.

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" Splice Plate	ASTM A36	See Assembly	—
k5	4	3/4"-10 UNC Heavy Hex Nut	ASTM A563DH or equivalent	See Assembly	FNX20b



Midwest Roadside
Safety Facility

NY Box Beam to HPBO
W-Beam Transition
Test Series NYBHT

Box Beam Splice Plate Details

DWG. NAME.
NYBHT-1-2_R7

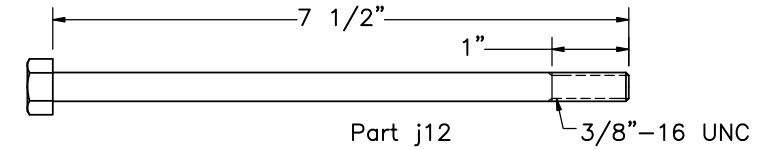
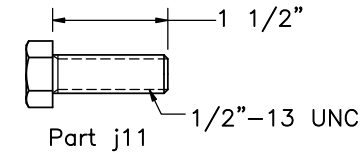
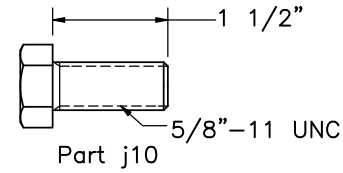
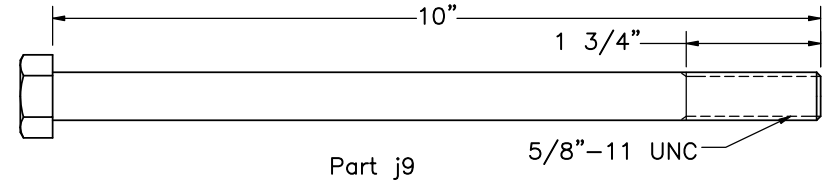
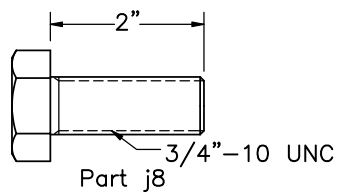
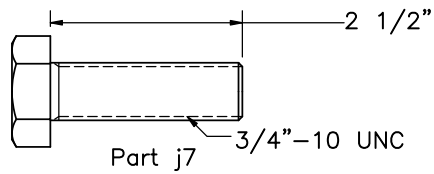
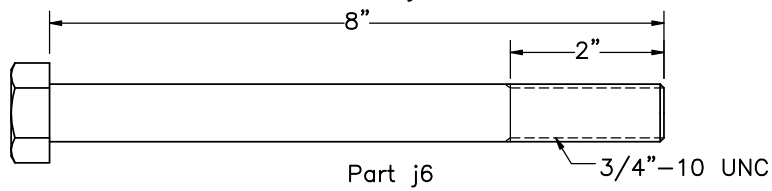
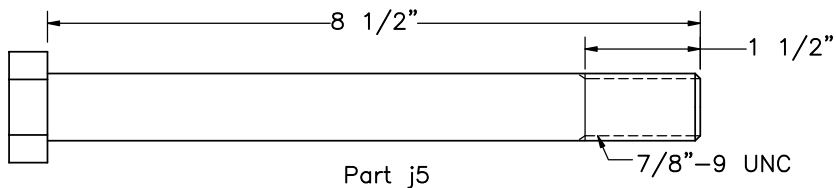
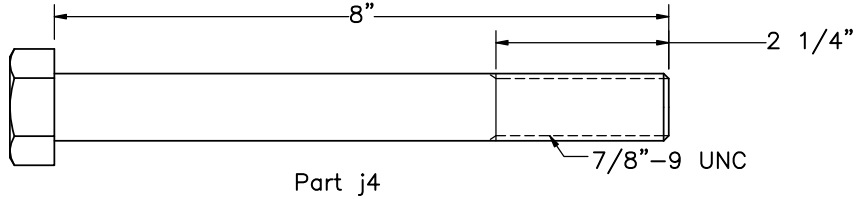
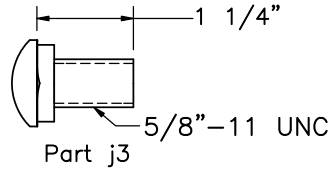
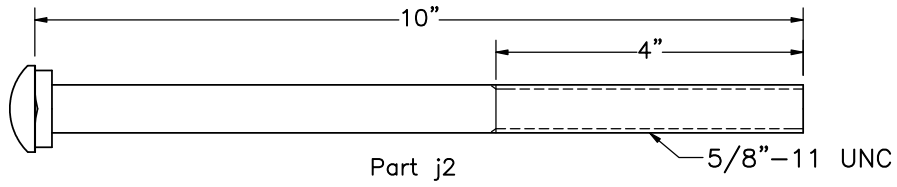
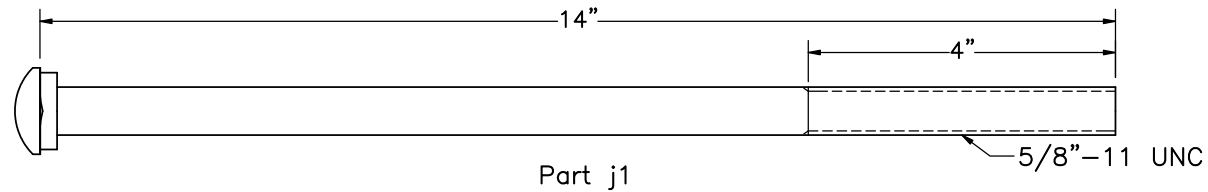
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UNITS: in.

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8/6/2021

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Midwest Roadside
Safety Facility

NY Box Beam to HPBO
W-Beam Transition
Test Series NYBHT

Hardware Details

DWG. NAME.
NYBHT-1-2_R7

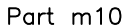
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UNITS: in.

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8/6/2021

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HR

REV. BY:
KAL/JCH/JR
R



Hardware Details

SCALE: 2:5
UNITS: in.

REV. BY:	
KAL/JCH/JR	

Item No.	QTY.	Description	Material Specification	Treatment Specification	Hardware Guide
a1	5	12'-6" 12-gauge W-Beam Section	AASHTO M180	ASTM A123 or A653	RWM04a
a2	2	12'-6" 12-gauge W-Beam Section	AASHTO M180	ASTM A123 or A653	—
a3	1	12'-6" 12-gauge W-Beam MGS End Section	AASHTO M180	ASTM A123 or A653	RWM14a
a4	1	W-Beam to Box Beam Transition Cover, 12-gauge	ASTM A36	ASTM A123 or A653	—
b1	1	TS6"x6"x3/16", 215 1/2" Long Box Beam	ASTM A500 Gr. B	ASTM A123	—
b2	4	TS6"x6"x3/16", 215 1/2" Long Box Beam	ASTM A500 Gr. B	ASTM A123	—
b3	1	TS6"x6"x3/16", 215 1/2" Long Box Beam	ASTM A500 Gr. B	ASTM A123	—
b4	10	27"x5 7/16"x5/8" Splice Plate	ASTM A36	See Assembly	—
c1	21	S3x5.7, 65" Long Post	ASTM A36	See Assembly	—
c2	21	24"x8"x1/4" Soil Plate	ASTM A36	See Assembly	—
c3	3	7"x4"x1/2", 3" Long L-Bracket	ASTM A36	ASTM A123	—
c4	18	5"x3 1/2"x3/8", 4 1/2" Long L-Bracket	ASTM A36	ASTM A123	—
c5	11	W6x8.5 or W6x9, 72" Long Steel Post	ASTM A36	ASTM A123	—
c6	11	14"x12"x6" Timber Blockout	SYP Grade No. 1 or better	—	—
d1	2	W6x15, 72" Long Post	ASTM A992 or ASTM A572 Gr. 50	—	—
d2	2	20"x14"x3/16" Plate	ASTM A36	—	—
d3	2	6 3/16"x4"x1/2" Plate	ASTM A36	—	—
d4	4	6 1/4"x4"x1/2" Plate	ASTM A36	—	—
d5	2	6 3/16"x6"x1/2" Plate	ASTM A36	—	—
e1	2	10"x9"x1/2" Box Beam Cable Anchor Base Plate	ASTM A36	See Assembly	—
e2	4	4"x4"x1/4" Box Beam Cable Anchor Gusset	ASTM A36	See Assembly	—
e3	2	4"x4"x1/2" Box Beam Cable Anchor Mounting Plate	ASTM A36	See Assembly	—
f1	1	Concrete	Pre-Cast Class A* Min. f'c = 3,000 psi NE Mix 47BD	—	—
f2	4	#3 Bar, 30 1/4" Long	ASTM A615 Gr. 60 or A996 Gr. 60	Epoxy-Coated (ASTM A775 or A934) **	—
f3	2	#3 Bar, 33 7/16" Long	ASTM A615 Gr. 60 or A996 Gr. 60	Epoxy-Coated (ASTM A775 or A934) **	—
f4	2	#3 Bar, 35 7/8" Long	ASTM A615 Gr. 60 or A996 Gr. 60	Epoxy-Coated (ASTM A775 or A934) **	—
f5	2	#3 Bar, 38 3/8" Long	ASTM A615 Gr. 60 or A996 Gr. 60	Epoxy-Coated (ASTM A775 or A934) **	—
f6	2	#3 Bar, 45 9/16" Long	ASTM A615 Gr. 60 or A996 Gr. 60	Epoxy-Coated (ASTM A775 or A934) **	—
f7	2	#3 Bar, 48" Long	ASTM A615 Gr. 60 or A996 Gr. 60	Epoxy-Coated (ASTM A775 or A934) **	—
f8	2	#3 Bar, 50 1/2" Long	ASTM A615 Gr. 60 or A996 Gr. 60	Epoxy-Coated (ASTM A775 or A934) **	—
f9	11	3/4" Dia. UNC, Hooked Anchor J-Bolt	ASTM F1554 Gr. 36	ASTM A153 or B695 Class 55 or F2329	FRH20a

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

** Epoxy-coating not necessary for testing purposes.

Note: (1) According to NY standards, blockouts may be wood, plastic, or synthetic.



Midwest Roadside
Safety Facility

NY Box Beam to HPBO
W-Beam Transition
Test Series NYBHT

Bill of Materials

DWG. NAME.
NYBHT-1-2_R7

SCALE: None
UNITS: in.

SHEET:
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8/6/2021

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HR

REV. BY:
KAL/JCH/JR
R

Item No.	QTY.	Description	Material Specification	Treatment Specification	Hardware Guide
g1	1	14"x9"x1/2" Plate	ASTM A36	See Assembly	—
g2	4	4"x2 13/16"x1/4" Cable Anchor Gusset	ASTM A36	See Assembly	—
g3	1	14"x3 1/2"x1/2" Cable Anchor Top Plate	ASTM A36	See Assembly	—
g4	1	1/4" Dia., 16 3/8" Long Brass Rod	ASTM B16-00	—	—
h1	9	3/4" Dia. UNC, 11" Long Threaded Rod	ASTM A307 Gr. A or equivalent	ASTM A153 or B695 Class 55 or F2329	RCE03
h2	3	3/4" Dia. UNC, 11" Long Left-Hand Threaded Rod	ASTM A307 Gr. A or equivalent	ASTM A153 or B695 Class 55 or F2329	RCE03
h3	6	Cable End Fitting	ASTM A27 Gr. 70-40 Class 1	ASTM A153 or B695	RCE03
h4	6	Cable Wedge	ASTM A47 Gr. 32510	—	FMM01
h5	3	Standard Turnbuckle	ASTM F1145	ASTM A153 or B633	—
h6	6	3/4" Dia. 3x7 IWRC IPS Wire Rope — Various Lengths	ASTM A741 Type 1	Class A Coating	RCM01
h7	6	BCT Anchor Cable End Swaged Fitting	Fitting — ASTM A576 Gr. 1035 Stud — ASTM F568 Class C	Fitting — ASTM A153 Stud — ASTM A153 or B695	—
h7	2	3/4" [19] Dia. 6x19 IWRC IPS Wire Rope	ASTM A741 Type 2	Class A Coating	—
i1	2	BCT Timber Post — MGS Height	SYP Grade No. 1 or better (No knots +/— 9" from weakening hole on tension face)	—	PDF01
i2	2	72" Long Foundation Tube	ASTM A500 Gr. B	ASTM A123	PTE06
i3	1	Ground Strut Assembly	ASTM A36	ASTM A123	PFP01
i4	1	Anchor Bracket Assembly	ASTM A36	ASTM A123	FPA01
i5	1	8"x8"x5/8" Anchor Bearing Plate	ASTM A36	ASTM A123	FPB01
i6	1	2 3/8" O.D. x 6" Long BCT Post Sleeve	ASTM A53 Gr. B Schedule 40	ASTM A123	FMM02
j1	11	5/8"—11 UNC, 14" Long Guardrail Bolt	ASTM A307 Gr. A	ASTM A153 or B695 Class 55 or F2329	FBB06
j2	2	5/8"—11 UNC, 10" Long Guardrail Bolt	ASTM A307 Gr. A	ASTM A153 or B695 Class 55 or F2329	FBB03
j3	52	5/8"—11 UNC, 1 1/4" Long Guardrail Bolt	ASTM A307 Gr. A	ASTM A153 or B695 Class 55 or F2329	FBB01
j4	2	7/8"—9 UNC, 8" Long Hex Head Bolt	ASTM A307 Gr. A or equivalent	ASTM A153 or B695 Class 55 or F2329	—
j5	2	7/8"—9 UNC, 8 1/2" Long Heavy Hex Head Bolt	ASTM F3125 Gr. A325 Type 1 or equivalent	ASTM A153 or B695 Class 55 or F1136 Gr. 3 or F2329 or F2833 Gr. 1	FBX22b
j6	11	3/4"—10 UNC, 8" Long Hex Head Bolt	ASTM A307 Gr. A or equivalent	ASTM A153 or B695 Class 55 or F2329	FBX20a
j7*	2	3/4"—10 UNC, 2 1/2" Long Fully Threaded Heavy Hex Head Bolt	ASTM F3125 Gr. A325 Type 1 or equivalent	ASTM A153 or B695 Class 55 or F1136 Gr. 3 or F2329 or F2833 Gr. 1	FBX20b
j8*	38	3/4"—10 UNC, 2" Long Fully Threaded Heavy Hex Head Bolt	ASTM F3125 Gr. A325 Type 1 or equivalent	ASTM A153 or B695 Class 55 or F1136 Gr. 3 or F2329 or F2833 Gr. 1	FBX20b
j9	2	5/8"—11 UNC, 10" Long Hex Head Bolt	ASTM A307 Gr. A or equivalent	ASTM A153 or B695 Class 55 or F2329	FBX16a
j10	8	5/8"—11 UNC, 1 1/2" Long Hex Head Bolt	ASTM A307 Gr. A or equivalent	ASTM A153 or B695 Class 55 or F2329	FBX16a
j11	18	1/2"—13 UNC, 1 1/2" Long Fully Threaded 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" shorter.



Midwest Roadside
Safety Facility

NY Box Beam to HPBO
W-Beam Transition
Test Series NYBHT

Bill of Materials

DWG. NAME.
NYBHT-1-2_R7

SCALE: None
UNITS: in.

REV. BY:
KAL/JCH/JR
R

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8/6/2021

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Item No.	QTY.	Description	Material Specification	Treatment Specification	Hardware Guide
j12	18	3/8"–16 UNC, 7 1/2" Long Hex Head Bolt	ASTM A307 Gr. A or equivalent	ASTM A153 or B695 Class 55 or F2329	FBX10a
j13	2	16D Double Head Nail	—	—	—
k1	6	1"–8 UNC Heavy Hex Nut	ASTM A563DH or equivalent	ASTM A153 or B695 Class 55 or F2329	FNX24b
k2	2	7/8"–9 UNC Hex Nut	ASTM A563A or equivalent	ASTM A153 or B695 Class 55 or F2329	—
k3	2	7/8"–9 UNC Heavy Hex Nut	ASTM A563DH or equivalent	ASTM A153 or B695 Class 55 or F2329	FNX22b
k4	30	3/4"–10 UNC Hex Nut	ASTM A563A or equivalent	ASTM A153 or B695 Class 55 or F2329	FNX20a
k5*	40	3/4"–10 UNC Heavy Hex Nut	ASTM A563DH or equivalent	See Assembly	FNX20b
k6	12	3/4"–10 UNC Square Nut	ASTM A563A or equivalent	ASTM A153 or B695 Class 55 or F2329	FNS20
k7	10	5/8"–11 UNC Hex Nut	ASTM A563A or equivalent	ASTM A153 or B695 Class 55 or F2329	FNX16a
k8	65	5/8"–11 UNC Heavy Hex Nut	ASTM A563A or equivalent	ASTM A153 or B695 Class 55 or F2329	FNX16b
k9	18	1/2"–13 UNC Hex Nut	ASTM A563A or equivalent	ASTM A153 or B695 Class 55 or F2329	FNX14a
k10	18	3/8"–16 UNC Hex Nut	ASTM A563A or equivalent	ASTM A153 or B695 Class 55 or F2329	FNX10a
m1	6	1" Dia. Plain USS Washer	ASTM F844	ASTM A123 or A153 or F2329	FWC24a
m2	4	7/8" Dia. Plain USS Washer	ASTM F844	ASTM A123 or A153 or F2329	—
m3	4	7/8" Dia. Hardened SAE Washer	ASTM F436	ASTM A153 or B695 Class 55 or F1136 Gr. 3 or F2329	FWC22b
m4	16	3/4" Dia. Plain USS Washer	ASTM F844	ASTM A123 or A153 or F2329	FWC20a
m5	40	3/4" Dia. Hardened USS Washer	ASTM F436	ASTM A153 or B695 Class 55 or F1136 Gr. 3 or F2329	FWC20b
m6	22	5/8" Dia. Plain USS Washer	ASTM F844	ASTM A123 or A153 or F2329	FWC16a
m7	11	5/8" Dia. Plain SAE Washer	ASTM F844	ASTM A123 or A153 or F2329	—
m8	18	1/2" Dia. Plain Narrow SAE Washer	SAE Low Carbon Gr. 2	ASTM A153 or B695 Class 55 or F1136 Gr. 3 or F2329	—
m9	36	3/8" Dia. Plain USS Washer	ASTM F844	ASTM A123 or A153 or F2329	FWC10a
m10	30	3/4" Dia. Hardened SAE Washer	ASTM F436	ASTM A153 or B695 Class 55 or F1136 Gr. 3 or F2329	FWC20b

* 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 Plus	Tolerance Minus	Basic	Tolerance Plus	Tolerance Minus	Basic	Max.	Min.
3/4"	Regular (m10)	0.812"	0.03"	0.007"	1.469"	0.03"	0.007"	0.134"	0.16"	0.108"
	Wide (m4)	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 HPBO
W-Beam Transition
Test Series NYBHT

Bill of Materials

DWG. NAME:
NYBHT-1-2_R7

SCALE: None
UNITS: in.

SHEET:
37 of 37
DATE:
8/6/2021
DRAWN BY:
JEK/SBW/G
HR
REV. BY:
KAL/JCH/JR
R

REV.	DATE OF ISSUE	Page	NATURE OF CHANGES	REVIEWER	REVISED BY
0	2/13/2020	–	Originated from drawing NYHBT-1-2_R14. Flipped upstream/downstream and sides that bolts are relative to flange.	–	JEK
1	2/19/2020	30	Part a2 hole pattern update.	KAL	JEK
2	2/21/2020	2	Post number corrections.	JCH	JEK
3	2/24/2020	–	Washers fixed in model in various locations.	KAL/JCH	JEK
		5	Bubble edit (to point to nut on anchor rather than rod).		
		6	Washer correction (cable bracket attachment). Model only: nuts and washers on cable end fixed.		
		24	Washer m5 replaced with new m10.		
		34	Washer m10 added.		
		BOM	New: m10. Qty: k4, k6, m1, m4, m5, m10. HWG: m5. Washer m5 to m10 in size table.		
4	3/10/2020	14	Removed note	KAL	SBW
		15	Added dimension		
		24	Updated material and galv specs on part h5		
		BOM	Updated material and galv specs on part h5		
5	3/12/2020	14	Weld corrections.	KAL	JEK
		15	Part g1 dimension adds.		
6	4/3/2020	BOM	Renumbered: h6-h8. Added h6 to overall BOM.	KAL	JEK
7	8/6/2021	1	Corrected test name for NYBHT-2. Corrected rail callouts in elevation view.	JRR	GHR
		BOM	Corrected part names.		