



U.S. Department
of Transportation
**Federal Highway
Administration**

1200 New Jersey Ave., SE
Washington, D.C. 20590

January 27, 2012

In Reply Refer To:
HSST/B-231

Scott Rosenbaugh
Research Associate Engineer
Midwest Roadside Safety Facility UNL
2200 Vine Street
130 Whittier Building
Lincoln NE, 68583-0853

Dear Mr. Rosenbaugh:

This letter is in response to your request for the Federal Highway Administration (FHWA) to review a roadside safety system for eligibility for reimbursement under the Federal-aid highway program.

Name of system:	Transition from steel post MGS to thrie-beam approach
Type of system:	W-beam to thrie-beam stiffness transition
Test Level:	MASH Test Level 3
Testing conducted by:	Midwest Roadside Safety Facility
Task Force 13 Designator:	STG03a
Date of request:	June 28, 2011
Date initially acknowledged:	July 17, 2011
Date of completed package:	June 28, 2011

Decision:

The following device is eligible, with details provided in your letter of June 28, 2011, which is enclosed as an integral part of this finding:

- Stiffness Transition from steel post MGS with 12-inch deep blockouts to thrie-beam approach using asymmetrical "Y."

Based on a review of crash test results submitted by the manufacturer certifying the device described herein meets the crashworthiness criteria of the American Association of State Highway and Transportation Officials' Manual for Assessing Safety Hardware (MASH), the device is eligible for reimbursement under the Federal-aid highway program. Eligibility for reimbursement under the Federal-aid highway program does not establish approval or endorsement by the FHWA for any particular purpose or use.

FHWA: HSST: Artimovich: sf: x61331:1/25/12

File: s://directory folder/HSST/Artimovich/ 231_MGS_Stiffness
_Transition Letter.dotx

cc: HSST (NArtimovich; JDewar)

The FHWA, the Department of Transportation, and the United States Government do not endorse products or services and the issuance of a reimbursement eligibility letter is not an endorsement of any product or service.

Requirements

Roadside safety devices should meet the guidelines contained in the MASH.

Description and Crash Testing

Guardrail to bridgerail transitions are designed to gradually increase the stiffness of the semi-rigid w-beam barrier until connected to the rigid bridge railing. Typically, a single critical impact point (CIP) has been evaluated with full-scale crash testing. That CIP is usually located at the point where we anticipate the greatest likelihood of vehicle snagging or pocketing near the beginning of the rigid bridge railing. Because the stiffness of the barrier transition hardware needed to adequately shield the end of the rigid bridge railing is substantial, there is also reason to determine if the change in stiffness between the w-beam guardrail and the transition design itself is safe. A transition from the MGS with 12-inch deep blockout to a stiffened thrie-beam rail using an asymmetrical “Y” transition piece was evaluated in your crash testing. The enclosed letter describes the transition design and the two crash tests conducted.

Also enclosed are the test data summary sheets and drawings of the transitions.

Findings

Therefore, the system described and detailed in the attached letter, including the various attachment alternatives, is eligible for reimbursement and may be installed under the range of conditions tested.

Please note the following standard provisions that apply to FHWA eligibility letters:

- This letter provides a AASHTO/ARTBA/AGC Task Force 13 designator that should be used for the purpose of the creation of a new and/or the update of existing Task Force 13 drawing for posting on the on-line ‘Guide to Standardized Highway Barrier Hardware’ currently referenced in AASHTO Roadside Design Guide.
- This finding of eligibility is limited to the crashworthiness characteristics of the systems and does not cover their structural features, nor conformity with the Manual on Uniform Traffic Control Devices.
- Any changes that may influence the crashworthiness of the system will require a new reimbursement eligibility letter.
- Should the FHWA discover that the qualification testing was flawed, that in-service performance reveals safety problems, or that the system is significantly different from the version that was crash tested, we reserve the right to modify or revoke this letter.
- You will be expected to supply potential users with sufficient information on design and installation requirements to ensure proper performance.
- You will be expected to certify to potential users that the hardware furnished has the same chemistry, mechanical properties, and geometry as that submitted for review, and that it will meet the crashworthiness requirements of the Manual for Assessing Safety Hardware.

- To prevent misunderstanding by others, this letter of eligibility is designated as number B-231 and shall not be reproduced except in full. This letter and the test documentation upon which it is based are public information. All such letters and documentation may be reviewed at our office upon request.
- This letter shall not be construed as authorization or consent by the FHWA to use, manufacture, or sell any patented system for which the applicant is not the patent holder. The finding of eligibility is limited to the crashworthiness characteristics of the candidate system, and the FHWA is neither prepared nor required to become involved in issues concerning patent law. Patent issues, if any, are to be resolved by the applicant.

Sincerely yours,

Michael S. Griffith
Director, Office of Safety Technologies
Office of Safety



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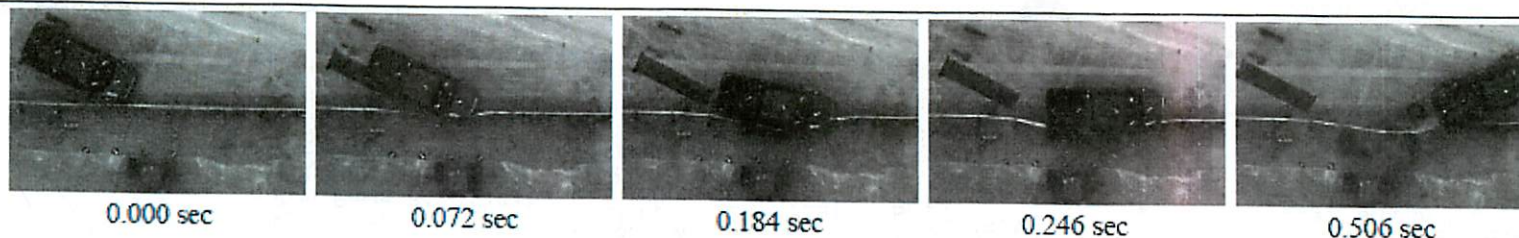
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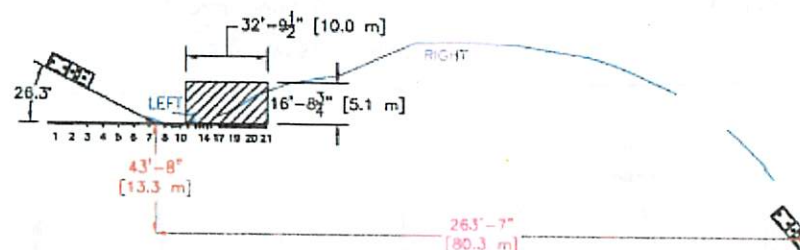
Sincerely yours,



Michael S. Griffith
Director, Office of Safety Technologies
Office of Safety



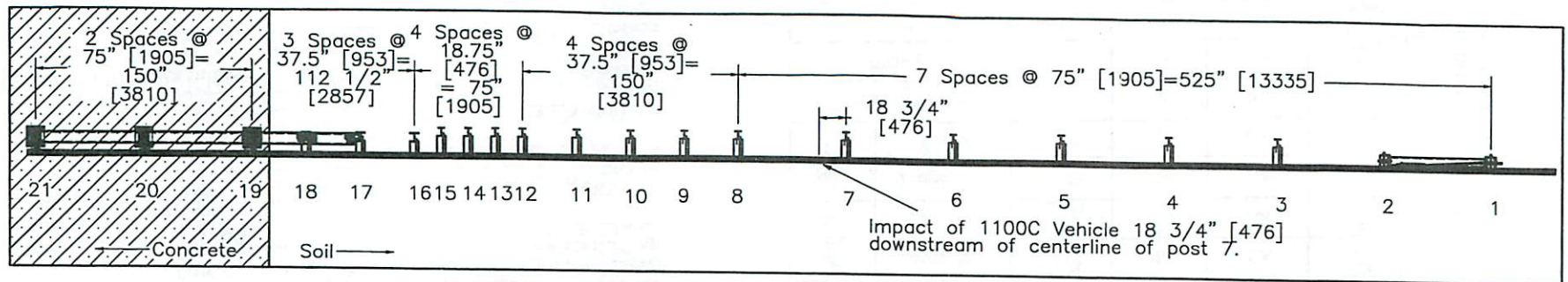
- Test Agency MwRSF
- Test Number MWTSP-2
- Date 7/7/08
- MASH Test Designation 3-21
- Test Article Stiffness Transition between MGS and Thrie Beam Transition
- Total Length 87 ft - 6 in. (26.7 m)
- Height to Top of Rail 31 in. (787 mm)
- Key Components - Steel W-Beam Guardrail
 - Thickness 12 gauge (2.66 mm)
- Key Components - Steel W-Beam to Thrie Beam Transition
 - Thickness 10 gauge (3.42 mm)
 - Segment Length 75 in. (1,905 mm)
- Key Components - Steel Thrie Beam
 - Thickness 12 gauge (2.66 mm)
- Key Components - Steel Posts
 - Post Nos. 3 - 15 72 in. (1,829 mm) long, W6x9 (W152x13.4)
 - Post Nos. 16 - 18 84 in. (2,134 mm) long, W6x15 (W152x22.3)
 - Post Nos. 19 - 21 29 1/2 in. (752 mm) long, W6x20 (W152x29.8)
- Post Spacing
 - Post Nos. 1 - 8, 19 - 21 75 in. (1,905 mm)
 - Post Nos. 8 - 12, 16 - 19 37 1/2 in. (953 mm)
 - Post Nos. 12 - 16 18 3/4 in. (476 mm)
- Type of Soil Grading B - AASHTO M 147-65
- Vehicle
 - Make and Model 2002 Dodge Ram 1500 Quad Cab
 - Curb 5,138 lb (2,331 kg)
 - Test Inertial 4,993 lb (2,265 kg)
 - Gross Static 5,158 lb (2,340 kg)
- Impact Conditions
 - Speed 61.2 mph (98.5 km/h)
 - Angle 26.3 deg
 - Impact Location 75 in. (1,905 mm) US of Post No. 9
- Exit Conditions
 - Speed 37.3 mph (60.0 km/h)
 - Angle 22.0 deg
- Vehicle Stability Satisfactory
- Exit Box Criteria Passed
- Vehicle Damage Moderate
- VDS⁽²⁴⁾ 1-RFQ-5
- CDC⁽²⁵⁾ 01-RFEW2



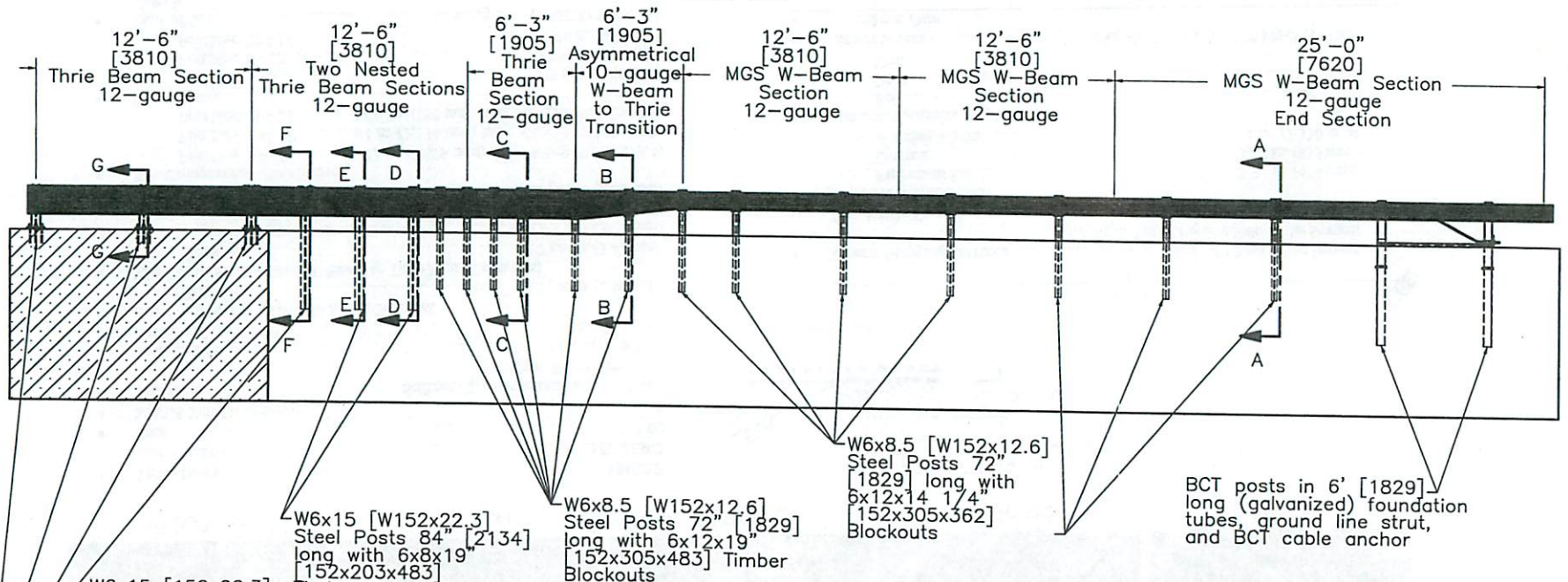
- Vehicle Stopping Distance 263 ft (80.2 m) DS of Impact
- Test Article Damage 43.7 ft (13.3 m) Laterally Behind the System
- Test Article Deflections Moderate
 - Permanent Set 25 3/4 in. (654 mm)
 - Dynamic 32.8 in. (833 mm)
 - Working Width 51.6 in. (1,310 mm)
- Maximum Angular Displacements
 - Roll 13° < 75°
 - Pitch 10° < 75°
 - Yaw 51°
- Impact Severity 126.8 kip-ft (171.9 kJ) > 106 kip-ft (144 kJ)
- Transducer Data

Evaluation Criteria		Transducer			MASH Limit
		EDR-3	EDR-4	DTS	
OIV ft/s (m/s)	Longitudinal	-21.21 (-6.46)	NA	NA	≤ 40 (12.2)
	Lateral	-16.91 (-5.15)	NA	NA	≤ 40 (12.2)
ORA g's	Longitudinal	-12.03	NA	NA	≤ 20.49
	Lateral	-9.87	NA	NA	≤ 20.49
THIV - ft/s (m/s)		-	NA	NA	not required
PHD - g's		-	NA	NA	not required
ASI		0.91	NA	NA	not required

Figure 64. Summary of Test Results and Sequential Photographs, Test No. MWTSP-2



PLAN VIEW



ELEVATION VIEW



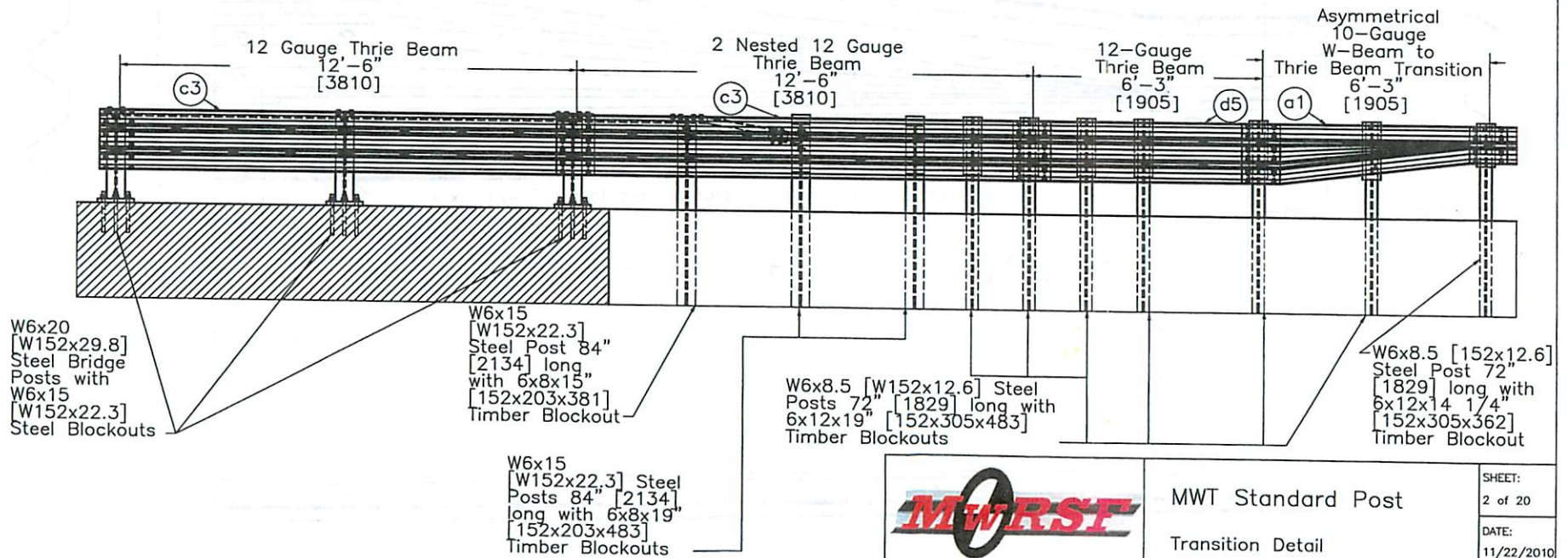
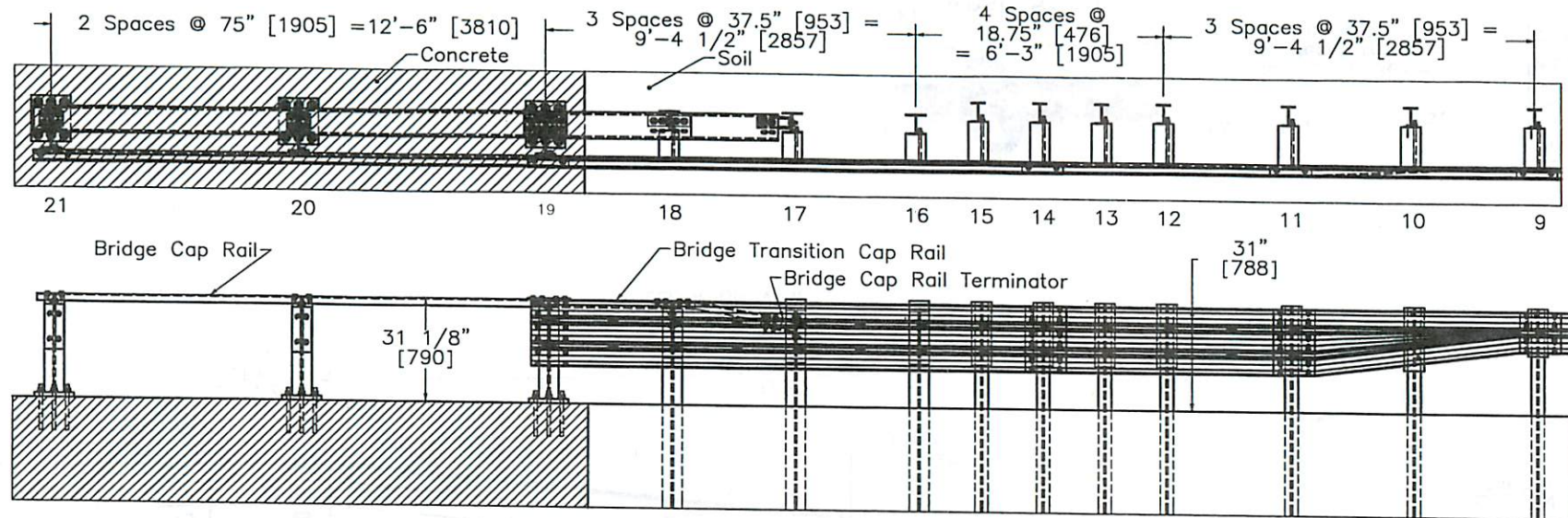
Midwest Roadside
Safety Facility

MWT Standard Post
System Layout

DWG. NAME.
MWT-SP-3_R3

SCALE: 1:110
UNITS: In./mm

SHEET:
1 of 20
DATE:
11/22/2010
DRAWN BY:
EMA/RJT
REV. BY:
KAP/SKR/
RKF



Midwest Roadside
Safety Facility

MWT Standard Post

Transition Detail

DWG. NAME:
MWT-SP-3_R3

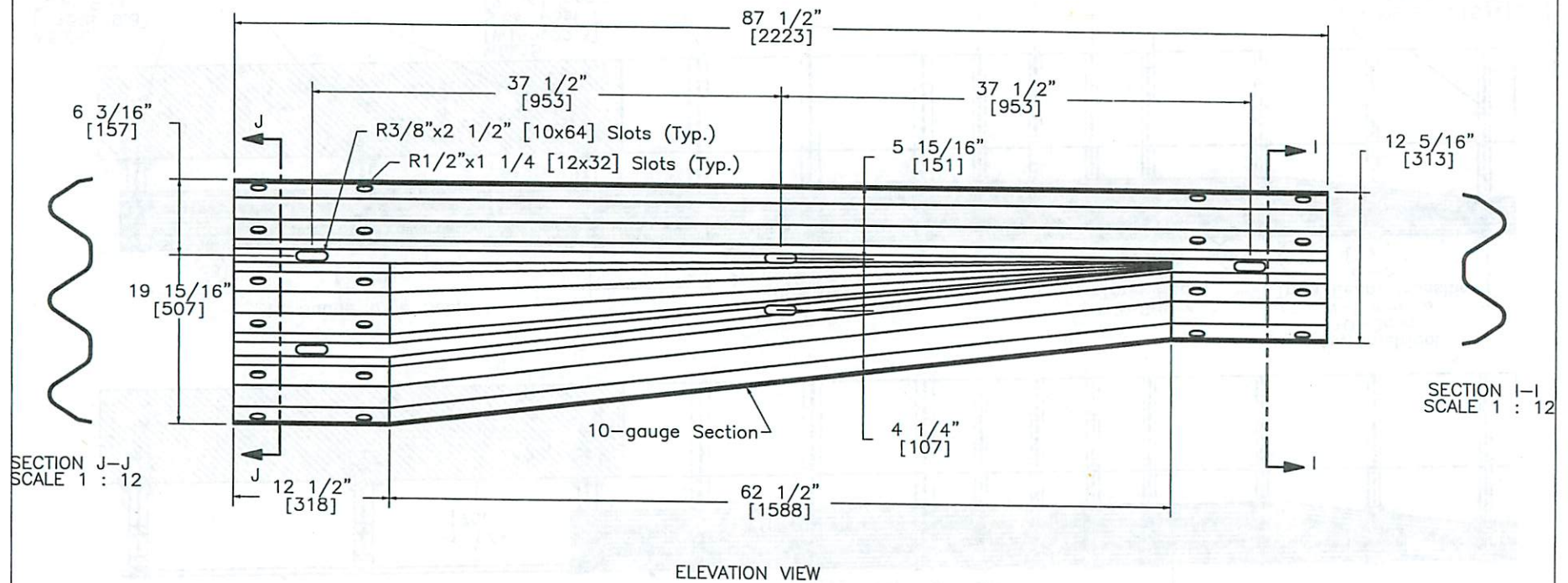
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REV. BY:
KAP/SKR/
RKE

SHEET:
2 of 20
DATE:
11/22/2010
DRAWN BY:
EMA/RJT



PLAN VIEW



Midwest Roadside
Safety Facility

MWT Standard Post

Asymmetrical W-Beam
to Thrie Beam Transition
Rail Section Detail

SHEET:
3 of 20

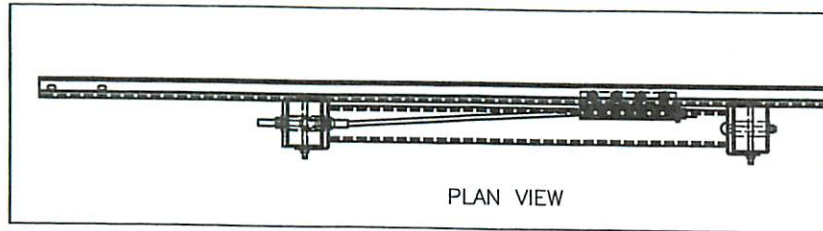
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11/22/2010

DRAWN BY:
EMA/RJT

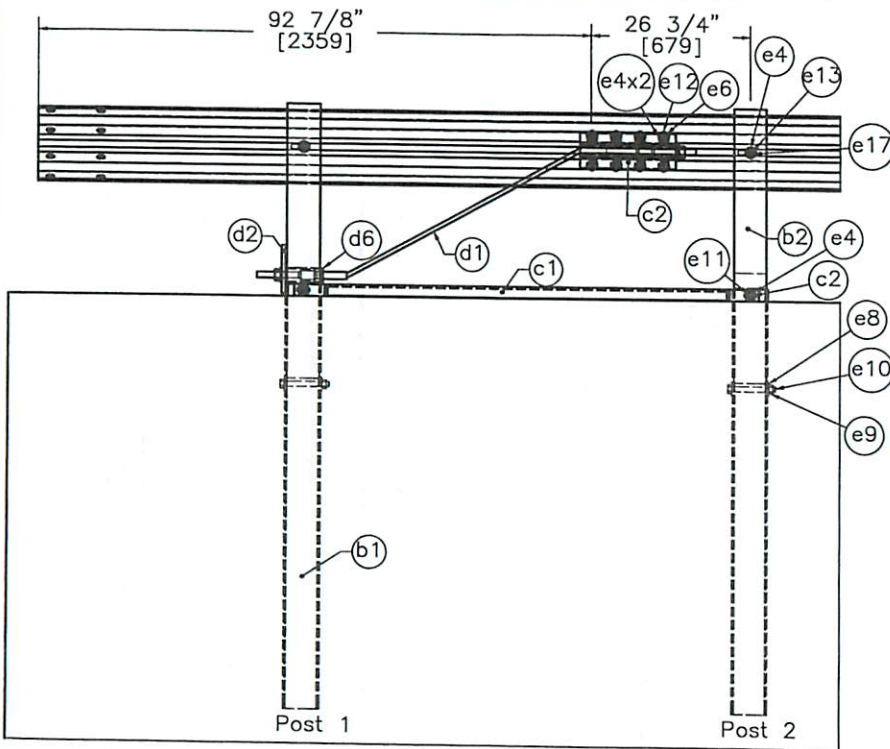
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MWT-SP-3_R3

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REV. BY:
KAP/SKR/
RKF



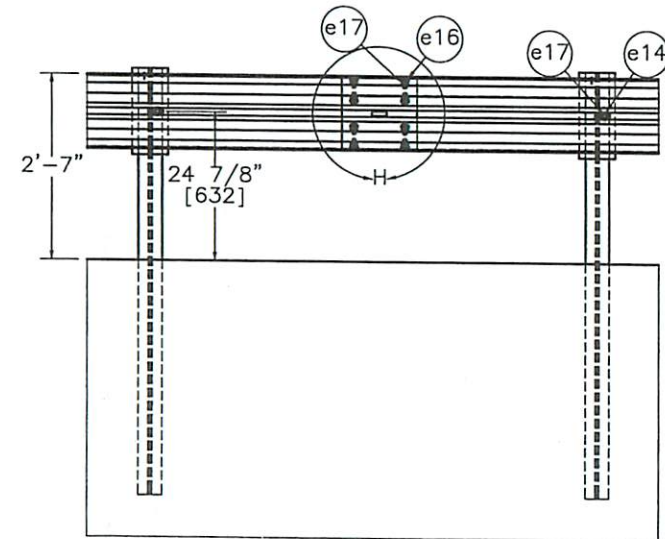
PLAN VIEW



ELEVATION VIEW
END RAIL DETAIL



DETAIL H
SCALE 1 : 15



ELEVATION VIEW
SPLICE DETAIL



Midwest Roadside
Safety Facility

MWT Standard Post

Splice Detail
End Rail Detail

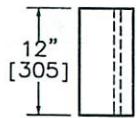
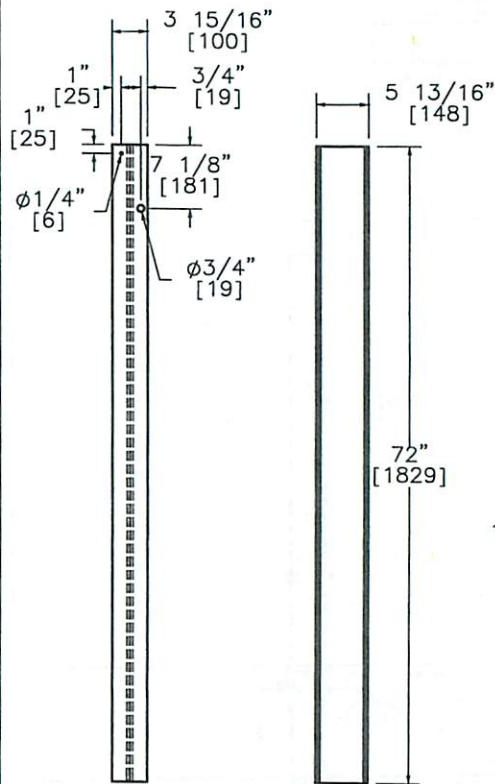
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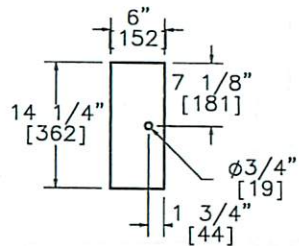
SHEET:
4 of 20
DATE:
11/22/2010
DRAWN BY:
EMA/RJT
REV. BY:
KAP/SKR/
RKF

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PLAN VIEW



PLAN VIEW



ELEVATION VIEW

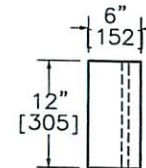
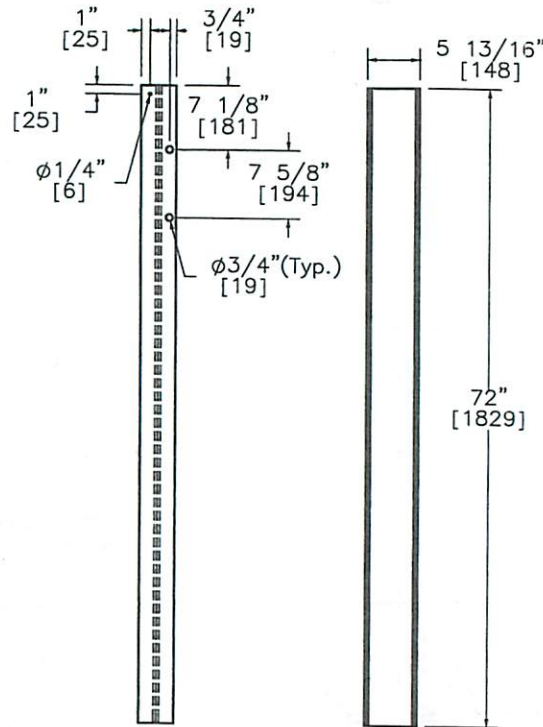
BLOCKOUT
Post 3-9
Part a2

ELEVATION VIEW PROFILE VIEW

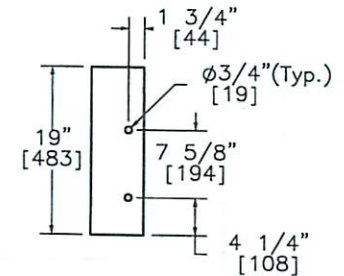
POST 3-9
W6x8.5
[W152x12.6]
Part f1

I

PLAN VIEW



PLAN VIEW



ELEVATION VIEW

BLOCKOUT
Post 10-15
Part a3

ELEVATION VIEW

PROFILE VIEW

POST 10-15
W6x8.5
[W152x12.6]
Part f2



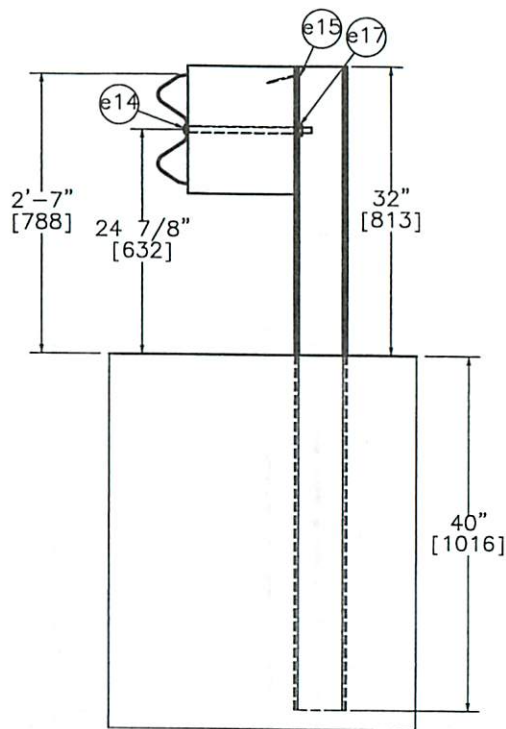
Midwest Roadside
Safety Facility

MWT Standard Post
Posts 3-15
Details

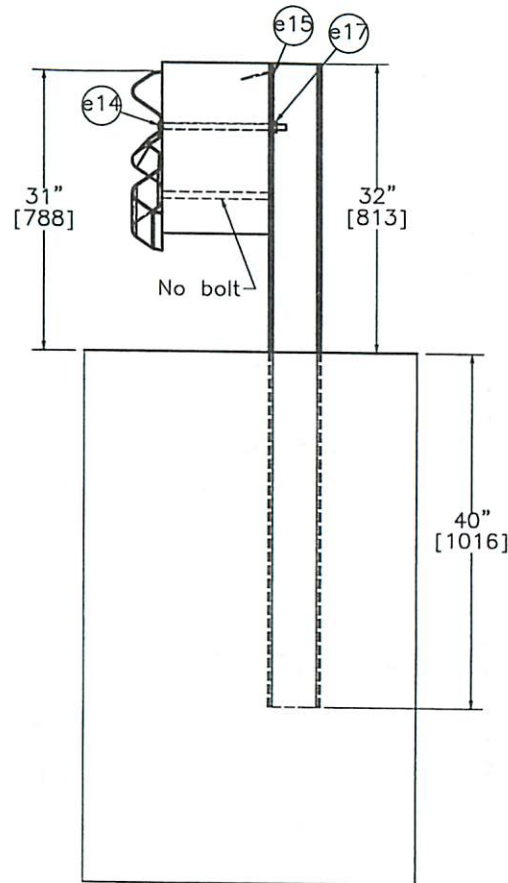
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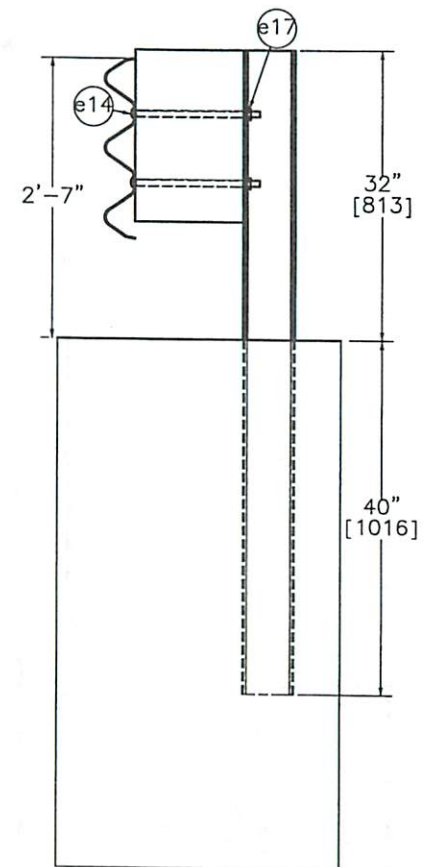
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5 of 20
DATE:
11/22/2010
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RKF



SECTION A-A
Post 3-9



SECTION B-B
Post 10



SECTION C-C
Post 11-15



Midwest Roadside
Safety Facility

MWT Standard Post

Posts 3-15 Details
with Rail

SHEET:
6 of 20

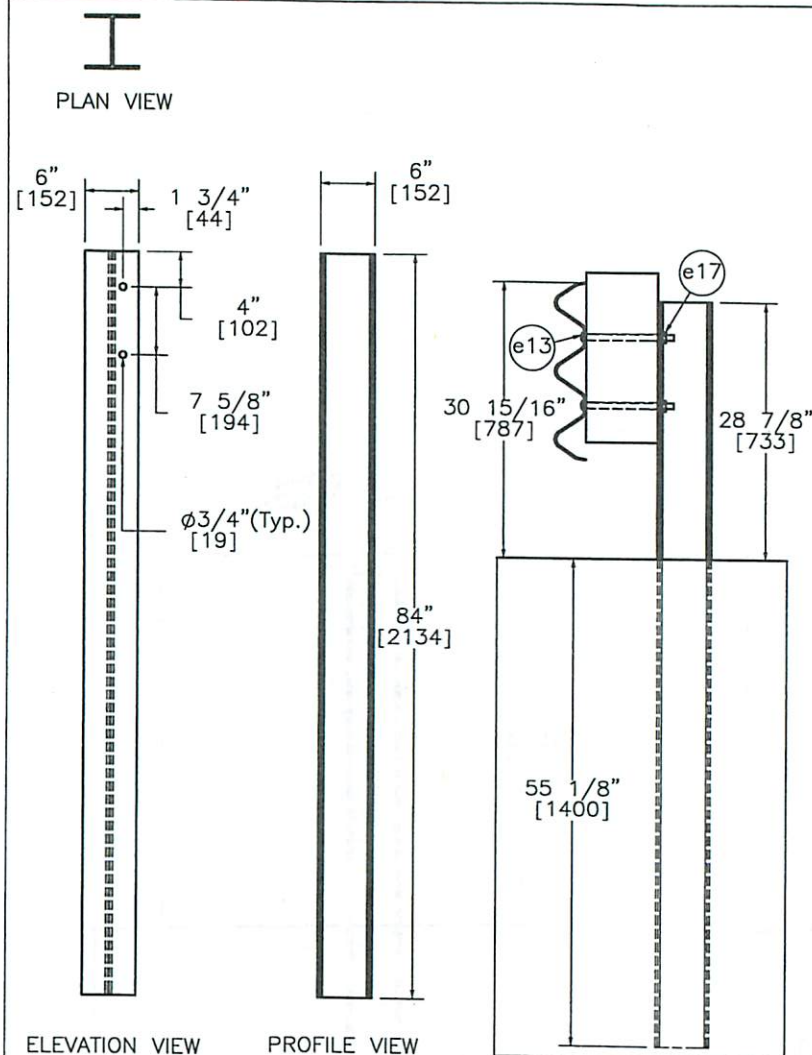
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EMA/RJT

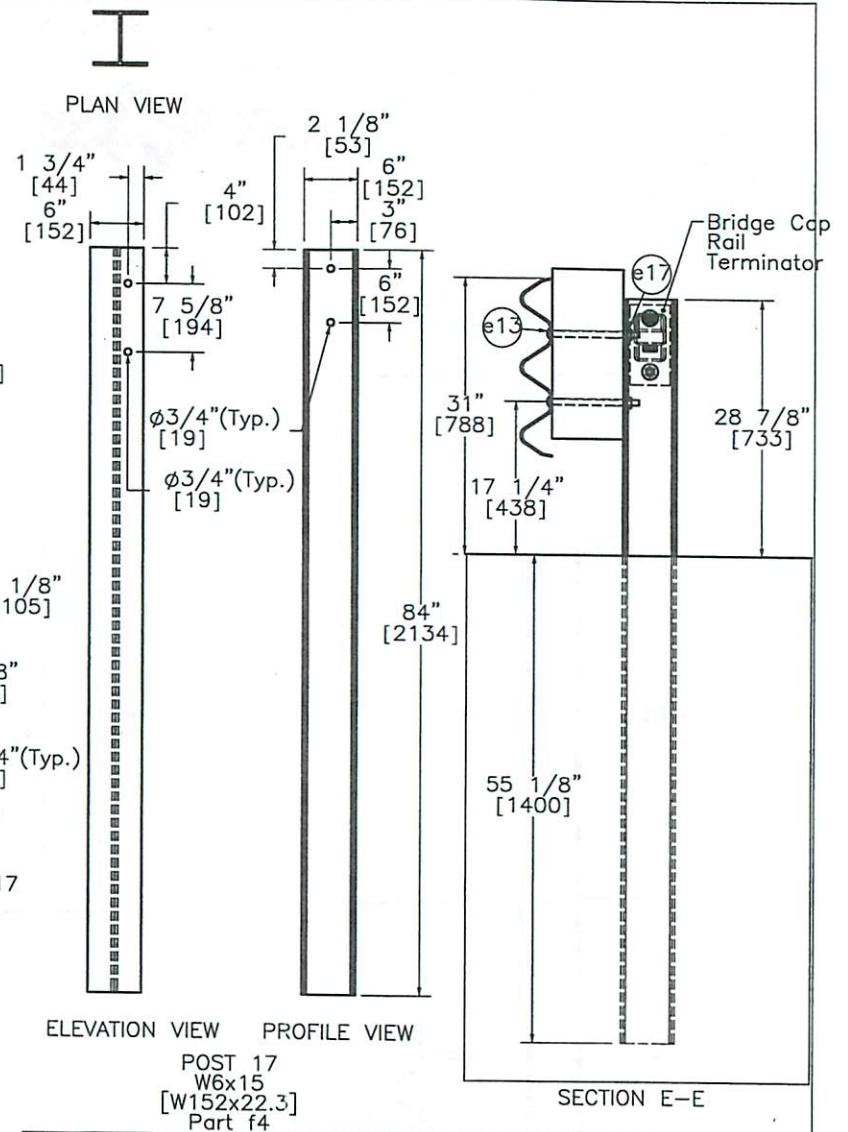
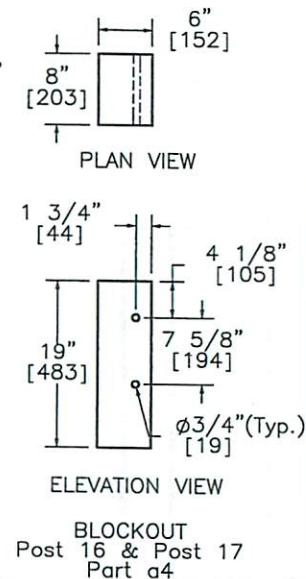
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MWT-SP-3_R3

SCALE: 1:20
UNITS: In./mm

REV. BY:
KAP/SKR/
RKF



POST 16
W6x15
[W152x22.3]
Part f3



POST 17
W6x15
[W152x22.3]
Part f4



Midwest Roadside
Safety Facility

MWT Standard Post

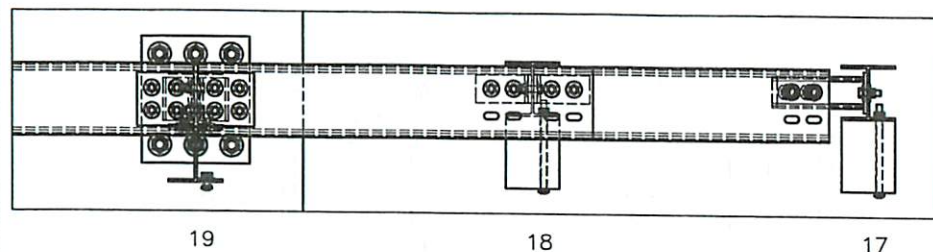
Posts 16 & 17
Detail

DWG. NAME.
MWT-SP-3_R3

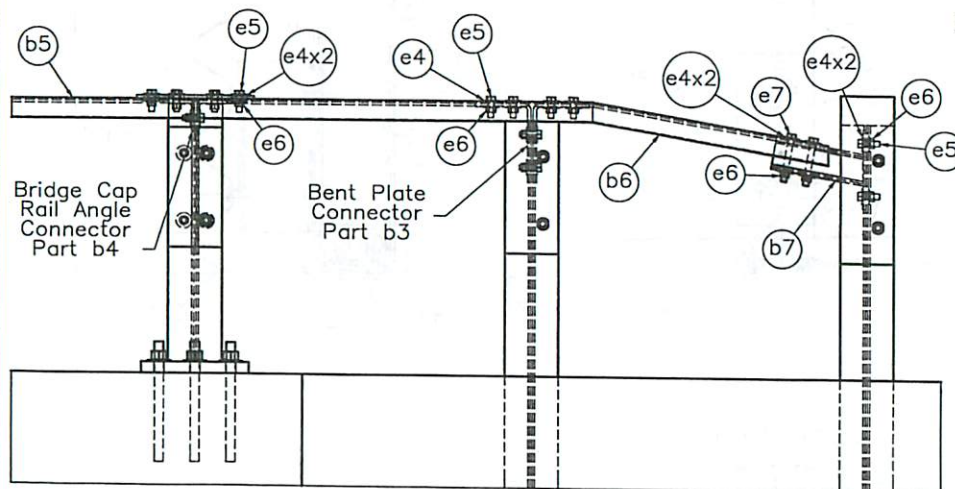
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SHEET:
7 of 20
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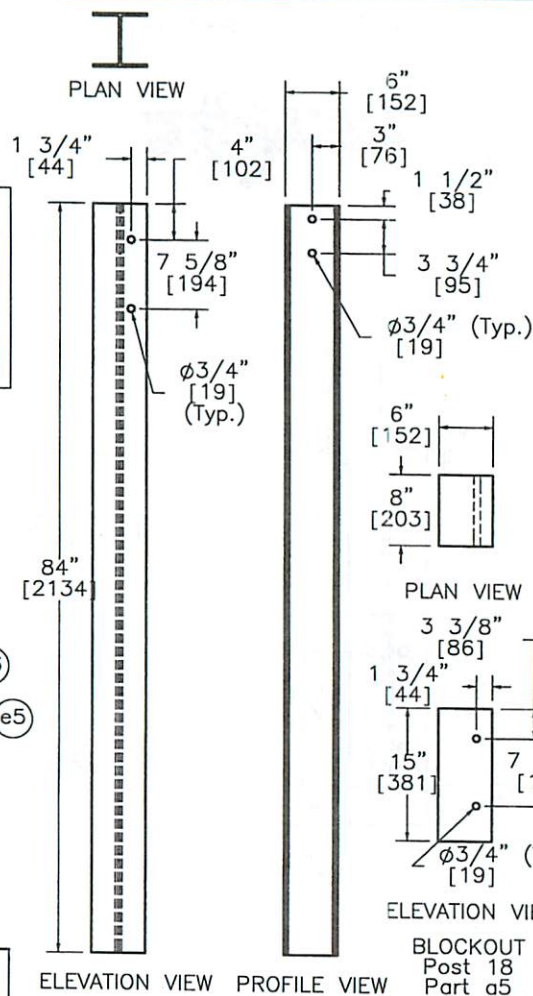


PLAN VIEW



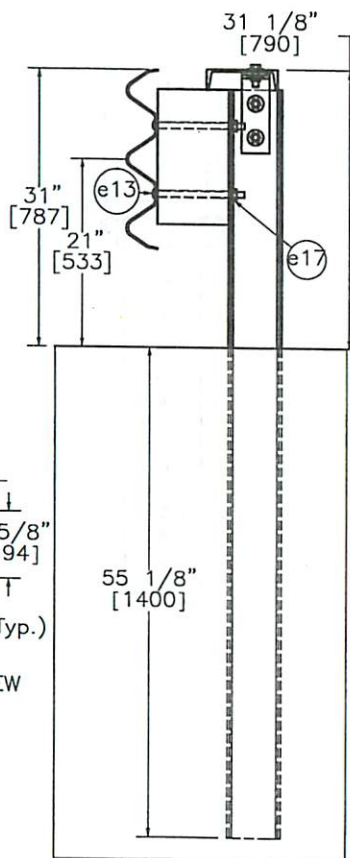
ELEVATION VIEW

CAP RAIL DETAILS



ELEVATION VIEW PROFILE VIEW

POST 18
W6x15
Part f5



SECTION F-F

MWRSF

Midwest Roadside
Safety Facility

MWT Standard Post

Cap Rail Hardware Details
Post 18 Detail

DWG. NAME:
MWT-SP-3_R3

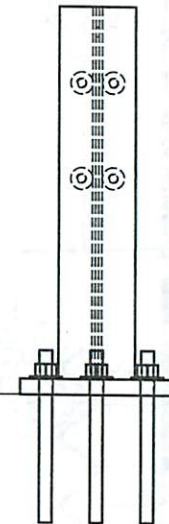
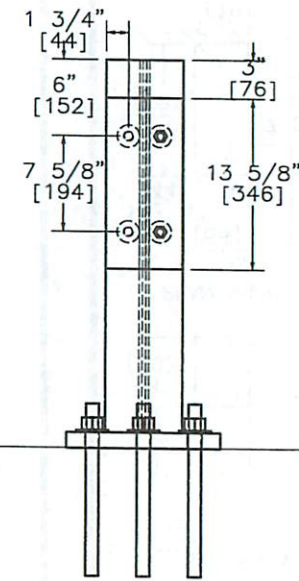
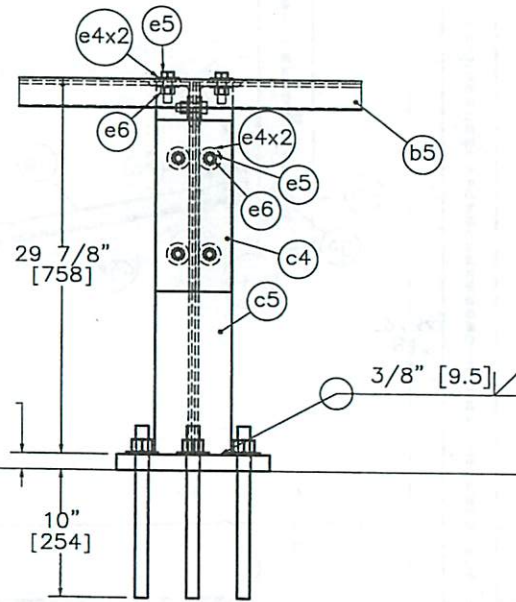
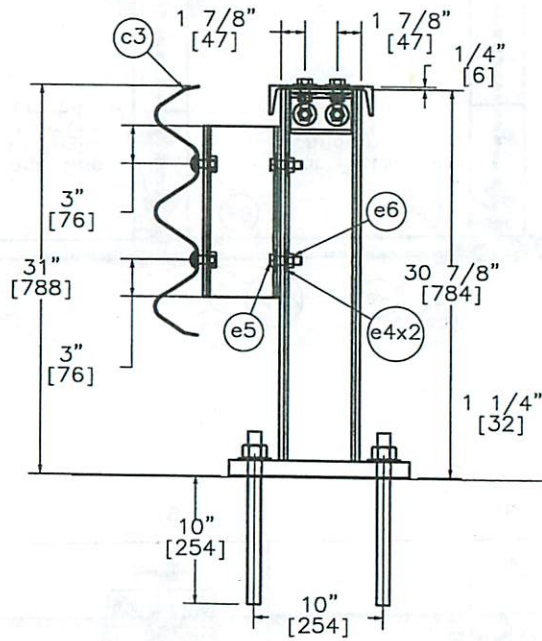
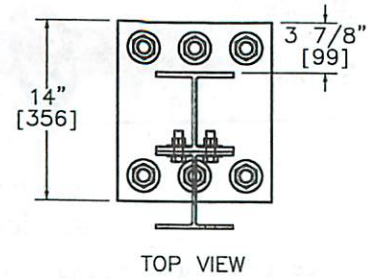
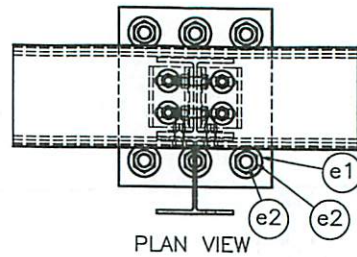
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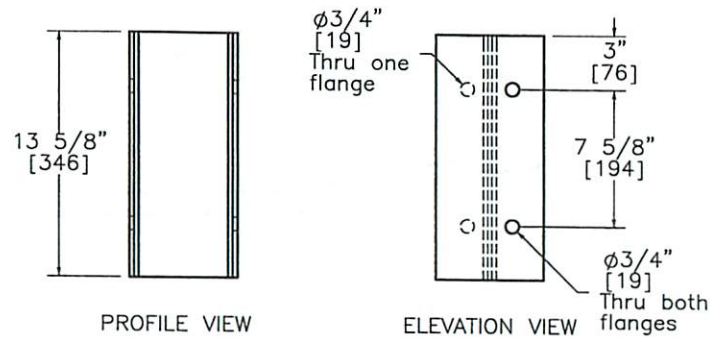
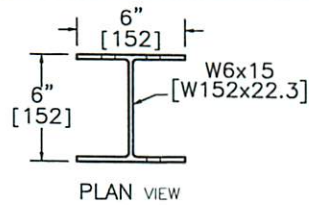


MWT Standard Post
Bridge Rail Details

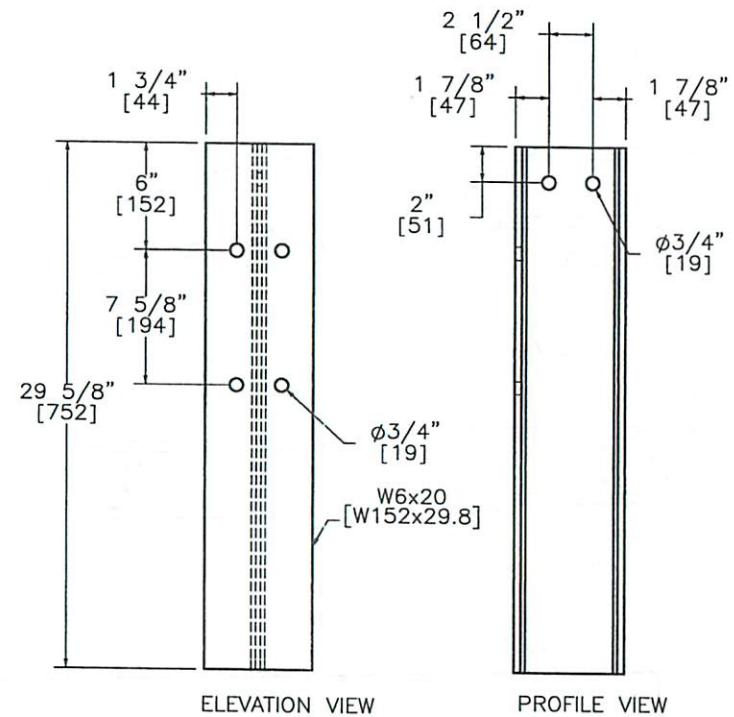
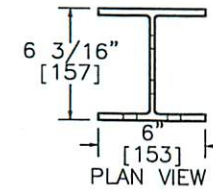
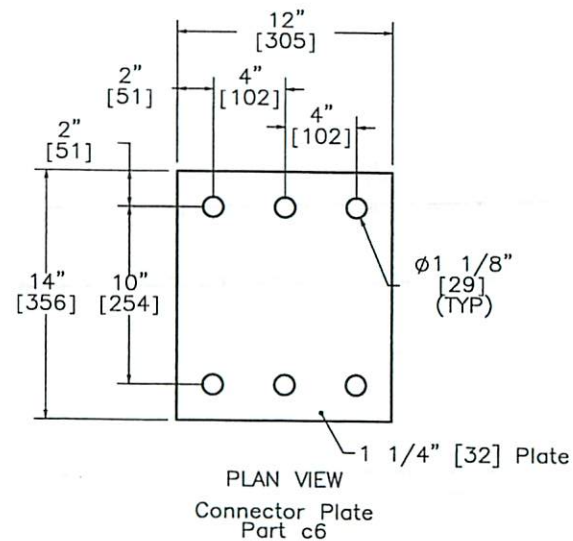
SHEET:
9 of 20
DATE:
11/22/2010
DRAWN BY:
EMA/RJT
REV. BY:
KAP/SKR/
RKF

DWG. NAME:
MWT-SP-3_R3

SCALE: 1:14
UNITS: In./mm



Steel Blockout
Part c4



Steel Post
Part c5



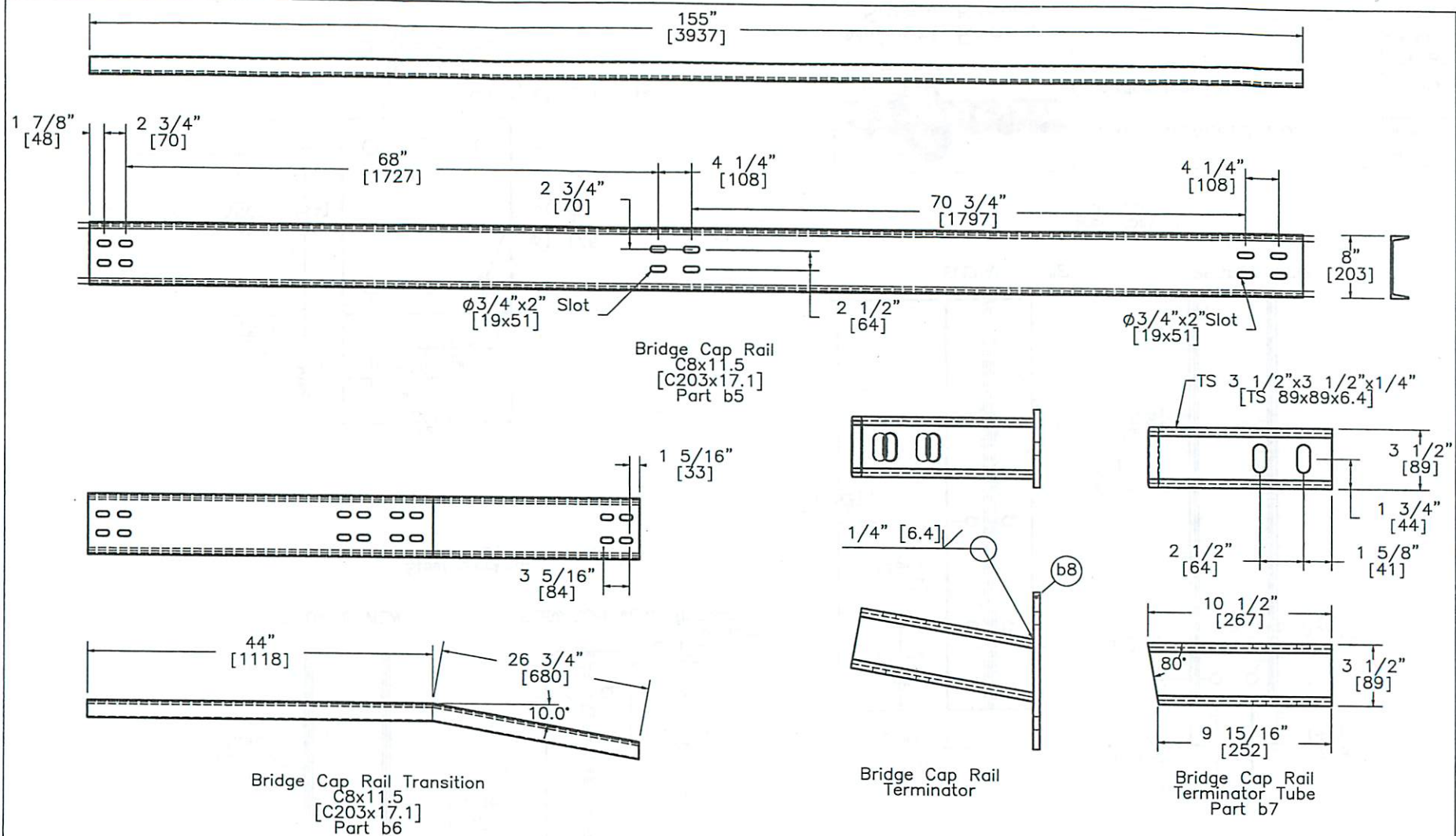
Midwest Roadside
Safety Facility

MWT Standard Post
Bridge Rail Details

DWG. NAME:
MWT-SP-3_R3

SCALE: 1:10
UNITS: In./mm

SHEET:
10 of 20
DATE:
11/22/2010
DRAWN BY:
EMA/RJT
REV. BY:
KAP/SKR/
RKF



Midwest Roadside
Safety Facility

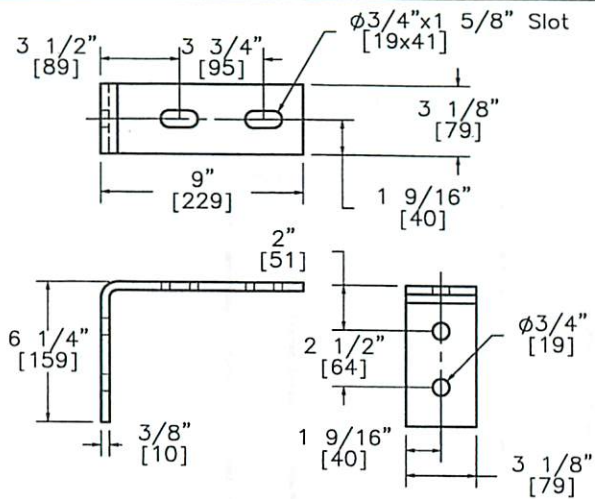
MWT Standard Post

Bridge Rail Details

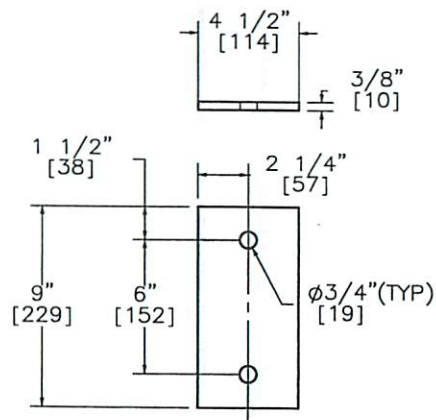
DWG. NAME:
MWT-SP-3_R3

SCALE: None
UNITS: In./mm

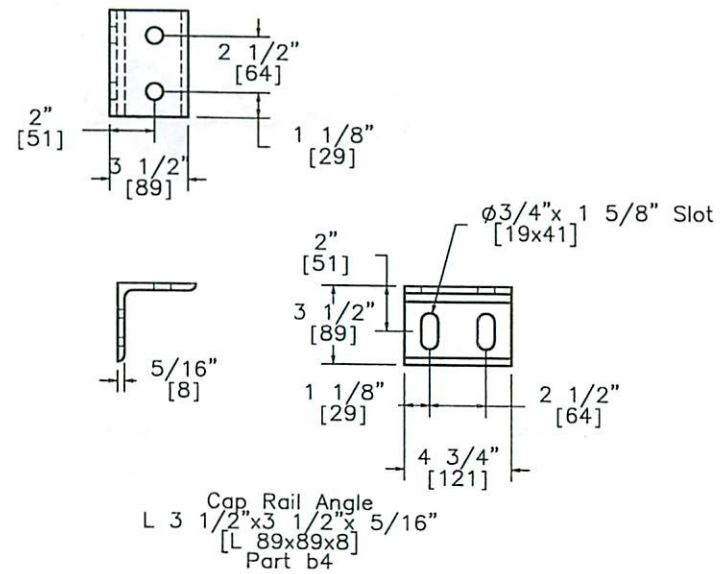
SHEET:
11 of 20
DATE:
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DRAWN BY:
EMA/RJT
REV. BY:
KAP/SKR/
RKF



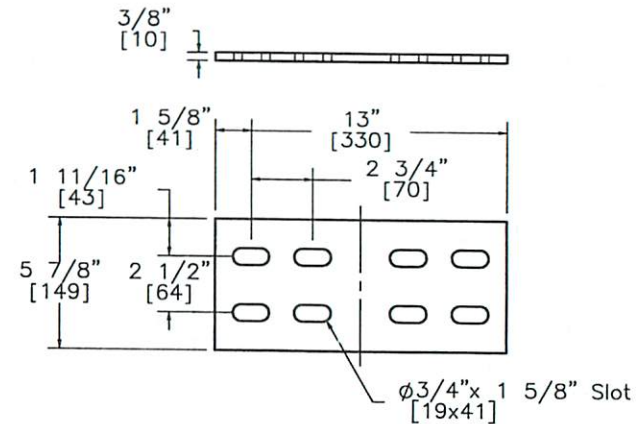
Bent Plate Connector
L 6 1/4"x9"x3/8"
[L 159x229x10]
Part b3



Bridge Cap Rail
Terminator Plate
Part b8



Cap Rail Angle
L 3 1/2"x3 1/2"x 5/16"
[L 89x89x8]
Part b4



Splice Plate
Part b9



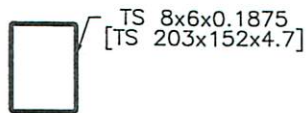
Midwest Roadside
Safety Facility

MWT Standard Post
Bridge Rail Details

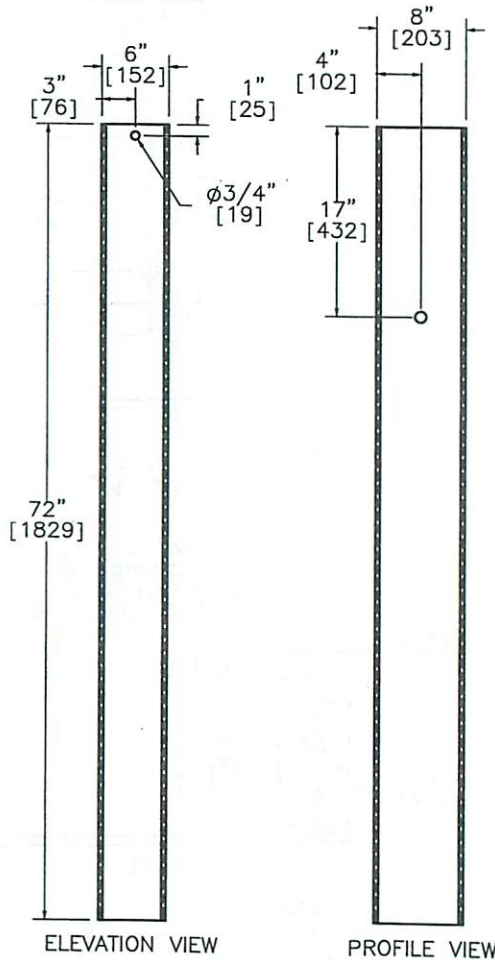
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MWT-SP-3_R3

SCALE: 1:8
UNITS: in./mm

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DATE:
11/22/2010
DRAWN BY:
EMA/RJT
REV. BY:
KAP/SKR/
RKF



PLAN VIEW



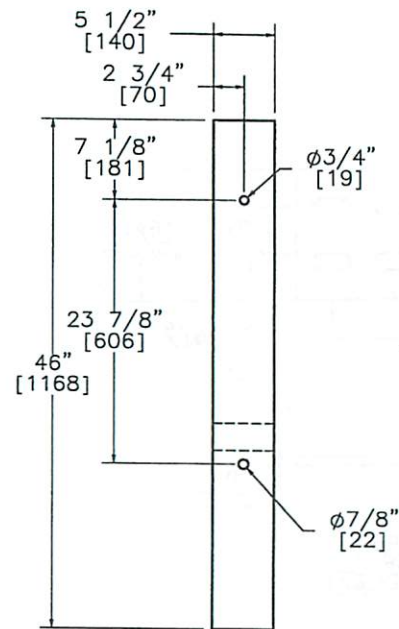
ELEVATION VIEW

PROFILE VIEW

Foundation Tube
Part b1



PLAN VIEW



ELEVATION VIEW

PROFILE VIEW

BCT (MGS) Timber Post
Part b2



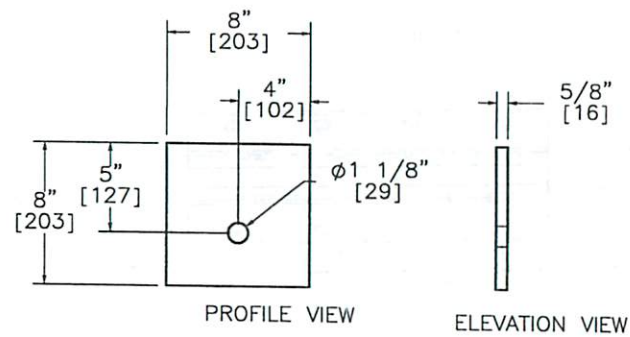
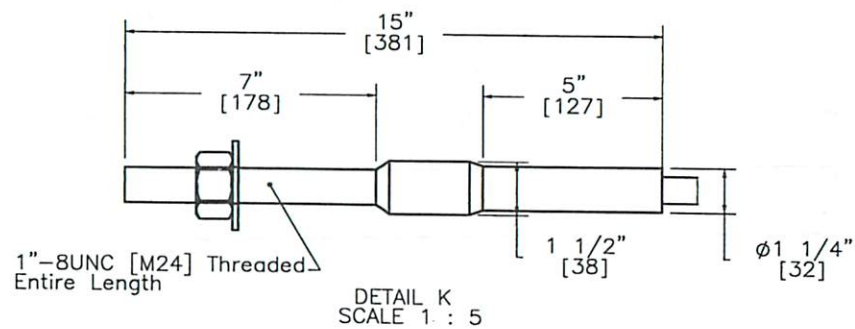
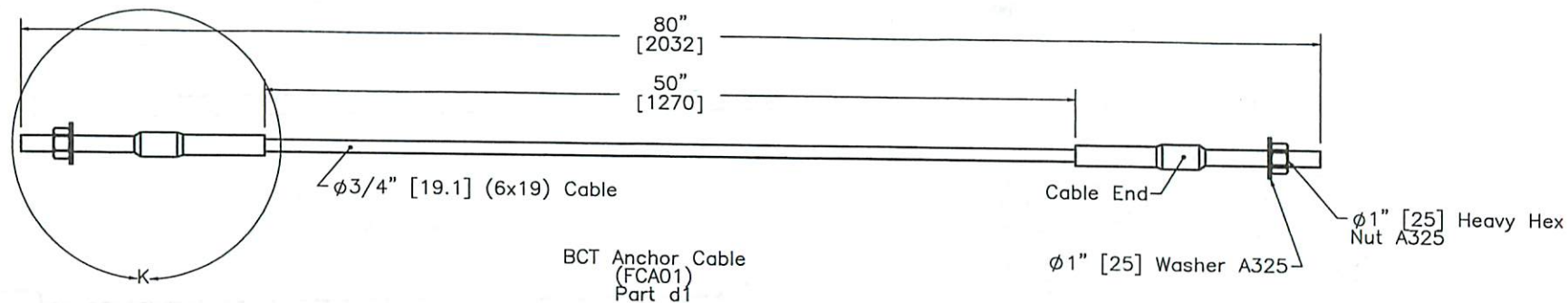
Midwest Roadside
Safety Facility

MWT Standard Post
BCT Timber Posts &
Foundation Tube Detail

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DATE:
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DRAWN BY:
EMA/RJT

DWG. NAME:
MWT-SP-3_R3

SCALE: 1:16
UNITS: In./mm
REV. BY:
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RKF



Anchor Cable Bearing Plate (FPB01)
Part d2



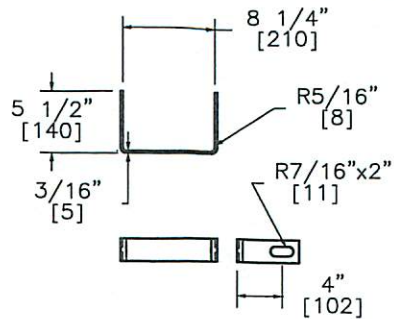
Midwest Roadside
Safety Facility

MWT Standard Post
BCT Anchor Cable Detail

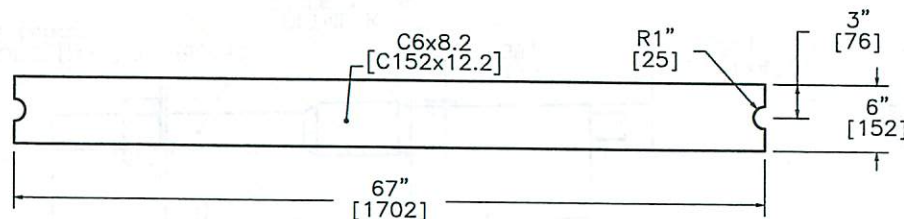
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MWT-SP-3_R3

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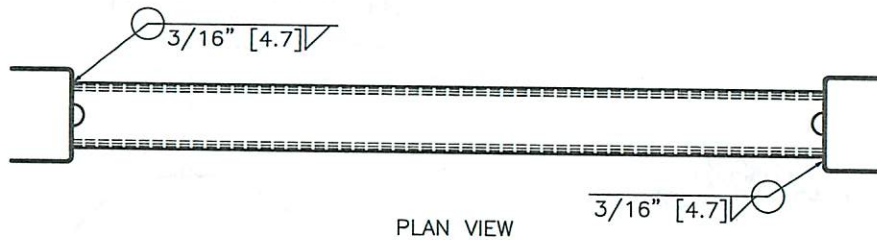
SHEET:
14 of 20
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11/22/2010
DRAWN BY:
EMA/RJT
REV. BY:
KAP/SKR/
RKF



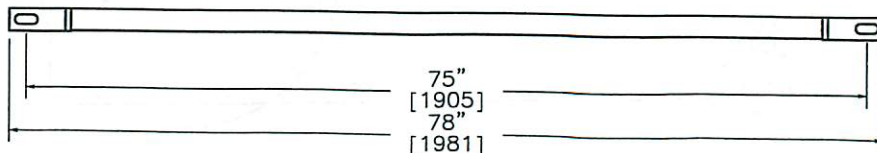
Yoke Detail



Strut Detail

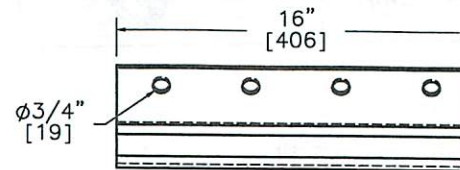


PLAN VIEW

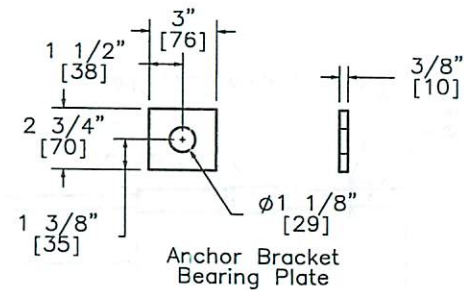
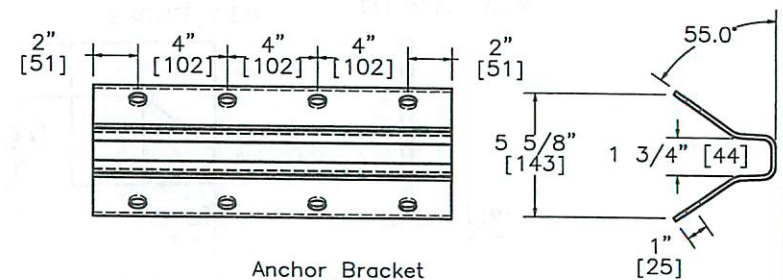


ELEVATION VIEW

Ground Strut
Part c1



Anchor Bracket
Part c2



Anchor Bracket
Bearing Plate



Midwest Roadside
Safety Facility

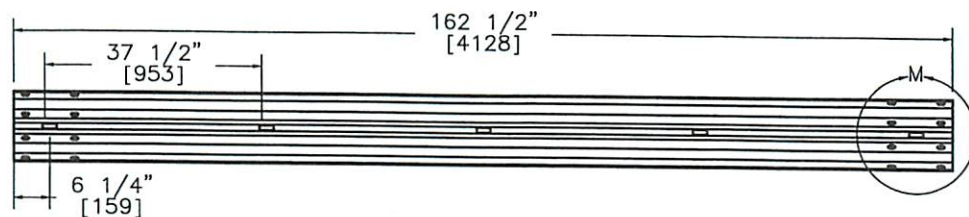
MWT Standard Post

Ground Strut & Anchor
Bracket Details

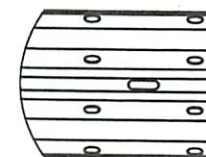
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MWT-SP-3_R3

SCALE: None
UNITS: In./mm

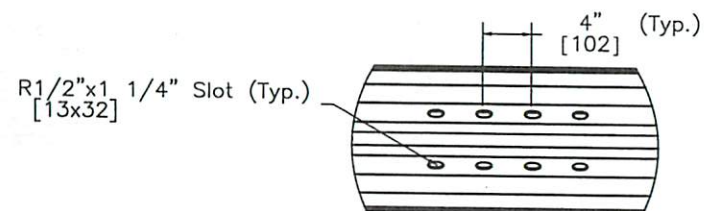
SHEET:
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DRAWN BY:
EMA/RJT
REV. BY:
KAP/SKR/
RKJ



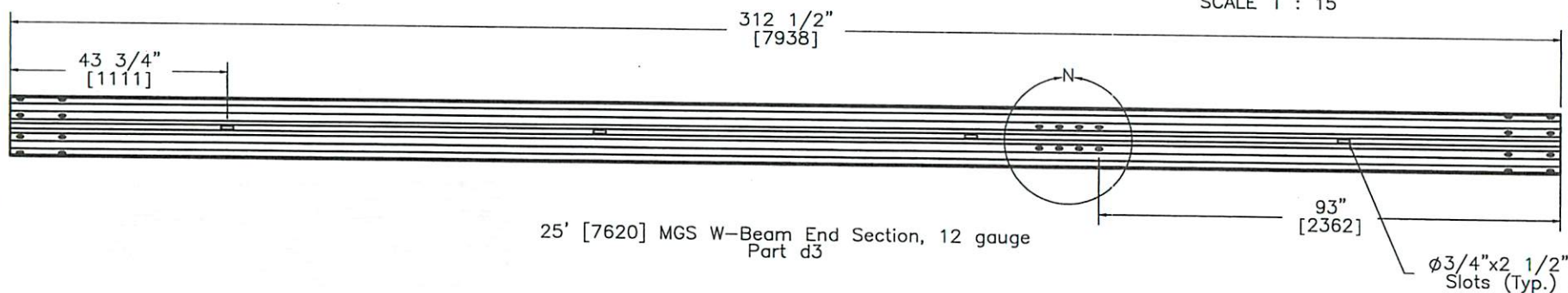
12'-6" [3810] MGS W-Beam, 12 gauge
Part d4



DETAIL M
SCALE 1 : 15



DETAIL N
SCALE 1 : 15



25' [7620] MGS W-Beam End Section, 12 gauge
Part d3



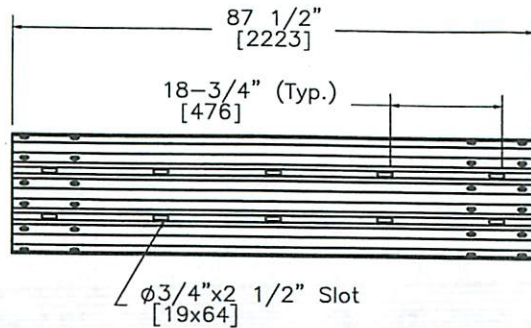
MWT Standard Post
Rail Section Details

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DRAWN BY:
EMA/RJT

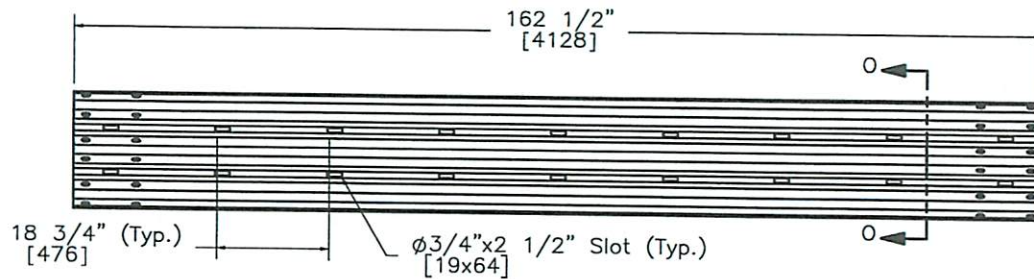
DWG. NAME:
MWT-SP-3_R3

SCALE: 1:31
UNITS: In./mm

REV. BY:
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6'-3" [1905] Thrie Beam Section, 12 gauge,
1/4 Post Spacing
Part d5



12'-6" [3810] Thrie Beam Section, 12 gauge,
1/4 Post Spacing
Part c3

SECTION 0-0




Midwest Roadside
Safety Facility

MWT Standard Post
Rail Section Details


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DATE:
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DRAWN BY:
EMA/RJT

DWG. NAME:
MWT-SP-3_R3

SCALE: 1:30
UNITS: In./mm
REV. BY:
KAP/SKR/
RKF

Midwest Guardrail System with Standard Post Spacing							
Item No.	QTY.	Description	Material Spec	Hardware Guide			
a1	1	6'-3" [1905] W-Beam to Thrie-Beam Transition Section	10 gauge AASHTO M180	-			
a2	7	6x12x14 1/4" [152x305x362] Blockout	SYP Grade No.1 or better	-			
a3	6	6x12x19" [152x305x483] Blockout - Post 10-15	SYP Grade No.1 or better	-			
a4	2	6x8x19" [152x305x483] Blockout - Post 16-17	SYP Grade No.1 or better	-			
a5	1	6x8x15" [152x305x381] Blockout - Post 18	SYP Grade No.1 or better	-			
b1	2	72" [1829] Foundation Tube	A500 Grade B	PTE05			
b2	2	BCT Timber Post -MGS Height	SYP Grade No. 1 or better	PDF01			
b3	2	Bridge Cap Rail Bent Plate Connector 6 1/4x9x3/8" [159x229x9.5]	A36 Steel	-			
b4	6	Bridge Cap Rail Angle 3 1/2x3 1/2x5/16" [89x89x7.9]	A36 Steel	-			
b5	1	Bridge Cap Rail C8x11.5 [C203x17.1]	A36 Steel	-			
b6	1	Bridge Cap Rail C8x11.5 [C203x17.1]	A36 Steel	-			
b7	1	Bridge Cap Rail Terminator Tube 3 1/2x3 1/2x1/4" [89x89x6.4]	A36 Steel	-			
b8	1	Terminator Plate 9x4 1/2x3/8" [229x114x9.5]	A36 Steel	-			
b9	1	Bridge Cap Rail Splice Plate 5 7/8x13x3/8" [149x330x9.5]	A36 Steel	-			
c1	1	Strut and Yoke Assembly	A36 Steel	PFP01			
c2	1	Anchor Bracket	A36 Steel	FPA01			
c3	3	12'-6" [3810] Thrie Beam Section - 1/2 Post Spacing	12 gauge AASHTO M180	-			
c4	3	W6x15 [W152x22.3] Steel Bridge Blockout	A36 Steel	-			
c5	3	W6x20 [W152x29.8] Steel Bridge Post	A36 Steel	-			
c6	3	12x14x1 1/4" [305x356x32] Bridge Cap Connector Plate	A36 Steel	-			
d1	1	BCT Anchor Cable 6' [1829] Long	6x19 Cable	FCA01			
d2	1	8x8x5/8" [203x203x15.9] Anchor Bearing Plate	A36 Steel	FPB01			
d3	1	25' [7620] W-Beam MGS End Section	12 gauge AASHTO M180	-			
d4	2	12'-6" [3810] W-Beam MGS Section	12 gauge AASHTO M180	-			
d5	1	6'-3" [1905] Thrie Beam Section - 1/2 Post Spacing	12 gauge AASHTO M180	-			
d6	1	2 3/8" [60] O.D.x 6" [152] long BCT Hole insert	ASTM A53 Grade B Schedule 40	FMM02			
					MWT Standard Post		SHEET: 18 of 20
					Bill of Materials		DATE: 11/22/2010
			Midwest Roadside Safety Facility		DWG. NAME: MWT-SP-3_R3		DRAWN BY: EMA/RJT
					SCALE: None UNITS: In./mm		REV. BY: KAP/SKR/ RKF

Midwest Guardrail System with Standard Post Spacing				
Item No.	QTY.	Description	Material Spec	Hardware Guide
e1	20	1"Dia. [25] Flat Washer	Grade 5	FWC24a
e2	20	1"Dia. [25] Heavy Hex Nut	Grade 5	A325 or A449 Substitute
e3	18	1"Dia. [25] Threaded Rod	Grade A307	—
e4	116	5/8"Dia. [15.9] Flat Washer	Grade 5	—
e5	42	5/8"Dia. x 2" [M16x51] long Hex Head Bolt	Grade 5	FBX16a
e6	54	5/8"Dia. [15.9] Hex Nut	Grade 5	A325 or A449 Substitute
e7	2	5/8"Dia. x 5" [M16x127] long Hex Head Bolt	Grade 5	FBX16a
e8	4	7/8"Dia. [22.2] Flat Washer	Grade 5	FWC22a
e9	2	7/8"Dia. [22.2] Hex Nut	Grade 5	FBX22a
e10	2	7/8"Dia. x 7 1/2" [M22x191] long Hex Head Bolt	Grade 5	FBX22a
e11	2	5/8"Dia. x 10" [M16x254] long Hex Head Bolt	Grade 5	FBX16a
e12	8	5/8"Dia. x 1 1/2" [M16x38.1] long Hex Head Bolt	Grade 5	FBX16a
e13	8	5/8"Dia. x 10" [M16x254] long Guardrail Bolt	Grade A307	FBB03
e14	18	5/8"Dia. x 14" [M16x356] long Guardrail Bolt	Grade A307	FBB06
e15	8	16D Double Head Nail	—	—
e16	66	5/8"Dia. x 1 1/2" [M16x38] Guardrail Bolt	Grade A307	FBB01
e17	92	5/8"Dia. [15.9] Guardrail Nut	Grade 5	—
f1	7	W6x8.5 [W152x12.6] 72" [1829] long — Post Nos. 3–9	A36 Steel	—
f2	6	W6x8.5 [W152x12.6] 72" [1829] long — Post Nos. 10–15	A36 Steel	—
f3	1	W6x15 [W152x22.3] 84" [2134] long — Post No. 16	A36 Steel	—
f4	1	W6x15 [W152x22.3] 84" [2134] long — Post No. 17	A36 Steel	—
f5	1	W6x15 [W152x22.3] 84" [2134] long — Post No. 18	A36 Steel	—



Midwest Roadside
Safety Facility

MWT Standard Post
Bill of Materials

DWG. NAME:
MWT-SP-3_R3

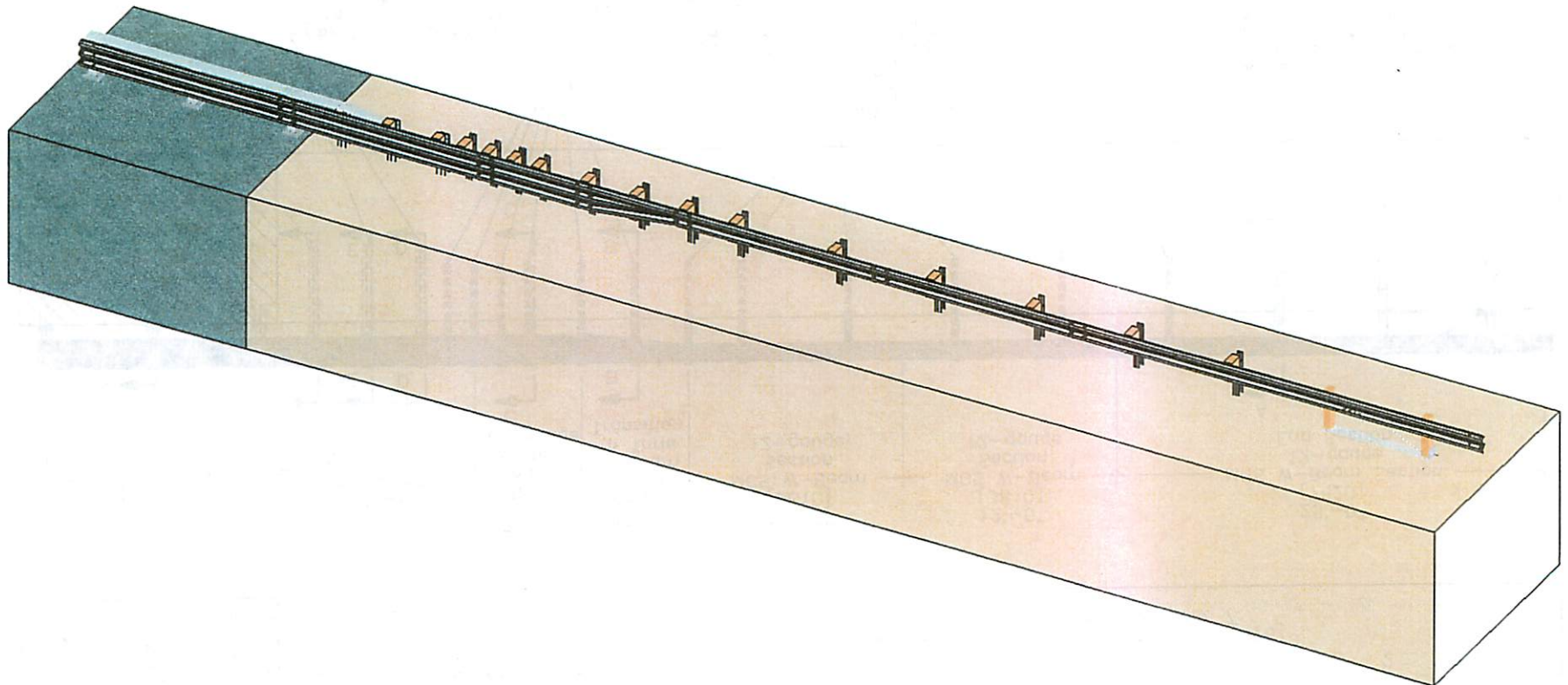
SCALE: None
UNITS: In./mm

REV. BY:
KAP/SKR/
RKF

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DATE:
11/22/2010

DRAWN BY:
EMA/RJT



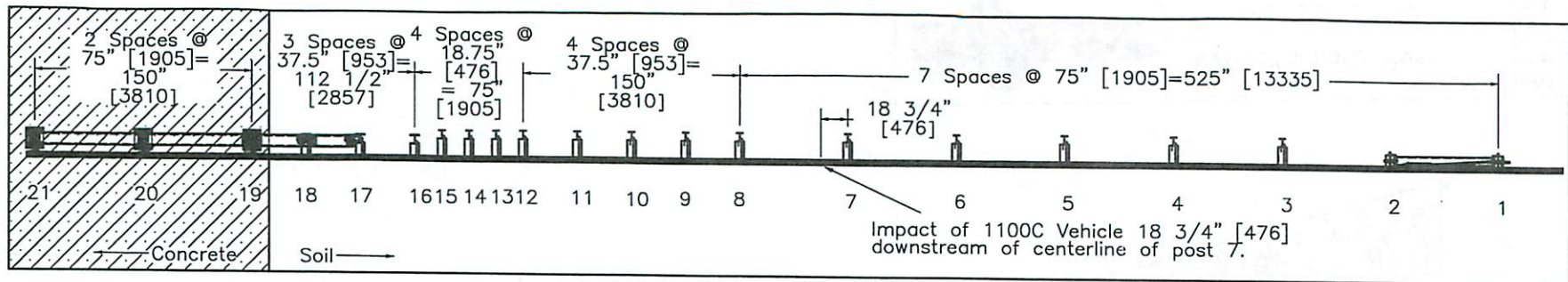
Midwest Roadside
Safety Facility

MWT Standard Post
Isometric System View

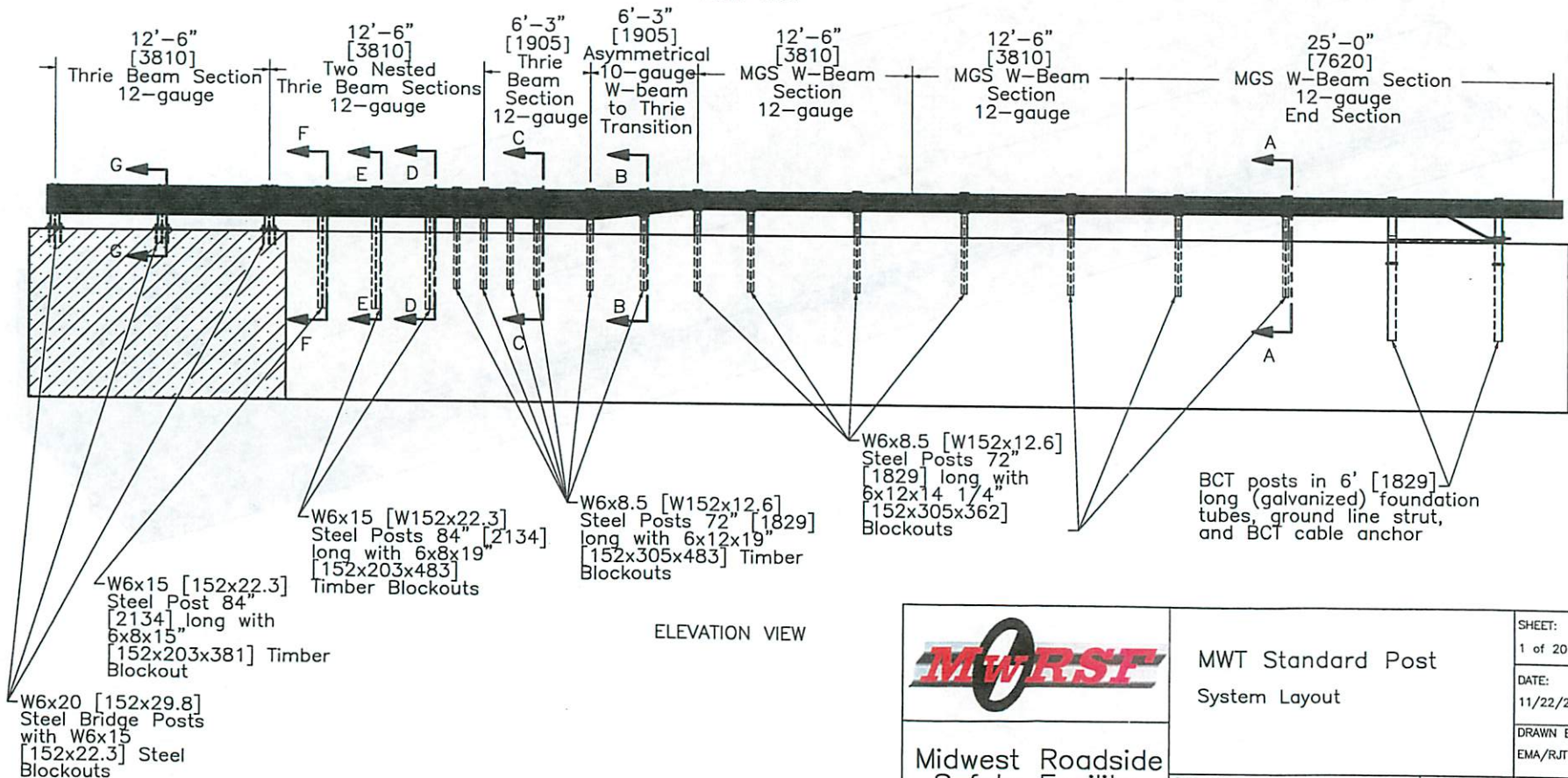
DWG. NAME.
MWT-SP-3_R3

SCALE: 1:105
UNITS: In./mm

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DRAWN BY:
EMA/RJT
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RKJ



PLAN VIEW



ELEVATION VIEW



Midwest Roadside Safety Facility

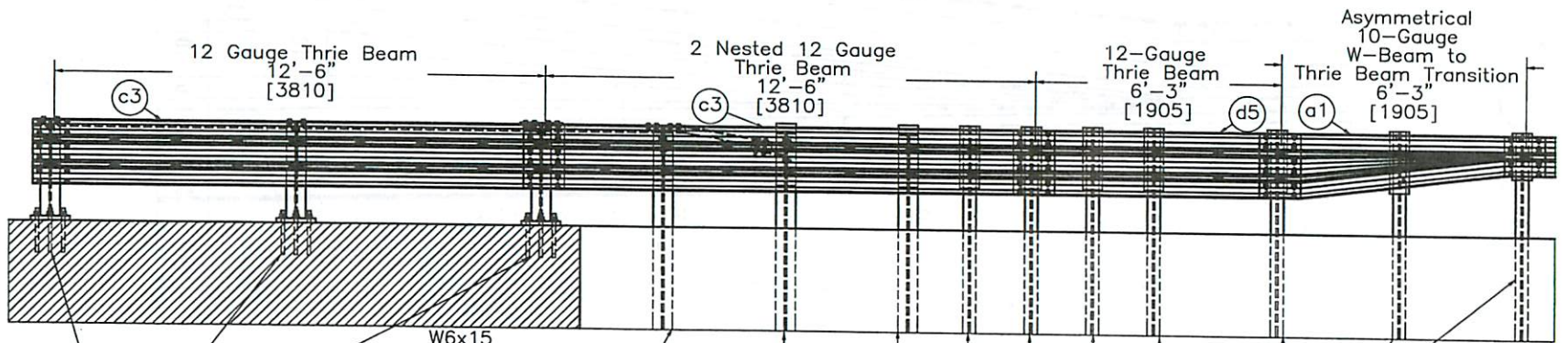
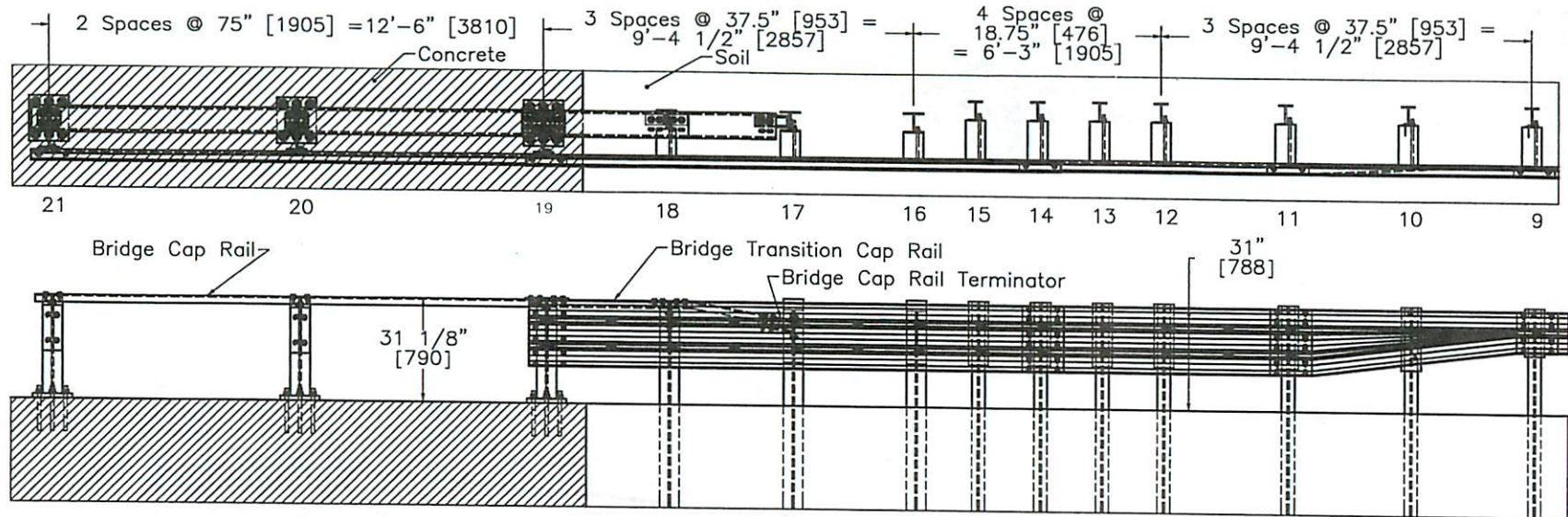
MWT Standard Post System Layout

DWG. NAME.
MWT-SP-3_R3

SCALE: 1:110
UNITS: In./mm

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RKF



W6x20
[W152x29.8]
Steel Bridge
Posts with
W6x15
[W152x22.3]
Steel Blockouts

W6x15
[W152x22.3]
Steel Post 84"
[2134] long
with 6x8x15"
[152x203x381]
Timber Blockout

W6x15
[W152x22.3] Steel
Posts 84" [2134]
long with 6x8x19"
[152x203x483]
Timber Blockouts

W6x8.5 [W152x12.6] Steel
Posts 72" [1829] long with
6x12x19" [152x305x483]
Timber Blockouts

W6x8.5 [W152x12.6]
Steel Post 72"
[1829] long with
6x12x14 1/4"
[152x305x362]
Timber Blockout



Midwest Roadside
Safety Facility

MWT Standard Post
Transition Detail

DWG. NAME.
MWT-SP-3_R3

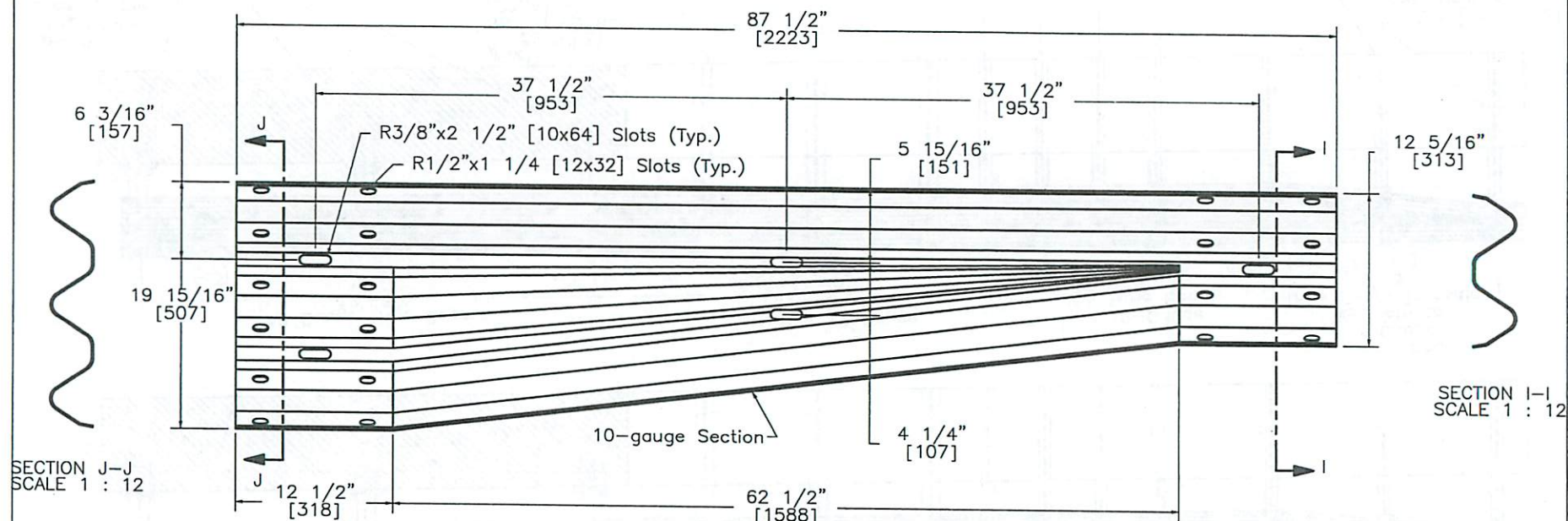
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UNITS: In./mm

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EMA/RJT

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PLAN VIEW



ELEVATION VIEW



Midwest Roadside
Safety Facility

MWT Standard Post

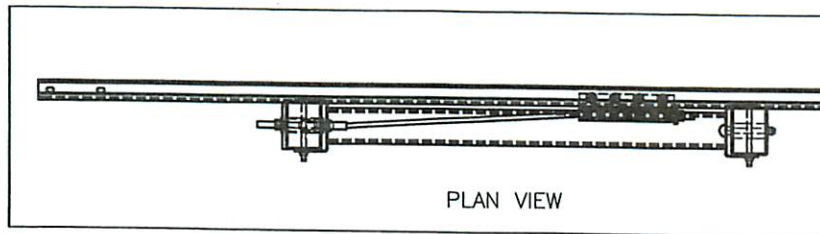
Asymmetrical W-Beam
to Thrie Beam Transition
Rail Section Detail

DWG. NAME.
MWT-SP-3_R3

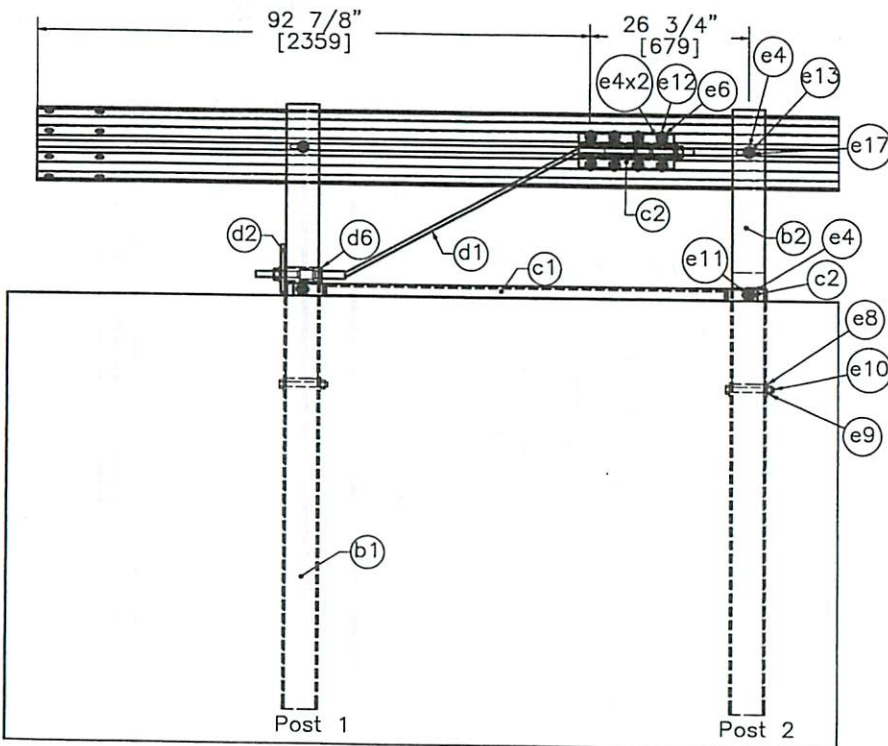
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DATE:
11/22/2010
DRAWN BY:
EMA/RJT

REV. BY:
KAP/SKR/
RKF



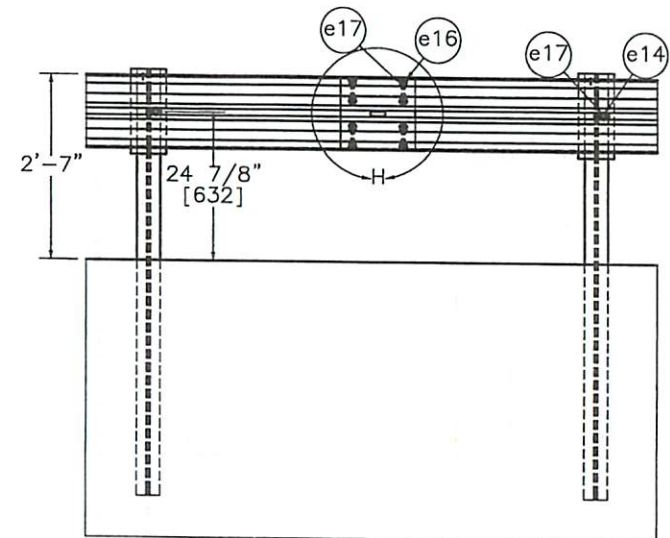
PLAN VIEW



ELEVATION VIEW
END RAIL DETAIL



DETAIL H
SCALE 1 : 15



ELEVATION VIEW
SPLICE DETAIL



Midwest Roadside
Safety Facility

MWT Standard Post

Splice Detail
End Rail Detail

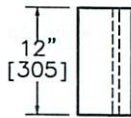
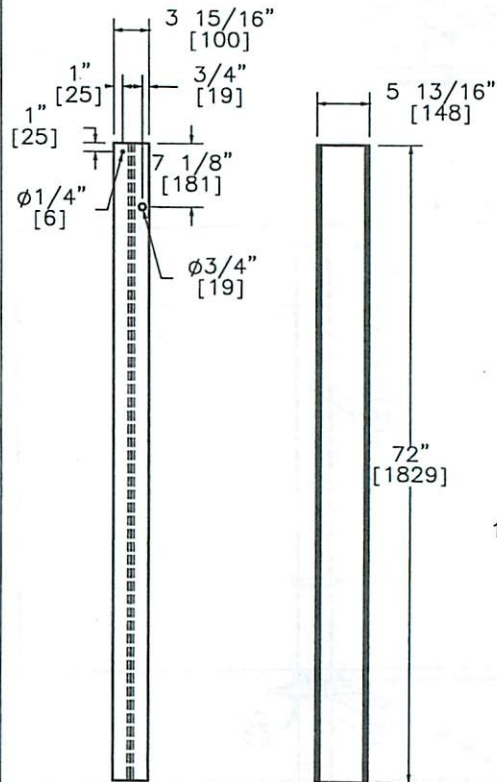
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MWT-SP-3_R3

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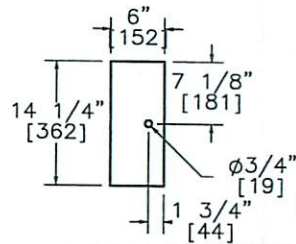
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DRAWN BY:
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REV. BY:
KAP/SKR/
RKF

I

PLAN VIEW



PLAN VIEW



ELEVATION VIEW

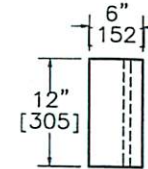
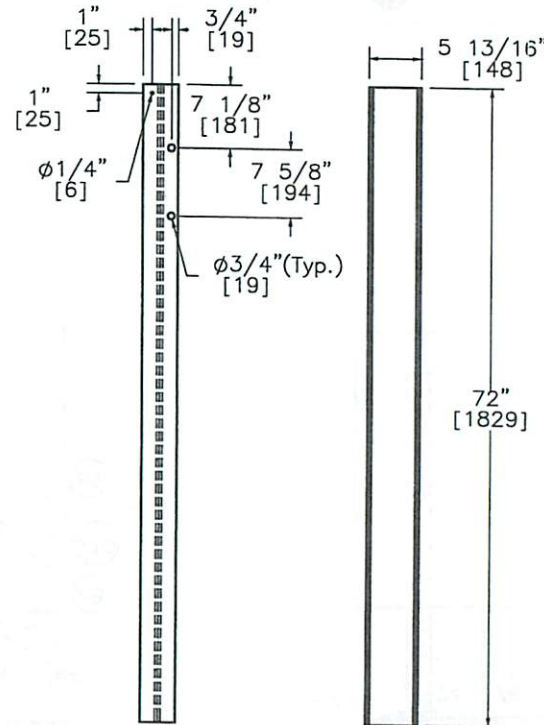
BLOCKOUT
Post 3-9
Part a2

ELEVATION VIEW PROFILE VIEW

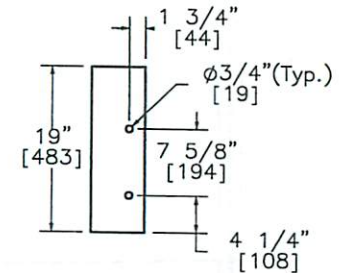
POST 3-9
W6x8.5
[W152x12.6]
Part f1

I

PLAN VIEW



PLAN VIEW



ELEVATION VIEW

BLOCKOUT
Post 10-15
Part a3

ELEVATION VIEW

PROFILE VIEW

POST 10-15
W6x8.5
[W152x12.6]
Part f2



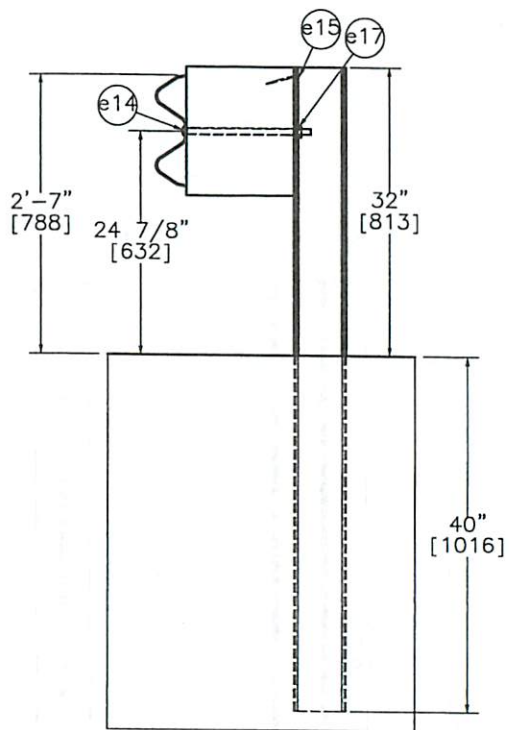
Midwest Roadside
Safety Facility

MWT Standard Post
Posts 3-15
Details

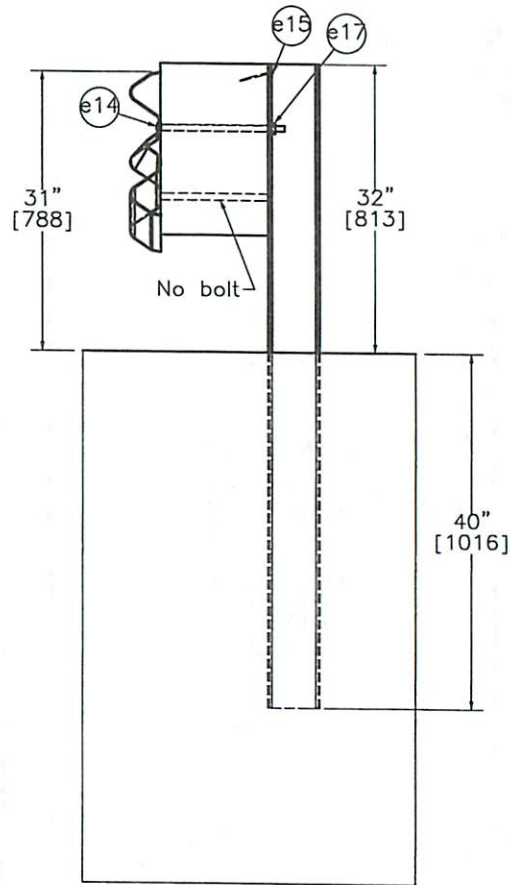
DWG. NAME.
MWT-SP-3_R3

SCALE: 1:20
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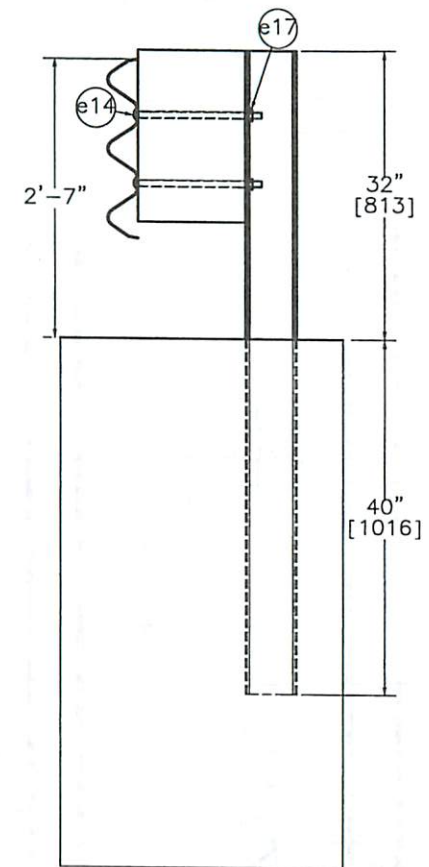
SHEET:
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SECTION A-A
Post 3-9



SECTION B-B
Post 10



SECTION C-C
Post 11-15



Midwest Roadside
Safety Facility

MWT Standard Post

Posts 3-15 Details
with Rail

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DRAWN BY:
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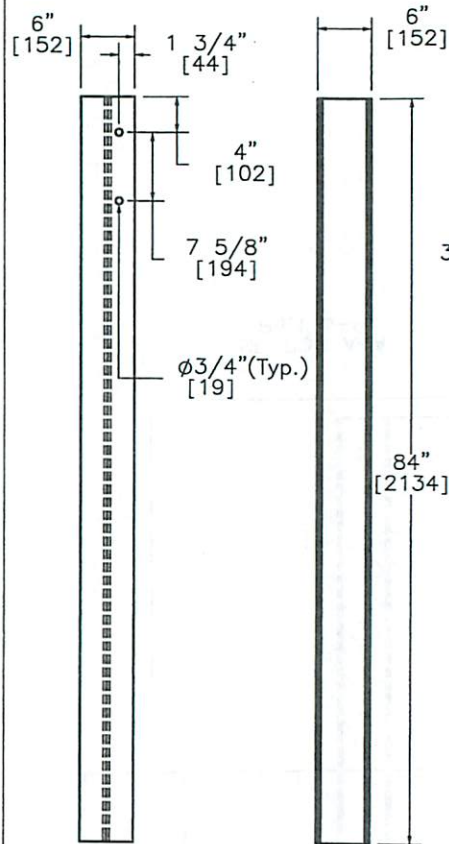
DWG. NAME:
MWT-SP-3_R3

SCALE: 1:20
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REV. BY:
KAP/SKR/
RK



PLAN VIEW



ELEVATION VIEW

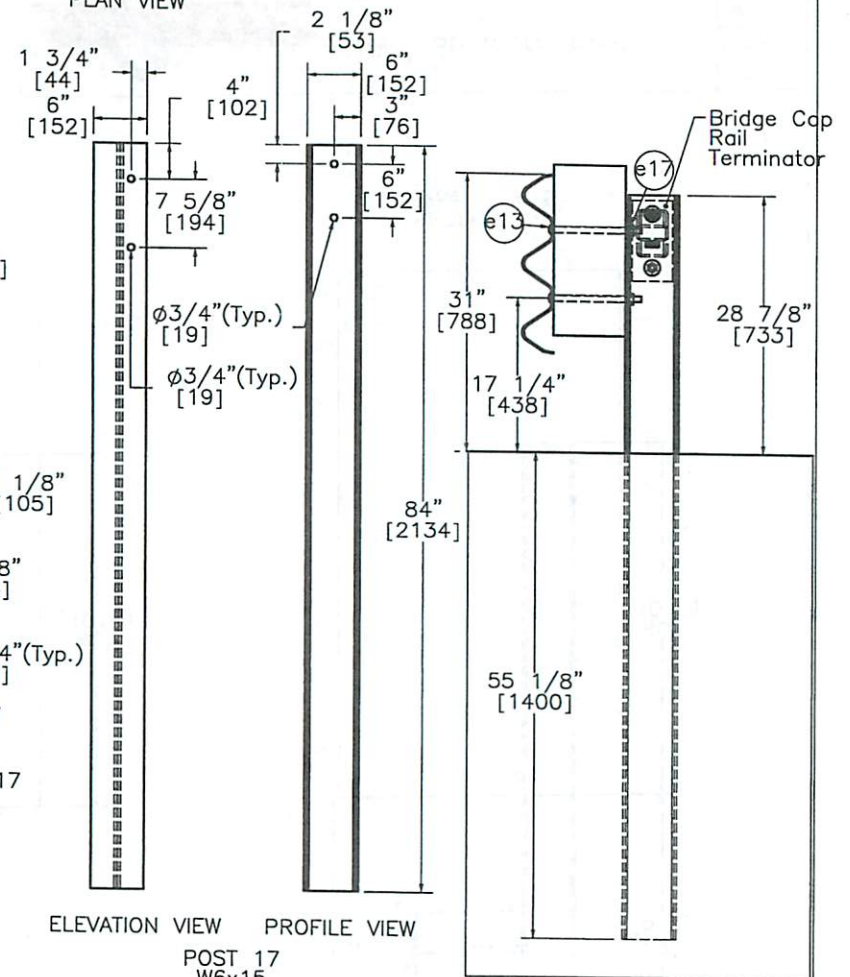
PROFILE VIEW

SECTION D-D

POST 16
 W6x15
 [W152x22.3]
 Part f3



PLAN VIEW



ELEVATION VIEW

PROFILE VIEW

SECTION E-E

POST 17
 W6x15
 [W152x22.3]
 Part f4



Midwest Roadside
 Safety Facility

MWT Standard Post

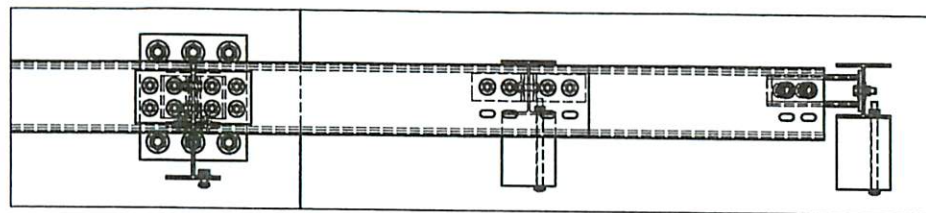
Posts 16 & 17
 Detail

DWG. NAME:
 MWT-SP-3_R3

SCALE: 1:20
 UNITS: In./mm
 REV. BY:
 KAP/SKR/
 RKF

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 11/22/2010
 DRAWN BY:
 EMA/RJT

Bridge Cap
 Rail
 Terminator

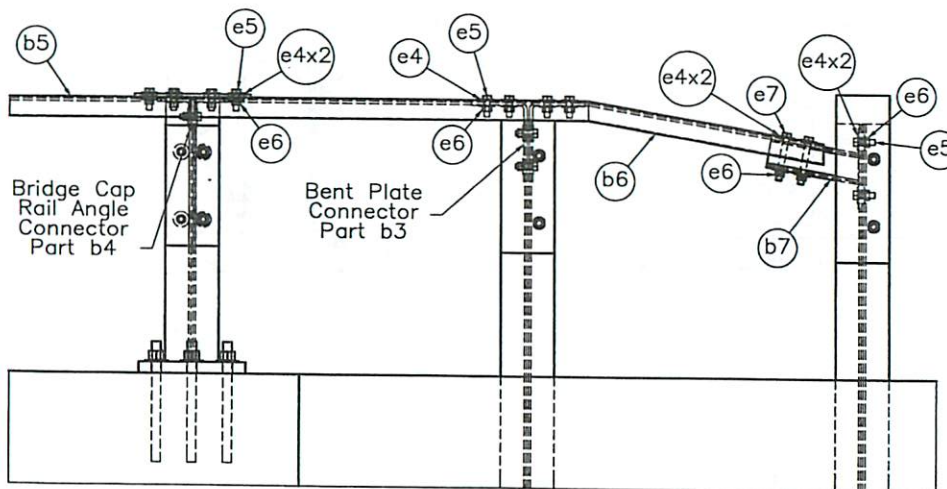


19

18

17

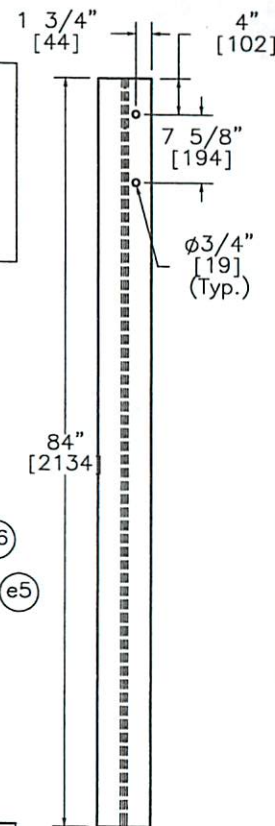
PLAN VIEW



ELEVATION VIEW

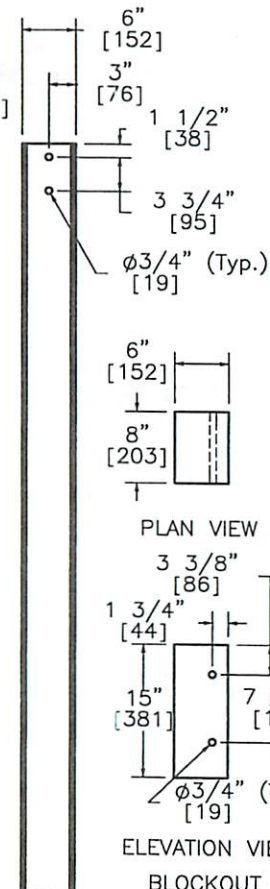
CAP RAIL DETAILS

PLAN VIEW



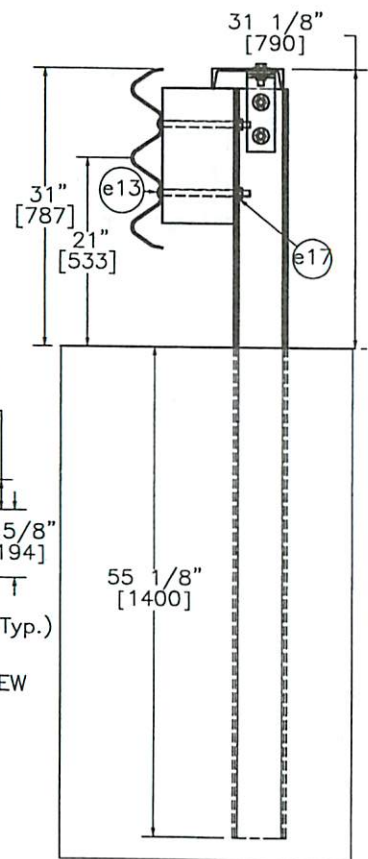
ELEVATION VIEW PROFILE VIEW

POST 18
W6x15
Part f5



ELEVATION VIEW

BLOCKOUT
Post 18
Part a5



SECTION F-F



Midwest Roadside
Safety Facility

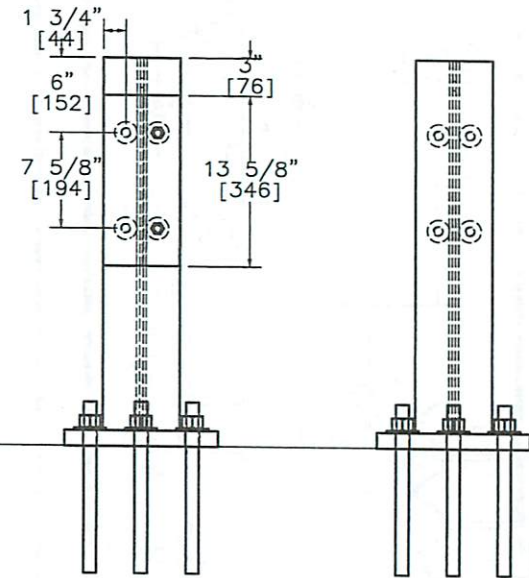
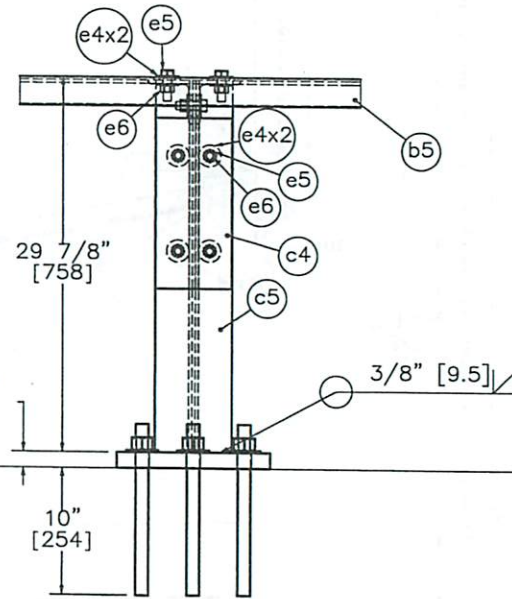
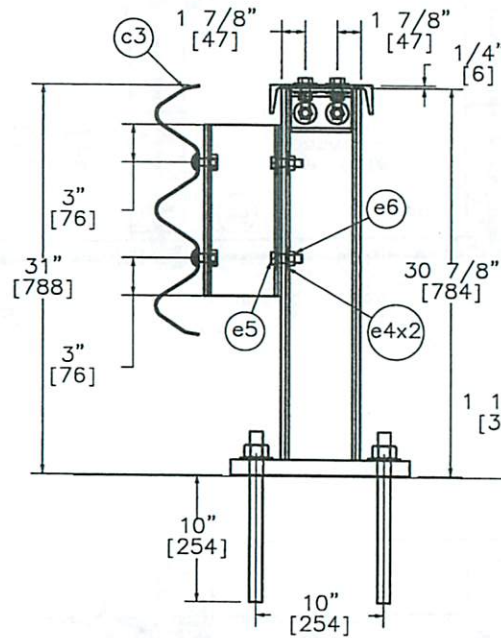
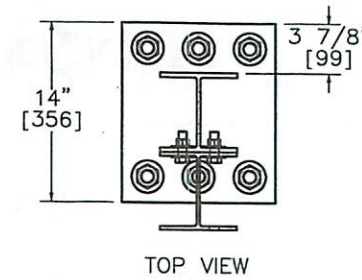
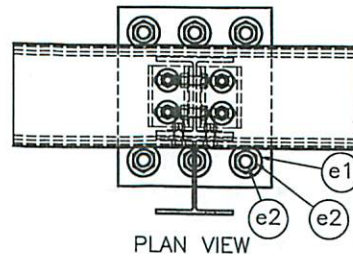
MWT Standard Post


Cap Rail Hardware Details
Post 18 Detail

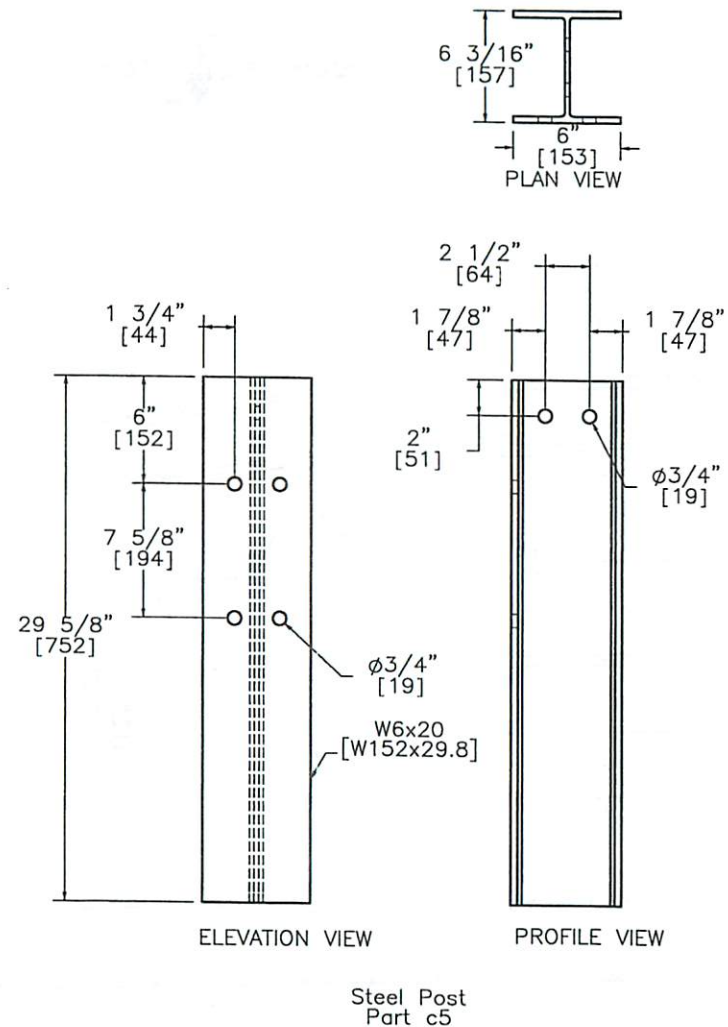
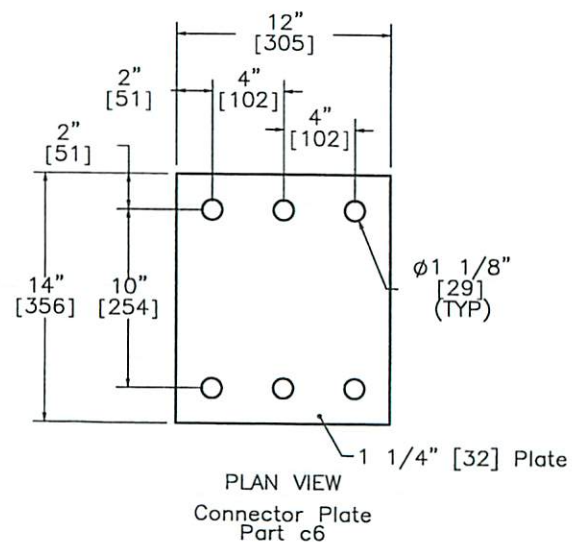
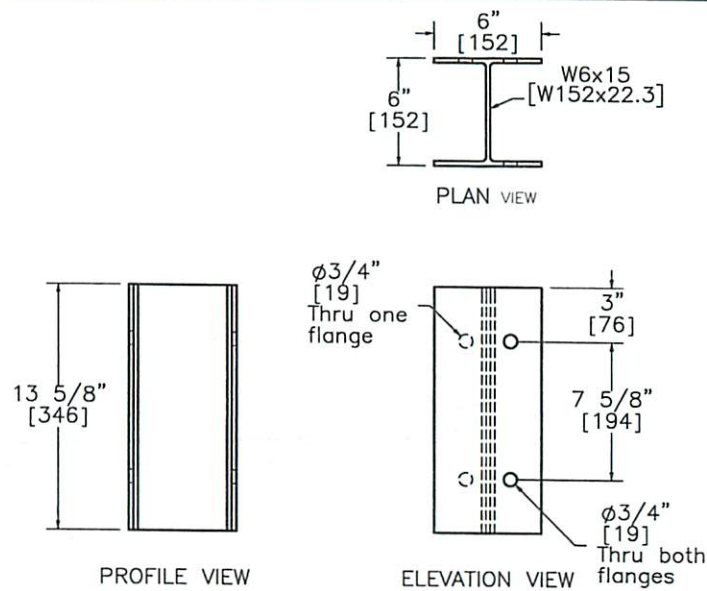
DWG. NAME:
MWT-SP-3_R3

SCALE: 1:20
UNITS: In./mm

SHEET:
8 of 20
DATE:
11/22/2010
DRAWN BY:
EMA/RJT
REV. BY:
KAP/SKR/
RKF



	MWT Standard Post		SHEET: 9 of 20
	Bridge Rail Details		DATE: 11/22/2010
Midwest Roadside Safety Facility	DWG. NAME: MWT-SP-3_R3		DRAWN BY: EMA/RJT
	SCALE: 1:14 UNITS: In./mm		REV. BY: KAP/SKR/ RKF



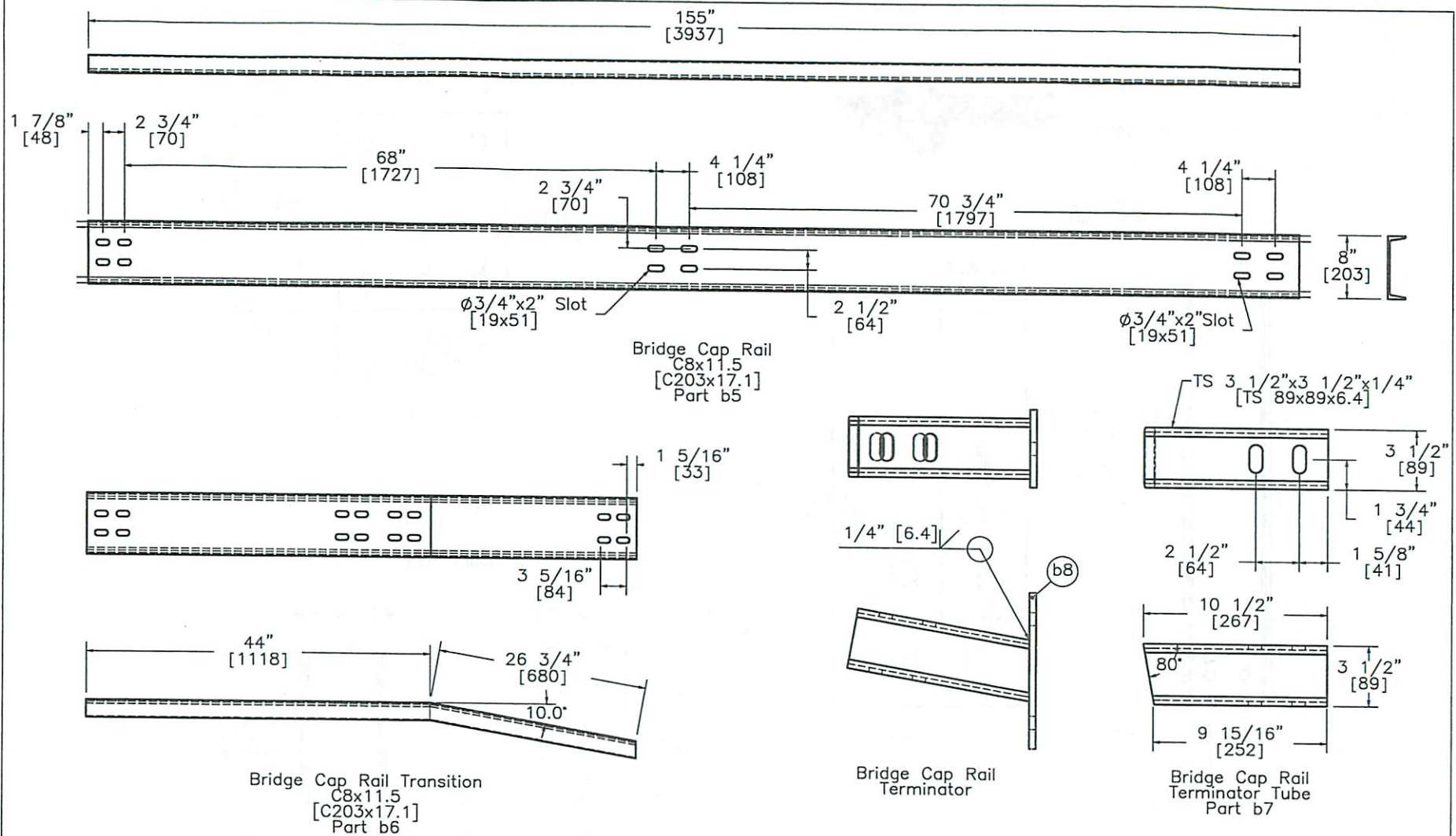
Midwest Roadside
Safety Facility

MWT Standard Post
Bridge Rail Details

DWG. NAME:
MWT-SP-3_R3

SCALE: 1:10
UNITS: In./mm

SHEET:
10 of 20
DATE:
11/22/2010
DRAWN BY:
EMA/RJT
REV. BY:
KAP/SKR/
RKF



Midwest Roadside
Safety Facility

MWT Standard Post

Bridge Rail Details

SHEET:
11 of 20

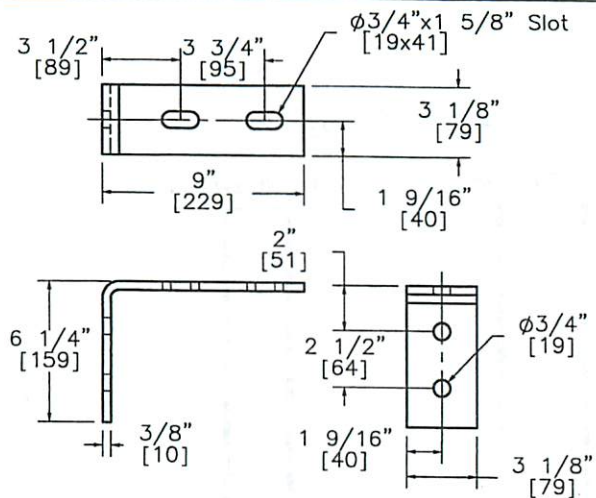
DATE:
11/22/2010

DRAWN BY:
EMA/RJT

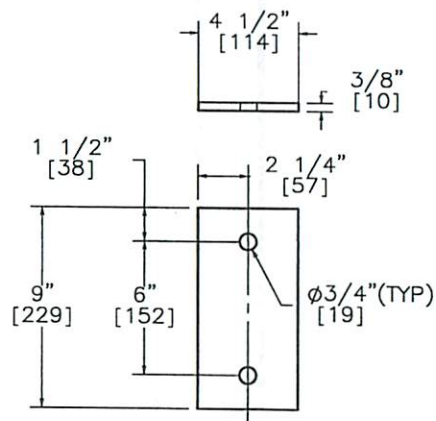
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MWT-SP-3_R3

SCALE: None
UNITS: In./mm

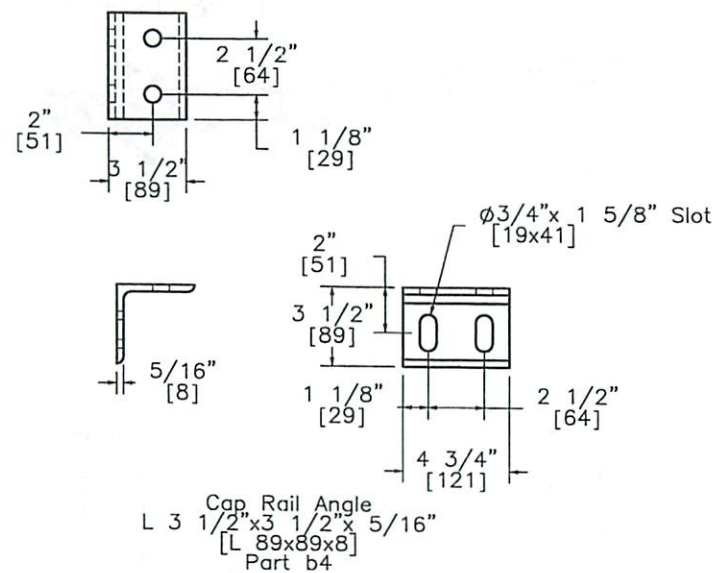
REV. BY:
KAP/SKR/
RKF



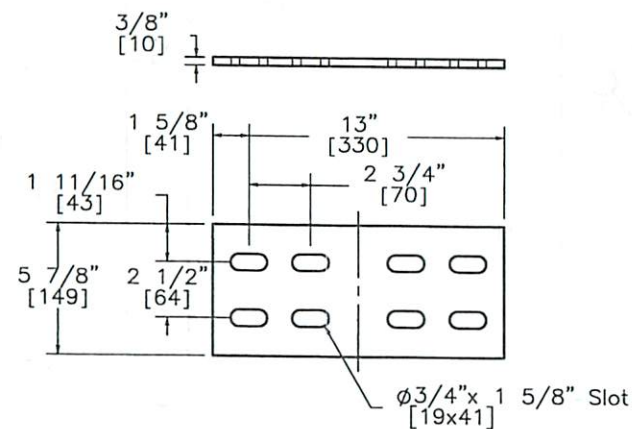
Bent Plate Connector
L 6 1/4"x9"x3/8"
[L 159x229x10]
Part b3



Bridge Cap Rail
Terminator Plate
Part b8



Cap Rail Angle
L 3 1/2"x3 1/2"x5/16"
[L 89x89x8]
Part b4



Splice Plate
Part b9

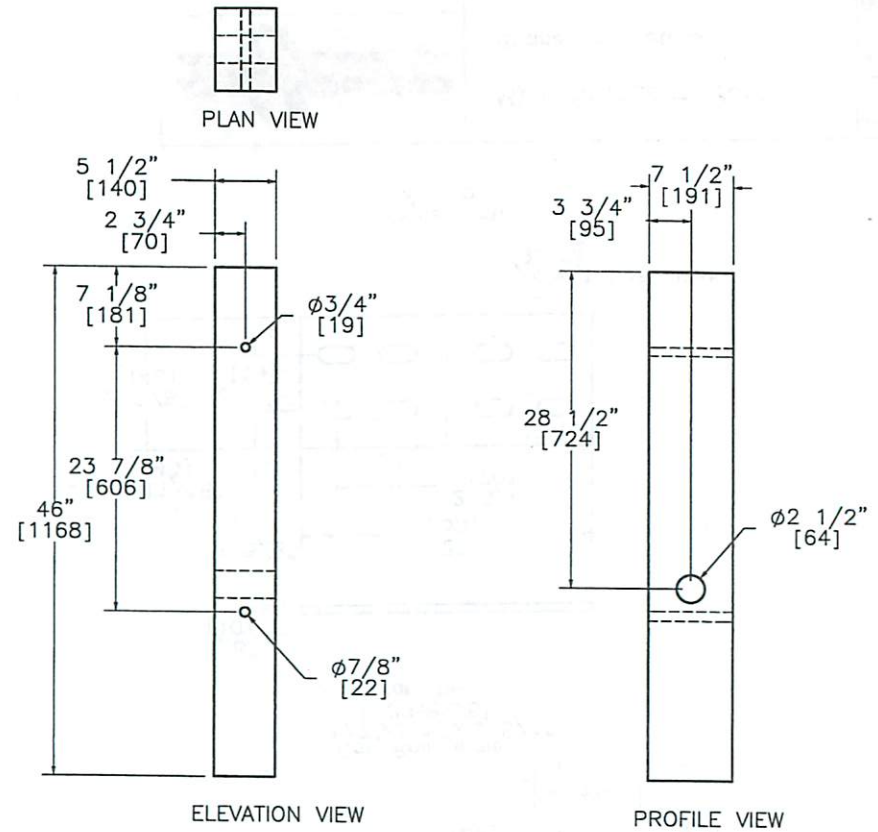
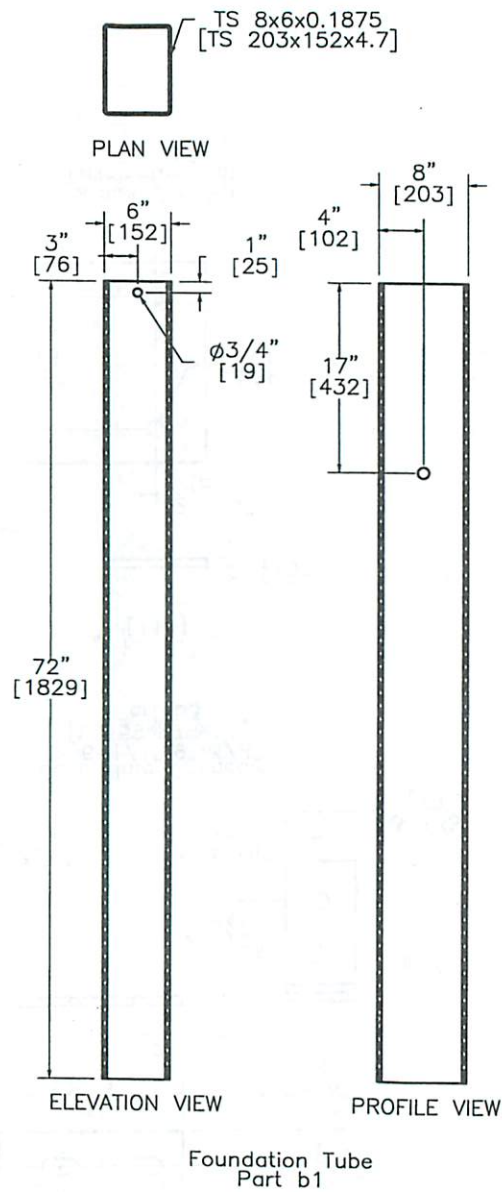
MWRSF
Midwest Roadside
Safety Facility

MWT Standard Post
Bridge Rail Details


DWG. NAME:
MWT-SP-3_R3

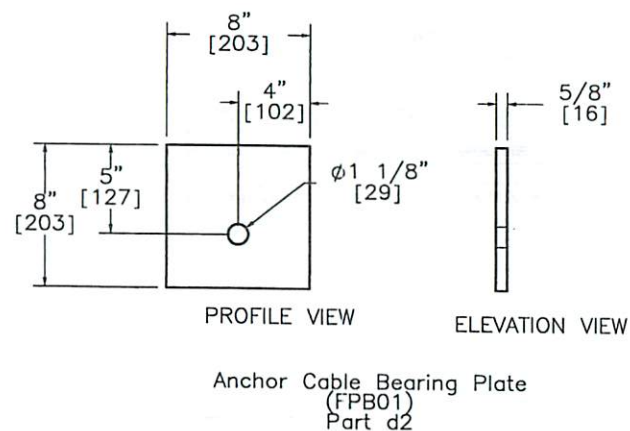
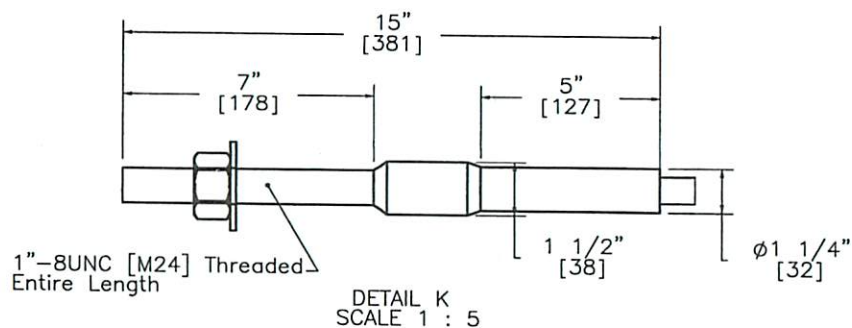
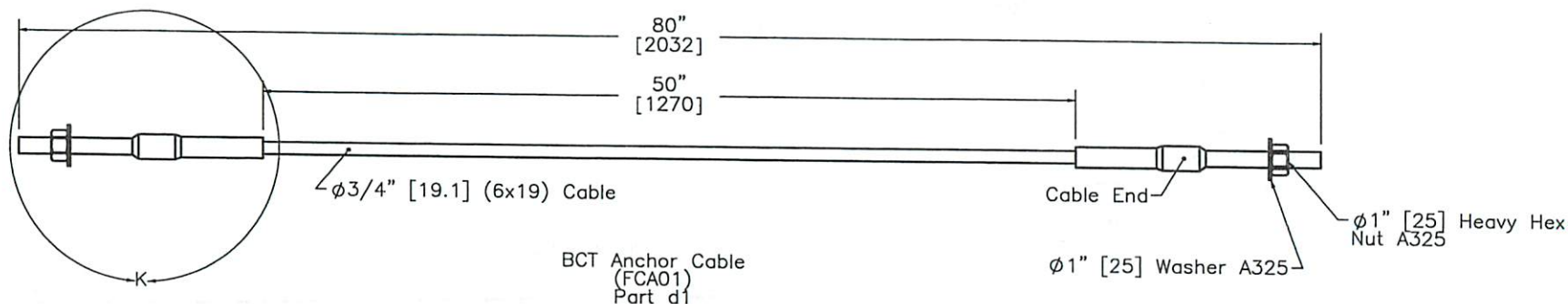
SCALE: 1:8
UNITS: In./mm


SHEET:
12 of 20
DATE:
11/22/2010
DRAWN BY:
EMA/RJT
REV. BY:
KAP/SKR/
RKF

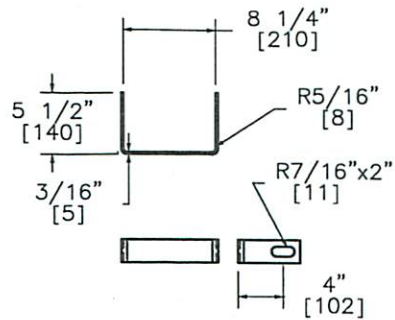


BCT (MGS) Timber Post
Part b2

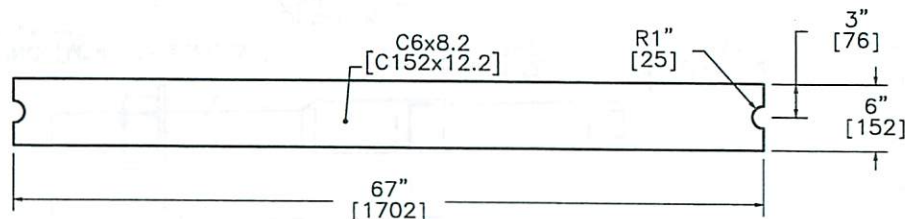
	MWT Standard Post		SHEET: 13 of 20
	BCT Timber Posts & Foundation Tube Detail		DATE: 11/22/2010
Midwest Roadside Safety Facility	DRAWN BY: EMA/RJT		REV. BY:
	DWG. NAME: MWT-SP-3_R3	SCALE: 1:16 UNITS: In, [mm]	KAP/SKR/ RKF



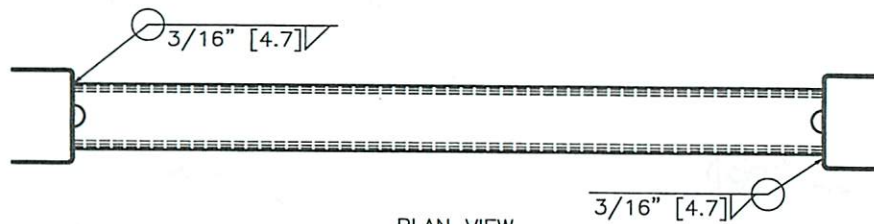
 Midwest Roadside Safety Facility	MWT Standard Post		SHEET: 14 of 20
	BCT Anchor Cable Detail		DATE: 11/22/2010
DWG. NAME: MWT-SP-3_R3		SCALE: 1:10 UNITS: In.[mm]	DRAWN BY: EMA/RJT
		REV. BY: KAP/SKR/ RKF	



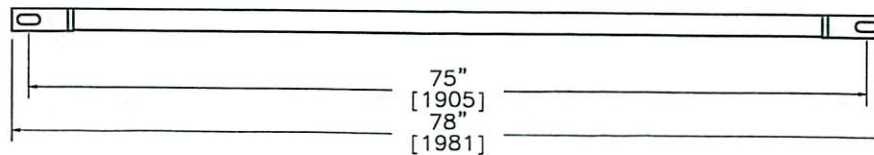
Yoke Detail



Strut Detail

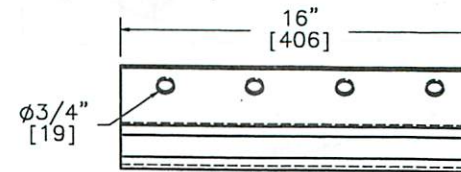


PLAN VIEW

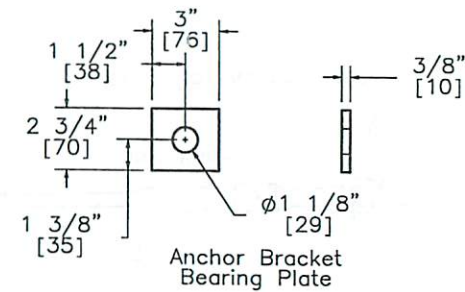
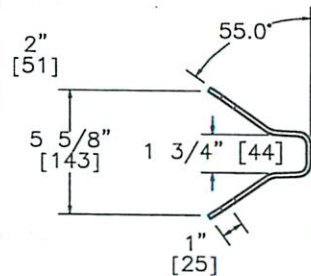


ELEVATION VIEW

Ground Strut
Part c1



Anchor Bracket
Part c2



Anchor Bracket
Bearing Plate



Midwest Roadside
Safety Facility

MWT Standard Post

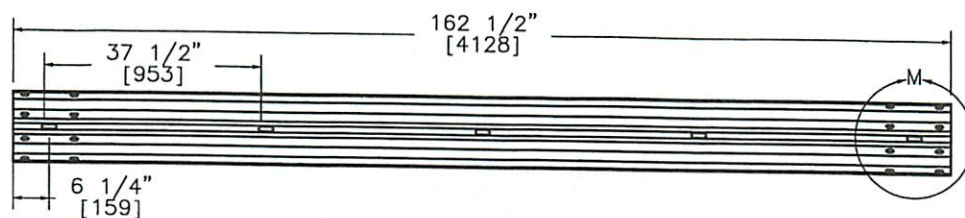
Ground Strut & Anchor
Bracket Details

DWG. NAME.
MWT-SP-3_R3

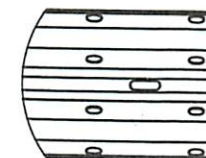
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UNITS: In./mm

SHEET:
15 of 20
DATE:
11/22/2010
DRAWN BY:
EMA/RJT

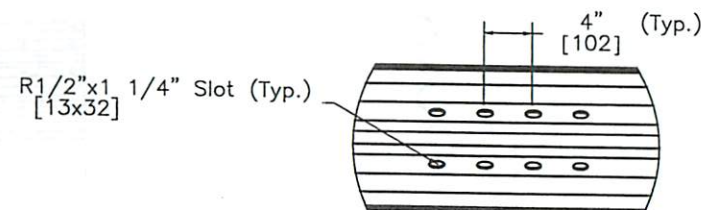
REV. BY:
KAP/SKR/
RKF



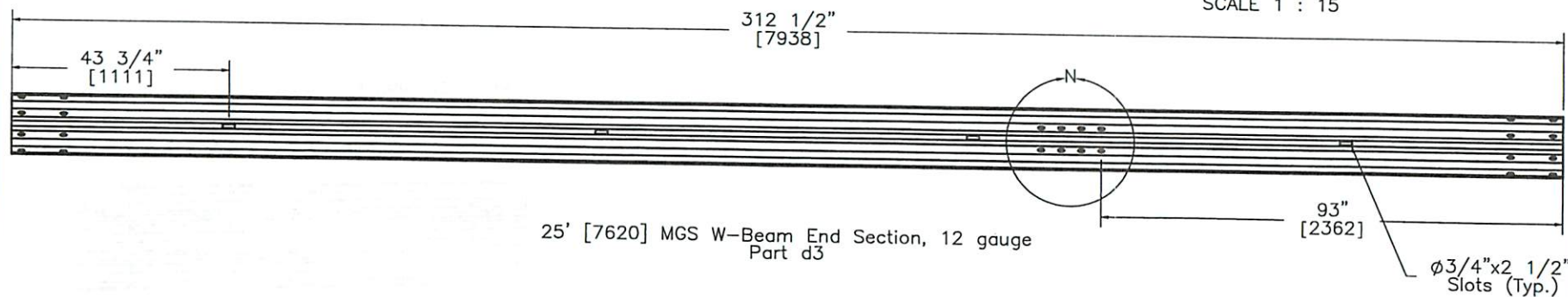
12'-6" [3810] MGS W-Beam, 12 gauge
Part d4



DETAIL M
SCALE 1 : 15



DETAIL N
SCALE 1 : 15



25' [7620] MGS W-Beam End Section, 12 gauge
Part d3



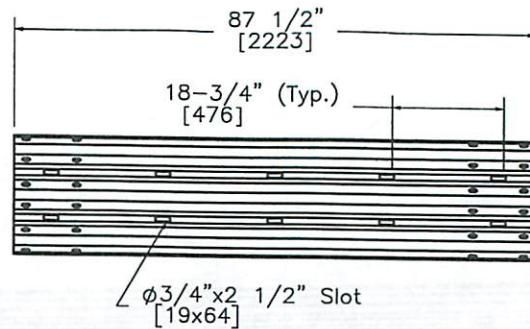
Midwest Roadside
Safety Facility

MWT Standard Post
Rail Section Details

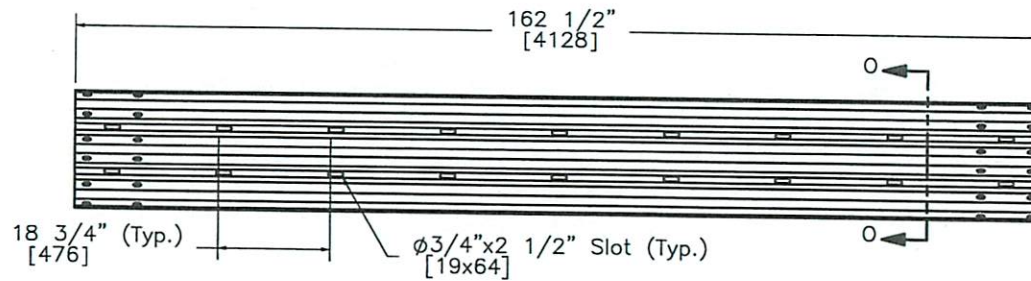
SHEET:
16 of 20
DATE:
11/22/2010
DRAWN BY:
EMA/RJT

DWG. NAME:
MWT-SP-3_R3

SCALE: 1:31
UNITS: In./mm
REV. BY:
KAP/SKR/
RKF




6'-3" [1905] Thrie Beam Section, 12 gauge,
1/4 Post Spacing
Part d5



12'-6" [3810] Thrie Beam Section, 12 gauge,
1/4 Post Spacing
Part c3

SECTION 0-0

 Midwest Roadside Safety Facility	MWT Standard Post		SHEET: 17 of 20
	Rail Section Details		DATE: 11/22/2010
DWG. NAME: MWT-SP-3_R3		SCALE: 1:30 UNITS: In./mm	DRAWN BY: EMA/RJT
		REV. BY: KAP/SKR/ RKF	

Midwest Guardrail System with Standard Post Spacing

Item No.	QTY.	Description	Material Spec	Hardware Guide
a1	1	6'-3" [1905] W-Beam to Thrie-Beam Transition Section	10 gauge AASHTO M180	-
a2	7	6x12x14 1/4" [152x305x362] Blockout	SYP Grade No.1 or better	-
a3	6	6x12x19" [152x305x483] Blockout - Post 10-15	SYP Grade No.1 or better	-
a4	2	6x8x19" [152x305x483] Blockout - Post 16-17	SYP Grade No.1 or better	-
a5	1	6x8x15" [152x305x381] Blockout - Post 18	SYP Grade No.1 or better	-
b1	2	72" [1829] Foundation Tube	A500 Grade B	PTE05
b2	2	BCT Timber Post -MGS Height	SYP Grade No. 1 or better	PDF01
b3	2	Bridge Cap Rail Bent Plate Connector 6 1/4x9x3/8" [159x229x9.5]	A36 Steel	-
b4	6	Bridge Cap Rail Angle 3 1/2x3 1/2x5/16" [89x89x7.9]	A36 Steel	-
b5	1	Bridge Cap Rail C8x11.5 [C203x17.1]	A36 Steel	-
b6	1	Bridge Cap Rail C8x11.5 [C203x17.1]	A36 Steel	-
b7	1	Bridge Cap Rail Terminator Tube 3 1/2x3 1/2x1/4" [89x89x6.4]	A36 Steel	-
b8	1	Terminator Plate 9x4 1/2x3/8" [229x114x9.5]	A36 Steel	-
b9	1	Bridge Cap Rail Splice Plate 5 7/8x13x3/8" [149x330x9.5]	A36 Steel	-
c1	1	Strut and Yoke Assembly	A36 Steel	PFP01
c2	1	Anchor Bracket	A36 Steel	FPA01
c3	3	12'-6" [3810] Thrie Beam Section - 1/2 Post Spacing	12 gauge AASHTO M180	-
c4	3	W6x15 [W152x22.3] Steel Bridge Blockout	A36 Steel	-
c5	3	W6x20 [W152x29.8] Steel Bridge Post	A36 Steel	-
c6	3	12x14x1 1/4" [305x356x32] Bridge Cap Connector Plate	A36 Steel	-
d1	1	BCT Anchor Cable 6' [1829] Long	6x19 Cable	FCA01
d2	1	8x8x5/8" [203x203x15.9] Anchor Bearing Plate	A36 Steel	FPB01
d3	1	25' [7620] W-Beam MGS End Section	12 gauge AASHTO M180	-
d4	2	12'-6" [3810] W-Beam MGS Section	12 gauge AASHTO M180	-
d5	1	6'-3" [1905] Thrie Beam Section - 1/2 Post Spacing	12 gauge AASHTO M180	-
d6	1	2 3/8" [60] O.D.x 6" [152] long BCT Hole insert	ASTM A53 Grade B Schedule 40	FMM02



Midwest Roadside
Safety Facility

MWT Standard Post


Bill of Materials

DWG. NAME.
MWT-SP-3_R3

SCALE: None
UNITS: In./mm

SHEET:
18 of 20
DATE:
11/22/2010
DRAWN BY:
EMA/RJT
REV. BY:
KAP/SKR/
RKF

Midwest Guardrail System with Standard Post Spacing				
Item No.	QTY.	Description	Material Spec	Hardware Guide
e1	20	1"Dia. [25] Flat Washer	Grade 5	FWC24a
e2	20	1"Dia. [25] Heavy Hex Nut	Grade 5	A325 or A449 Substitute
e3	18	1"Dia. [25] Threaded Rod	Grade A307	-
e4	116	5/8"Dia. [15.9] Flat Washer	Grade 5	-
e5	42	5/8"Dia. x 2" [M16x51] long Hex Head Bolt	Grade 5	FBX16a
e6	54	5/8"Dia. [15.9] Hex Nut	Grade 5	A325 or A449 Substitute
e7	2	5/8"Dia. x 5" [M16x127] long Hex Head Bolt	Grade 5	FBX16a
e8	4	7/8"Dia. [22.2] Flat Washer	Grade 5	FWC22a
e9	2	7/8"Dia. [22.2] Hex Nut	Grade 5	FBX22a
e10	2	7/8"Dia. x 7 1/2" [M22x191] long Hex Head Bolt	Grade 5	FBX22a
e11	2	5/8"Dia. x 10" [M16x254] long Hex Head Bolt	Grade 5	FBX16a
e12	8	5/8"Dia. x 1 1/2" [M16x38.1] long Hex Head Bolt	Grade 5	FBX16a
e13	8	5/8"Dia. x 10" [M16x254] long Guardrail Bolt	Grade A307	FBB03
e14	18	5/8"Dia. x 14" [M16x356] long Guardrail Bolt	Grade A307	FBB06
e15	8	16D Double Head Nail	-	-
e16	66	5/8"Dia. x 1 1/2" [M16x38] Guardrail Bolt	Grade A307	FBB01
e17	92	5/8"Dia. [15.9] Guardrail Nut	Grade 5	-
f1	7	W6x8.5 [W152x12.6] 72" [1829] long - Post Nos. 3-9	A36 Steel	-
f2	6	W6x8.5 [W152x12.6] 72" [1829] long - Post Nos. 10-15	A36 Steel	-
f3	1	W6x15 [W152x22.3] 84" [2134] long - Post No. 16	A36 Steel	-
f4	1	W6x15 [W152x22.3] 84" [2134] long - Post No. 17	A36 Steel	-
f5	1	W6x15 [W152x22.3] 84" [2134] long - Post No. 18	A36 Steel	-



Midwest Roadside
Safety Facility

MWT Standard Post
Bill of Materials

DWG. NAME:
MWT-SP-3_R3

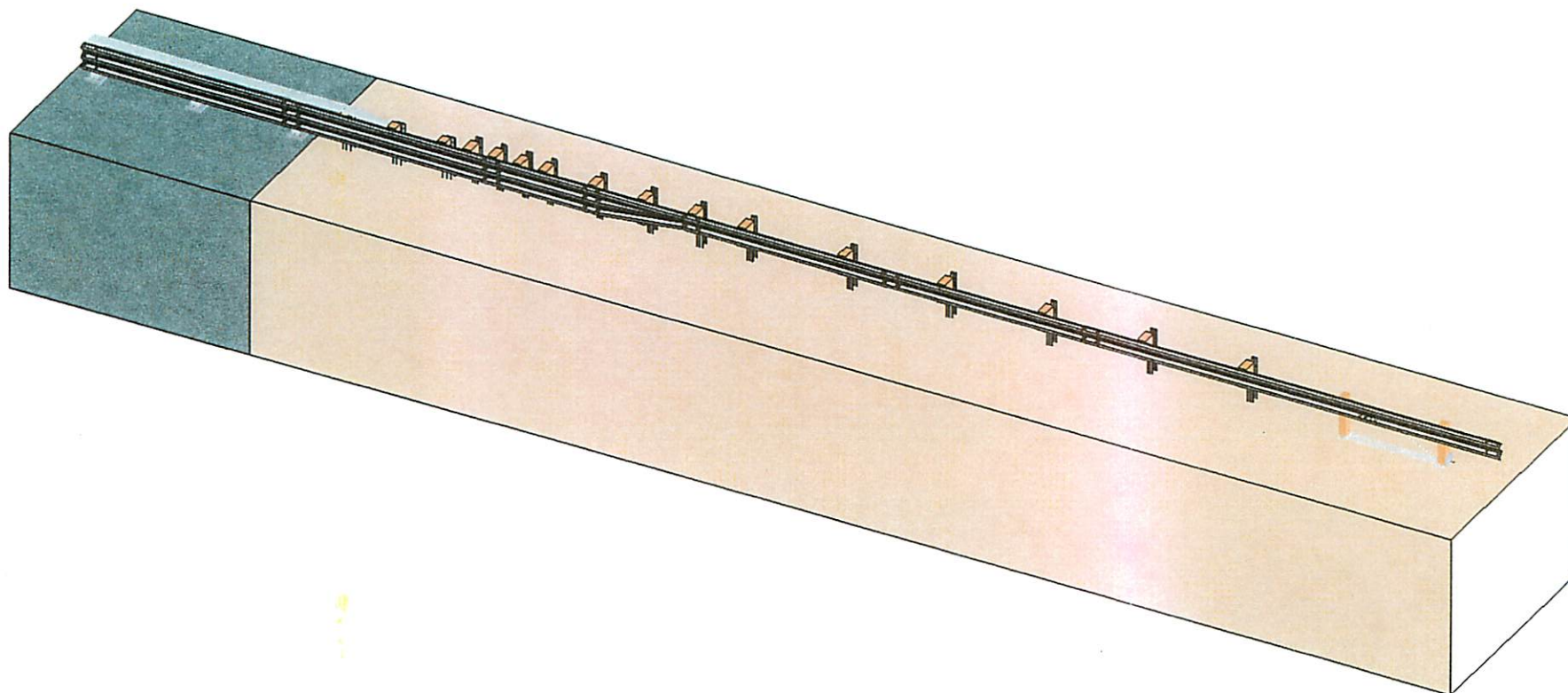
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UNITS: in./mm

REV. BY:
KAP/SKR/
RKF

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19 of 20

DATE:
11/22/2010

DRAWN BY:
EMA/RJT



Midwest Roadside
Safety Facility

MWT Standard Post
Isometric System View

DWG. NAME:
MWT-SP-3_R3

SCALE: 1:105
UNITS: in.[mm]
REV. BY:
KAP/SKR/
RKF

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20 of 20
DATE:
11/22/2010
DRAWN BY:
EMA/RJT