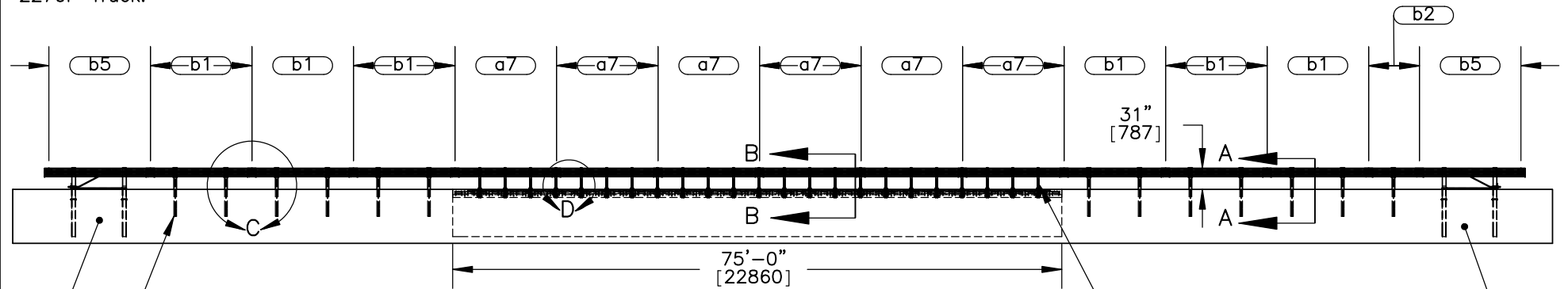


Impact: 16' [4877]
Upstream of Centerline of
the Splice at Post No. 20.
Impact Line Referenced to
Left Side of (MASH-08)
2270P Truck.

PLAN VIEW



ELEVATION VIEW

BCT post in 6' [1829] Long
(Galvanized) Foundation
Tubes, Ground Line
Strut, and BCT Cable Anchor

- Notes: (1) Posts nos. 7, 32, and 33 are place in 3' [914] diameter holes. Post no. 8 has to be placed in a 2' [610] diameter hole due to the location of the bridge pier, the center of post is 1' [305] away from bridge pier.
- (2) All remaining posts in the transition have 2' [610] diameter holes.



Midwest Roadside
Safety Facility

MGS Bridge Rail

System Layout

DWG. NAME.
MGS Bridge Rail_V13

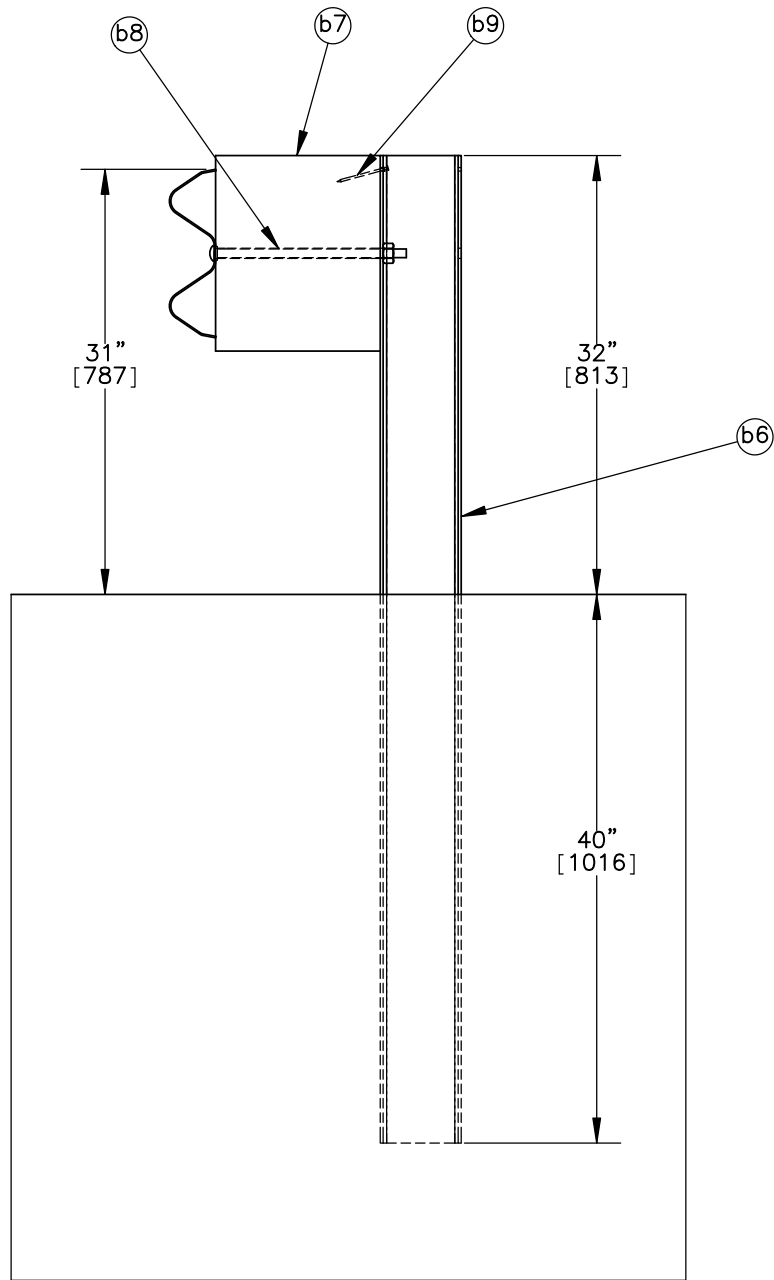
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UNITS: In.[mm]

SHEET:
1 of 26

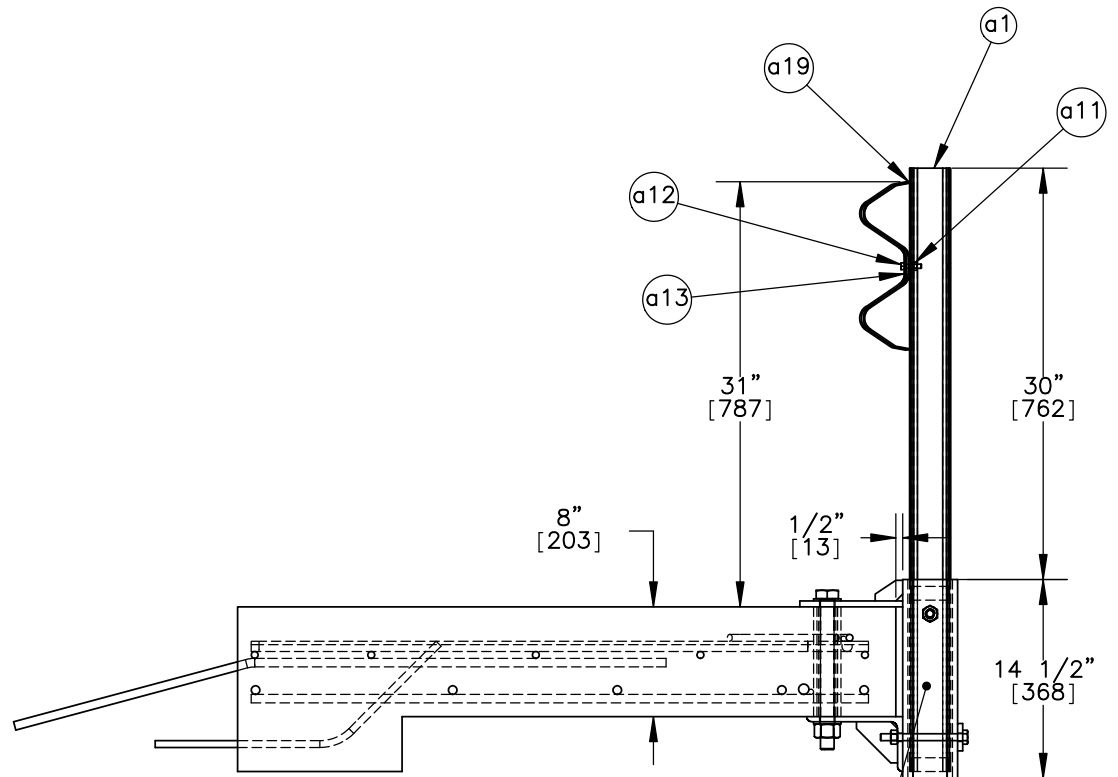
DATE:
11/19/2009

DRAWN BY:
MW/RJT

REV. BY:
KAL/EJ/RF



SECTION A-A



SECTION B-B

Weak Post Assembly



Midwest Roadside
Safety Facility

MGS Bridge Rail

Post Details

DWG. NAME:
MGS Bridge Rail_V13

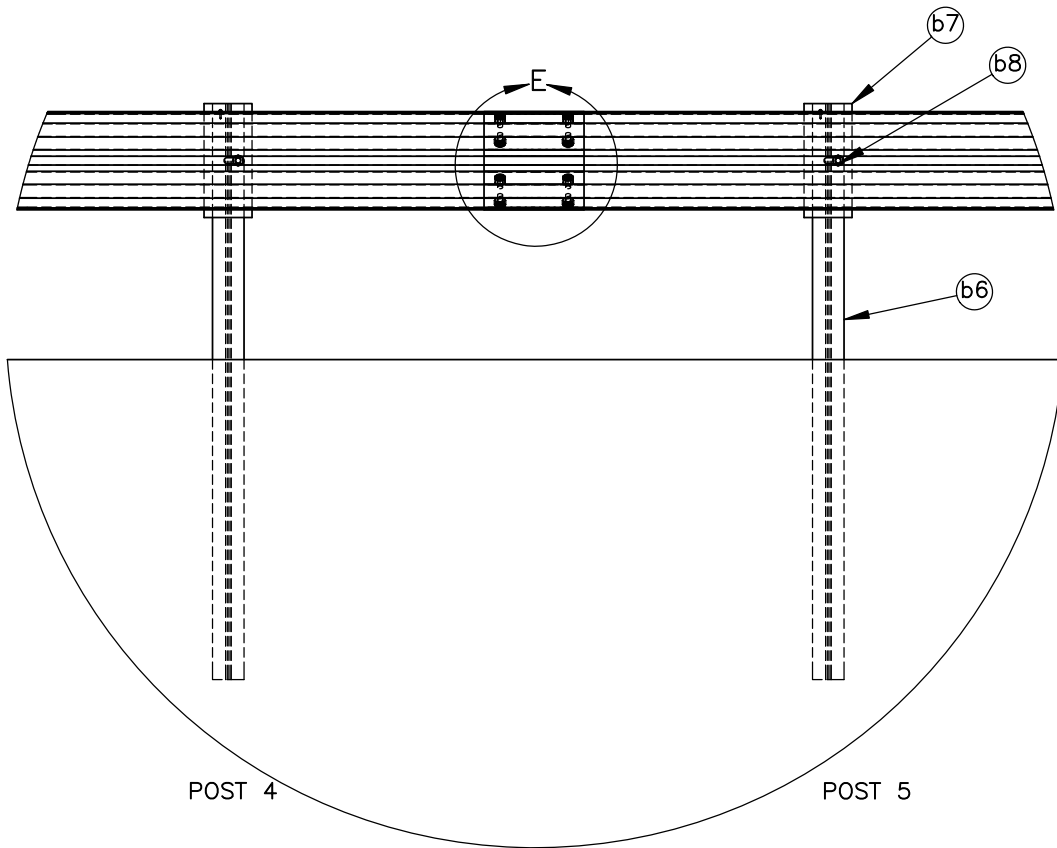
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SHEET:
2 of 26

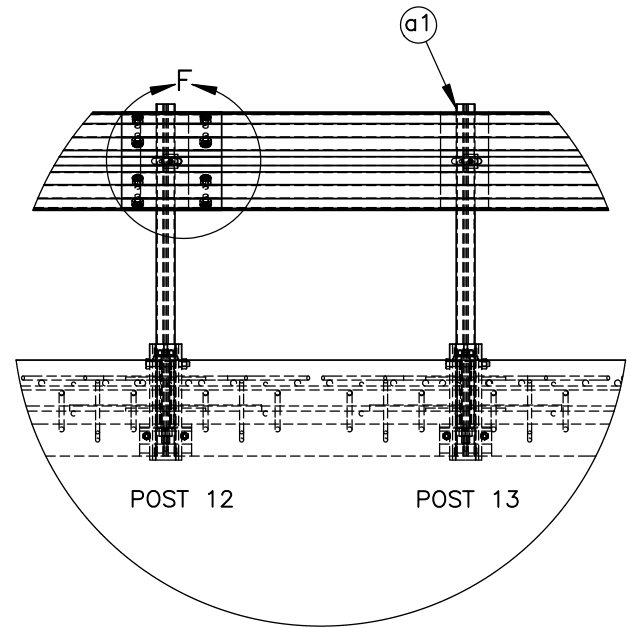
DATE:
11/19/2009

DRAWN BY:
MW/RJT

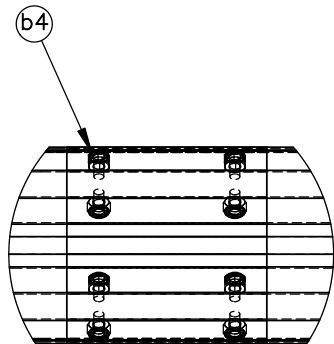
REV. BY:
KAL/EJ/RF



SECTION C
END SECTION SPLICE DETAILS

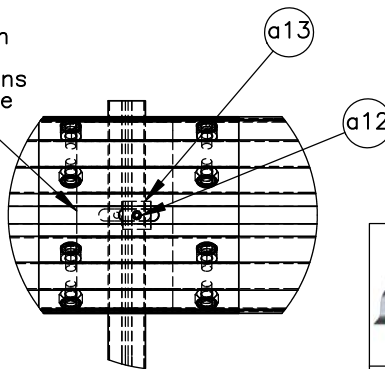


SECTION D
BRIDGE RAIL SECTIONSPLICE DETAILS

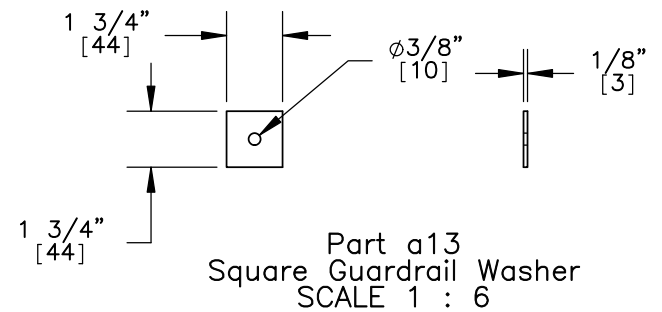


DETAIL E
SCALE 1 : 12

part a19
6" [152] long W-Beam
backup plate placed
between guardrail sections
and post at every bridge
post location



DETAIL F
SCALE 1 : 12



Midwest Roadside
Safety Facility

MGS Bridge Rail

Splice Details

DWG. NAME.
MGS Bridge Rail_V13

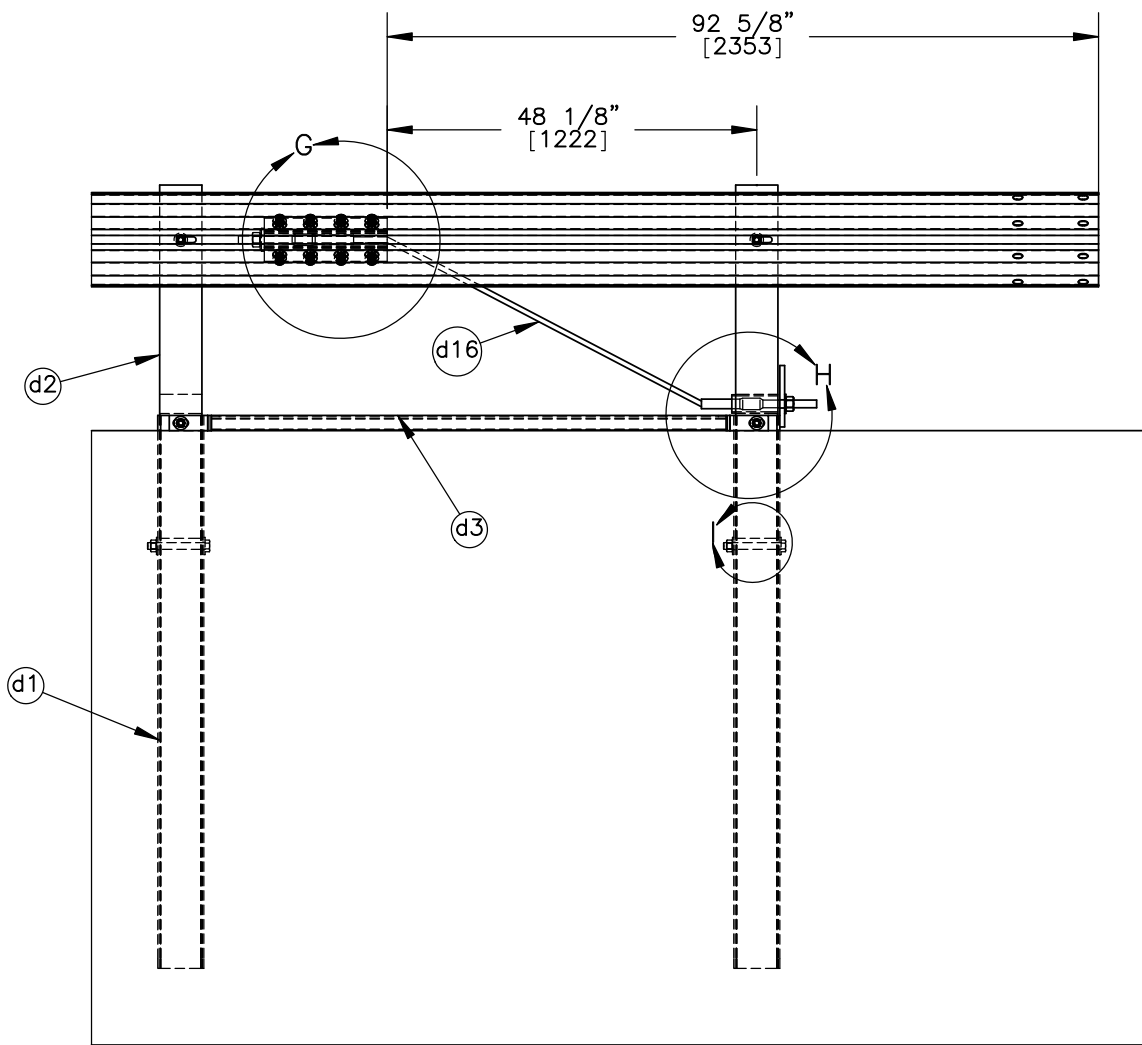
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SHEET:
3 of 26

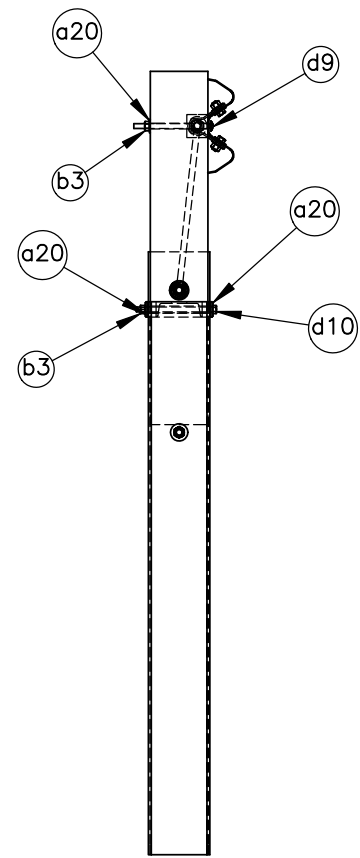
DATE:
11/19/2009

DRAWN BY:
MW/RJT

REV. BY:
KAL/EJ/RF



FRONT VIEW



SIDE VIEW



Midwest Roadside
Safety Facility

MGS Bridge Rail

End Rail Details

DWG. NAME:
MGS Bridge Rail_V13

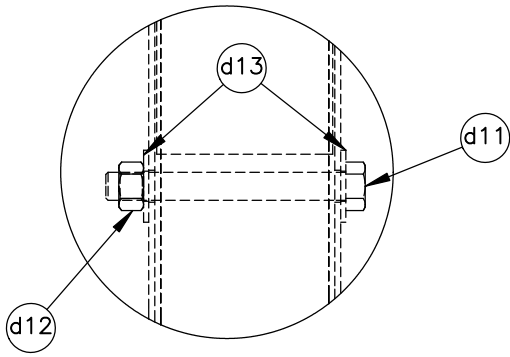
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SHEET:
4 of 26

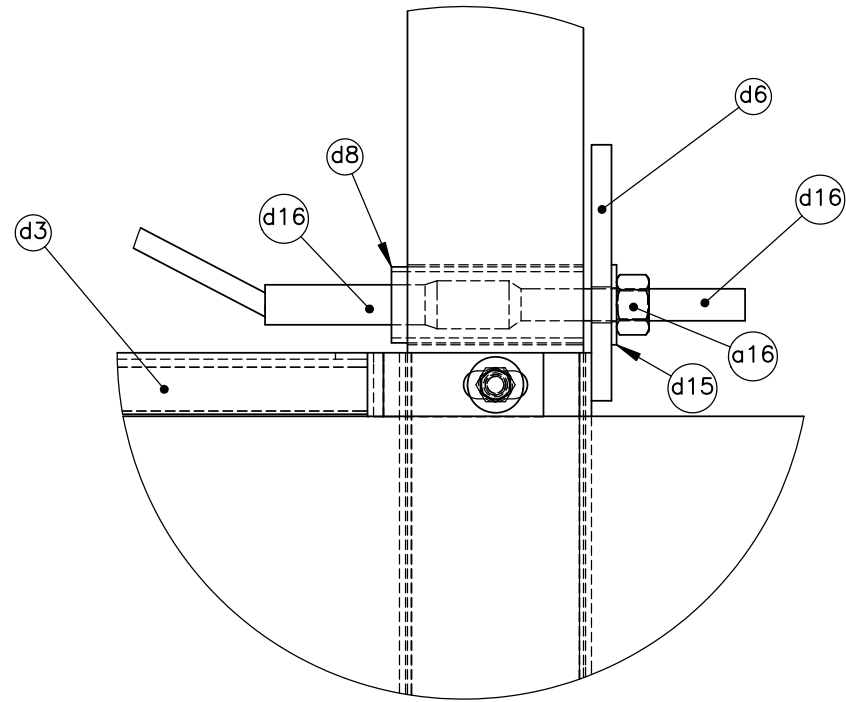
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11/19/2009

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MW/RJT

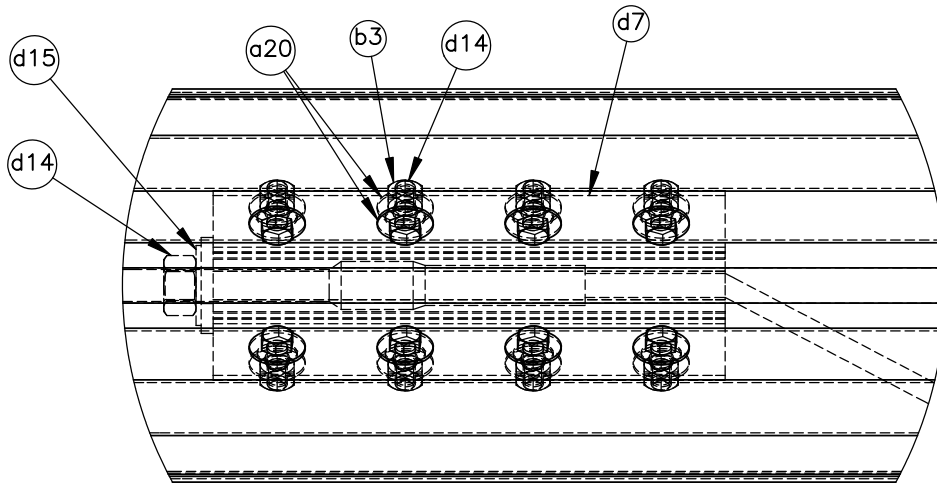
REV. BY:
KAL/EJ/RF



DETAIL I



DETAIL H



DETAIL G



Midwest Roadside
Safety Facility

MGS Bridge Rail

Anchor Details

DWG. NAME:
MGS Bridge Rail_V13

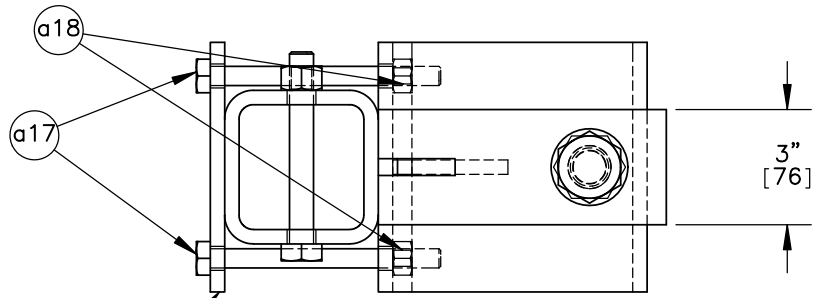
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SHEET:
5 of 26

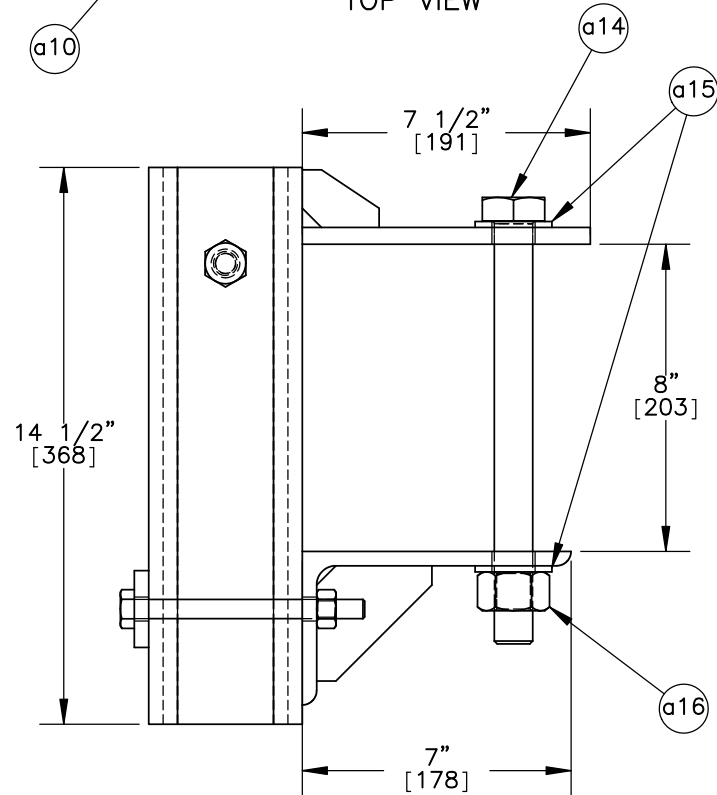
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11/19/2009

DRAWN BY:
MW/RJT

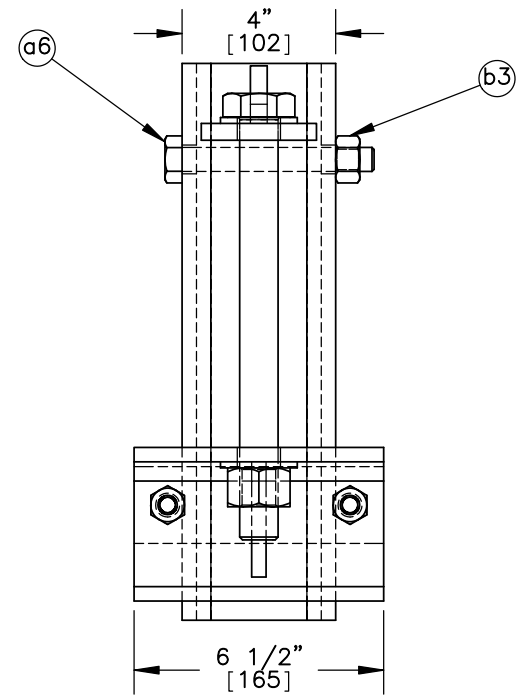
REV. BY:
KAL/EJ/RF



TOP VIEW



SIDE VIEW



FRONT VIEW



Midwest Roadside
Safety Facility

MGS Bridge Rail

Weak Post Assembly

DWG. NAME.
MGS Bridge Rail_V13

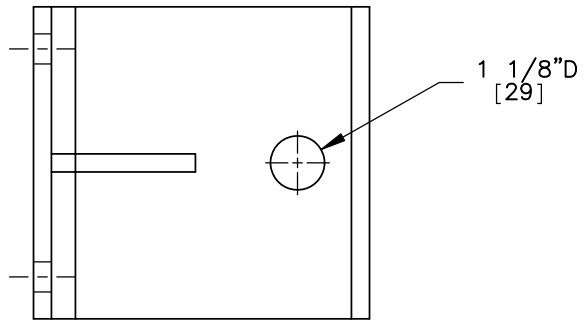
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SHEET:
6 of 26

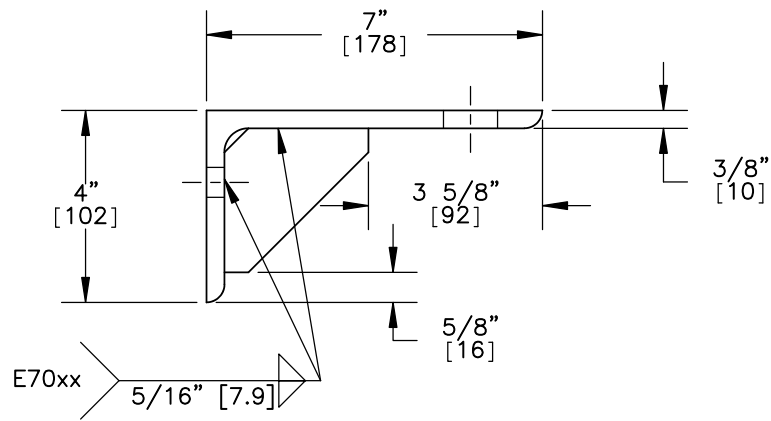
DATE:
11/19/2009

DRAWN BY:
MW/RJT

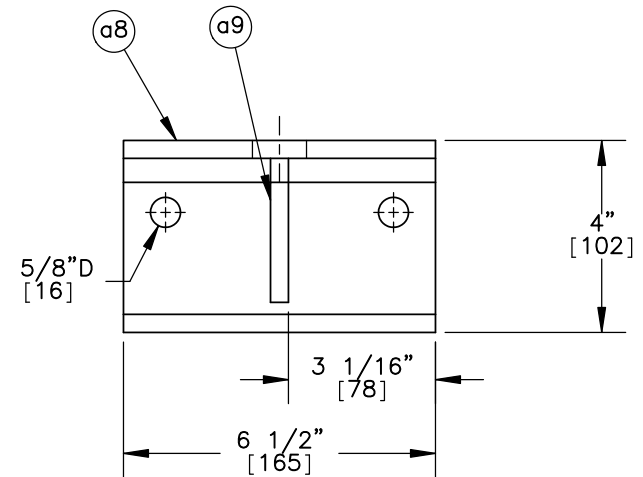
REV. BY:
KAL/EJ/RF




TOP VIEW

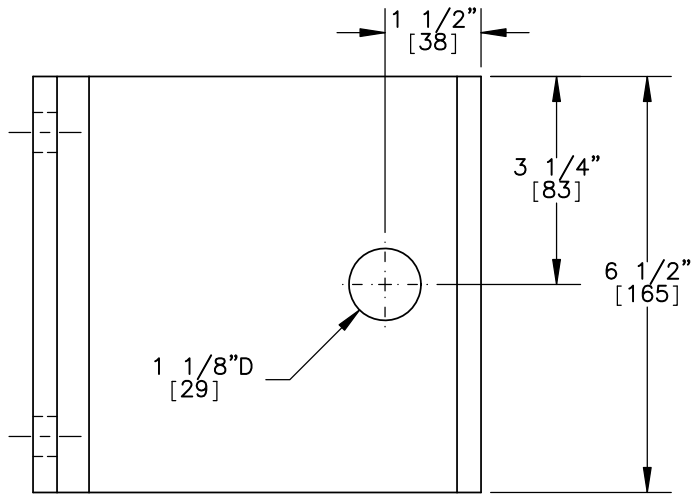


SIDE VIEW

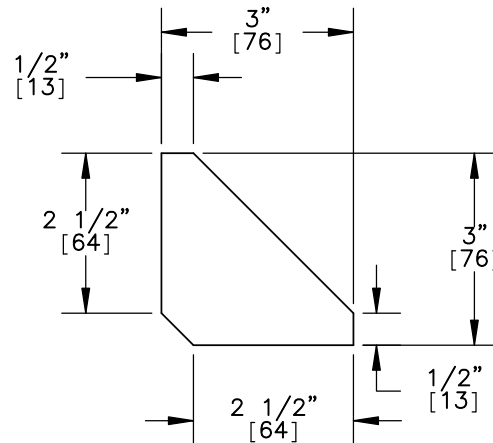
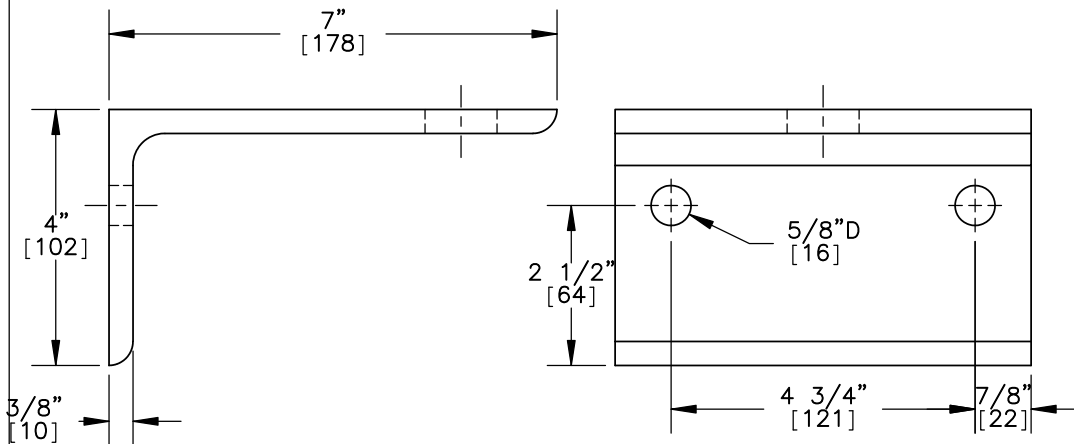


FRONT VIEW

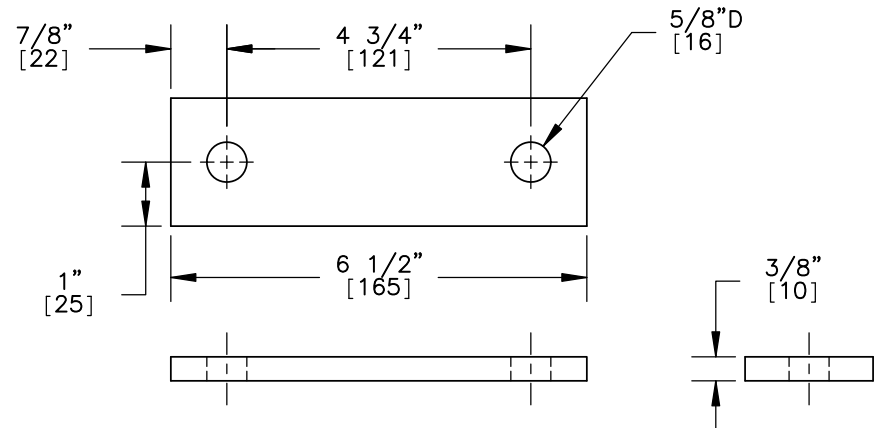
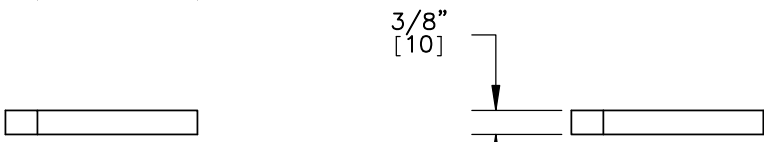
	MGS Bridge Rail		SHEET: 7 of 26
	Weak Post Mounting Bracket-Bottom Assembly		DATE: 11/19/2009
Midwest Roadside Safety Facility			DWG. NAME: MGS Bridge Rail_V13
	SCALE: 1:4	UNITS: In.[mm]	REV. BY: KAL/EJ/RF



Part a8
Bottom Mounting Plate



Part a9
Bottom Mounting Plate Gusset



Part a10
Backside Retainer Plate



Midwest Roadside
Safety Facility

MGS Bridge Rail

Weak Post Mounting
Bracket—Bottom Assembly Details

DWG. NAME:
MGS Bridge Rail_V13

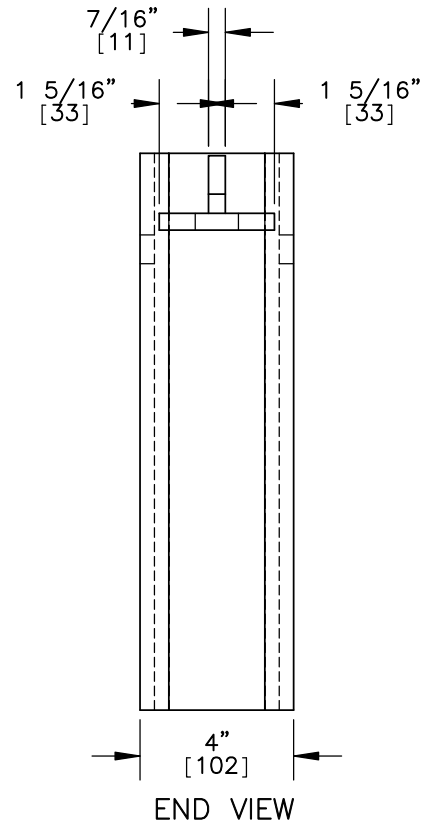
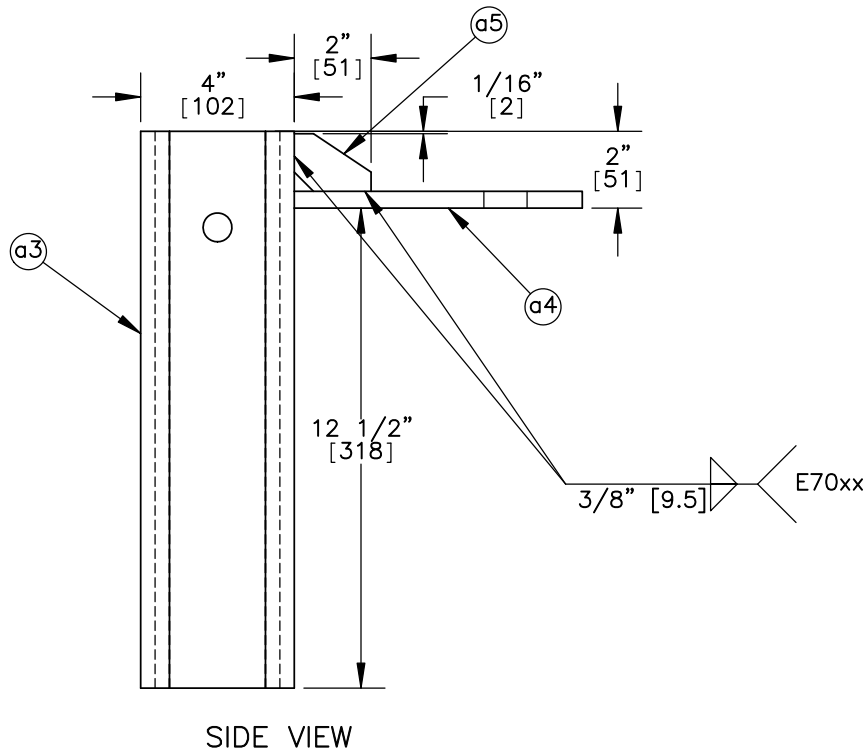
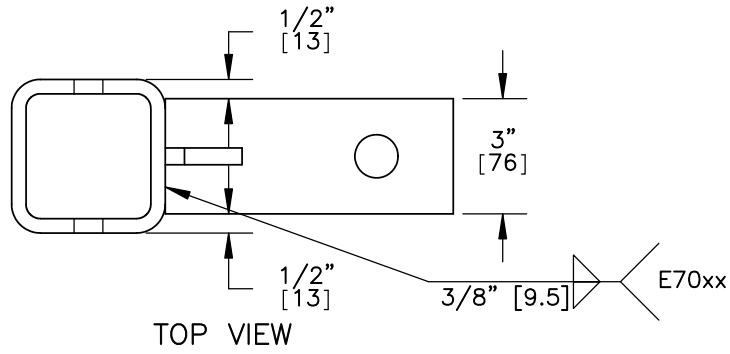
SCALE: 1:3
UNITS: In.[mm]

SHEET:
8 of 26

DATE:
11/19/2009

DRAWN BY:
MW/RJT

REV. BY:
KAL/EJ/RF



Midwest Roadside
Safety Facility

MGS Bridge Rail

Weak Post Mounting
Bracket-Top Assembly

DWG. NAME.
MGS Bridge Rail_V13

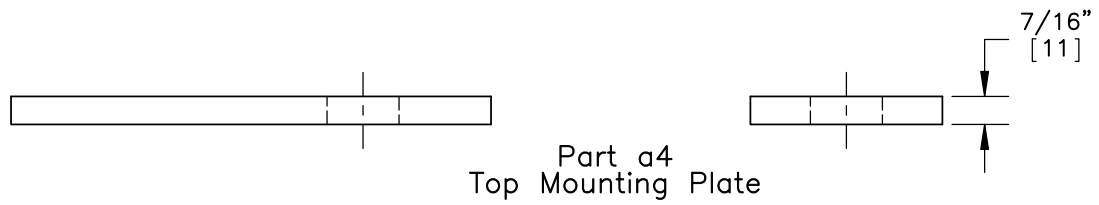
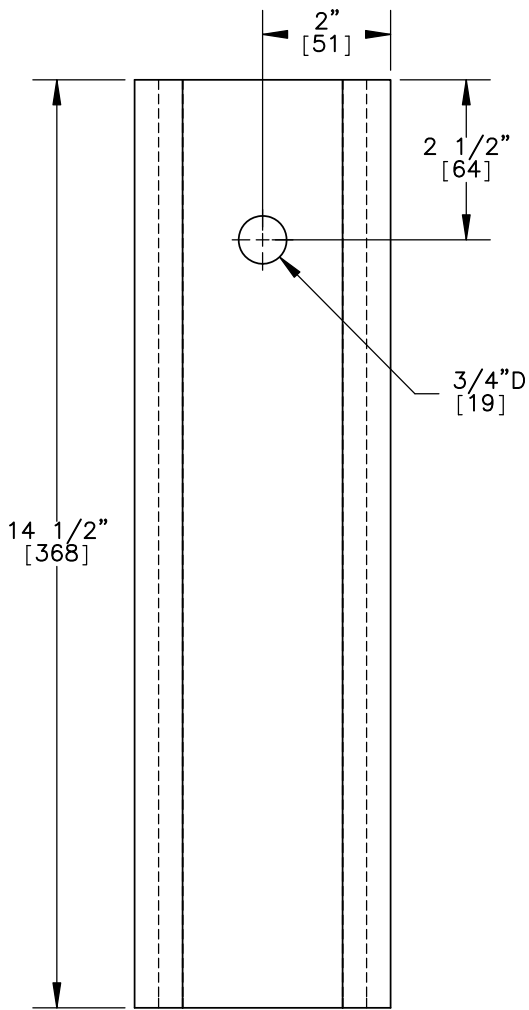
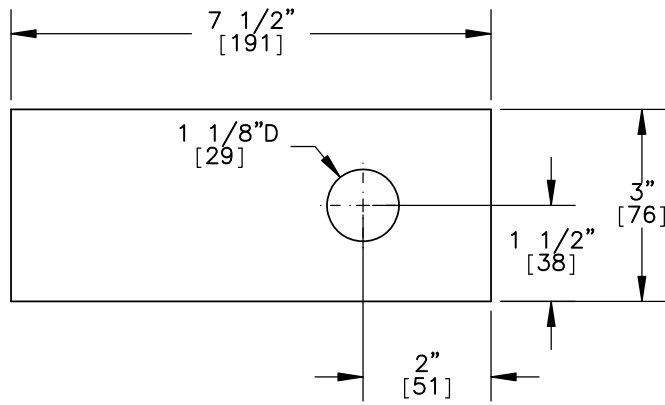
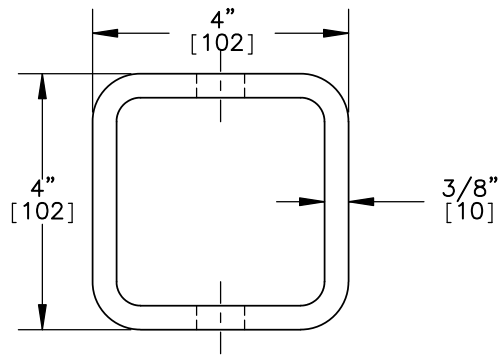
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SHEET:
9 of 26

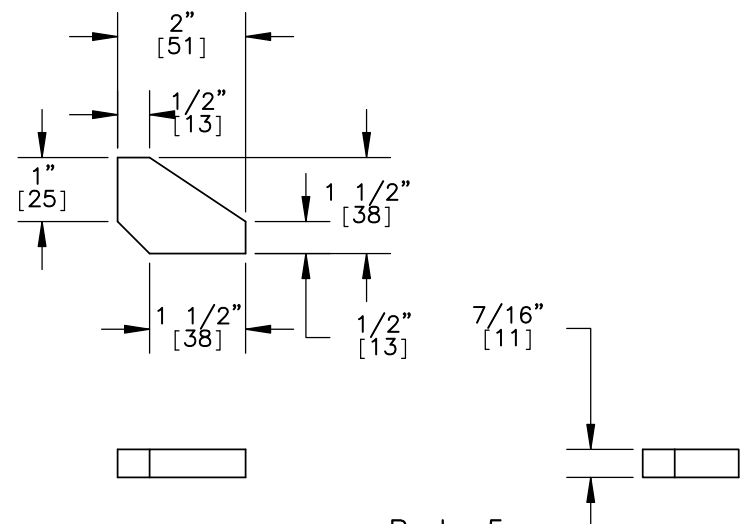
DATE:
11/19/2009

DRAWN BY:
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REV. BY:
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Part a4
Top Mounting Plate



Part a5
Top Mounting Plate Gusset

Part a3
4x4x0.375 Square Tube
[102x102x9.5]



Midwest Roadside Safety Facility

MGS Bridge Rail

Weak Post Mounting Bracket-Top Assembly Details

DWG. NAME:
MGS Bridge Rail_V13

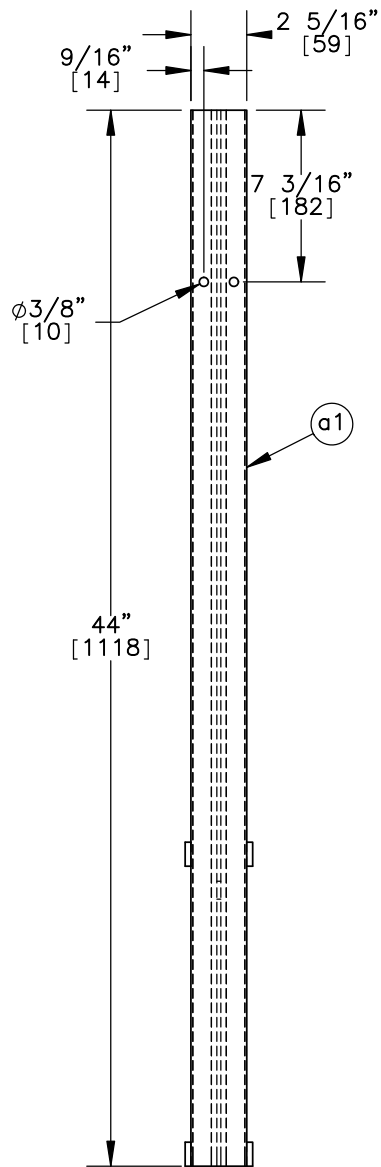
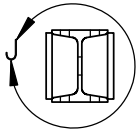
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SHEET:
10 of 26

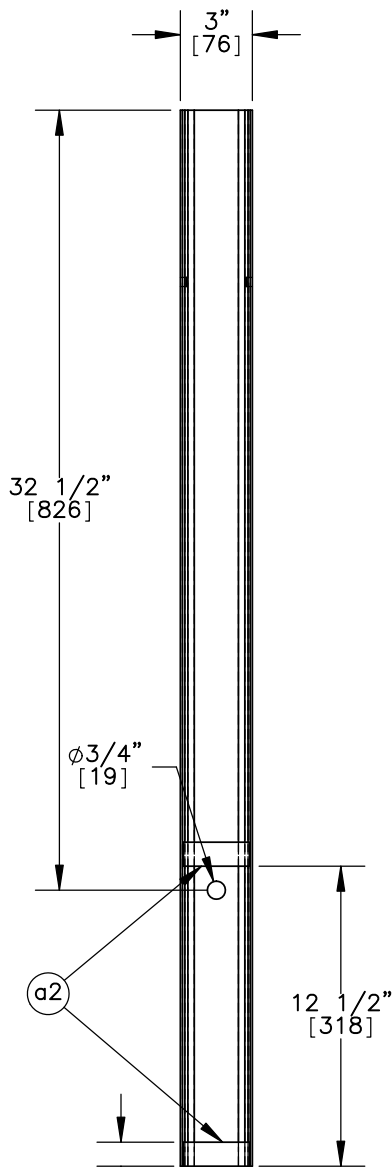
DATE:
11/19/2009

DRAWN BY:
MW/RJT

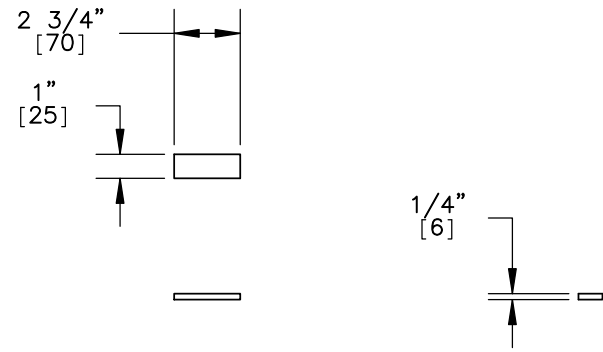
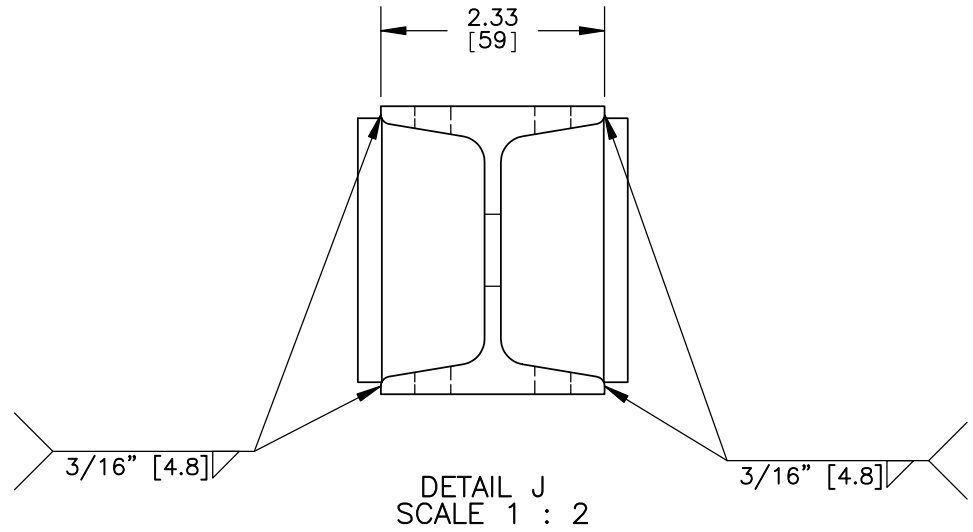
REV. BY:
KAL/EJ/RF



Part a1
S3x5.7 Post
[S76x8.5]



1" [25]



Part a2
Post Standoff



Midwest Roadside
Safety Facility

MGS Bridge Rail

S3x5.7 [S76x8.5] Post and
Standoff Details

DWG. NAME:
MGS Bridge Rail_V13

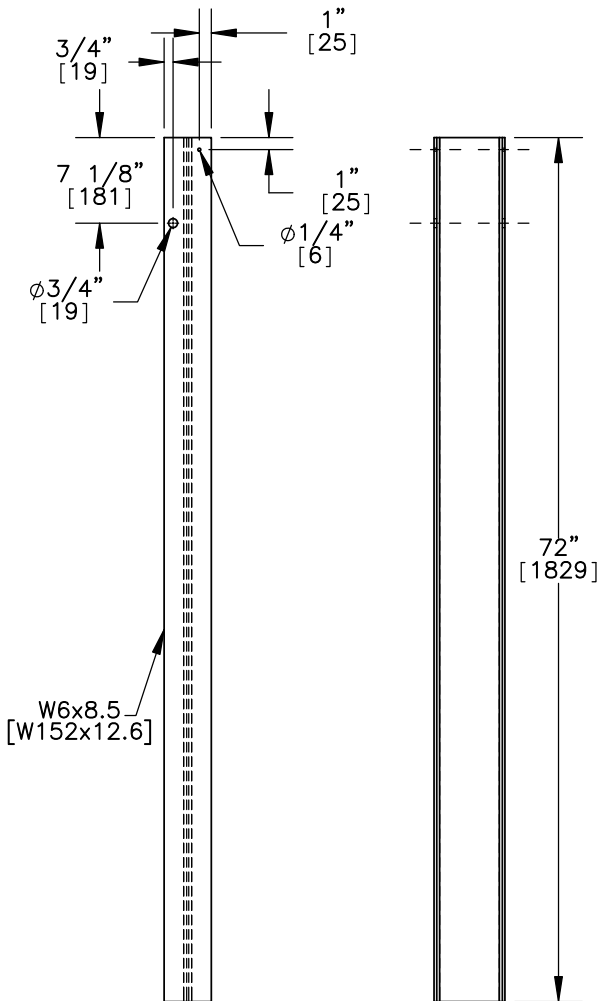
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SHEET:
11 of 26

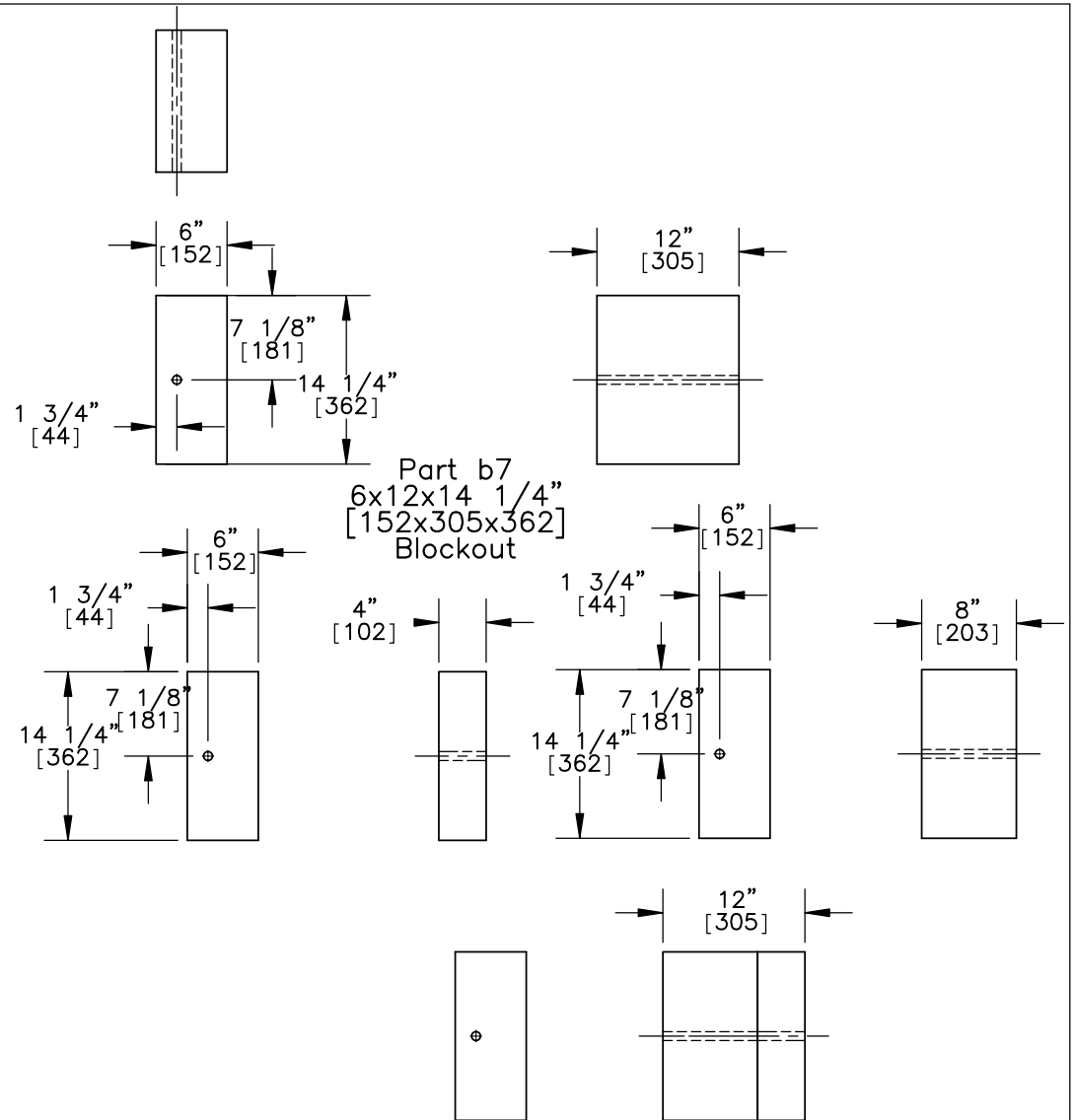
DATE:
11/19/2009

DRAWN BY:
MW/RJT

REV. BY:
KAL/EJ/RF



Part b6
Line Post



Alternate Combined Blockout Option:
 6x4x14 1/4" [152x102x362] and 6x8x14 1/4" [152x203x362] Blockouts



Midwest Roadside
Safety Facility

MGS Bridge Rail

Posts 3-8 and 32-37 Details

DWG. NAME:
MGS Bridge Rail_V13

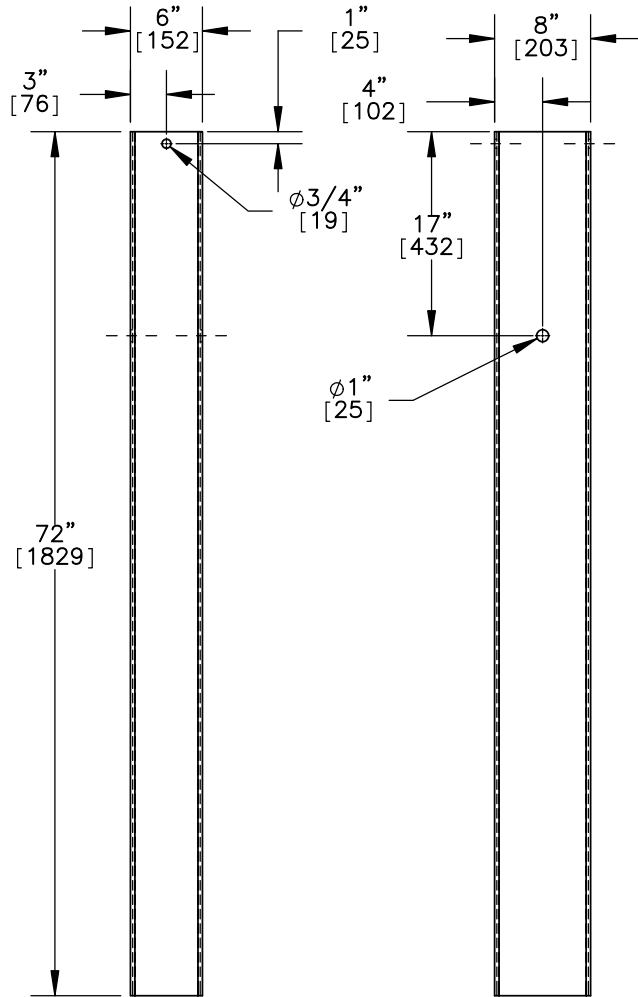
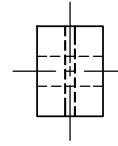
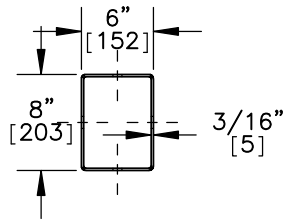
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SHEET:
12 of 26

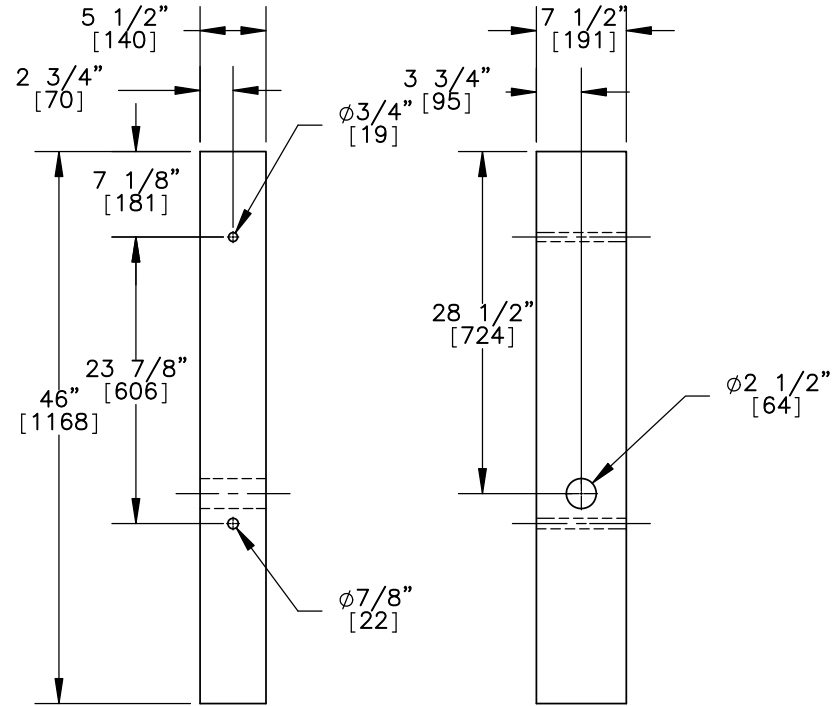
DATE:
11/19/2009

DRAWN BY:
MW/RJT

REV. BY:
KAL/EJ/RF



Part d1
Foundation Tube



Part d2
BCT (MGS) Timber Post



Midwest Roadside
Safety Facility

MGS Bridge Rail

BCT Timber Posts &
Foundation Tube Details

DWG. NAME.
MGS Bridge Rail_V13

SCALE: 1:16
UNITS: In.[mm]

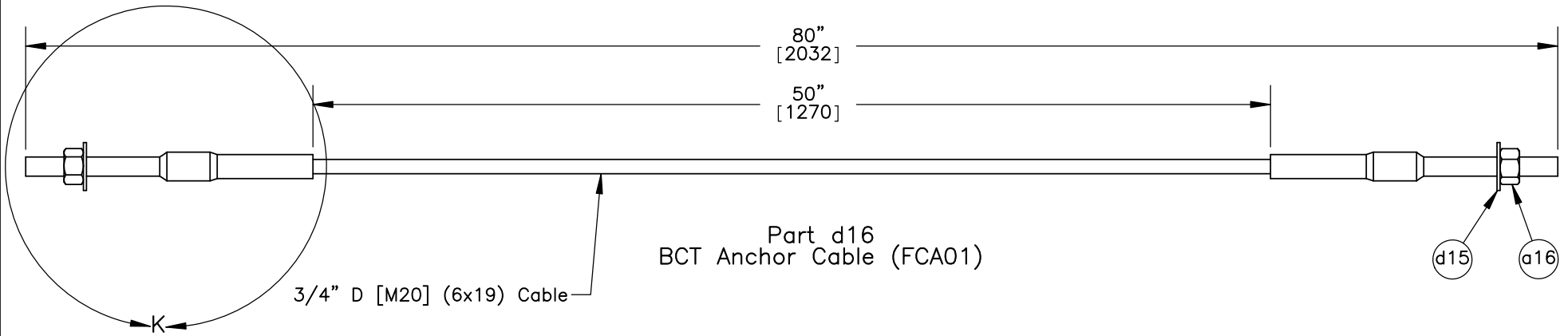
SHEET:
13 of 26

DATE:
11/19/2009

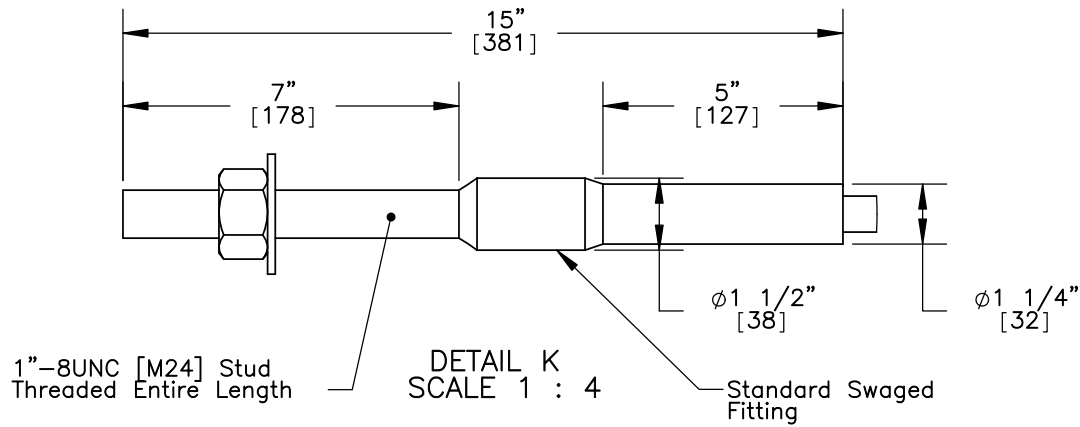
DRAWN BY:
MW/RJT

REV. BY:
KAL/EJ/RF

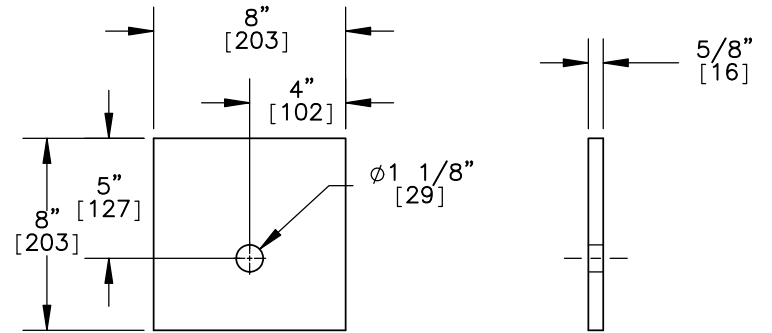
Note: (1) 6x19 and 6x25 IWRC cables are equivalent.



Part d16
BCT Anchor Cable (FCA01)



DETAIL K
SCALE 1 : 4



Part d6
Anchor Cable Bearing Plate



Midwest Roadside
Safety Facility

MGS Bridge Rail

BCT Anchor Cable

DWG. NAME.
MGS Bridge Rail_V13

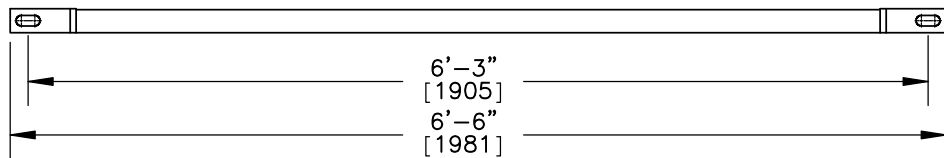
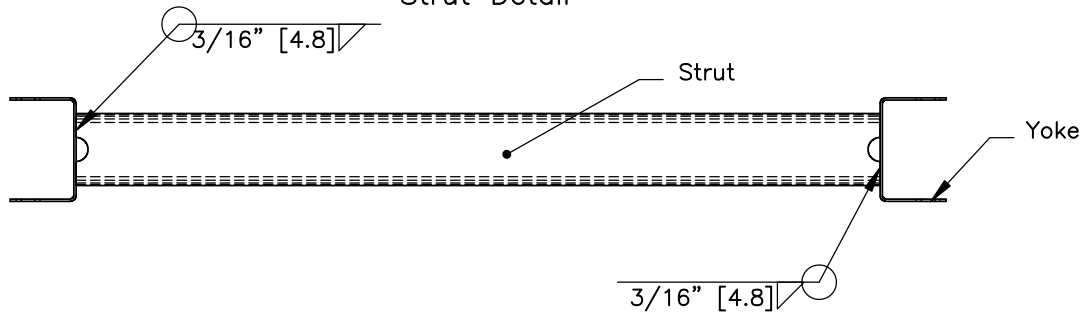
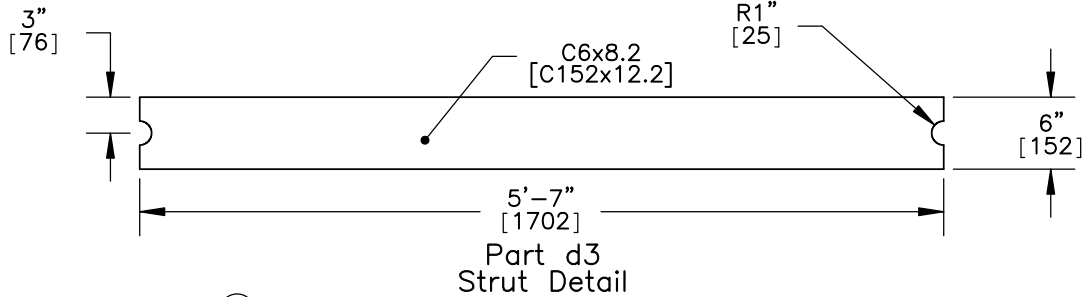
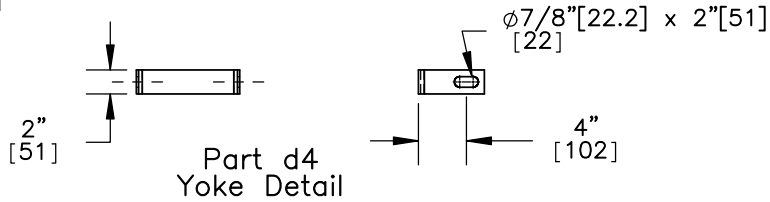
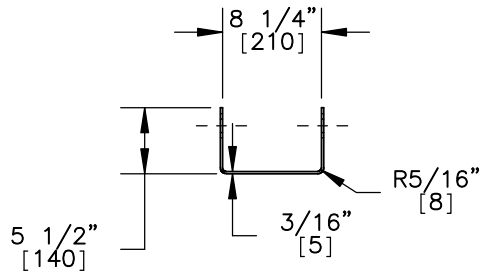
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SHEET:
14 of 26

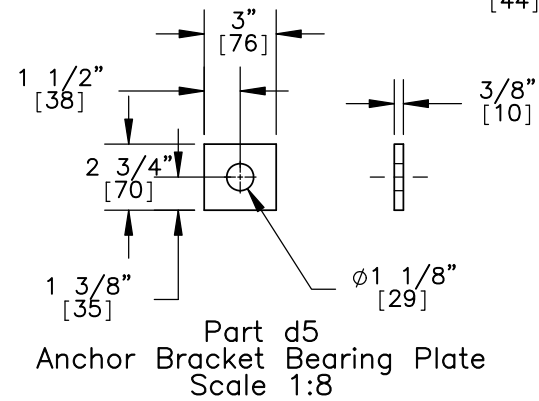
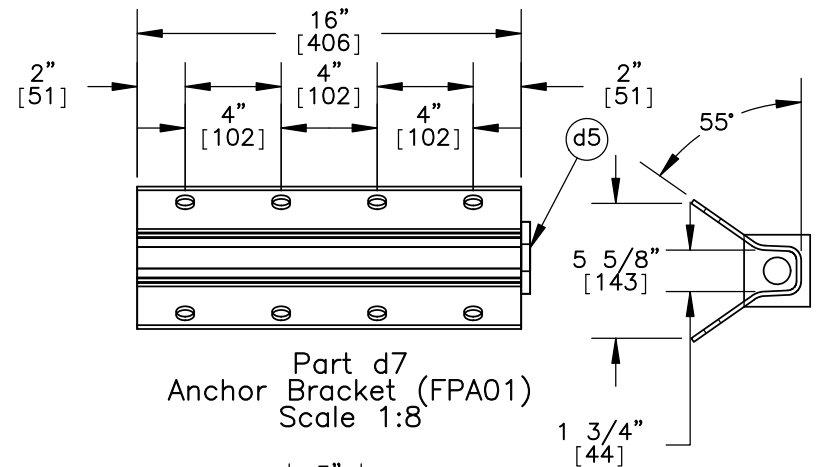
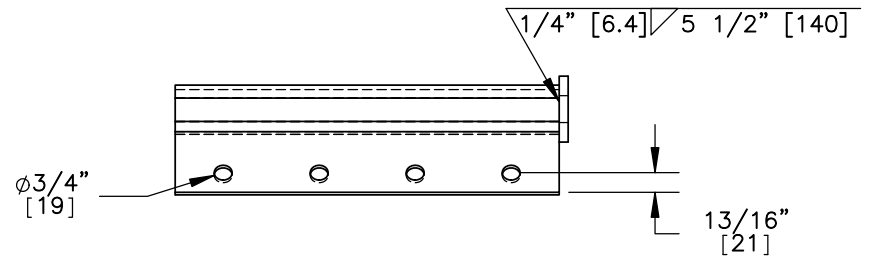
DATE:
11/19/2009

DRAWN BY:
MW/RJT

REV. BY:
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Ground Strut



Midwest Roadside
Safety Facility

MGS Bridge Rail

Ground Strut & Anchor
Bracket Details

DWG. NAME:
MGS Bridge Rail_V13

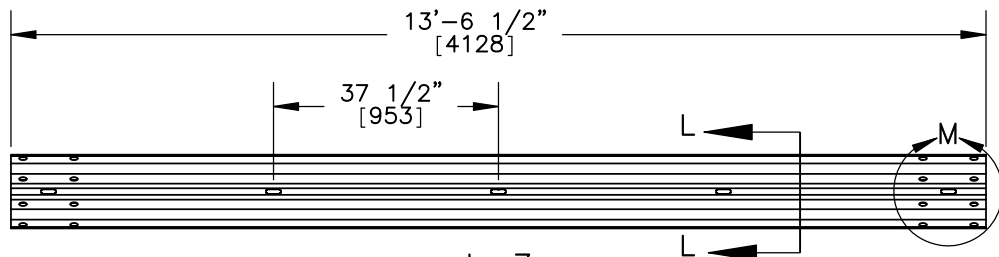
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UNITS: In.[mm]

SHEET:
15 of 26

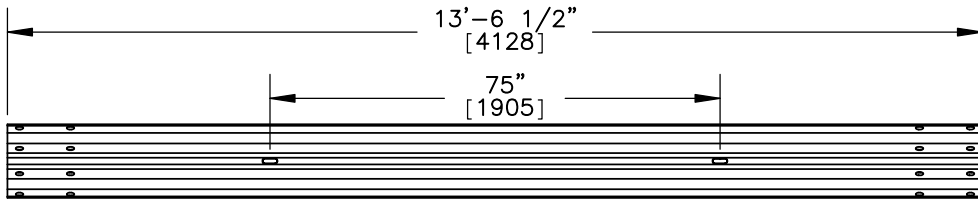
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11/19/2009

DRAWN BY:
MW/RJT

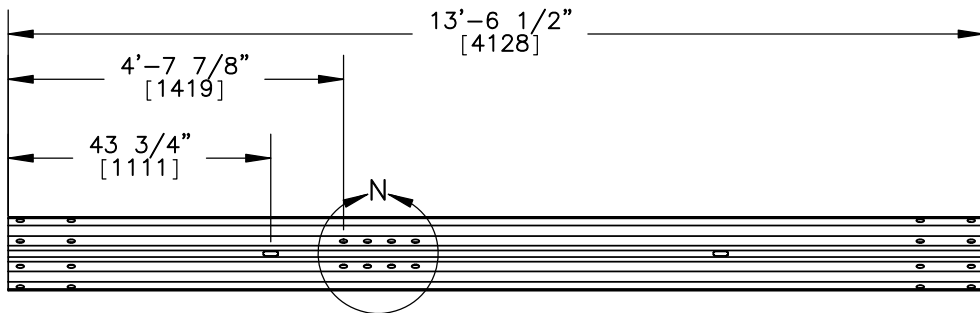
REV. BY:
KAL/EJ/RF



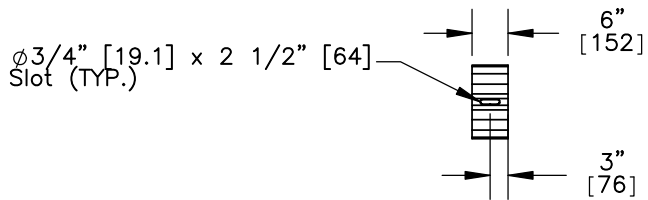
part a7
12'-6" [3810] W-Beam Section, 12 gauge,
13'-6 1/2" Half Post Spacing
[4128]



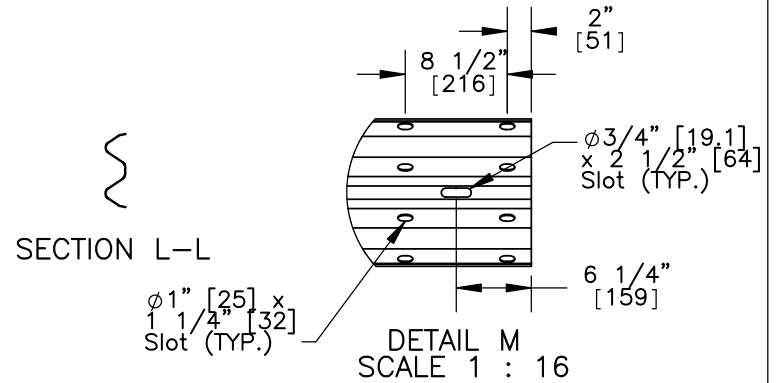
part b1
12'-6" [3810] W-Beam Section, 12 gauge,
Full Post Spacing



part b5
12'-6" [3810] W-Beam Section, 12 gauge,
End Section

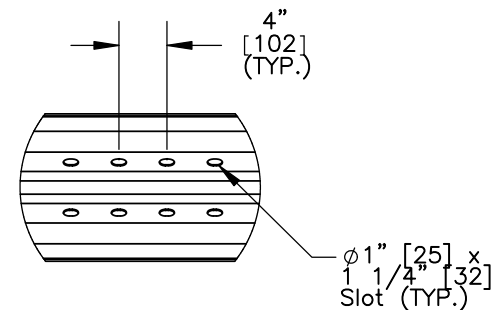
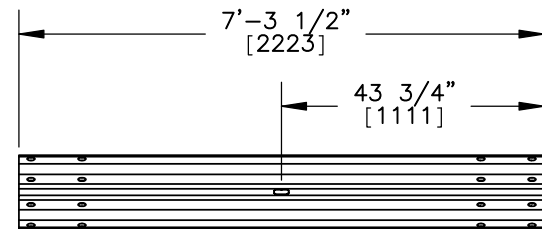


part a19
6" [152] W-Beam Backup Plate, 12 gauge



SECTION L-L
DETAIL M
SCALE 1 : 16

part b2
6'-3" [1905] W-Beam Section, 12 gauge,
Full Post Spacing



DETAIL N
SCALE 1 : 16



Midwest Roadside
Safety Facility

MGS Bridge Rail

Rail Section Details

DWG. NAME.
MGS Bridge Rail_V13

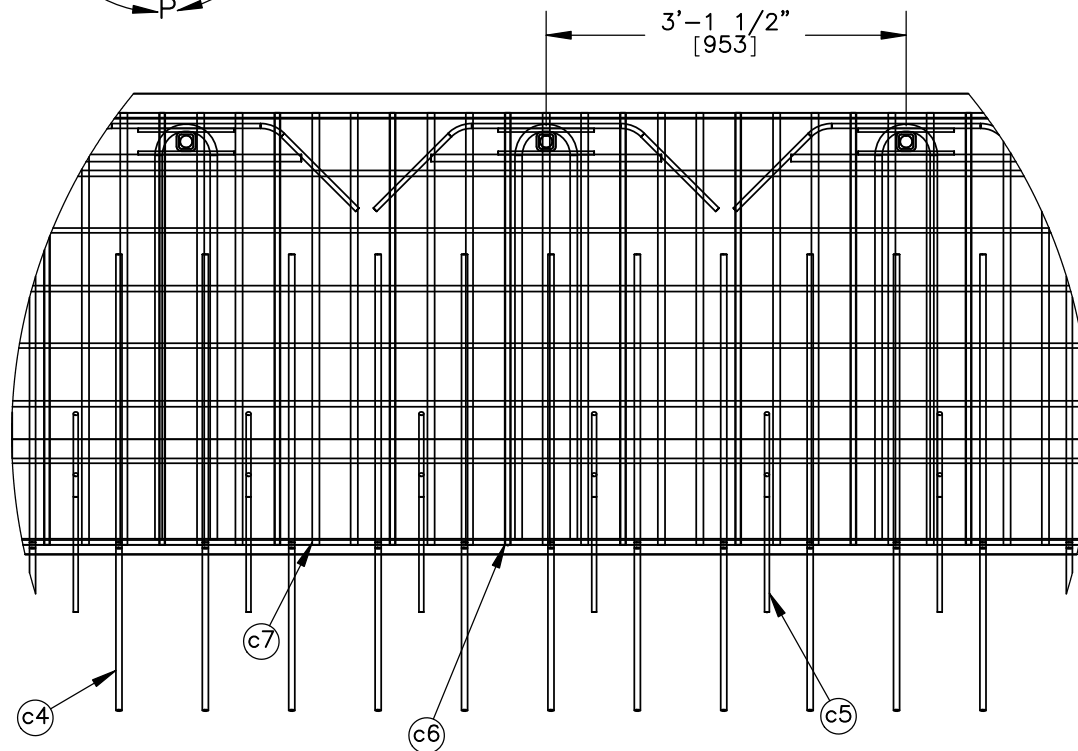
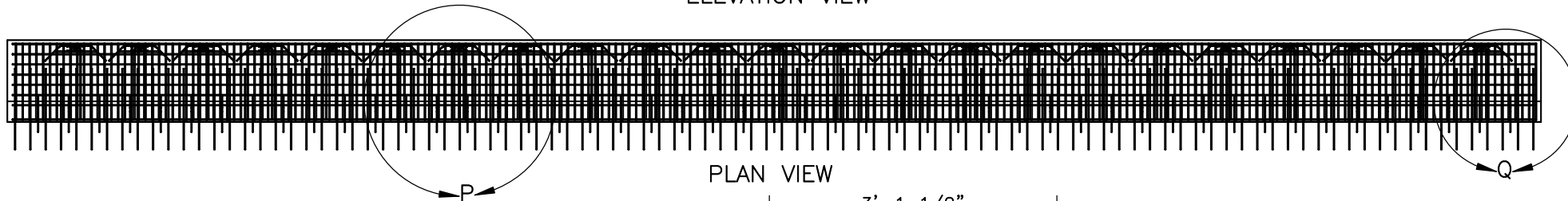
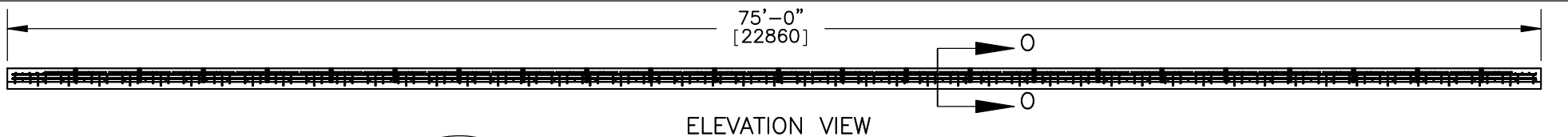
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UNITS: In.[mm]

SHEET:
16 of 26

DATE:
11/19/2009

DRAWN BY:
MW/RJT

REV. BY:
KAL/EJ/RF



- NOTES: (1) The concrete for the bridge deck should have a minimum 28-day concrete compressive strength of 4,000 psi [27.6 MPa].
- (2) Shift transverse bars which interfere with vertical bolt sleeves to the side of the tubes, as needed.
- (3) For c1 and c2 use any number of pieces to fit the length with a minimum of 18" [457] and 24" [610] laps, respectively.



Midwest Roadside
Safety Facility

MGS Bridge Rail

Bridge Deck Details

DWG. NAME.
MGS Bridge Rail_V13

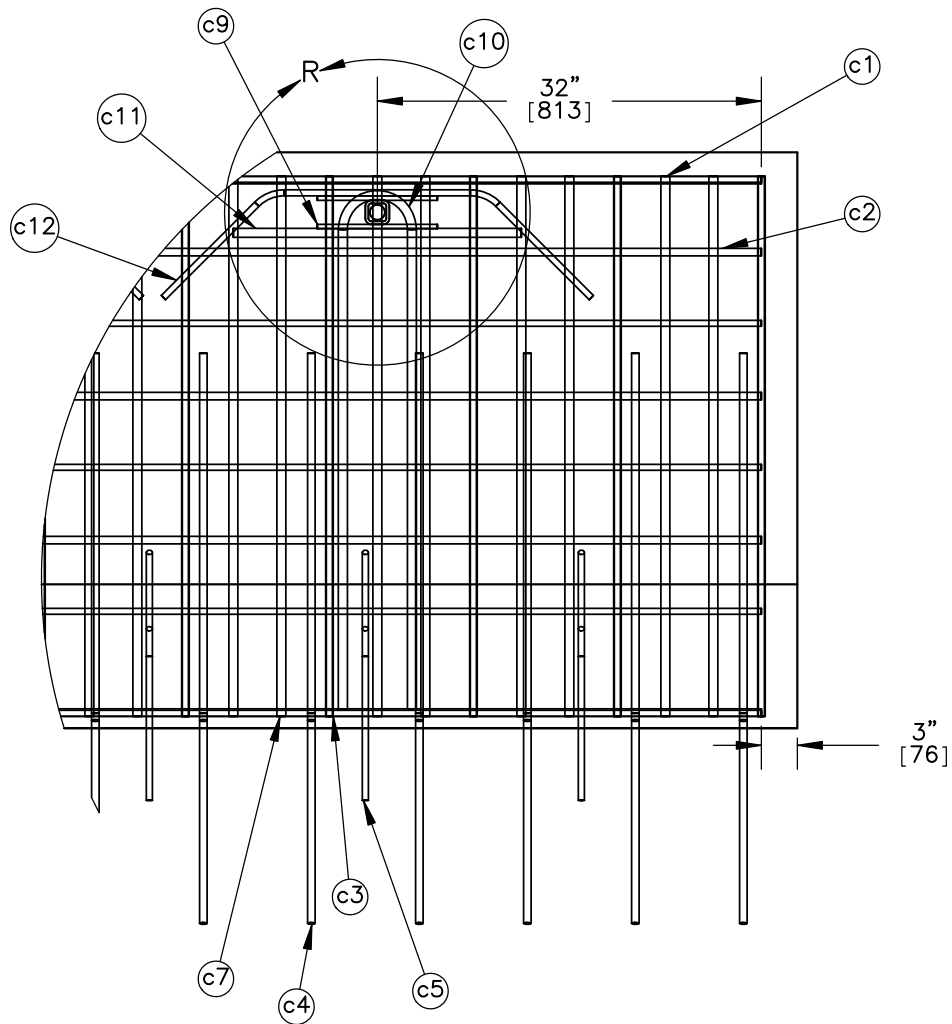
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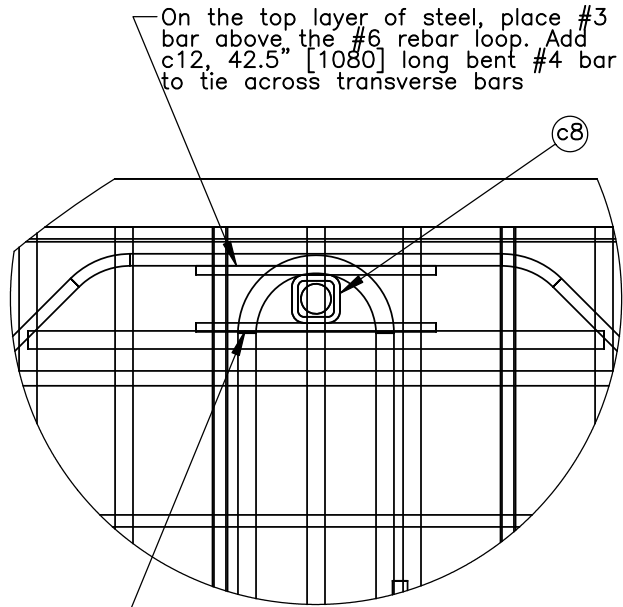
DATE:
11/19/2009

DRAWN BY:
MW/RJT

REV. BY:
KAL/EJ/RF



DETAIL Q



On the top layer of steel, place #3 bar above the #6 rebar loop. Add c12, 42.5" [1080] long bent #4 bar to tie across transverse bars

DETAIL R
SCALE 1 : 8

On the bottom layer of steel, tie #3 bar above the #6 bars. These bars are tied to the #5 bars in the deck. Add c11, 24" [610] long #6 bar



Midwest Roadside
Safety Facility

MGS Bridge Rail

Bridge Deck Details

DWG. NAME.
MGS Bridge Rail_V13

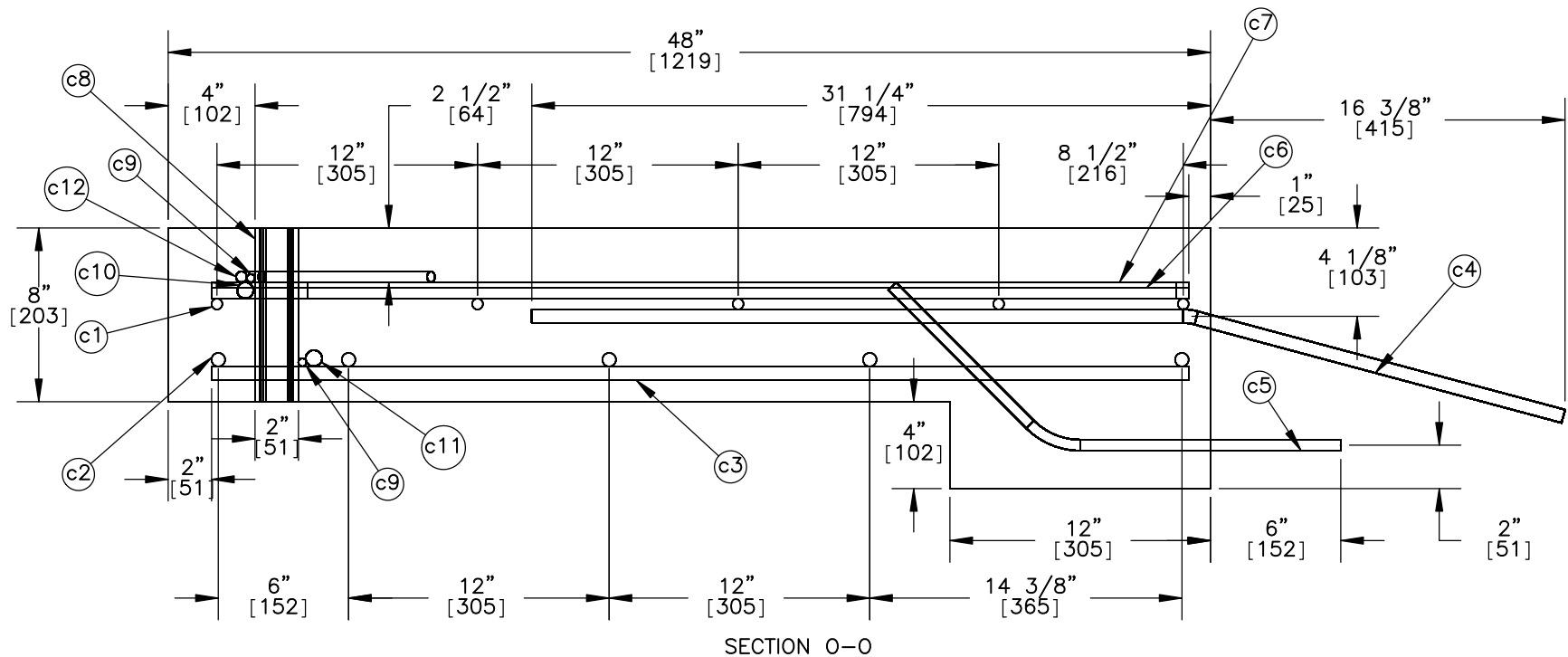
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DATE:
11/19/2009

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- Notes:
- (1) Tie #4 and #6 bars to #3 bars after placement in the deck.
 - (2) The bottom of #4 and #6 bars are tied at the same plane as the bottom of the #3 bars. These bars are not centered.
 - (3) For c1 and c2 use any number of pieces to fit the length with a minimum of 18" [457] and 24" [610] laps, respectively.



Midwest Roadside
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MGS Bridge Rail

Bridge Deck Details

DWG. NAME.
MGS Bridge Rail_V13

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

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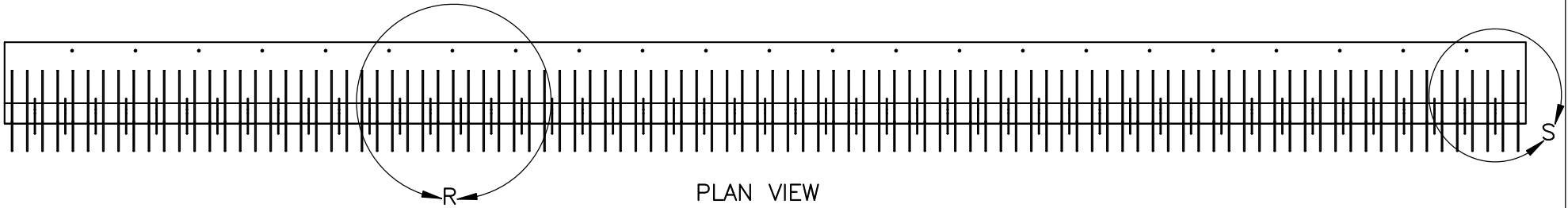
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11/19/2009

DRAWN BY:
MW/RJT

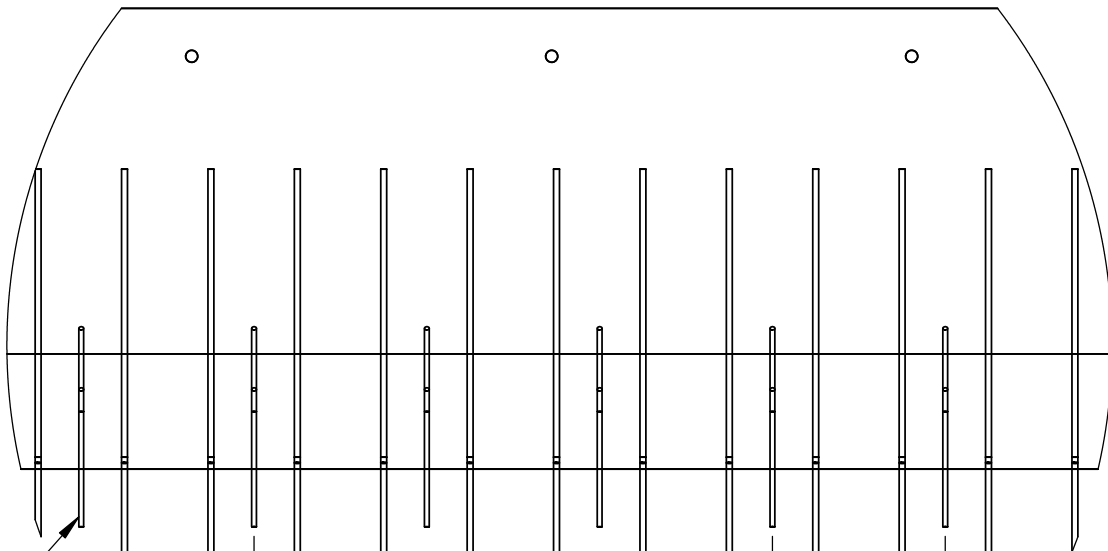
REV. BY:
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ELEVATION VIEW

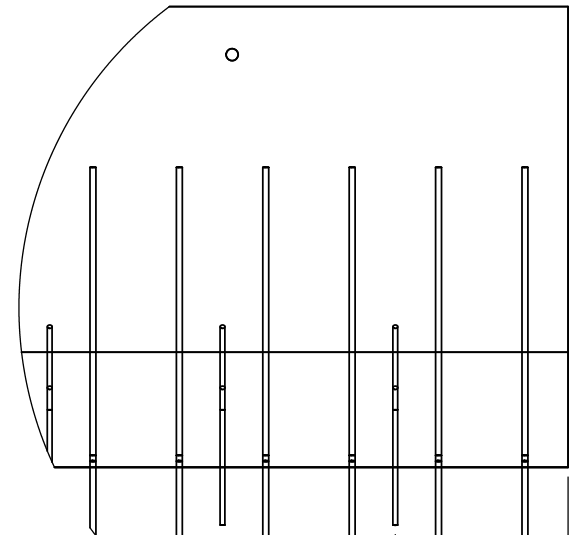


PLAN VIEW



DETAIL R
SCALE 1 : 20
9" [229]
4 1/2" [114]

18" [457]



DETAIL S
SCALE 1 : 20
13 1/2" [343]
4 1/2" [114]



Midwest Roadside
Safety Facility

MGS Bridge Rail

Description of View

DWG. NAME.
MGS Bridge Rail_V13

SCALE: 1:90
UNITS: In.[mm]

SHEET:
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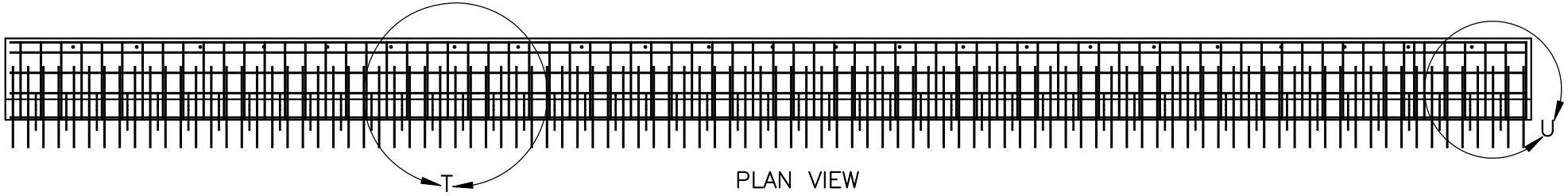
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11/19/2009

DRAWN BY:
MW/RJT

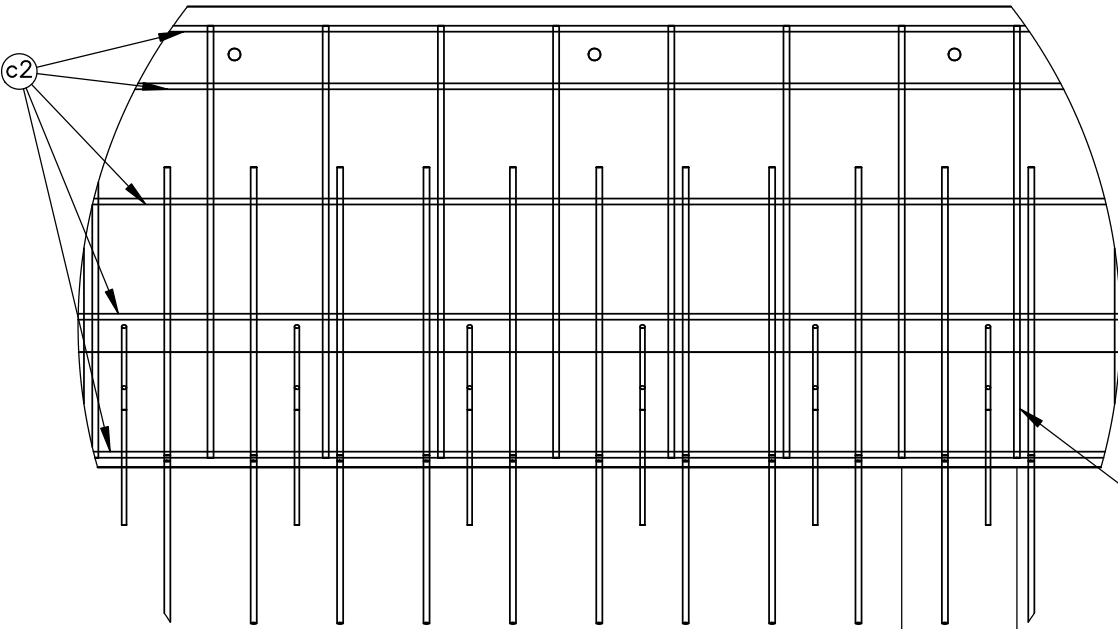
REV. BY:
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ELEVATION VIEW

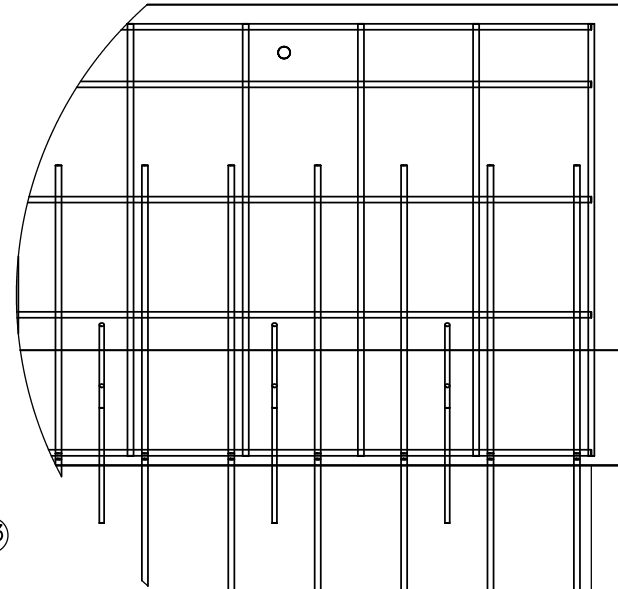


PLAN VIEW



DETAIL T
SCALE 1 : 20

12"
[305]



DETAIL U
SCALE 1 : 20

3"
[76]



Midwest Roadside
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MGS Bridge Rail

Bridge Deck Bottom Rebar
with Dowels

DWG. NAME.
MGS Bridge Rail_V13

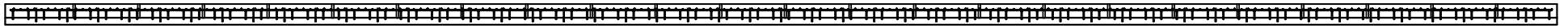
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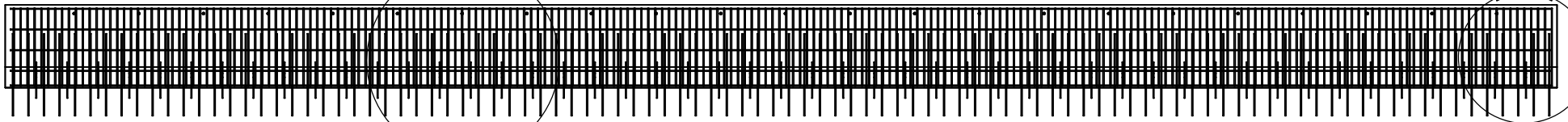
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11/19/2009

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MW/RJT

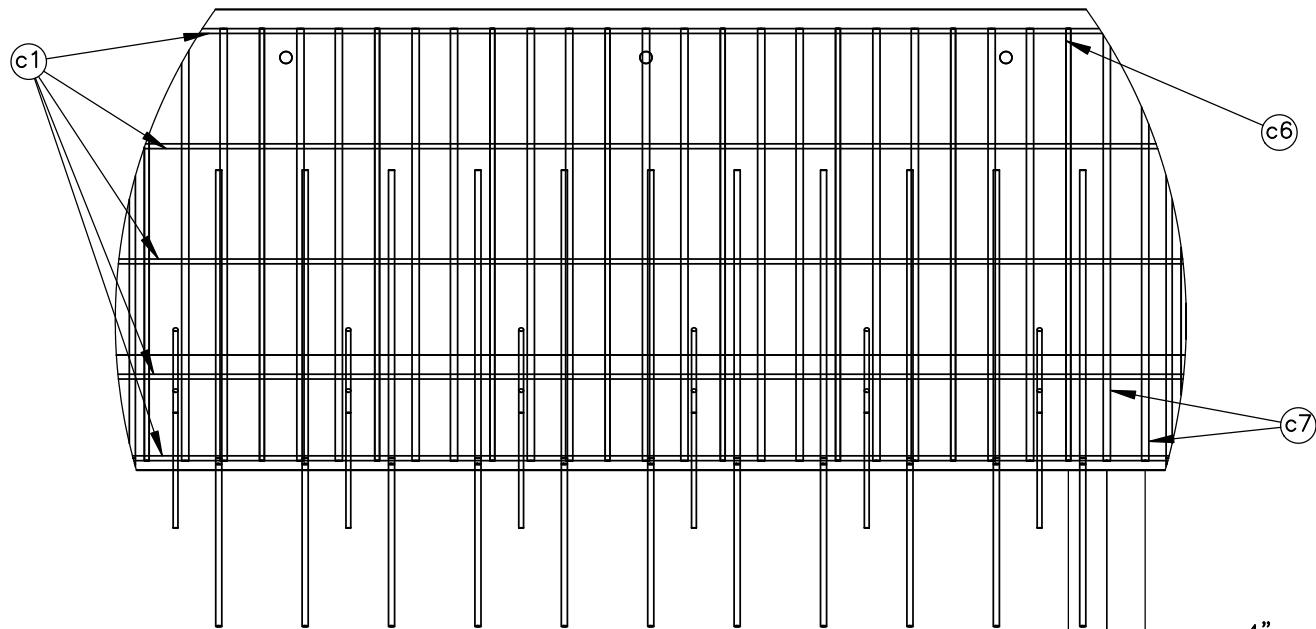
REV. BY:
KAL/EJ/RF



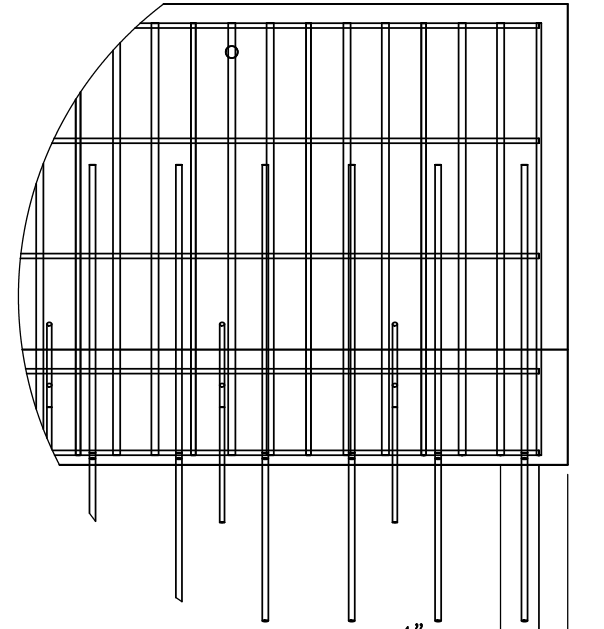
ELEVATION VIEW



PLAN VIEW



DETAIL V
SCALE 1 : 20



DETAIL W
SCALE 1 : 20



Midwest Roadside
Safety Facility

MGS Bridge Rail

Bridge Deck Top Rebar with
Dowels

DWG. NAME:
MGS Bridge Rail_V13

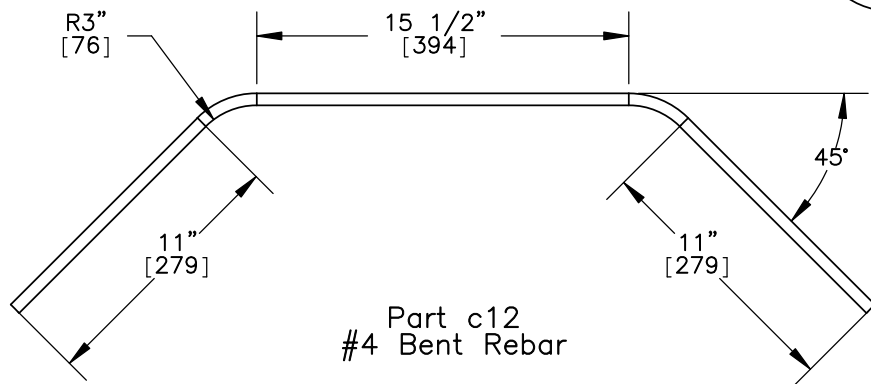
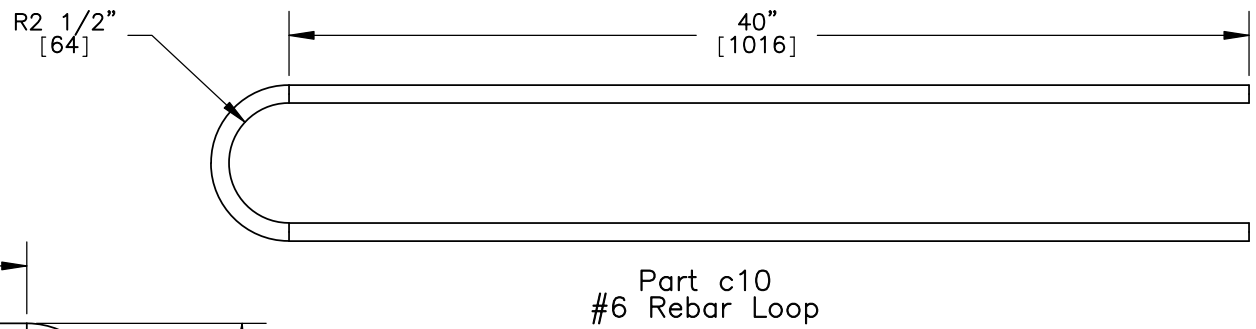
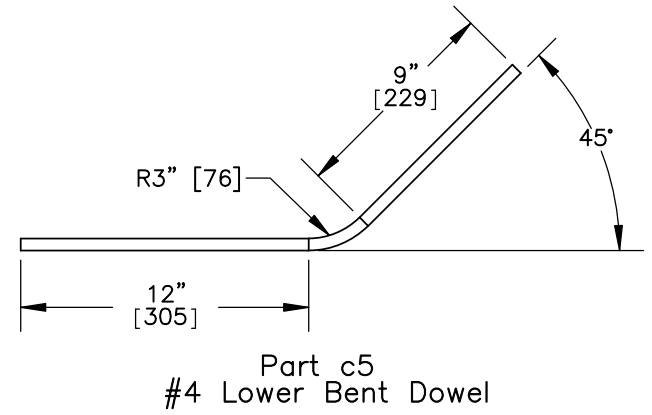
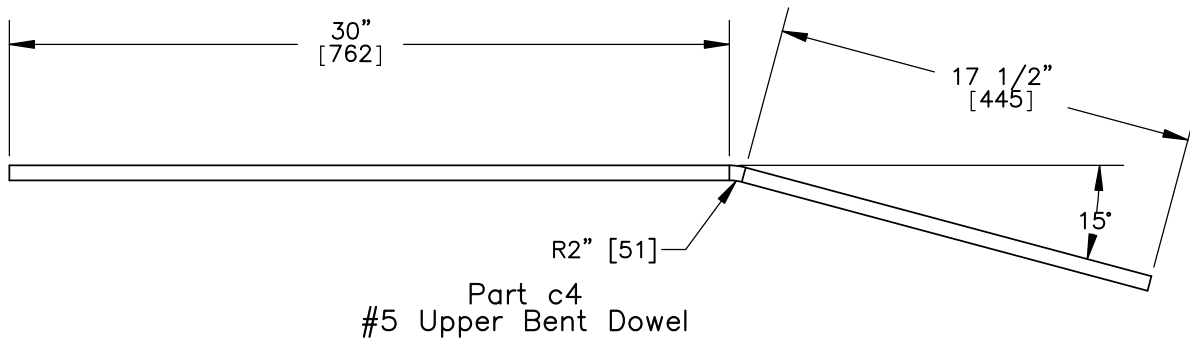
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UNITS: In.[mm]

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Midwest Roadside
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MGS Bridge Rail

Bent Rebar

DWG. NAME.
MGS Bridge Rail_V13

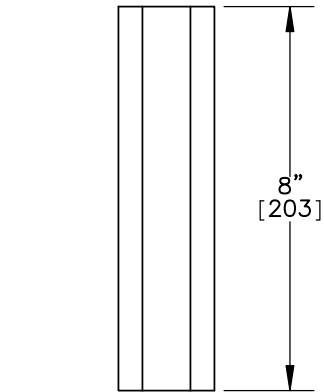
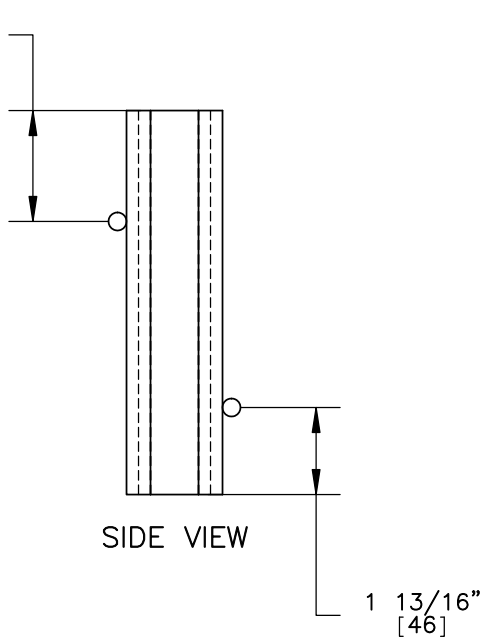
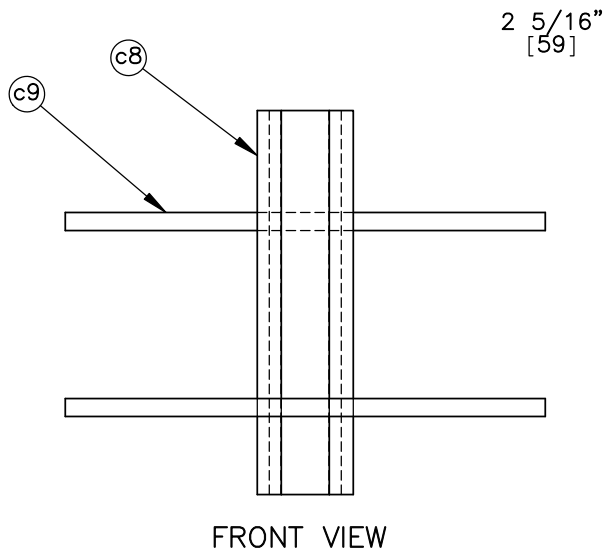
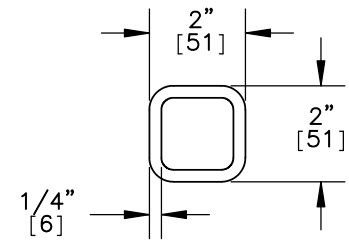
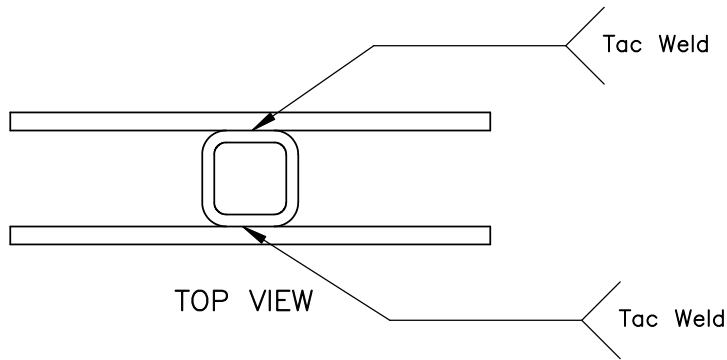
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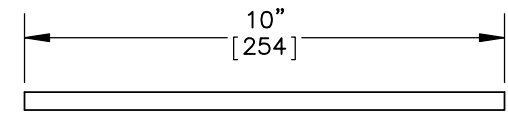
DATE:
11/19/2009

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Part c8
Vertical Bolt Sleeve



#3 10" [254] long rebar

- Notes: (1) Vertical Bolt Sleeve to be galvanized after fabrication.
 (2) For placement in construction, weld #3 bars onto tube prior to galcanization.

 Midwest Roadside Safety Facility	MGS Bridge Rail	SHEET: 24 of 26
	Vertical Bolt Sleeve Assembly	DATE: 11/19/2009
DWG. NAME: MGS Bridge Rail_V13	SCALE: 1:4 UNITS: In.[mm]	DRAWN BY: MW/RJT
		REV. BY: KAL/EJ/RF

MGS Bridge Rail System				
Item No.	QTY.	Description	Material Specification	Hardware
a1	23	S3x5.7 [S76x8.5], 44" [1118] Long Steel Post	ASTM A992 Grade 50 Steel Galvanized	—
a2	92	2 3/4"x1"x1/4" [70x25x6] S3x5.7 Post Standoff	A36 Steel Galvanized	—
a3	23	4"x4"x3/8" [102x102x10], 14 1/2" [368] Long SQ Tube	A500 Grade B Steel Galvanized	—
a4	23	7 1/2"x3"x7/16" [191x76x11] Top Mounting Plate	A572 Grade 50 Steel Galvanized	—
a5	23	Top Mounting Plate Gusset	A36 Steel Galvanized	—
a6	23	5/8" [16] Dia. UNC, 5" [127] Long Hex Bolt	ASTM A325 Type 1 Galvanized	FBX16a
a7	6	12'-6" [3810] W-Beam MGS Section 1/2 Post Spacing	12 gauge AASHTO M180	—
a8	23	L7"x4"x3/8" [L178x102x10] Bottom Mounting Plate	A36 Steel Galvanized	—
a9	23	3"x3"x1/2" [76x76x13] Bottom Mounting Plate Gusset	A36 Steel Galvanized	—
a10	23	6 1/2"x2"x3/8" [165x51x10] Backside Retainer Plate	A36 Steel Galvanized	—
a11	23	5/16" [8] Dia. Hex Nut	Grade 5	—
a12	23	5/16" [8] Dia. UNC, 1 1/4" [32] Long Hex Bolt	Grade A307	FBX08a
a13	23	1 3/4"x1 3/4"x1/8" [44x44x3] Square Guardrail Washer	A36 Steel	RWR01
a14	23	1" [25] Dia. UNC, 11" [279] Long Hex Bolt	Grade 5	—
a15	46	1" [25] Flat Washer	F436 Grade 1 Galvanized	—
a16	24	1" [25] Dia. Hex Nut	ASTM A563 DH Galvanized	FBX24a
a17	46	1/2" [13] Dia. UNC, 6" [152] Long Fully Threaded Hex Bolt	ASTM A325 Type 1 Galvanized	FBX14a
a18	46	1/2" [13] Dia. Hex Nut	ASTM A563 DH Galvanized	FBX14a
a19	23	6" [152] W-Beam Backup Plate	12 gauge AASHTO M180	—
a20	44	5/8" [16] Flat Washer	F436 Grade 1	FWC166
b1	6	12'-6" [3810] W-Beam MGS Section Full Post Spacing	12 gauge AASHTO M180	—
b2	1	6'-3" 1905] W-Beam MGS Section	12 gauge AASHTO M180	—
b3	47	5/8" [16] Dia. Hex Nut	ASTM A563 DH Galvanized	FBX16a
b4	112	5/8" [16] Dia. UNC, 1 1/2" [38] Long Guardrail Bolt and Nut	Grade A307	FBB01
b5	2	12'-6" [3810] W-Beam MGS End Section	12 gauge AASHTO M180	RWM04a
b6	13	W6x8.5 [W152x12.6] or W6x9 [W152x13.4], 72" [1829] Long	ASTM A992 Steel	PWE06
b7	13	6"x12"x14 1/4" [152x305x362] Blockout	SYP Grade No.1 or better	—
b8	13	5/8" [16] Dia. UNC, 14" [356] Long Guardrail Bolt and Nut	Grade A307	FBB06
b9	13	16D Double Head Nail	—	—



Midwest Roadside
Safety Facility

MGS Bridge Rail

Bill of Materials

DWG. NAME.
MGS Bridge Rail_V13

SCALE: 1:384
UNITS: In.[mm]

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DATE:
11/19/2009

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KAL/EJ/RF

MGS Bridge Rail System

Item No.	QTY.	Description	Material Specification	Hardware
c1	5	74'-6" [22.7m] Long #4 Straight Rebar	Grade 60	-
c2	5	74'-6" [22.7m] Long #5 Straight Rebar	Grade 60	-
c3	76	45" [1143] Long #5 Straight Rebar	Grade 60	-
c4	100	#5 Upper Bent dowel, total length unbent 42" [1067]	Grade 60	-
c5	49	#4 Lower Bent Dowel, total length unbent 23 1/2" [597]	Grade 60	-
c6	75	45" [1143] Long #4 Transverse Bar	Grade 60	-
c7	149	45" [1143] Long #6 Transverse Bar	Grade 60	-
c8	23	2"x2"x1/4" [51x51x6], 8" [203] Long Bolt Sleeves	ASTM A500 Grade B	-
c9	46	10" [254] Long #3 Straight Rebar	Grade 60	-
c10	23	#6 Rebar Loop, Total Length Unbent 89" [2261]	Grade 60	-
c11	23	24" [610] Long #6 Straight Rebar	Grade 60	-
c12	23	#4 Bent Rebar, Total Length Unbent 42 1/2" [1080]	Grade 60	-
c13	1	Concrete Deck	f'c = 4,000 psi	-
d1	4	72" [1829] Long Foundation Tube	ASTM A53 Grade B Schedule 40	PTE05
d2	4	BCT Timber Post -MGS Height	SYP Grade No. 1 or better	PDF01
d3	2	67" [1702] Long Straight Ground Strut	C6x8.2 Channel Section A36 Steel	PFP01
d4	4	Yoke	A36 Steel	PFP01
d5	2	Anchor Bracket End Plate	A36 Steel	FPA01
d6	2	5"x8"x5/8" [127x203x16] Anchor Bearing Plate	A36 Steel	FPB01
d7	2	Anchor Bracket	A36 Steel	FPA01
d8	2	2" [51] Schedule 10"x6" [254x152] Long BCT Hole Insert	ASTM A53 Grade B	FMM02
d9	4	5/8" [16] Dia. UNC, 10" [254] Long Guardrail Bolt	Grade A307	FBB03
d10	4	5/8" [16] Dia. UNC, 10" [254] Long Hex Head Bolt	A307	FBX16a
d11	4	7/8" [22] Dia. UNC, 7 1/2" [191] Long Hex Head Bolt	Grade 5	FBX22a
d12	4	7/8" [22] Dia. Hex Nut	Grade 5	FBX22a
d13	8	7/8" [22] Flat Washer	Grade 5	FWC22a
d14	16	5/8" [16] Dia. UNC, 1 1/2" [38] Long Hex Head Bolt	A307	FBX16a
d15	4	1" [25] Flat Washer	Grade 5	FWC24a
d16	2	BCT Anchor Cable Assembly	ø0.75" 6x9 IWRC IPS Galvanized Wire Rope	FCA01-02



Midwest Roadside
Safety Facility

MGS Bridge Rail

Bill of Materials Continued

DWG. NAME.
MGS Bridge Rail_V13

SCALE: 1:768
UNITS: In.[mm]

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