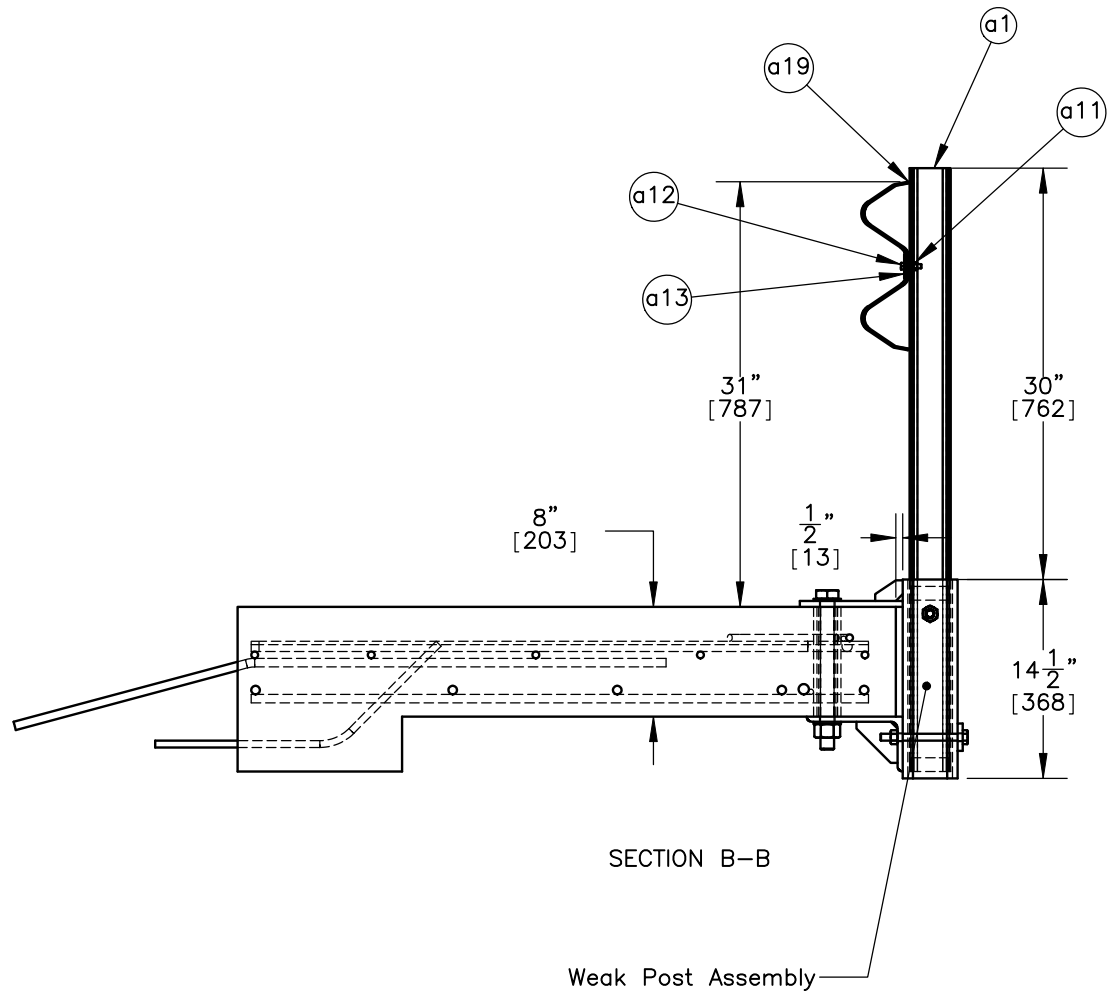


SECTION A-A



SECTION B-B

Weak Post Assembly



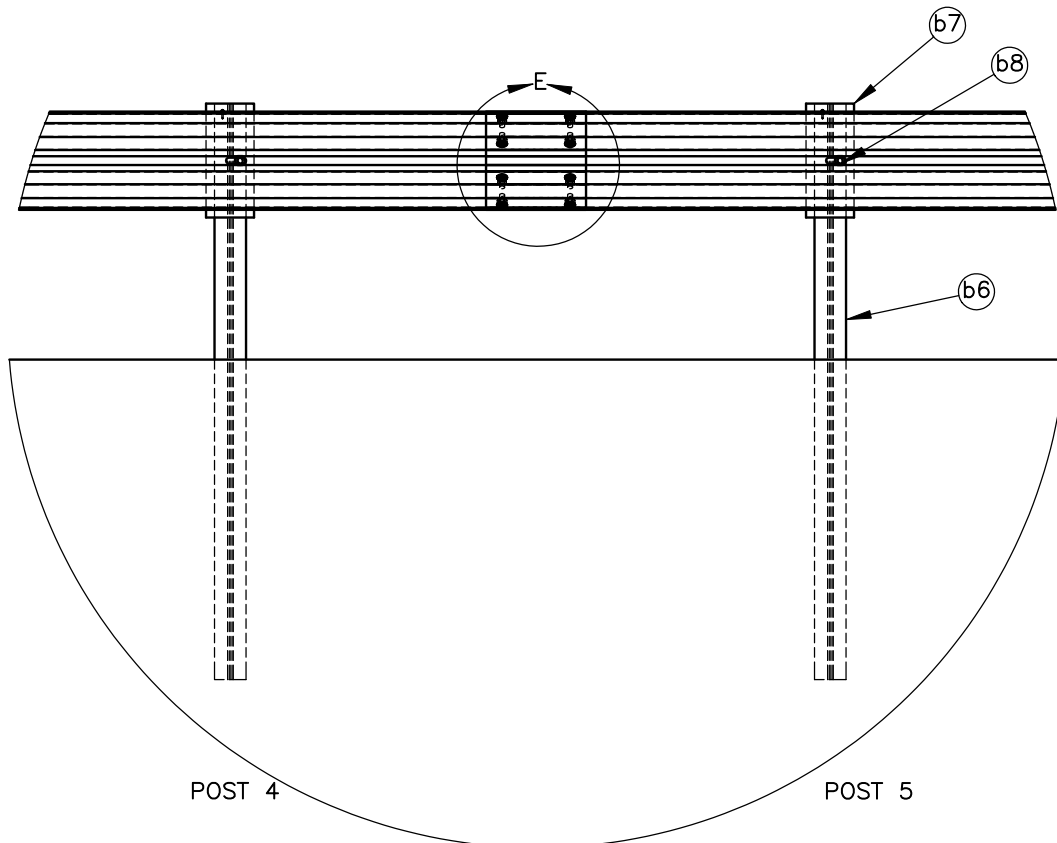
Midwest Roadside
Safety Facility

MGS Bridge Rail
Post Details

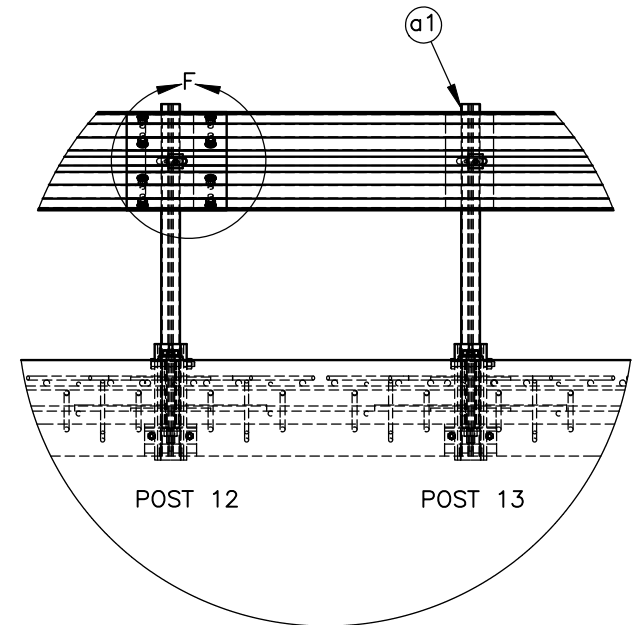
DWG. NAME.
MGS Bridge Rail_V13

SCALE: 1:14
UNITS: In.[mm]

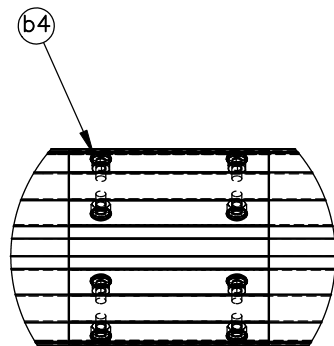
SHEET:
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DATE:
11/19/2009
DRAWN BY:
MW/RJT
REV. BY:
KAL/EJ/RF



SECTION C
END SECTION SPLICE DETAILS

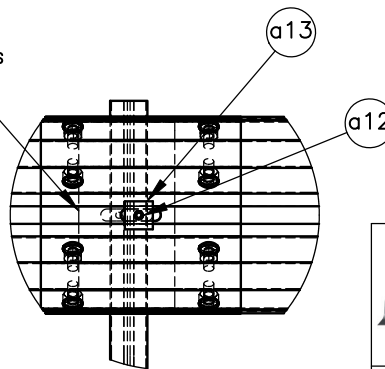


SECTION D
BRIDGE RAIL SECTIONSPLICE DETAILS

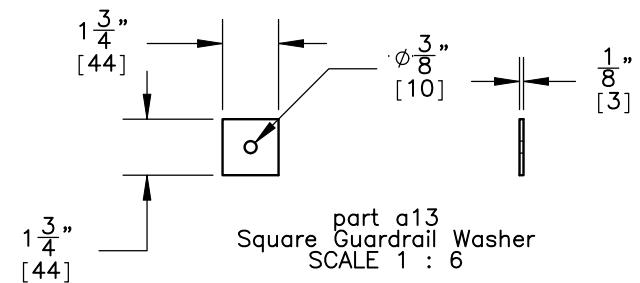


DETAIL E
SCALE 1 : 12

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

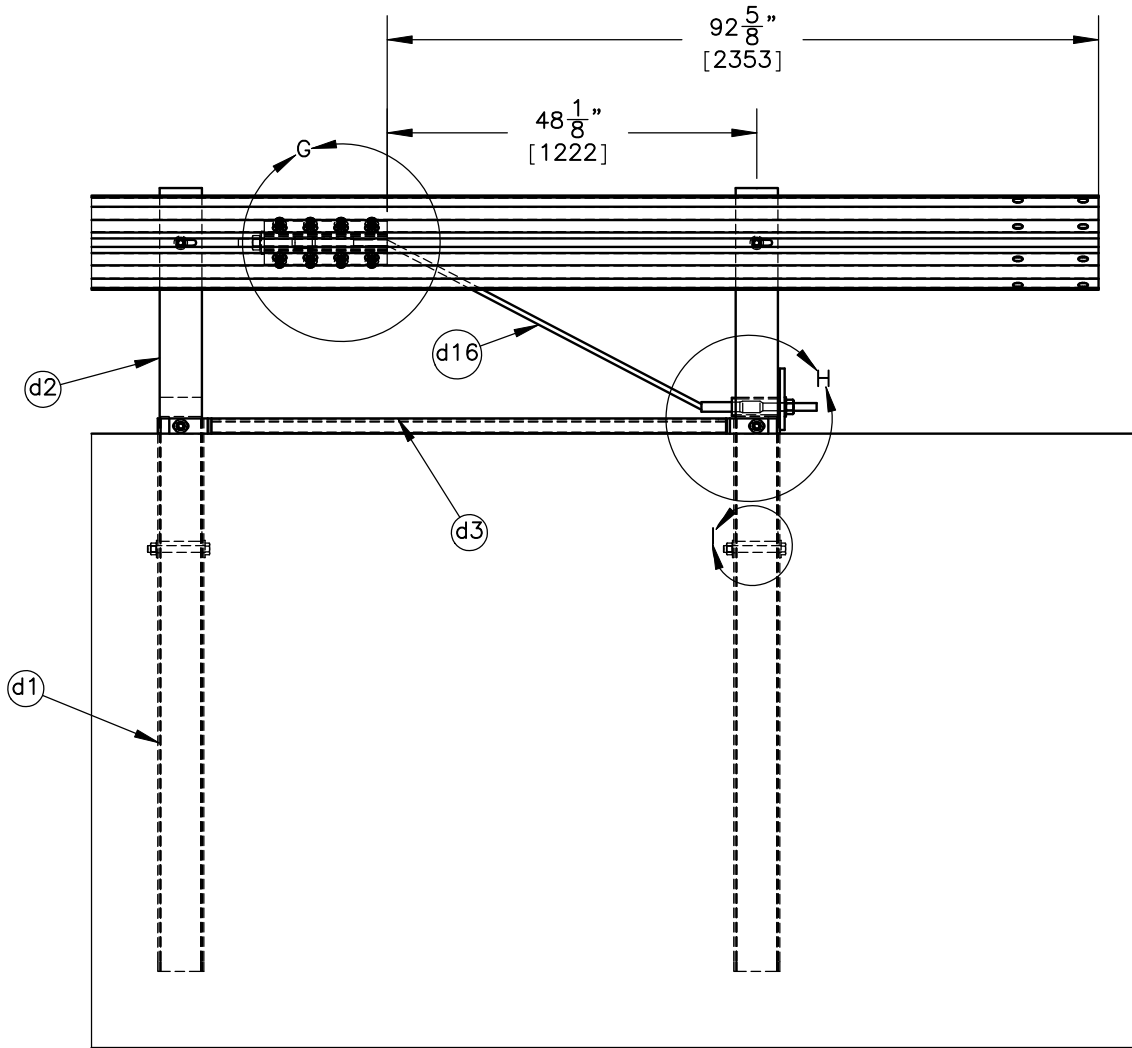
MGS Bridge Rail
Splice Details

DWG. NAME.
MGS Bridge Rail_V13

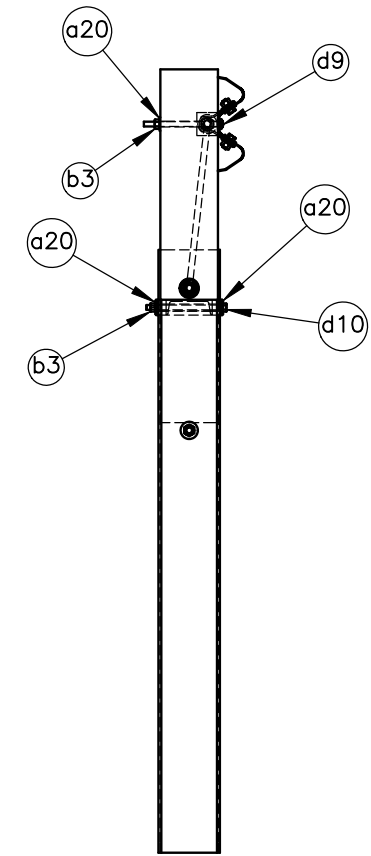
SCALE: 1:24
UNITS: In.[mm]

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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

SHEET:
4 of 26

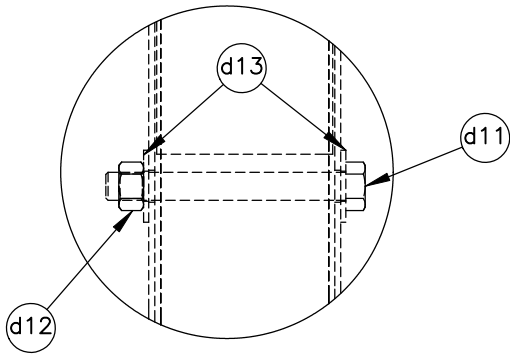
DATE:
11/19/2009

DRAWN BY:
MW/RJT

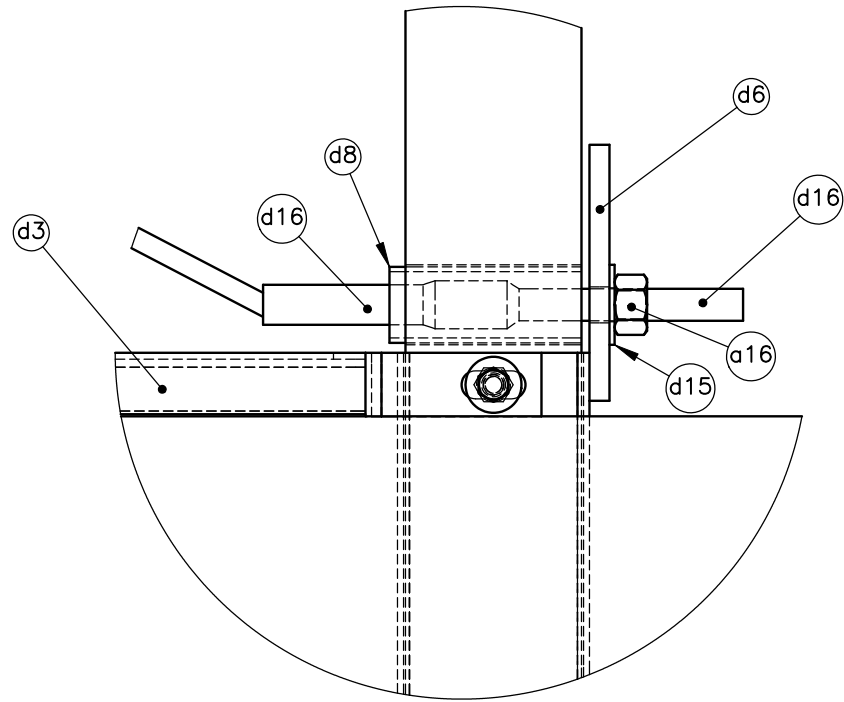
DWG. NAME:
MGS Bridge Rail_V13

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

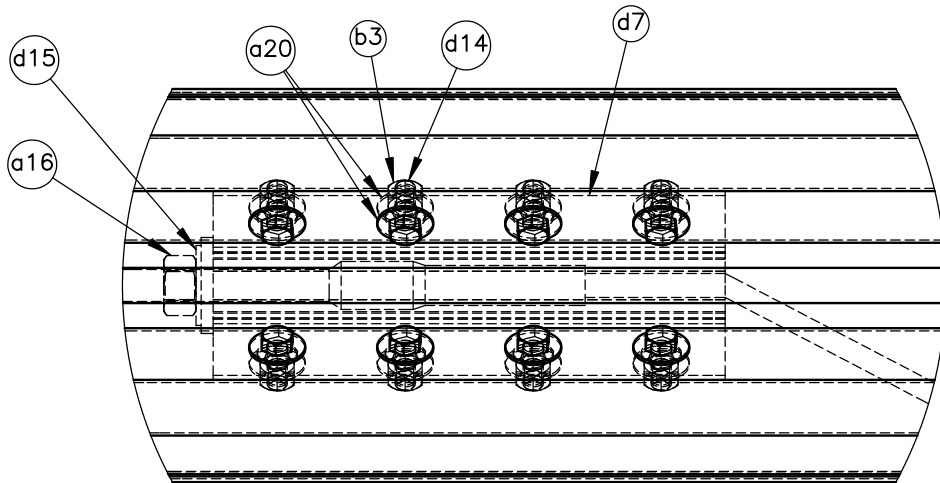
REV. BY:
KAL/EJ/RF



DETAIL I



DETAIL H



DETAIL G



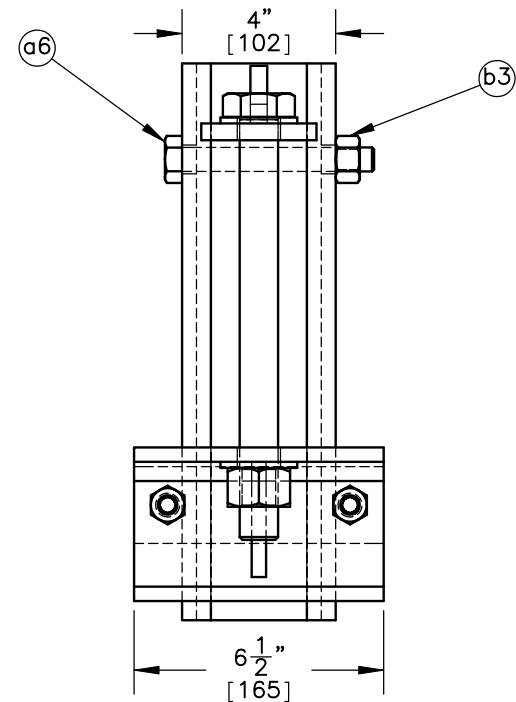
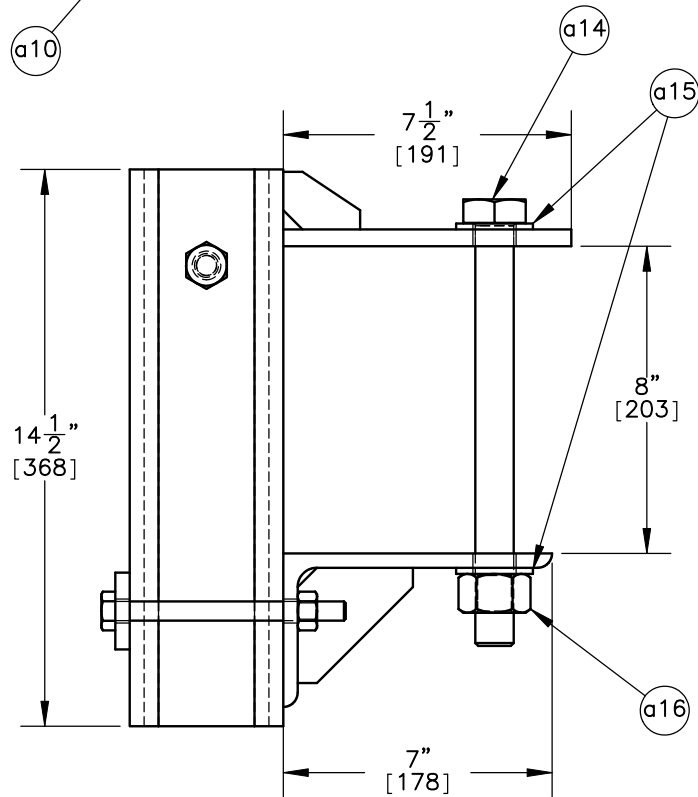
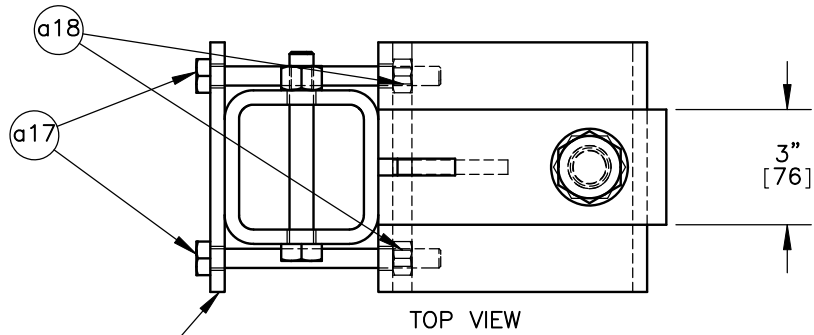
Midwest Roadside
Safety Facility

MGS Bridge Rail
Anchor Details

DWG. NAME.
MGS Bridge Rail_V13

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

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DATE:
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DRAWN BY:
MW/RJT
REV. BY:
KAL/EJ/RF



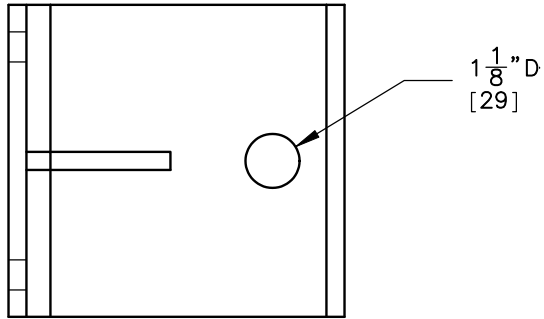
Midwest Roadside
Safety Facility

MGS Bridge Rail
Weak Post Assembly

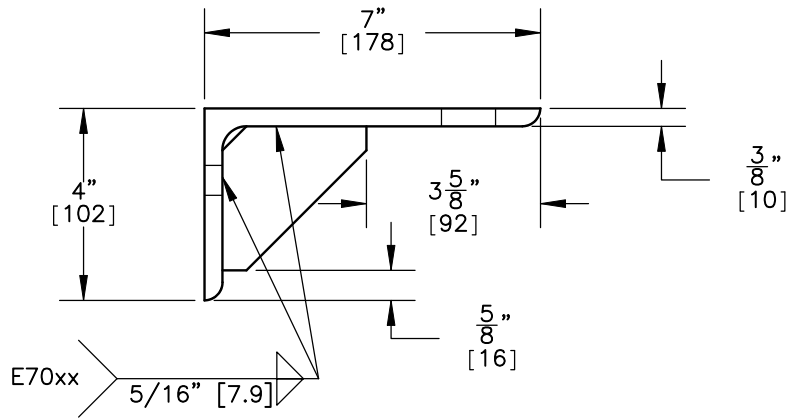
DWG. NAME.
MGS Bridge Rail_V13

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

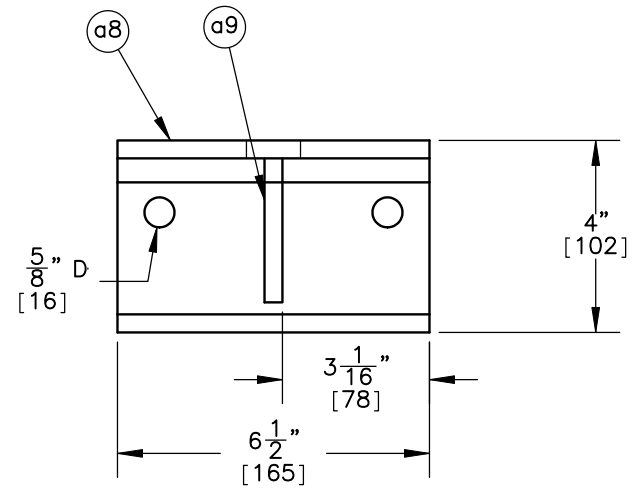
SHEET:
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DATE:
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DRAWN BY:
MW/RJT
REV. BY:
KAL/EJ/RF



TOP VIEW



SIDE VIEW



FRONT VIEW



Midwest Roadside
Safety Facility

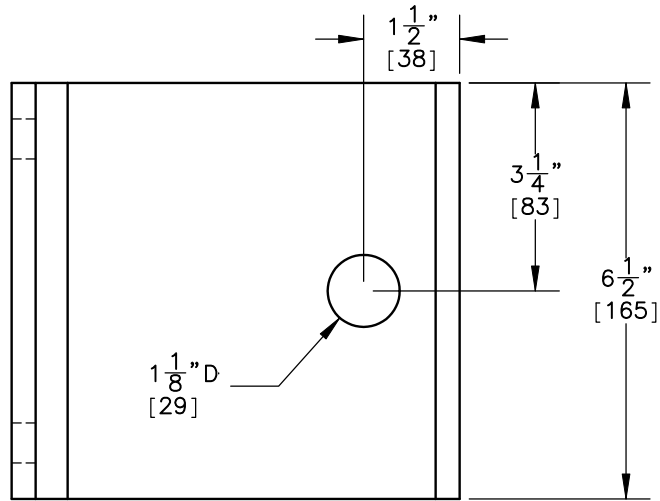
MGS Bridge Rail
Weak Post Mounting
Bracket-Bottom Assembly

DWG. NAME.
MGS Bridge Rail_V13

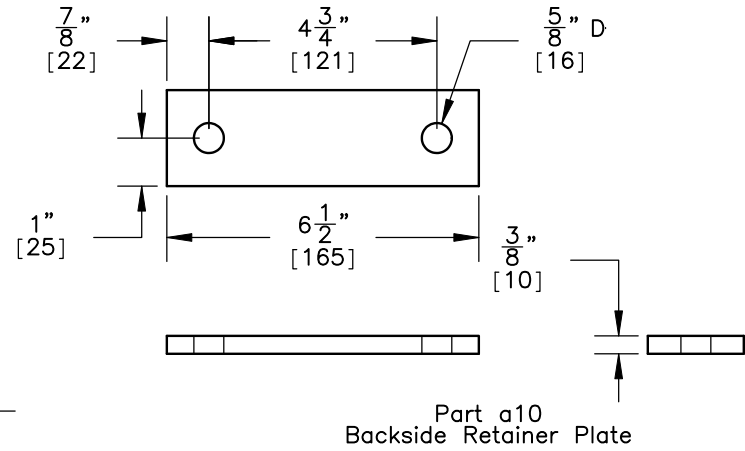
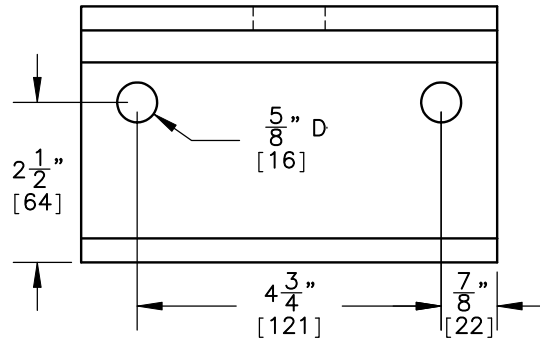
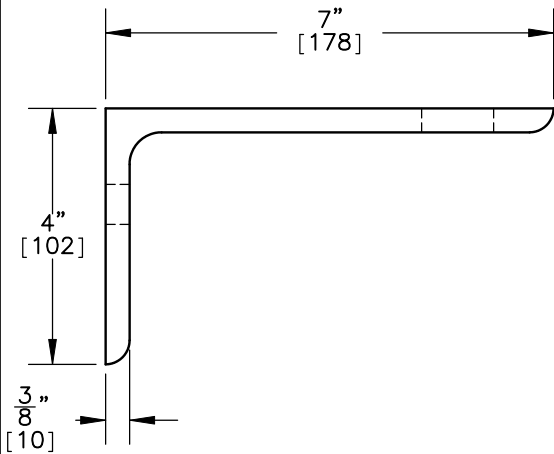
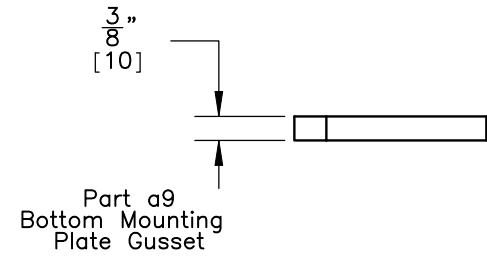
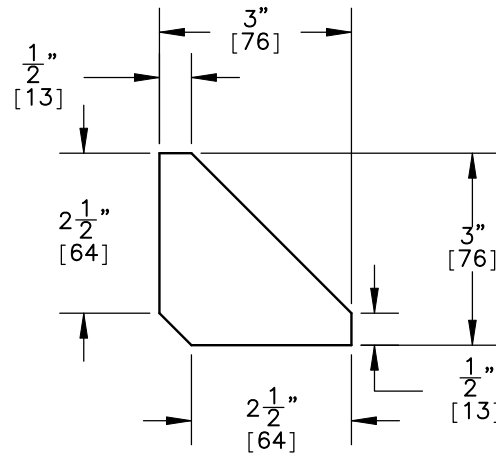
SCALE: 1:4
UNITS: In.[mm]

SHEET:
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DATE:
11/19/2009
DRAWN BY:
MW/RJT

REV. BY:
KAL/EJ/RF



Part a8
Bottom Mounting Plate



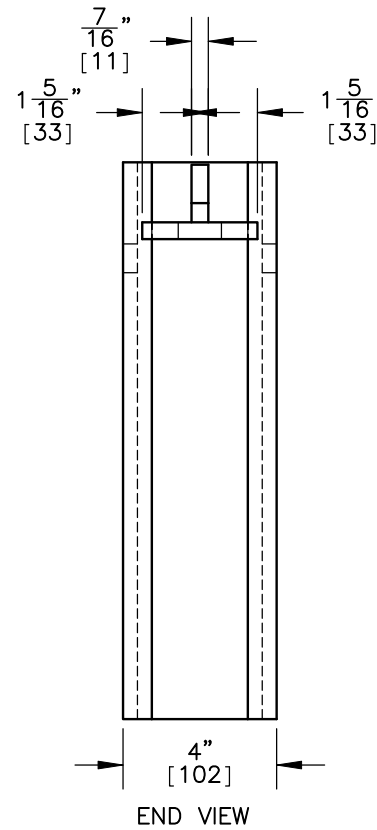
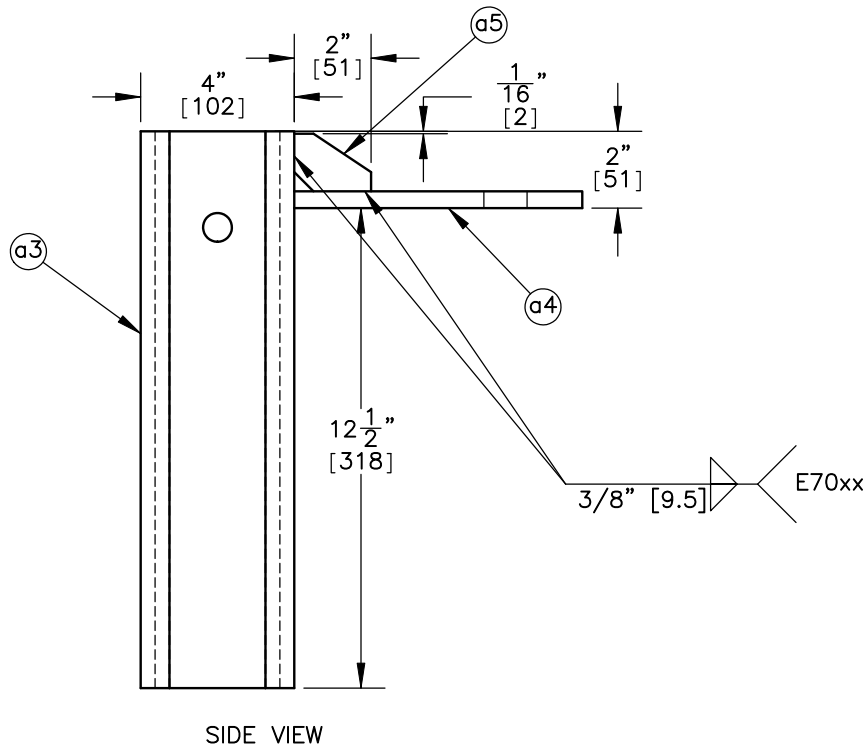
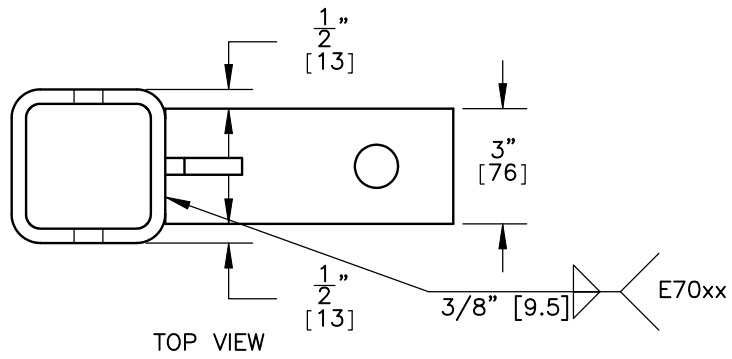
Midwest Roadside
Safety Facility

MGS Bridge Rail
Weak Post Mounting
Bracket-Bottom Assembly Details

DWG. NAME.
MGS Bridge Rail_V13

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

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DATE:
11/19/2009
DRAWN BY:
MW/RJT
REV. BY:
KAL/EJ/RF



Midwest Roadside
Safety Facility

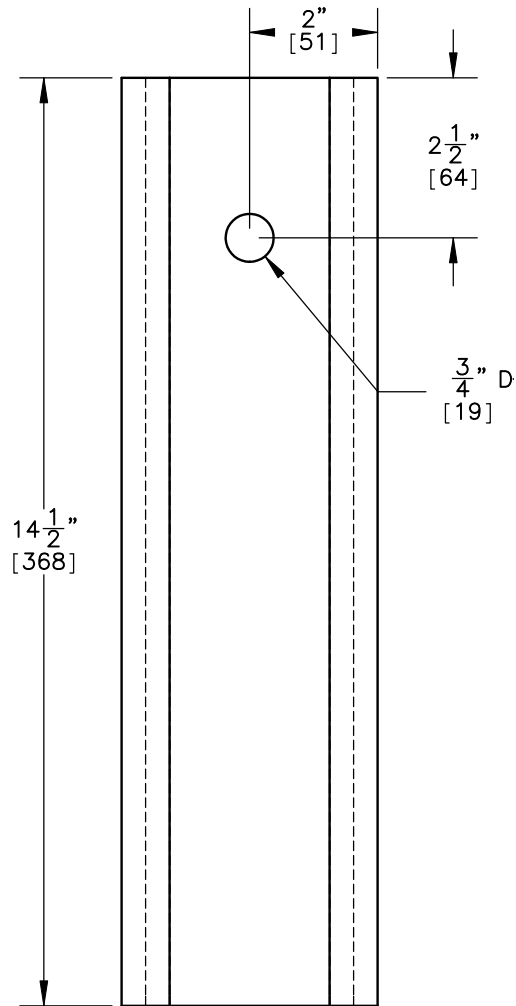
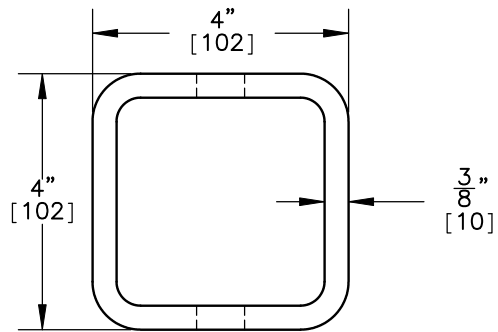
MGS Bridge Rail
Weak Post Mounting
Bracket-Top Assembly

DWG. NAME.
MGS Bridge Rail_V13

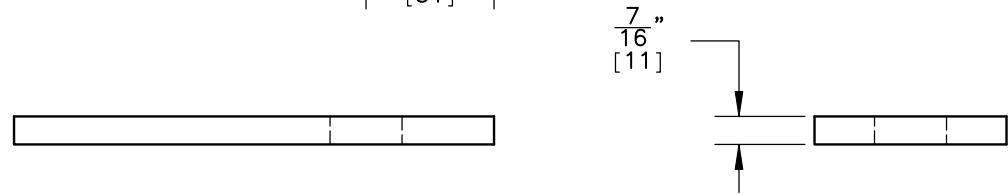
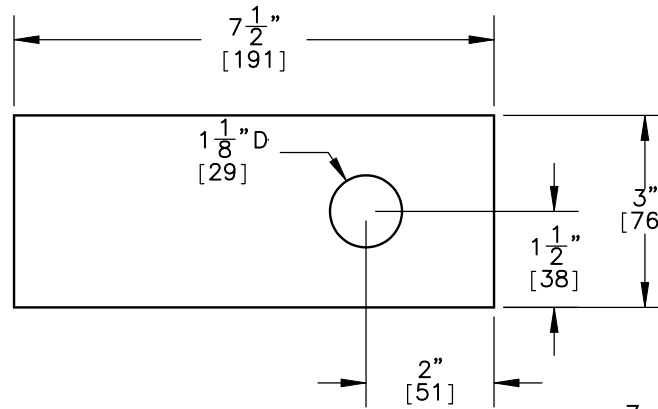
SCALE: 1:5
UNITS: In.[mm]

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DATE:
11/19/2009
DRAWN BY:
MW/RJT

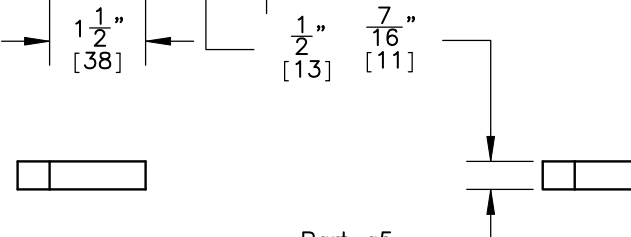
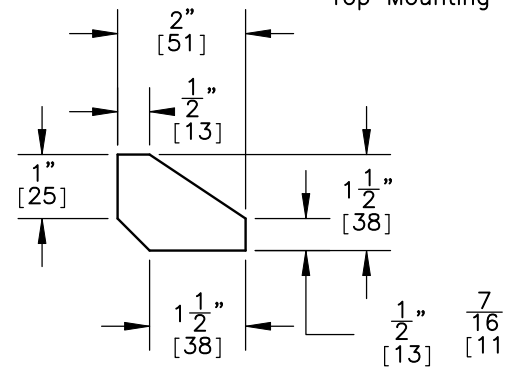
REV. BY:
KAL/EJ/RF



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



Part a4
Top Mounting Plate



Part a5
Top Mounting Plate Gusset



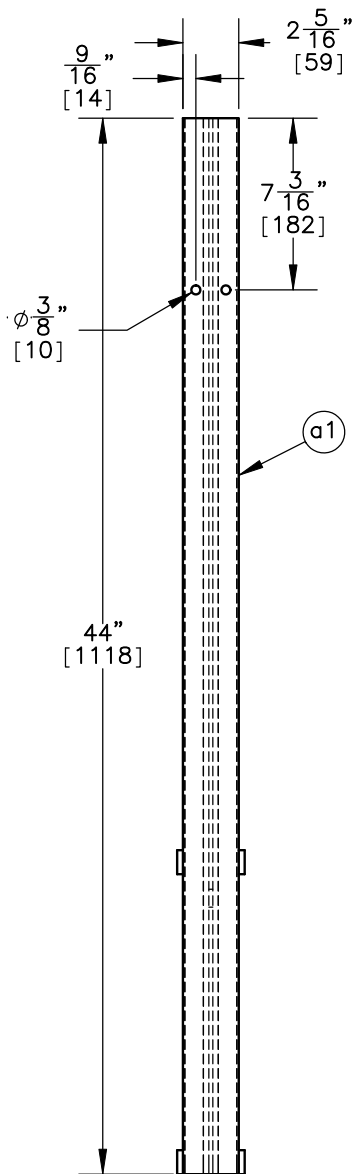
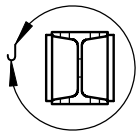
Midwest Roadside
Safety Facility

MGS Bridge Rail
Weak Post Mounting
Bracket-Top Assembly Details

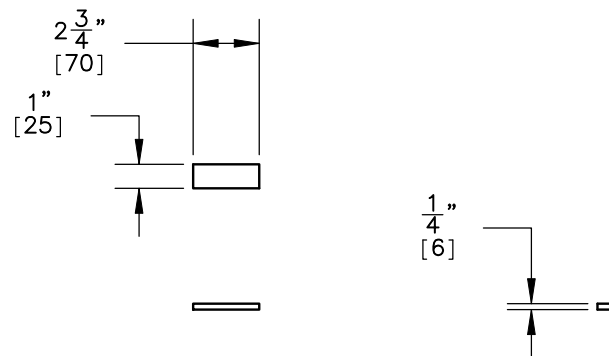
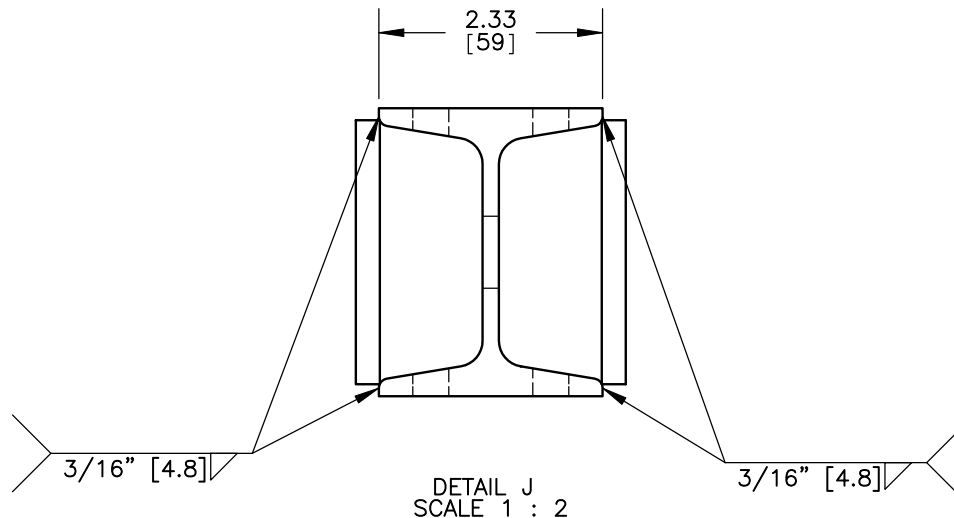
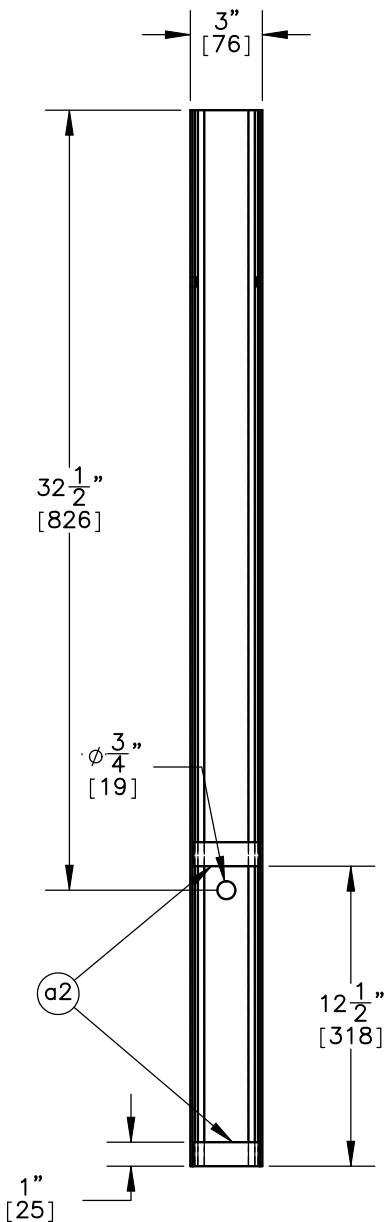
DWG. NAME.
MGS Bridge Rail_V13

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

SHEET:
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DATE:
11/19/2009
DRAWN BY:
MW/RJT
REV. BY:
KAL/EJ/RF



Part a1
S3x5.7 Post
[S76x8.5]

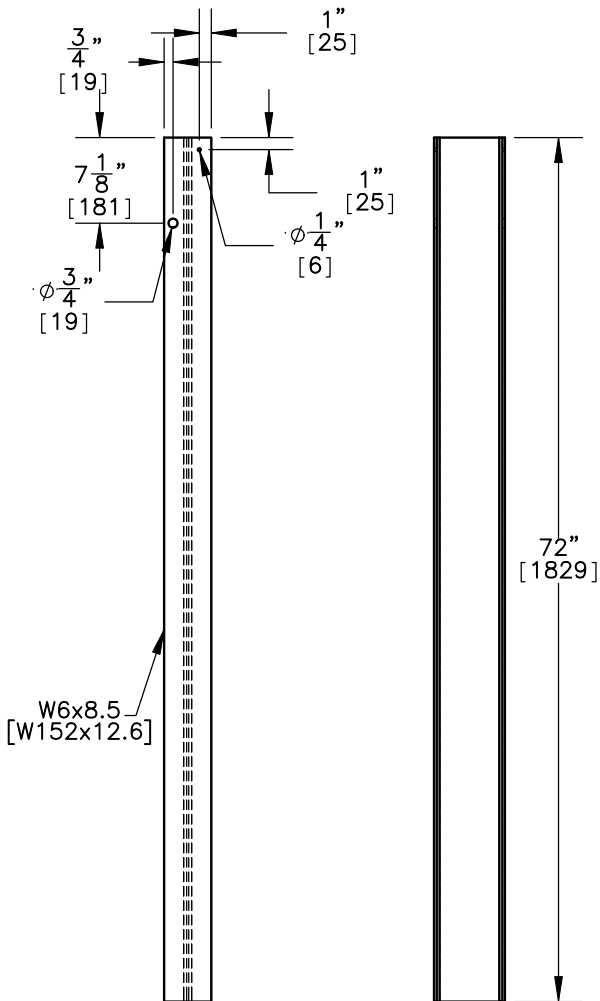


Part a2
Post
Standoff

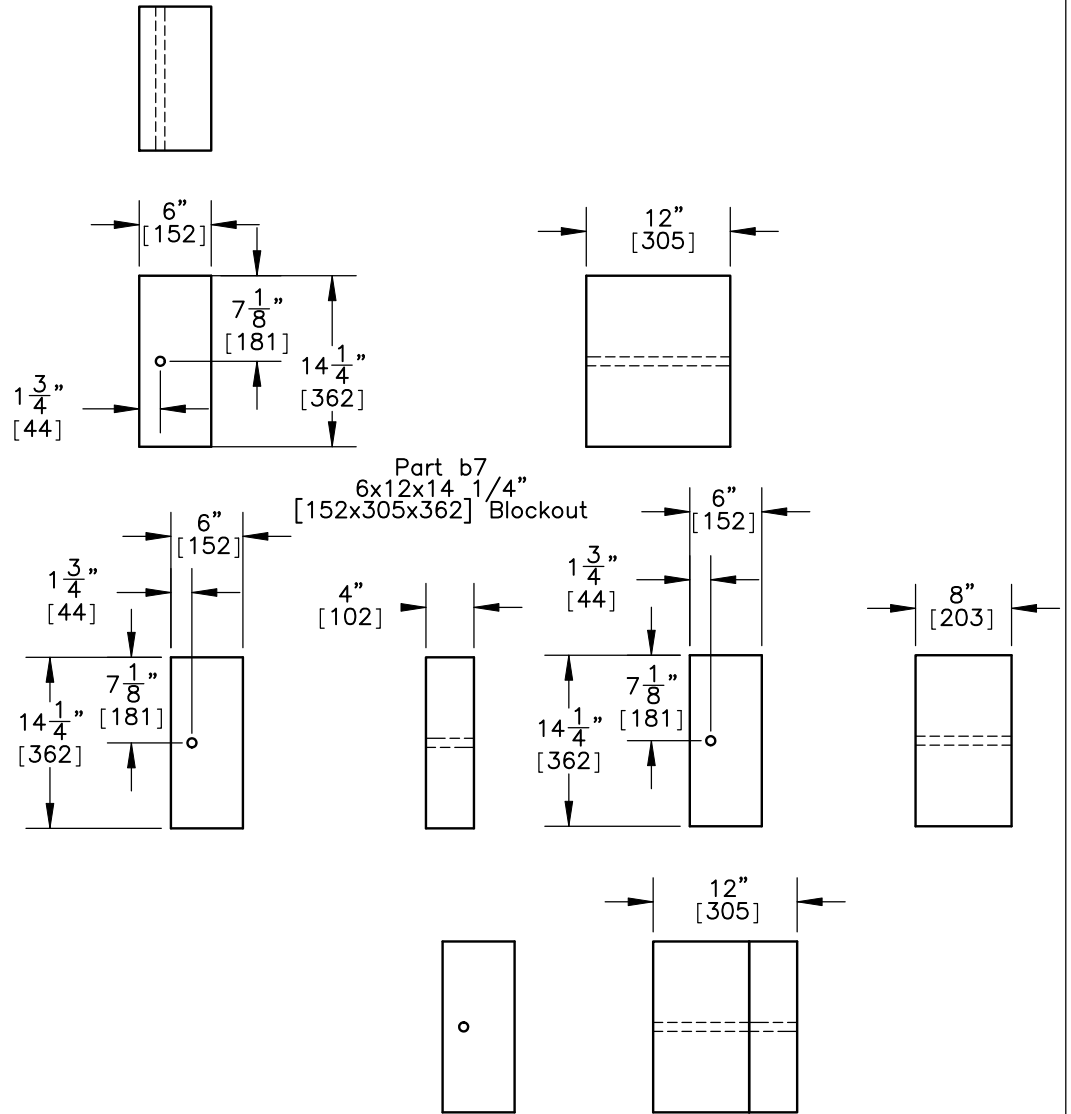


Midwest Roadside
Safety Facility

MGS Bridge Rail		SHEET: 11 of 26
S3x5.7 [S76x8.5] Post and Standoff Details		DATE: 11/19/2009
DWG. NAME: MGS Bridge Rail_V13		DRAWN BY: MW/RJT
SCALE: 1:8	REV. BY:	KAL/EJ/RF
UNITS: In./mm		



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

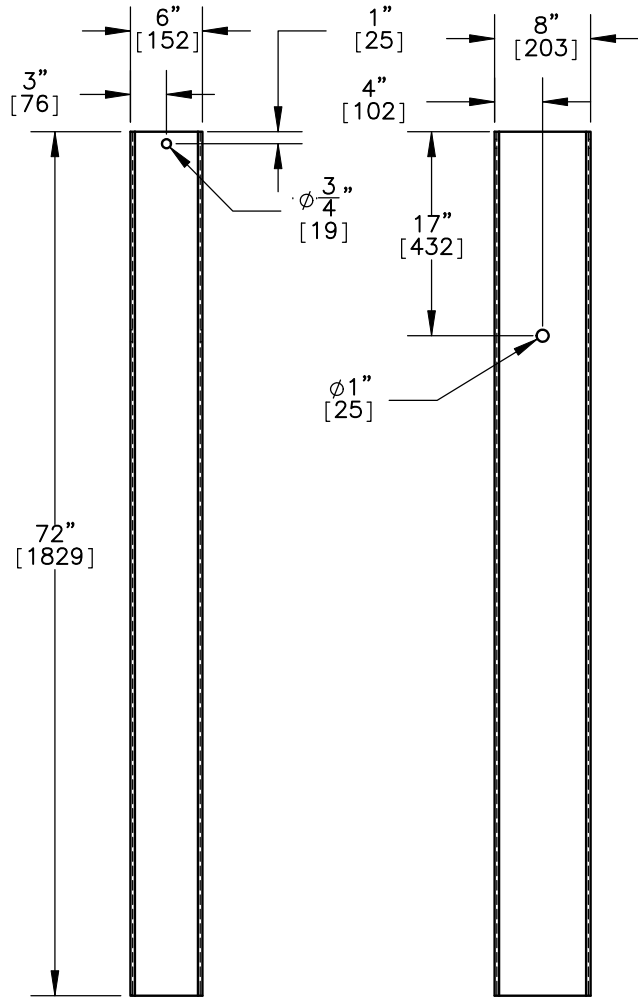
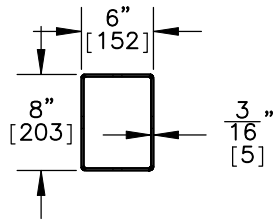
SHEET:
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DATE:
11/19/2009

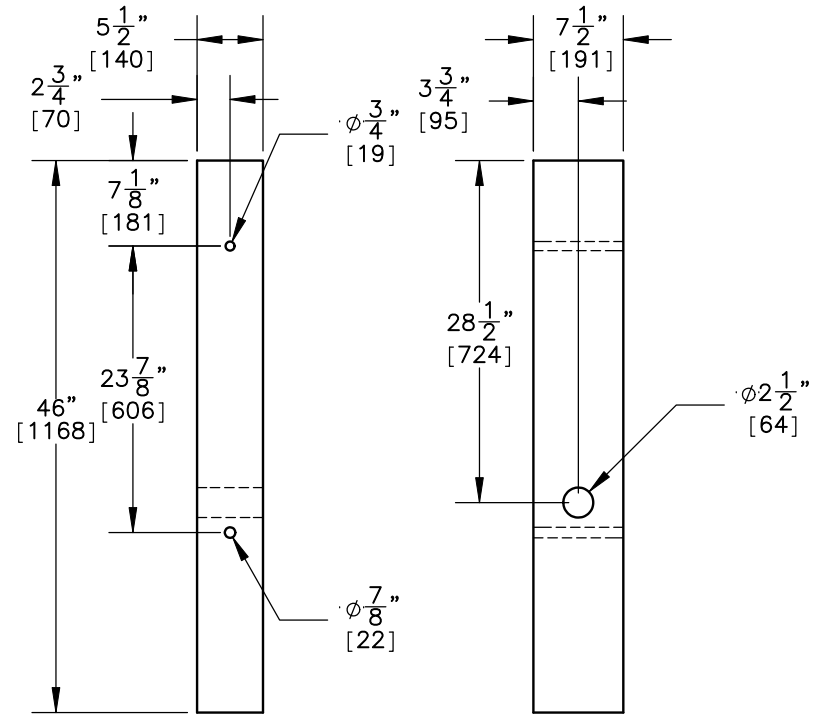
DRAWN BY:
MW/RJT

DWG. NAME:
MGS Bridge Rail_V13

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

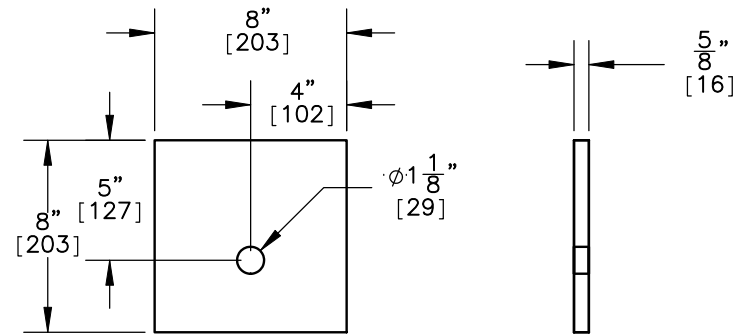
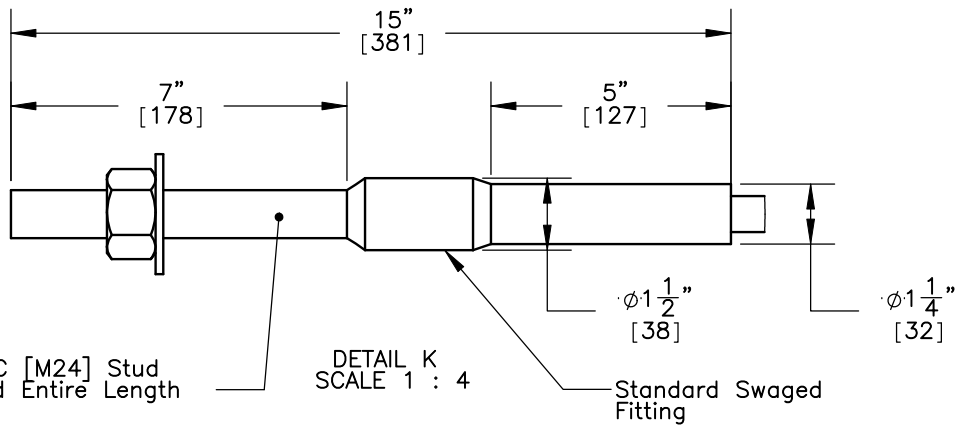
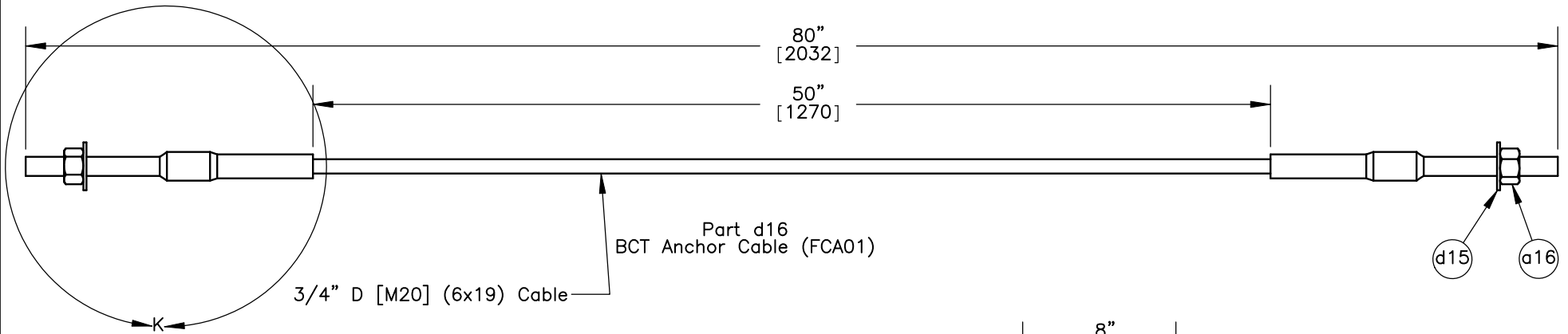
DWG. NAME.
MGS Bridge Rail_V13

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

SHEET:
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DATE:
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DRAWN BY:
MW/RJT

REV. BY:
KAL/EJ/RF

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



Part d6
Anchor Cable Bearing Plate

1"-8UNC [M24] Stud
Threaded Entire Length

DETAIL K
SCALE 1 : 4

Standard Swaged
Fitting



Midwest Roadside
Safety Facility

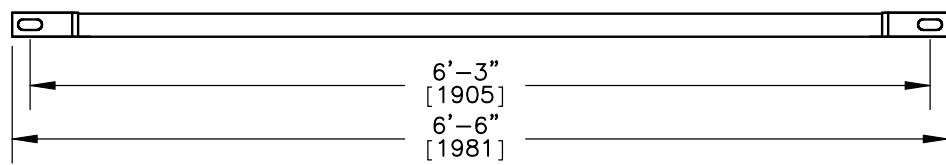
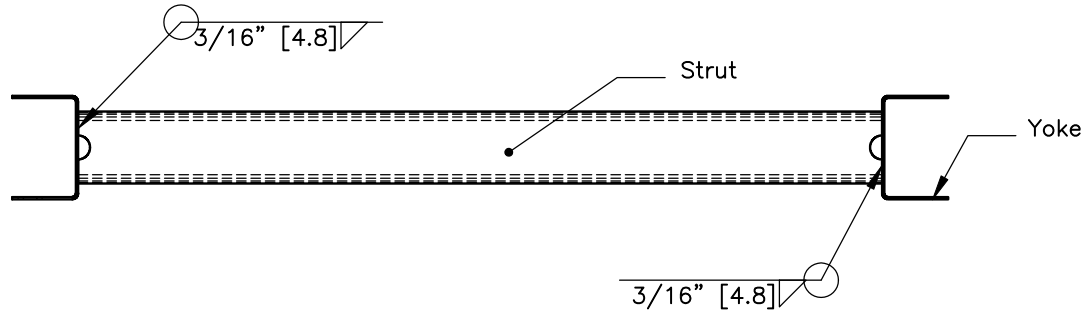
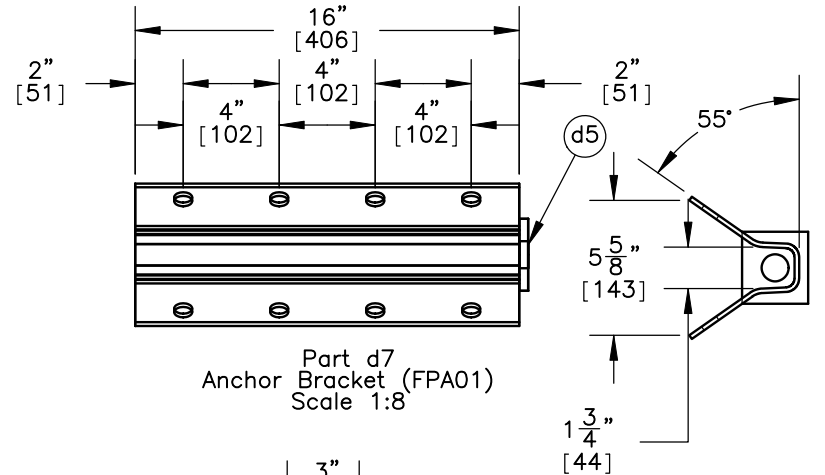
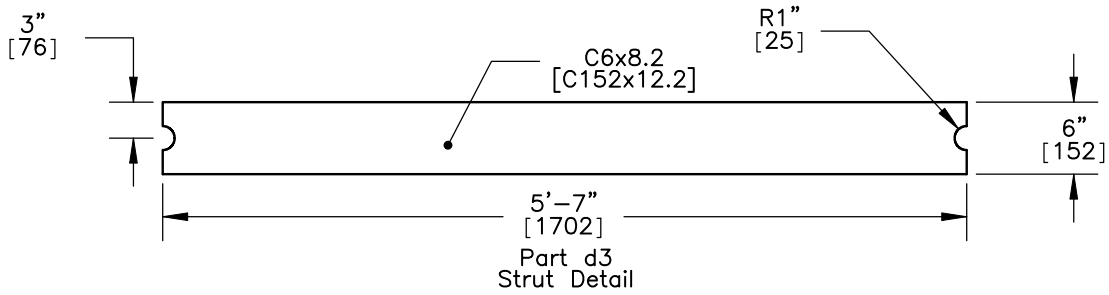
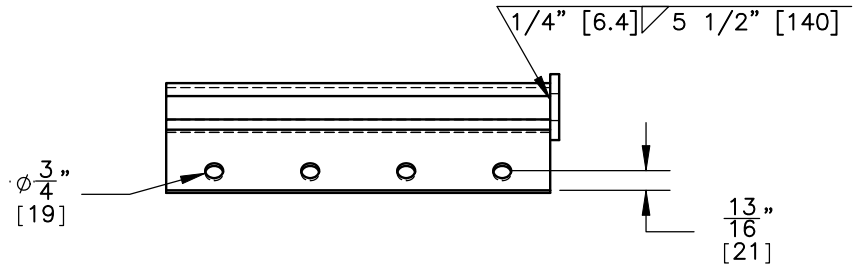
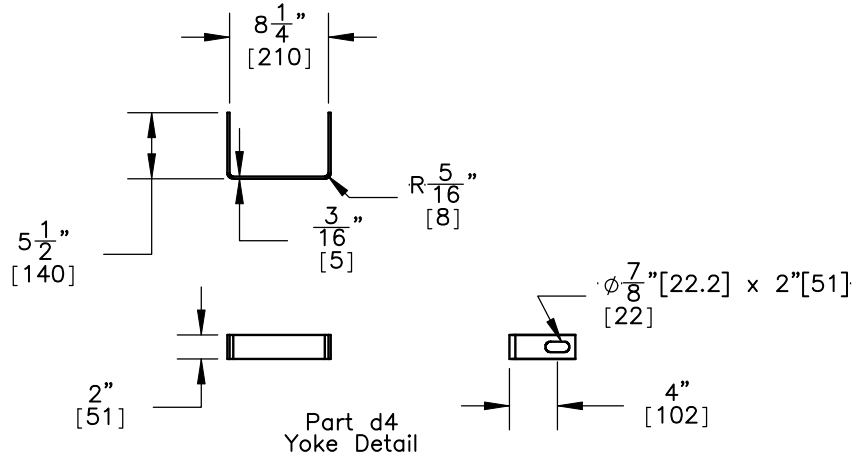
MGS Bridge Rail
BCT Anchor Cable

DWG. NAME.
MGS Bridge Rail_V13

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

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DATE:
11/19/2009
DRAWN BY:
MW/RJT

REV. BY:
KAL/EJ/RF



MGS Bridge Rail
Ground Strut & Anchor
Bracket Details

DWG. NAME:
MGS Bridge Rail_V13

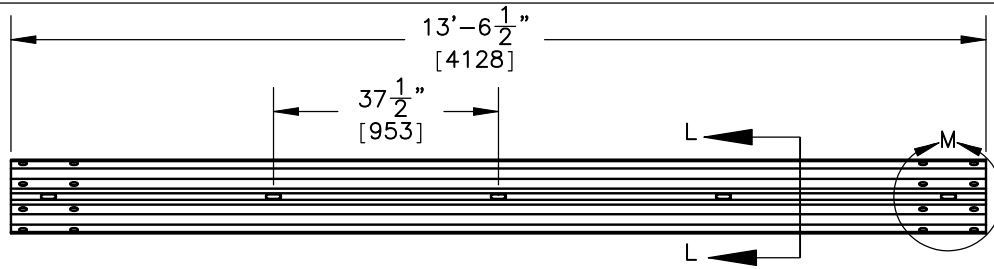
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REV. BY:
KAL/EJ/RF

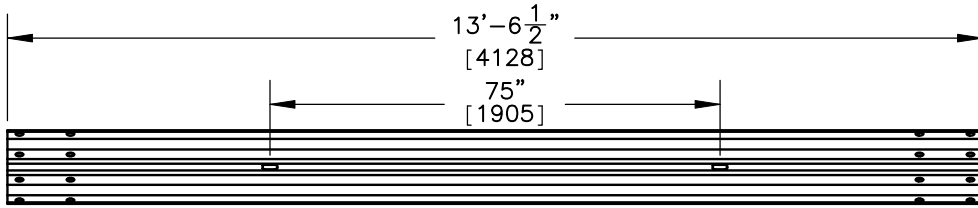
SHEET:
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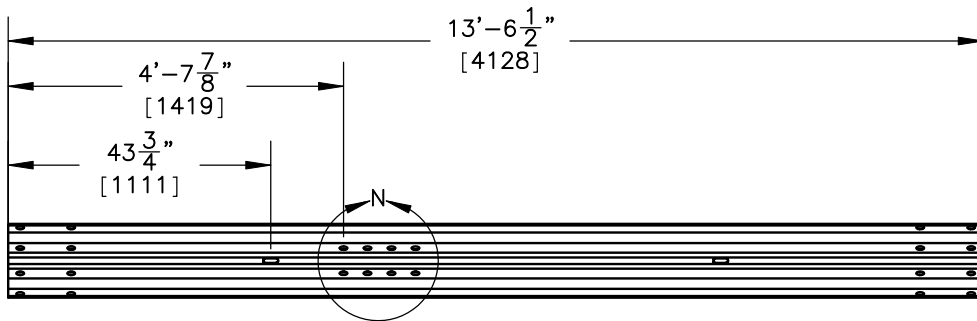
DRAWN BY:
MW/RJT



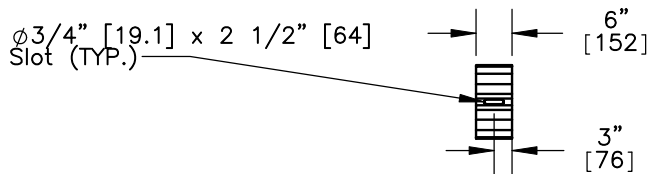
part a7
12'-6" [3810] W-Beam Section, 12 gauge, Half Post Spacing



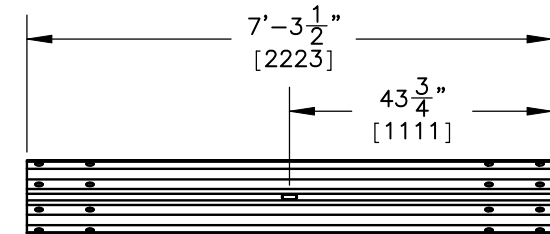
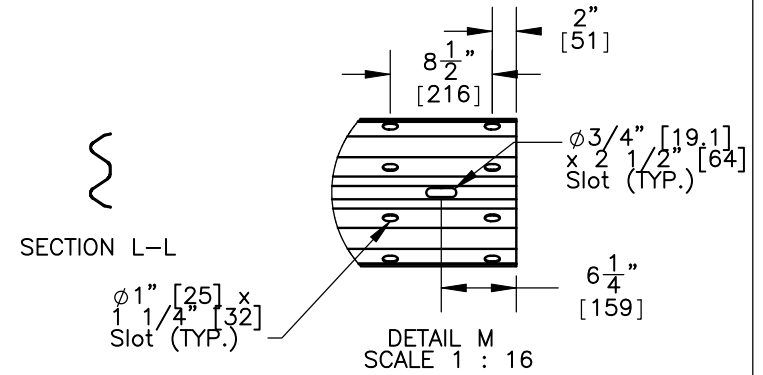
part b1
12'-6" [3810] W-Beam Section, 12 gauge, Full Post Spacing



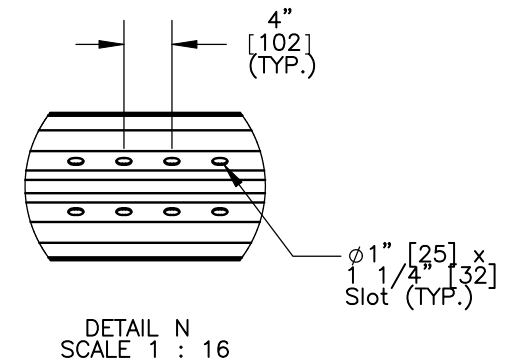
part b5
12'-6" [3810] W-Beam Section, 12 gauge, End Section



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



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



Midwest Roadside
Safety Facility

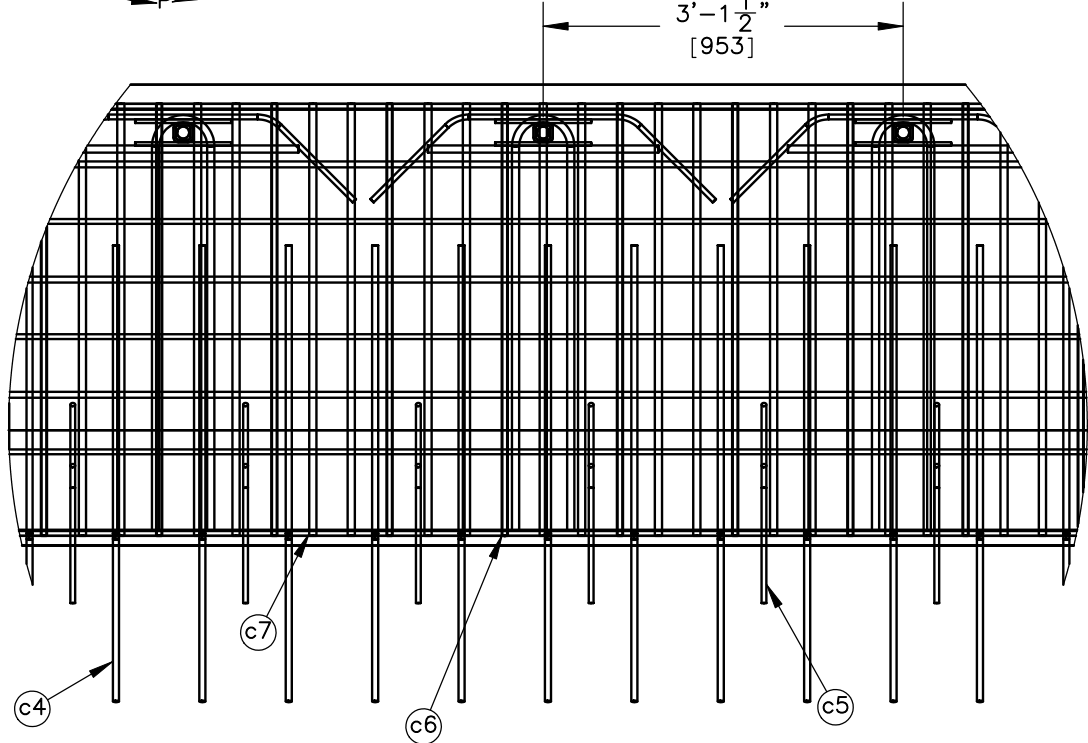
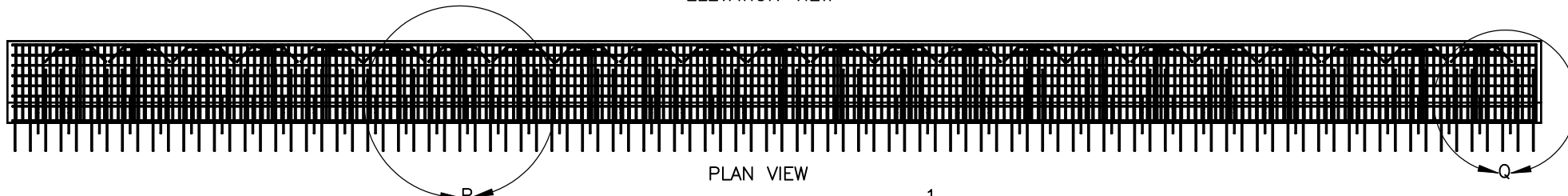
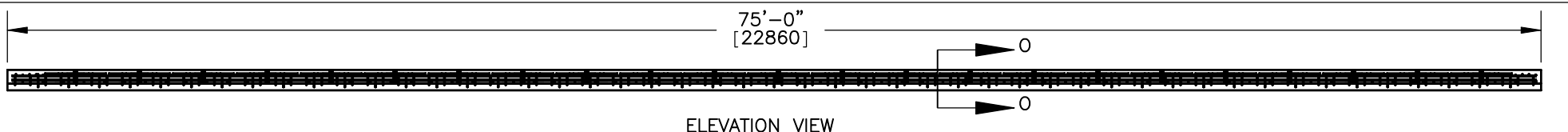
MGS Bridge Rail
Rail Section Details

DWG. NAME.
MGS Bridge Rail_V13

SCALE: 1:32
UNITS: In./mm

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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

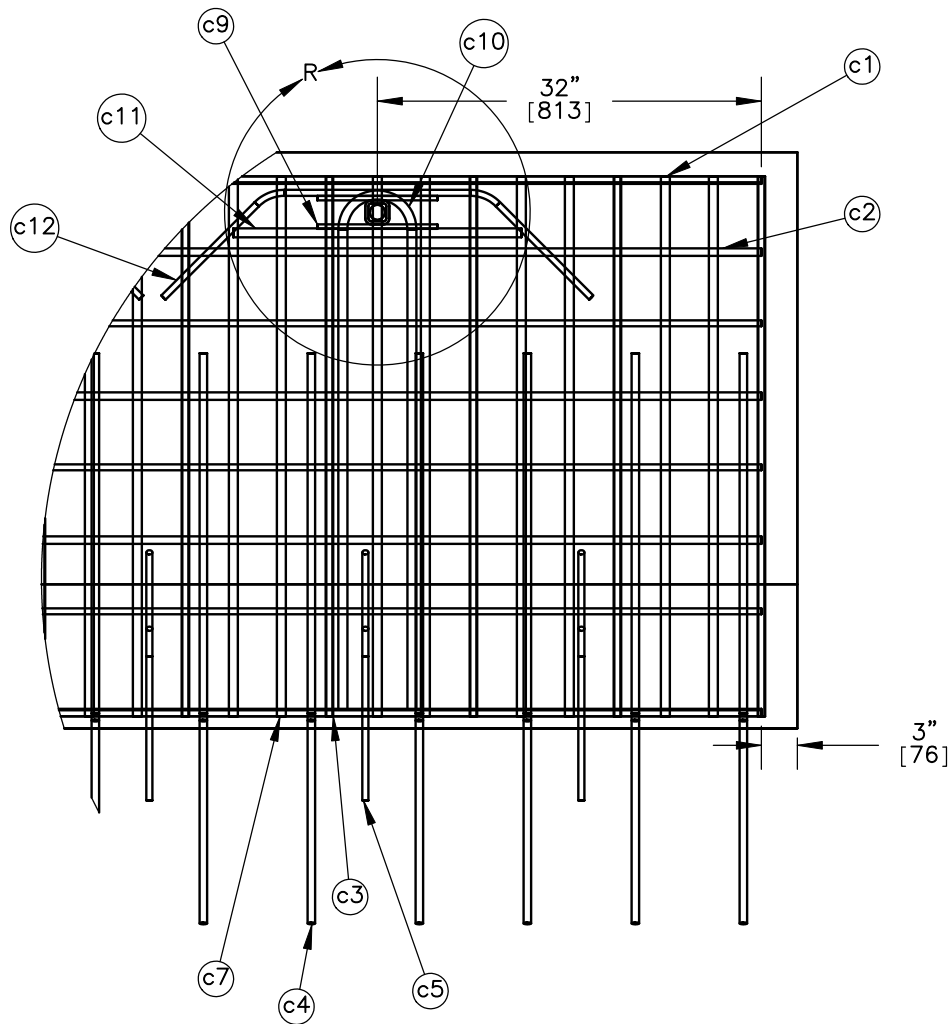
SCALE: 1:90
UNITS: In./mm

SHEET:
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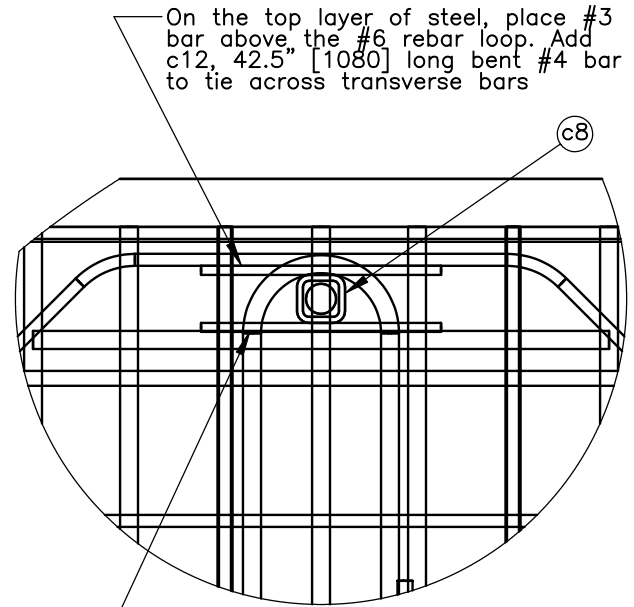
DATE:
11/19/2009

DRAWN BY:
MW/RJT

REV. BY:
KAL/EJ/RF



DETAIL Q
SCALE 1 : 16



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

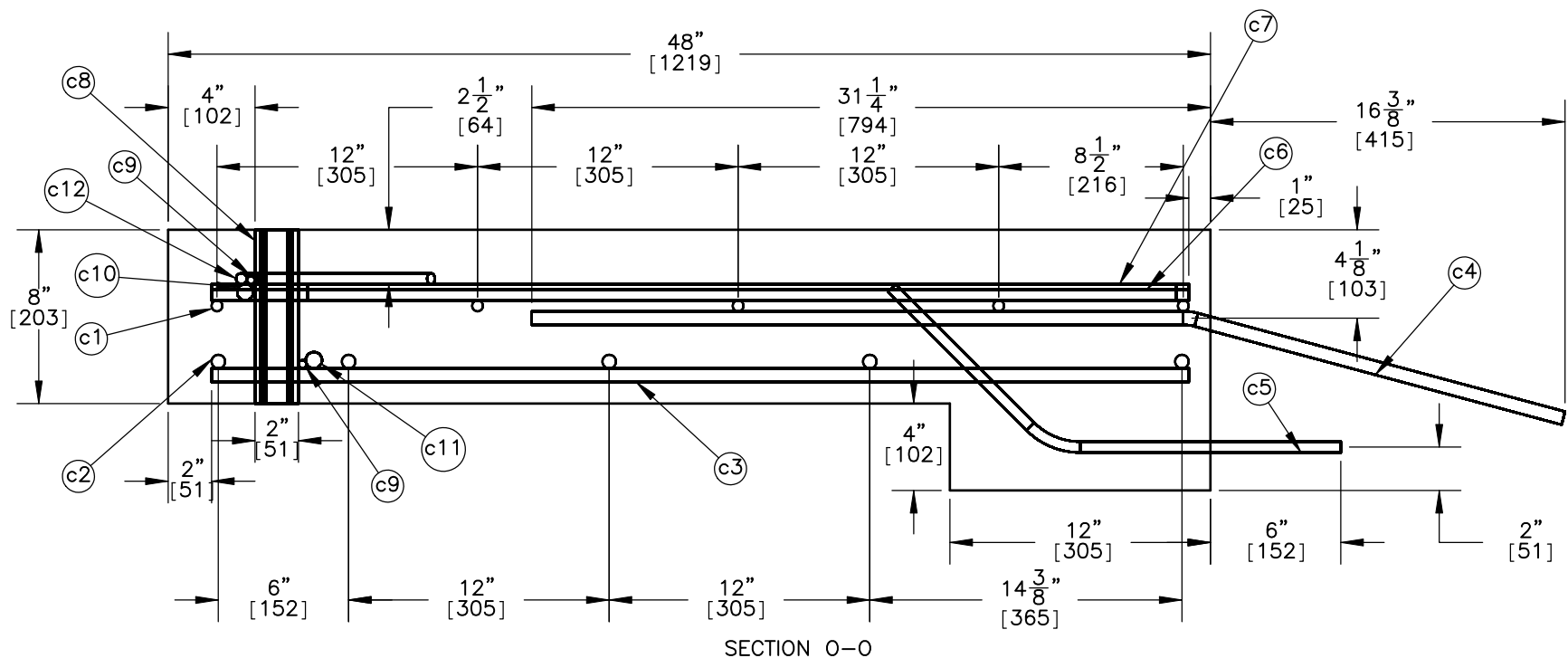
SCALE: 1:16
UNITS: In.[mm]

REV. BY:
KAL/EJ/RF


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DATE:
11/19/2009

DRAWN BY:
MW/RJT

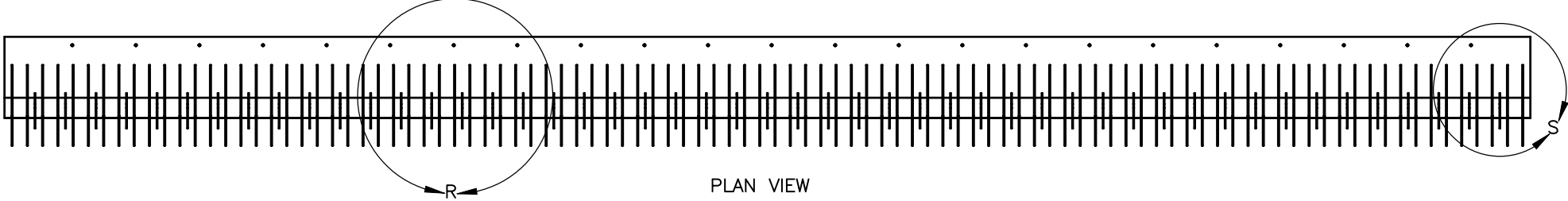


- Notes: (1) Tie #4 and #6 bars to #3 bars after placement in the deck.
 (2) The bottom of #4 and #6 bars are tied at the same plane as the bottom of the #3 bars. These bars are not centered.
 (3) For c1 and c2 use any number of pieces to fit the length with a minimum of 18" [457] and 24" [610] laps,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

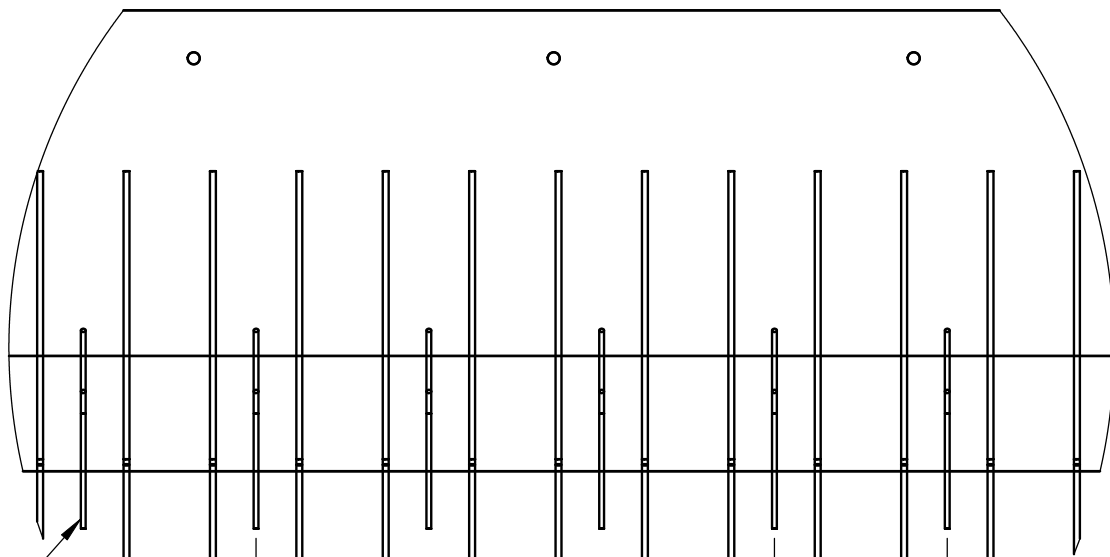
 Midwest Roadside Safety Facility	MGS Bridge Rail Bridge Deck Details		SHEET: 19 of 26
	DWG. NAME: MGS Bridge Rail_V13		DATE: 11/19/2009
		SCALE: 1:8 UNITS: In.[mm]	DRAWN BY: MW/RJT
			REV. BY: KAL/EJ/RF



ELEVATION VIEW



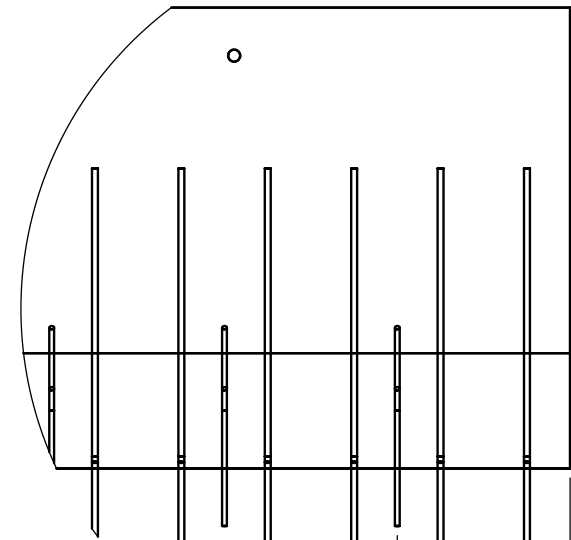
PLAN VIEW



DETAIL R
SCALE 1 : 20

c5
c4
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
Bridge Deck Dowels

DWG. NAME.
MGS Bridge Rail_V13

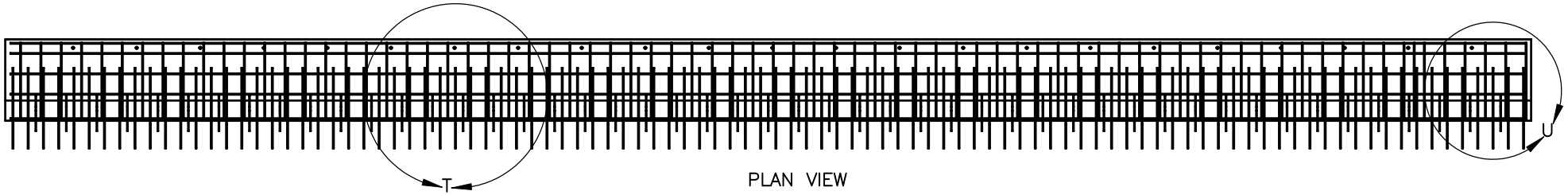
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UNITS: In.[mm]

SHEET:
20 of 26
DATE:
11/19/2009
DRAWN BY:
MW/RJT

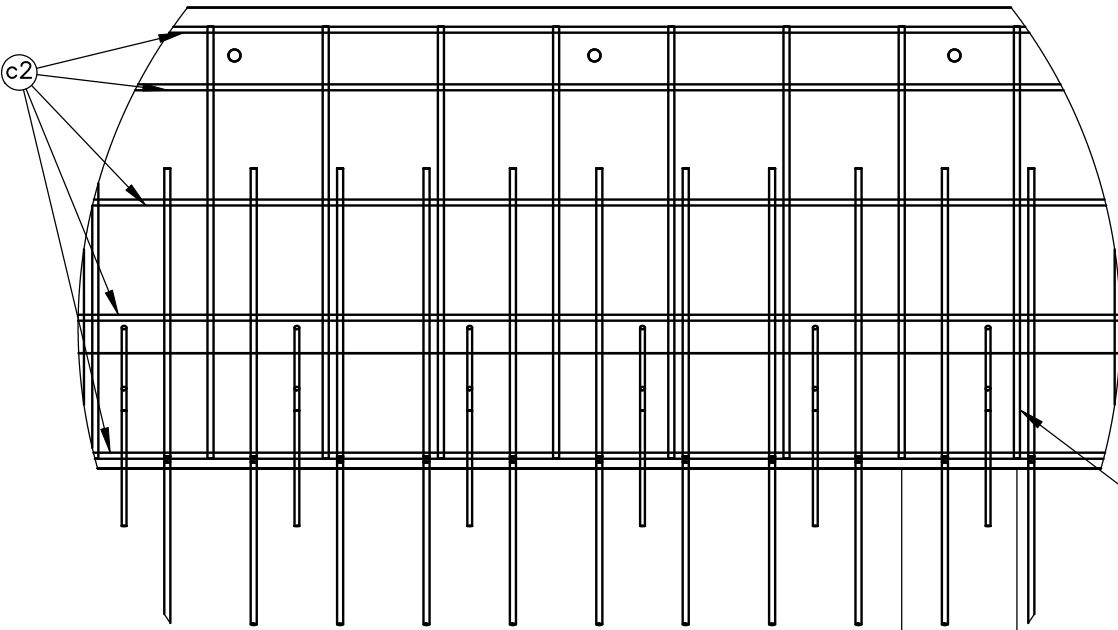
REV. BY:
KAL/EJ/RF



ELEVATION VIEW

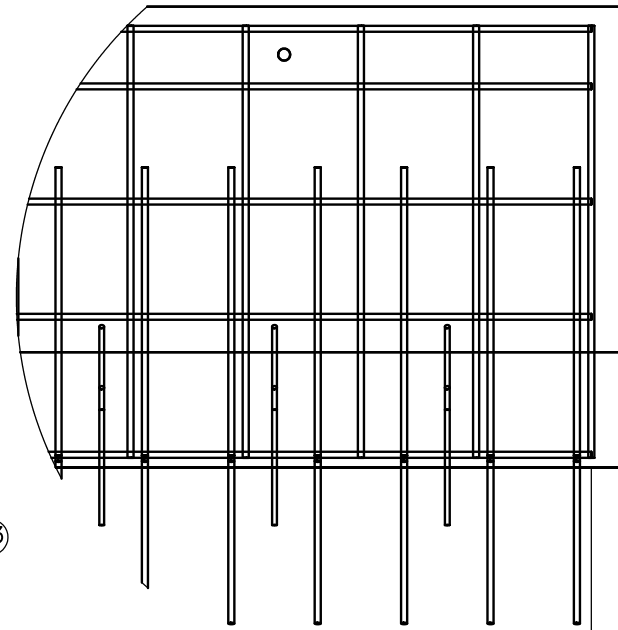


PLAN VIEW



DETAIL T
SCALE 1 : 20

12"
[305]



DETAIL U
SCALE 1 : 20

3"
[76]



Midwest Roadside
Safety Facility

MGS Bridge Rail

Bridge Deck Bottom Rebar
with Dowels

DWG. NAME.
MGS Bridge Rail_V13

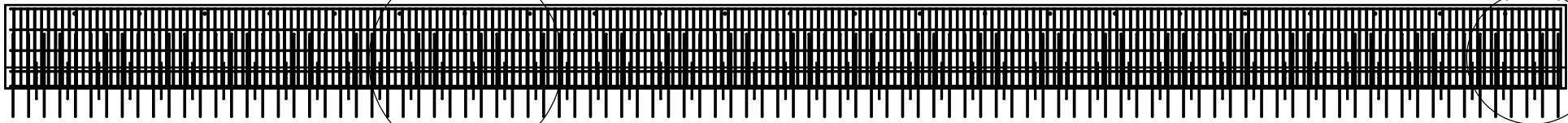
SCALE: 1:90
UNITS: In.[mm]

SHEET:
21 of 26
DATE:
11/19/2009
DRAWN BY:
MW/RJT

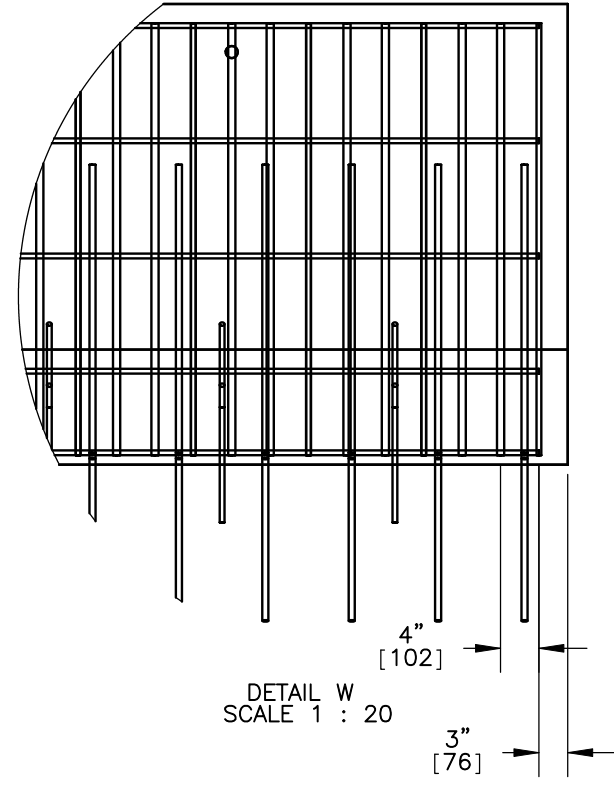
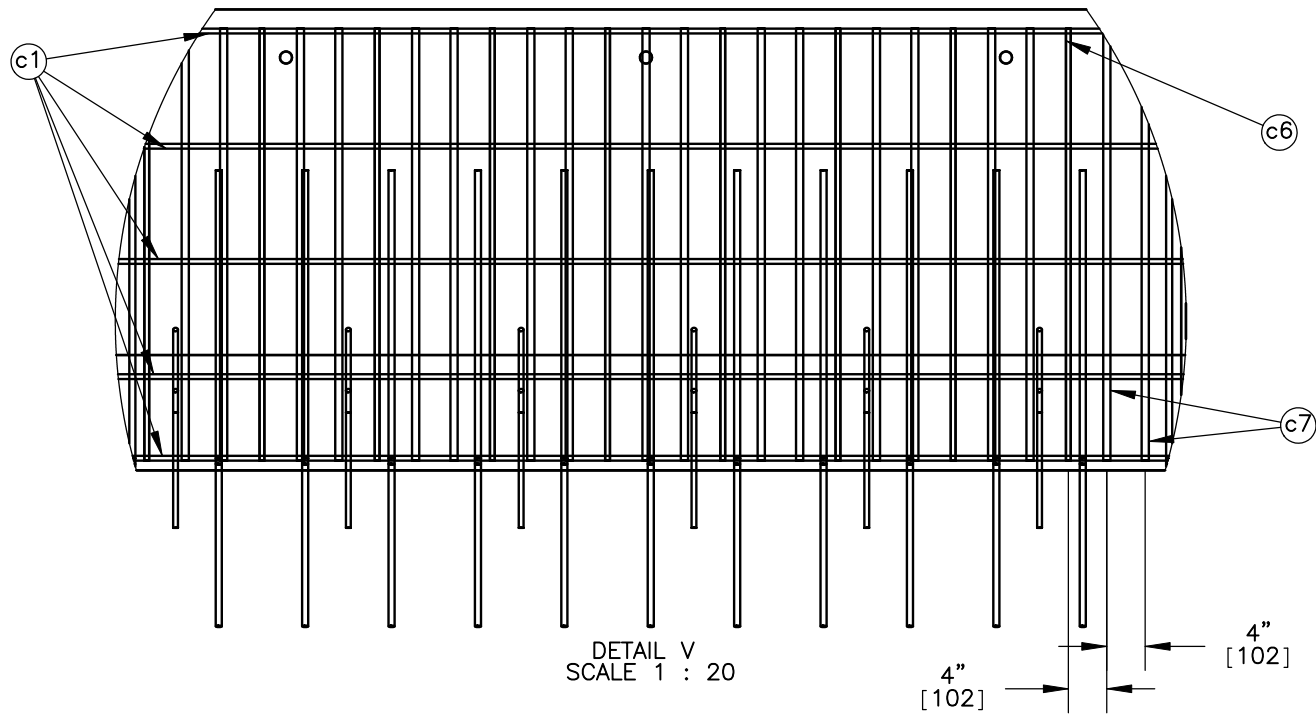
REV. BY:
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ELEVATION VIEW



PLAN VIEW



Midwest Roadside
Safety Facility

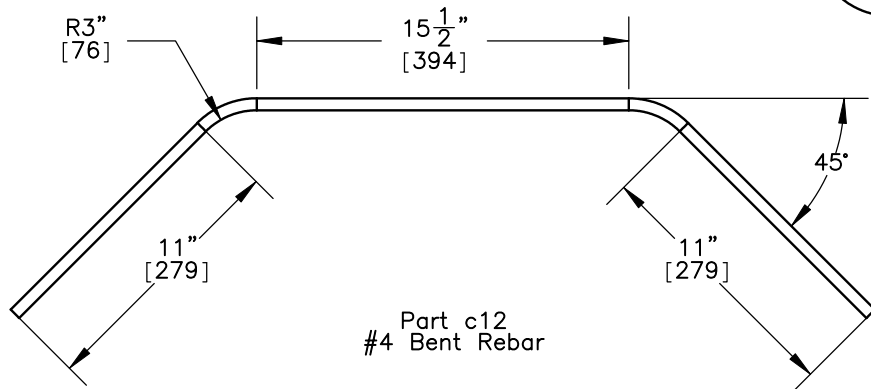
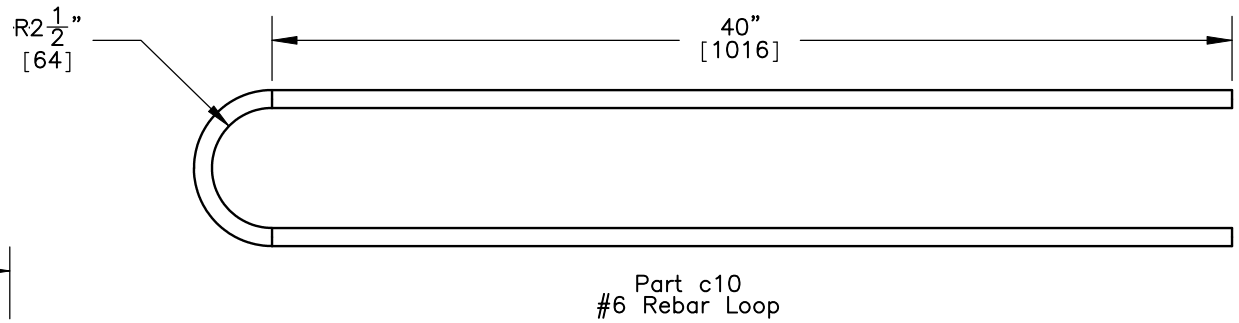
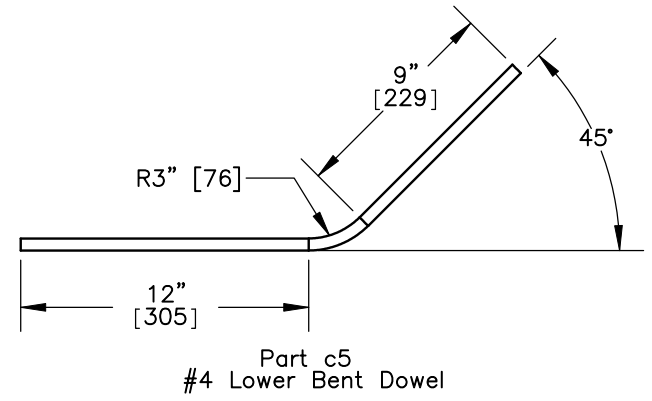
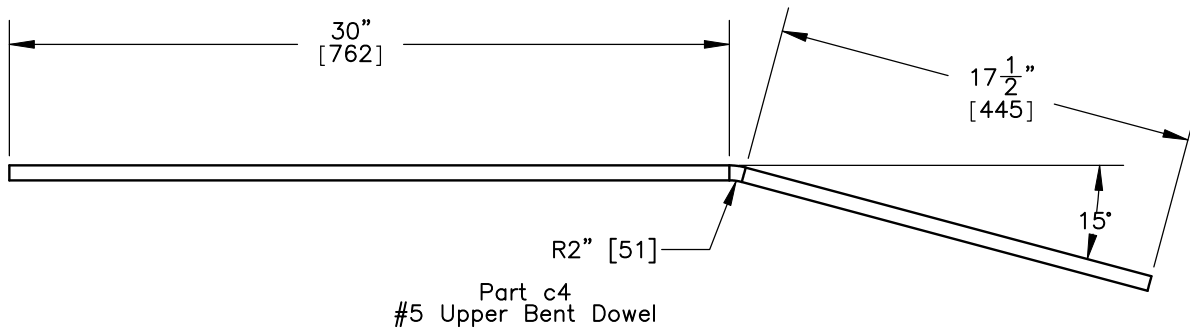
MGS Bridge Rail
Bridge Deck Top Rebar with
Dowels

DWG. NAME.
MGS Bridge Rail_V13

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

SHEET:
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DATE:
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DRAWN BY:
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Midwest Roadside
Safety Facility

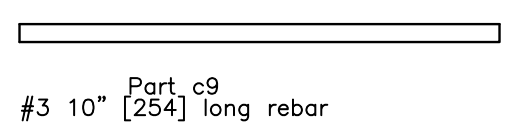
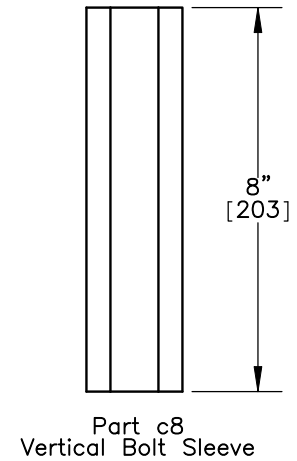
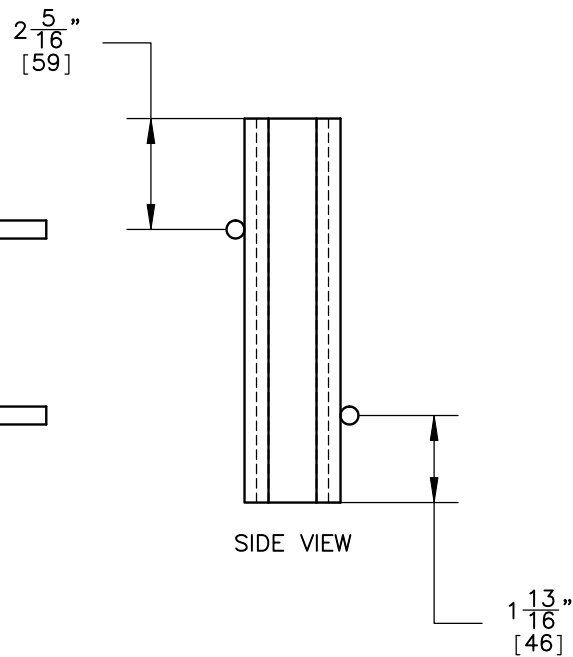
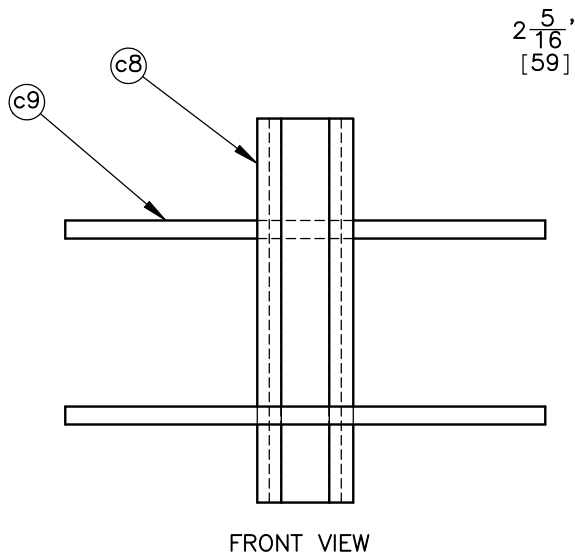
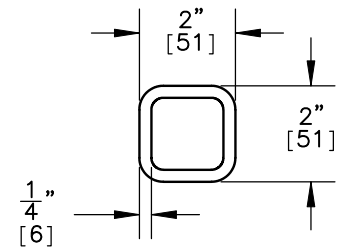
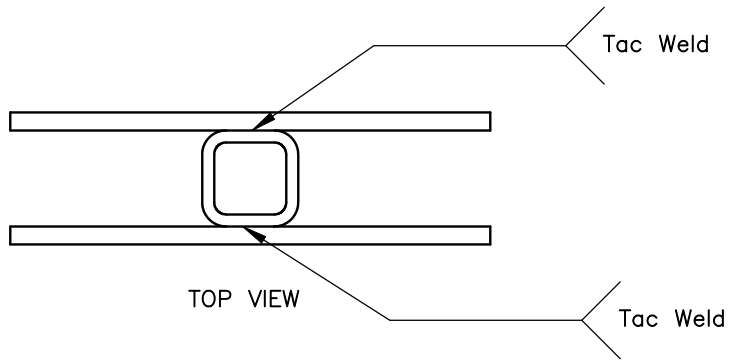
MGS Bridge Rail
Bent Rebar

DWG. NAME.
MGS Bridge Rail_V13

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

SHEET:
23 of 26
DATE:
11/19/2009
DRAWN BY:
MW/RJT

REV. BY:
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- 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
Vertical Bolt Sleeve Assembly

SHEET:
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DATE:
11/19/2009

DRAWN BY:
MW/RJT

DWG. NAME:
MGS Bridge Rail_V13

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

REV. BY:
KAL/EJ/RF

MGS Bridge Rail System				
Item No.	QTY.	Description	Material Spec	Hardware Guide
a1	23	S3x5.7 by 44" long Post	A36 Steel Galvanized	—
a2	92	2.75"x1"x0.25" S3x5.7 Post Standoff	A36 Steel Galvanized	—
a3	23	4"x4"x0.375" by 14.5" Long SQ Tube	A500 Grade B Steel Galvanized	—
a4	23	7.5"x3"x0.4375" Top Mounting Plate	A572 Grade 50 Steel Galvanized	—
a5	23	Top Mounting Plate Gusset	A36 Steel Galvanized	—
a6	23	0.625"—11x5"x1.25" Hex Bolt	ASTM A325 Type 1 Galvanized	FBX16a
a7	6	12'-6" W-Beam MGS Section 1/2 Post Spacing	12 gauge AASHTO M180	—
a8	23	L7x4x0.375 Bottom Mounting Plate	A36 Steel Galvanized	—
a9	23	L7x4x0.375 Bottom Mounting Plate Gusset	A36 Steel Galvanized	—
a10	23	6.5"x2"x0.375" Backside Retainer Plate	A36 Steel Galvanized	—
a11	23	0.3125" Dia. Hex Nut	Grade 5	—
a12	23	0.3125"—18x1.25"x1.25" Hex Bolt	Grade A307	FBX08a
a13	23	1.75"x1.75"x0.125" Square Guardrail Washer	A36 Steel	RWR01
a14	23	1"—8x11"x2.5" Hex Bolt	Grade 5	—
a15	46	1" Flat Washer	F436 Grade 1 Galvanized	—
a16	27	1" Dia. Hex Nut	ASTM A563 DH Galvanized	FBX24a
a17	46	0.5"—13x6"x6" Hex Bolt	ASTM A325 Type 1 Galvanized	FBX14a
a18	46	0.5" Dia. Hex Nut	ASTM A563 DH Galvanized	FBX14a
a19	23	6" W-Beam Backup Plate	12 gauge AASHTO M180	—
a20	44	0.625" Flat Washer	F436 Grade 1	FWC166
b1	6	12'-6" W-Beam MGS Section Full Post Spacing	12 gauge AASHTO M180	—
b2	1	6'-3" W-Beam MGS Section	12 gauge AASHTO M180	—
b3	47	0.625" Dia. Hex Nut	ASTM A563 DH Galvanized	FBX16a
b4	112	0.625"x1.5" Guardrail Bolt and Nut	Grade A307	FBB01
b5	2	12'-6" W-Beam MGS End Section	12 gauge AASHTO M180	RWM04a
b6	13	W6x8.5 by 72" long (W6x9 can be substituted)	A36 Steel	PWE06
b7	13	6"x12"x14 1/4" Blockout	SYP Grade No.1 or better	—
b8	13	0.625"x14" Guardrail Bolt and Nut	Grade A307	FBB06
b9	13	16D Double Head Nail	—	—
c1	5	#4 Straight Rebar, Total Length 74.5'	Grade 60	—
c2	5	#5 Straight Rebar, Total Length 74.5'	Grade 60	—
c3	76	#5 Straight Rebar, 45" long	Grade 60	—
c4	100	#5 Upper Bent dowel, total length unbent 42"	Grade 60	—
c5	49	#4 Lower Bent Dowel, total length unbent 23.5"	Grade 60	—
c6	75	#4 Transverse Bar, 45" long	Grade 60	—
c7	149	#6 Transverse Bar, 45" long	Grade 60	—
c8	23	2"x2"x1/4" by 8" Long Bolt Sleeves	ASTM A500 Grade B	—
c9	46	#3 Straight Rebar, 10" long	Grade 60	—



Midwest Roadside Safety Facility


MGS Bridge Rail
Bill of Materials

DWG. NAME.
MGS Bridge Rail_V13

SCALE: None
UNITS: In.[mm]

SHEET:
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DATE:
11/19/2009
DRAWN BY:
MW/RJT
REV. BY:
KAL/EJ/RF

MGS Bridge Rail System				
Item No.	QTY.	Description	Material Spec	Hardware Guide
c10	23	#6 Rebar Loop, Total Length Unbent 89"	Grade 60	—
c11	23	#6 Straight Rebar, 24" long	Grade 60	—
c12	23	#4 Bent Rebar, Total Length Unbent 42.5"	Grade 60	—
c13	1	Concrete Deck	f'c = 4,000 psi	—
d1	4	72" 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	Straight Ground Strut 67" long	C6x8.2 Channel Section A36 Steel	PPF01
d4	4	Yoke	A36 Steel	PPF01
d5	2	Anchor Bracket End Plate	A36 Steel	FPA01
d6	2	5"x8"x0.625" Anchor Bearing Plate	A36 Steel	FPB01
d7	2	Anchor Bracket	A36 Steel	FPA01
d8	2	2" Schedule 10 x 6" long BCT Hole Insert	ASTM A53 Grade B	FMM02
d9	4	0.625"x10" Guardrail Bolt	Grade A307	FBB03
d10	4	0.625"x10" Hex Head Bolt	A307	FBX16a
d11	4	0.875"x7 1/2" Hex Head Bolt	Grade 5	FBX22a
d12	4	0.875" Dia. Hex Nut	Grade 5	FBX22a
d13	8	0.875" Flat Washer	Grade 5	FWC22a
d14	16	0.625"x1 1/2" Hex Head Bolt	Grade A307	FBX16a
d15	4	1" Flat Washer	Grade 5	FWC24a
d16	2	BCT Anchor Cable Assembly	∅0.75" 6x9 IWRC IPS Galvanized Wire Rope	FCA01–02

 Midwest Roadside Safety Facility	MGS Bridge Rail Bill of Materials Continued	SHEET: 26 of 26
		DATE: 11/19/2009
		DRAWN BY: MW/RJT
	DWG. NAME: MGS Bridge Rail_V13	SCALE: None UNITS: In.[mm]
		REV. BY: KAL/EJ/RF