



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

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

January 12, 2012

In Reply Refer To:
HSST/ B-230

Scott Rosenbaugh
Research Associate Engineer
Midwest Roadside Safety Facility UNL
527 Nebraska Hall
P.O. Box 880529
Lincoln Nebraska 68588-0529

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:	Midwest Guardrail System with White Pine Posts
Type of system:	31 inch high W-beam guardrail
Test Level:	MASH Test Level 3
Testing conducted by:	Midwest Roadside Safety Facility
Task Force 13 Designator:	SGR20c
Date of request:	June 28, 2011
Date initially acknowledged:	July 18, 2011
Date of completed package:	June 28, 2011

Decision:

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

- Midwest Guardrail System (MGS) with White Pine Posts

Based on a review of crash test results you submitted 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.

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.

FHWA: HSST: NArtimovicht: ms: x61331:1/9/12
File: s://directory folder/HSST/Artimovich/B-230 Scott Rosenbaugh
MGSWhitePine Letter.dotx
cc: HSST (NArtimovich; JDewar)

Requirements

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

Description and Crash Testing

The MGS with White Pine Posts is described in the enclosed letter dated June 28, 2011 and is illustrated in the enclosed drawings. The MASH Test 3-11 is detailed in the enclosed Test Data Summary Sheet and showed that the pickup truck test met all appropriate criteria. The maximum dynamic deflection of the barrier was 46.3 inches, and the Working Width of the system was 58.4 inches. In comparison, the Working Width of the MGS on Southern Yellow Pine posts was 49 inches.

Findings

Therefore, the system described and detailed in the enclosures 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-230 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

Enclosures



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

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

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Sincerely yours,

A handwritten signature in black ink that reads "Michael S. Griffith". The signature is written in a cursive style with a large initial 'M' and a stylized 'G'.

Michael S. Griffith

Director, Office of Safety Technologies
Office of Safety

Enclosures

June 28, 2011

Mr. Nicholas A. Artimovich
Highway Engineer
Federal Highway Administration - HSSD
Office of Safety Design
Room E71-322
1200 New Jersey Avenue, SE
Washington, D.C. 20590
(202) 366-1331 phone

Subject: Application for Federal Highway Administration (FHWA) acceptance of the Midwest Guardrail System (MGS) with White Pine posts.

Dear Mr. Artimovich:

I have enclosed documentation on the compliance testing and evaluation of a longitudinal barrier system by the Midwest Roadside Safety Facility (MwRSF) at the University of Nebraska-Lincoln. In this research project, the Midwest Guardrail System (MGS) utilizing White Pine timber posts was successfully crash tested according to Test Level-3 (TL-3) requirements provided in the *Manual for Assessing Safety Hardware (MASH)*. A final MwRSF research report has been prepared for this guardrail system using White Pine posts entitled:

Evaluation of the Midwest Guardrail System (MGS) with White Pine Wood Posts
MwRSF Research Report No. TRP-03-241-11, March 28, 2011

Please note that the MGS utilizing either steel W6x9 or Southern Yellow Pine timber 6"x8" posts has previously been shown to meet the TL-3 requirements provided in NCHRP Report No. 350 and has been accepted by the Federal Highway Administration (FHWA) in Letter No. B-133, dated March 1, 2005. Variations of the MGS utilizing round timber posts made from Douglas Fir, Ponderosa Pine, and Southern Yellow Pine were also previously shown to satisfy NCHRP Report No. 350, TL-3 requirements and have been accepted by the FHWA in Letter B-175, dated June 25, 2008. Further, an acceptance letter stating that the MGS satisfies MASH TL-3 requirements is currently in draft form under letter B-215.

According to TL-3 guidelines contained in MASH, longitudinal barrier systems should be subjected to two full-scale crash test: (1) test designation no. 3-10 consisting of a 2,425-lb passenger vehicle impacting at 62.1 mph and 25 degrees and (2) test designation no. 3-11 consisting of a 5,000-lb pickup truck impacting at 62.1 mph and 25 degrees. However, previous full-scale tests have illustrated that vehicle snagging and occupant risk values are minimal during the small car test. Therefore, only the pickup truck test was deemed necessary to evaluate the system's performance with the weaker White Pine timber posts. Documentation of the compliance testing and analysis is contained within the CD-ROM and hard copy file enclosures listed at the

end of this letter.

On behalf of the Wisconsin Department of Transportation, MwRSF is requesting that the FHWA accept the use of the MGS with White Pine timber posts for roadside use along Federal-aid highways.

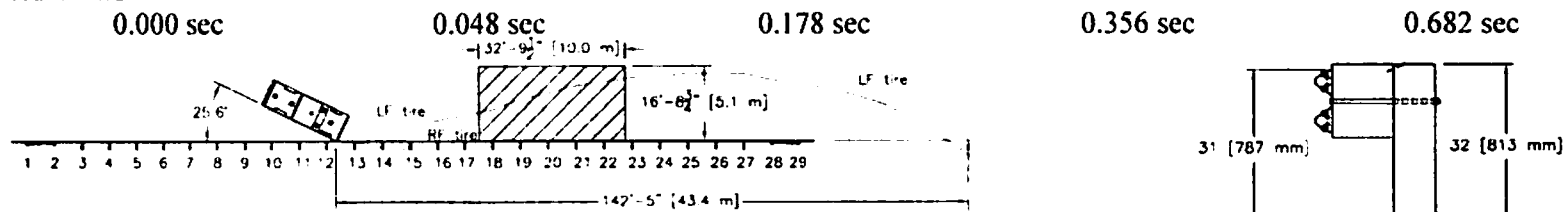
If you have any questions regarding the enclosed information or need any other information, please feel free to contact either Mr. Rosenbaugh [(402) 472-9324 or srosenba@unlserve.unl.edu] or Dr. Faller [(402) 472-6864 or rfallerl@unl.edu] at your earliest convenience.

Sincerely,

Scott Rosenbaugh, MSCE, EIT
Research Associate Engineer

Ronald K. Faller, Ph.D., P.E.
Research Assistant Professor

Enclosures: (1) two copies of MwRSF research report no. TRP-03-241-11
(2) one CD-ROM set documenting the full-scale crash test
(3) one CD-ROM with electronic drawing and PDF report files
(4) one hard copy of CAD system drawings

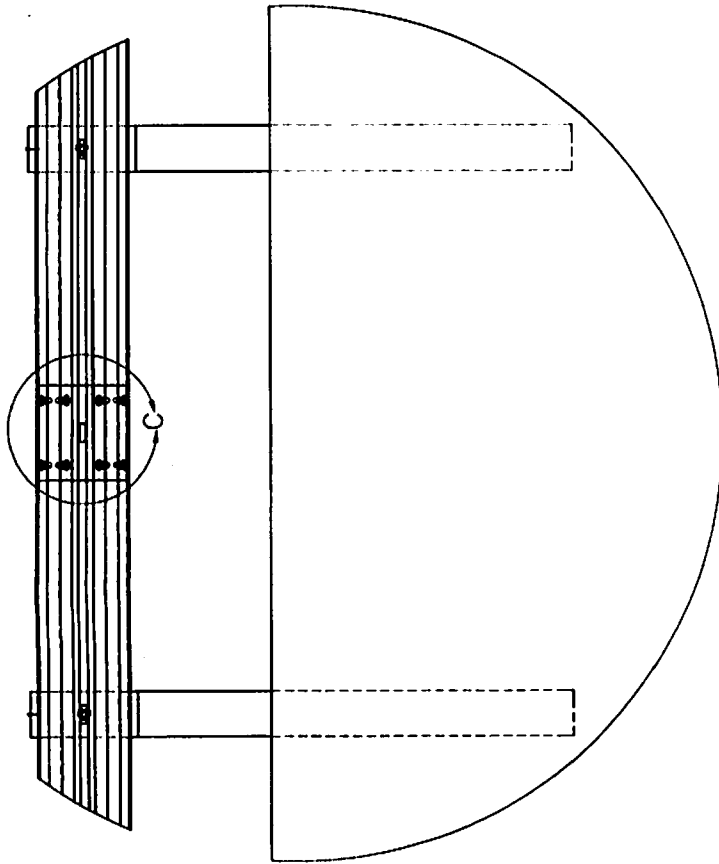


- Test Agency MwRSF
- Test Number MGSWP-1
- Date 4/2/2010
- MASH Test Designation 3-11
- Test Article MGS with White Pine Wood Posts
- Total Length 175 ft (53.3 m)
- Key Component - White Pine Wood Posts
 - Post Spacing 75 in (1,905 mm)
 - Post Dimensions 6 x 8 x 72 in (152 x 203 x 1,829 mm)
- Key Component - Wood Spacer Blocks
 - Blockout Dimensions 6 x 12 x 14 1/4 in (152 x 305 x 362 mm)
- Key Component - Steel MGS Rail
 - Thickness 12 gauge (2.66 mm)
 - Top Mounting Height 31 in (787 mm)
- Soil Type Grading B of AASHTO M147-65 (1990)
- Vehicle Make /Model 2003 Dodge Ram 1500 Quad Cab
 - Curb 4,979 lb (2,258 kg)
 - Test Inertial 4,999 lb (2,268 kg)
 - Gross Static 5,169 lb (2,345 kg)
- Impact Conditions
 - Speed 63.8 mph (102.7 km/h)
 - Angle 25.6 deg
 - Location 13 ft - 4 1/2 in (4.1 m) US of splice between posts 14 and 15
- Exit Conditions
 - Speed 39.6 mph (63.7 km/h)
 - Angle 16.6 deg
- Exit Box Criterion Pass
- Vehicle Stability Satisfactory
- Vehicle Stopping Distance 142 ft - 5 in (43.4 m) downstream
53 ft - 11 in (16.4 m) laterally behind
- Vehicle Damage Moderate
 - VDS 01-RFQ-4
 - CDC 01-RYEN-3
 - Maximum Interior Deformation 1 in (25 mm), door below seat
- Test Article Damage Moderate

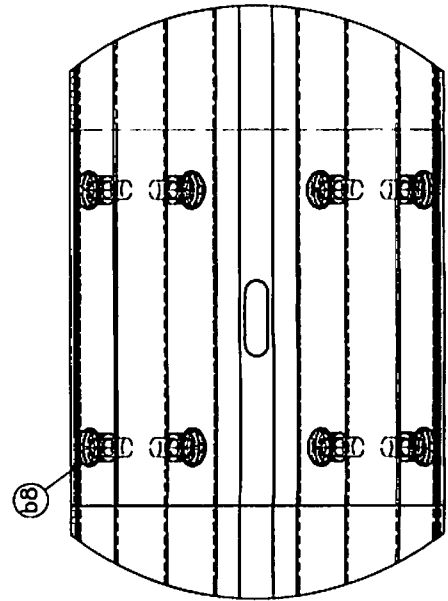
- Test Article Deflections
 - Permanent Set 33 1/2 in (857 mm)
 - Dynamic 46.3 in (1,176 mm)
 - Working Width 58.4 in (1,483 mm)
- Maximum Angular Displacements
 - Roll 7 < 75
 - Pitch -3 < 75
 - Yaw 78
- Impact Severity (IS) 131.5 kip-ft (178.3 kJ) > 106 kip-ft (144 kJ)
- Transducer Data

Evaluation Criteria		Transducer			MASH Limit
		EDR-3	DTS Set 1	DTS Set 2	
OIV ft/s (m/s)	Longitudinal	-15.38 (-4.69)	-15.27 (-4.65)	-15.75 (-4.80)	≤ 40 (12.2)
	Lateral	-14.95 (-4.56)	-16.14 (-4.92)	-15.91 (-4.85)	≤ 40 (12.2)
ORA g's	Longitudinal	-8.08	-8.25	-8.25	≤ 20.49
	Lateral	-9.32	-10.13	-9.86	≤ 20.49
THIV - ft/s (m/s)		NA	21.23 (6.47)	NA	not required
PHD - g's		NA	12.36	NA	not required
ASI		0.69	0.77	NA	not required

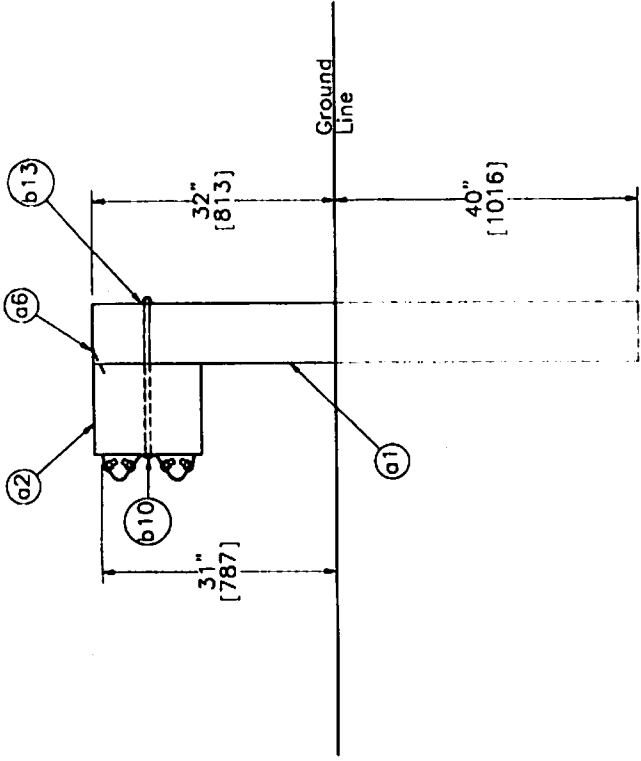
Figure 19. Summary of Test Results and Sequential Photographs. Test No. MGSWP-1




DETAIL A

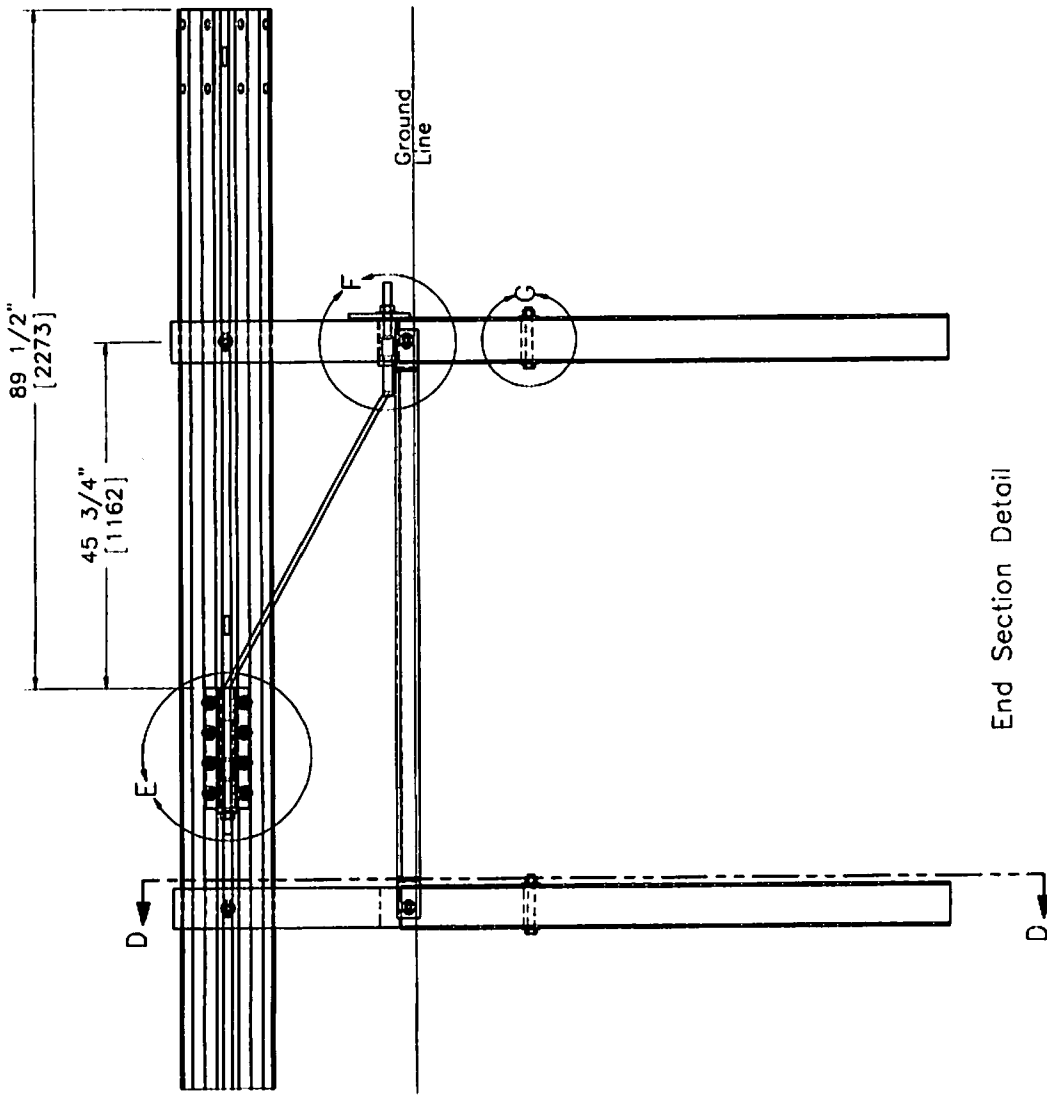


DETAIL C
SCALE 1:6

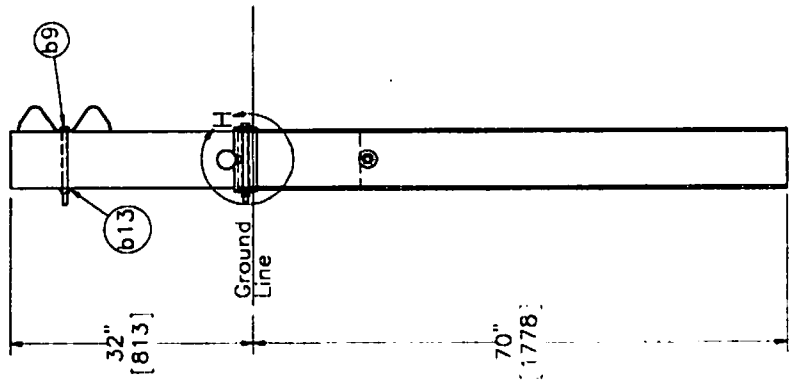


SECTION B-B


	MGS with White Pine Wood Posts		SHEET: 2 of 11
	Post and Splice Details		DATE: 05/16/2011
Midwest Roadside Safety Facility		DWG. NAME: MCSWP--L_R11	DRAWN BY: MAM/BJT/ MDM/JSP/D WH
		SCALE: 1/24 UNITS: in [mm]	REV BY: SKR/RWB/ JCL/RK

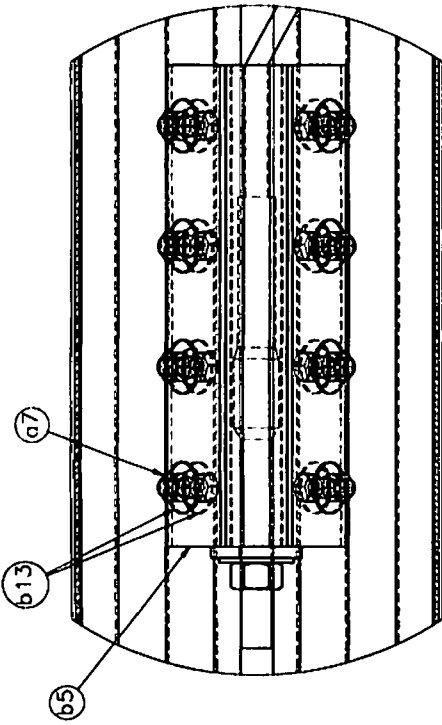


End Section Detail

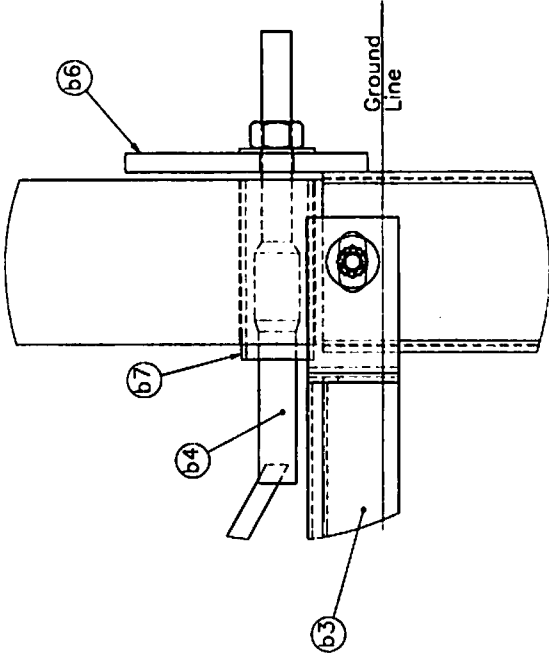


SECTION D-D

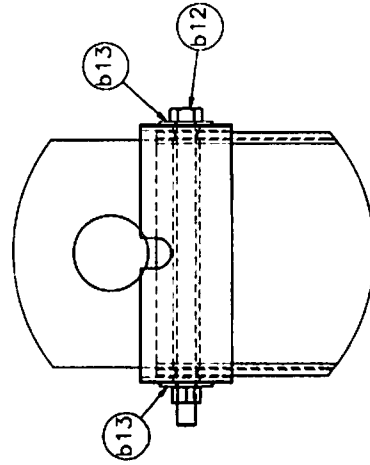
	MGS with White Pine Wood Posts End Rail Details		SHEET: 3 of 11
	DWG NAME: MGSWP-1_R11		DATE: 06/16/2011
Midwest Roadside Safety Facility		SCALE: 1:24 UNITS: in [mm]	DRAWN BY: WDW/RSF/D JMH
			REV. BY: SKB/KAL/ RWB/RKF



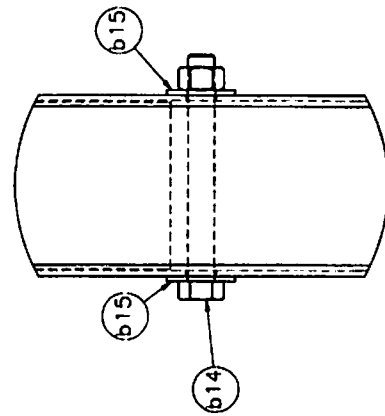
DETAIL E




DETAIL F




DETAIL H

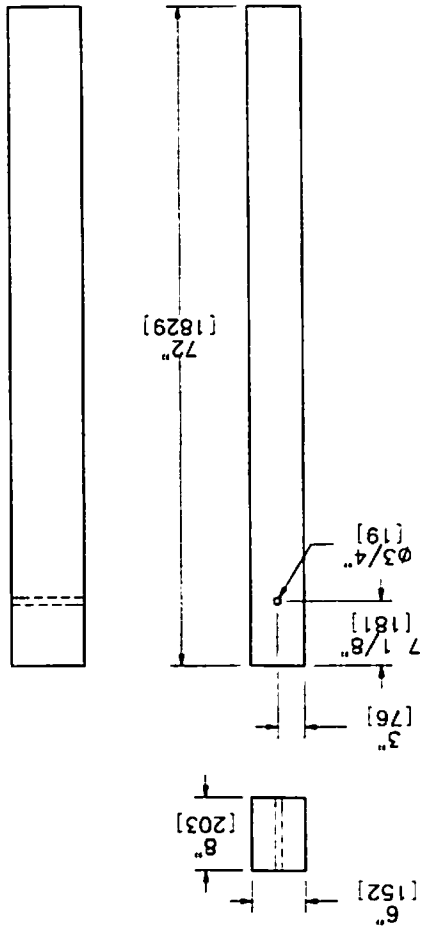


DETAIL G

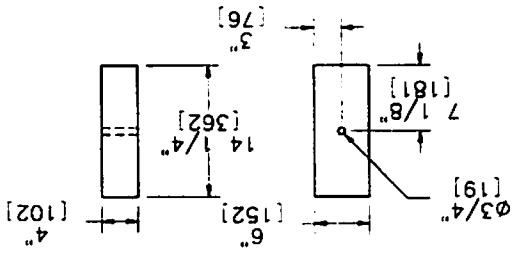
	<p>MCS with White Pine Wood Posts</p> <p>Anchor Details</p>	<p>SHEET: 4 of 11</p>
		<p>DATE: 06/16/2011</p>
<p>Midwest Roadside Safety Facility</p>	<p>DWG. NAME: MCSWP-1_R11</p>	<p>DESIGN BY: MGM/JGF/ DWH</p>
		<p>SCALE: 1/8 UNITS: in, [mm]</p>
		<p>REV. BY: SKR/RWB/ CAL/RKT</p>

MGS with White Pine			Midwest Roadside Safety Facility
Wood Posts			
Post Nos. 3-27 Details			
SHEET: 5 of 11	DATE: 06/16/2011	DRAWN BY: MGN/EL/D	DWG NAME: MGSWP-1.R11
REV BY: SXR/RWB/	SCALE: 1:20	MGS/RWB/	NOSWP-1.R11

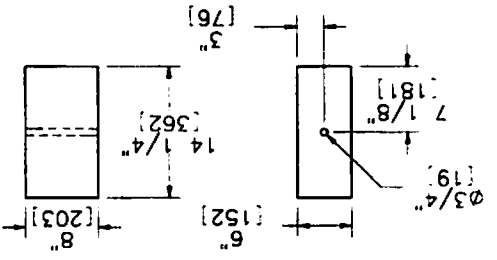
Line Post
Part 01



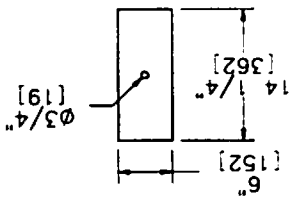
6"x4"x14 1/4" [152x102x362] Blockout



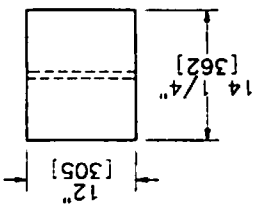
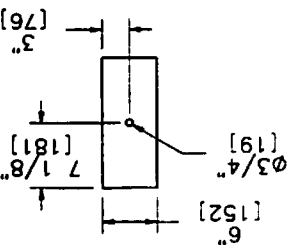
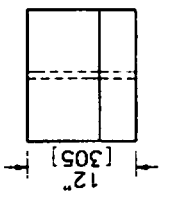
6"x8"x14 1/4" [152x203x362] Blockout

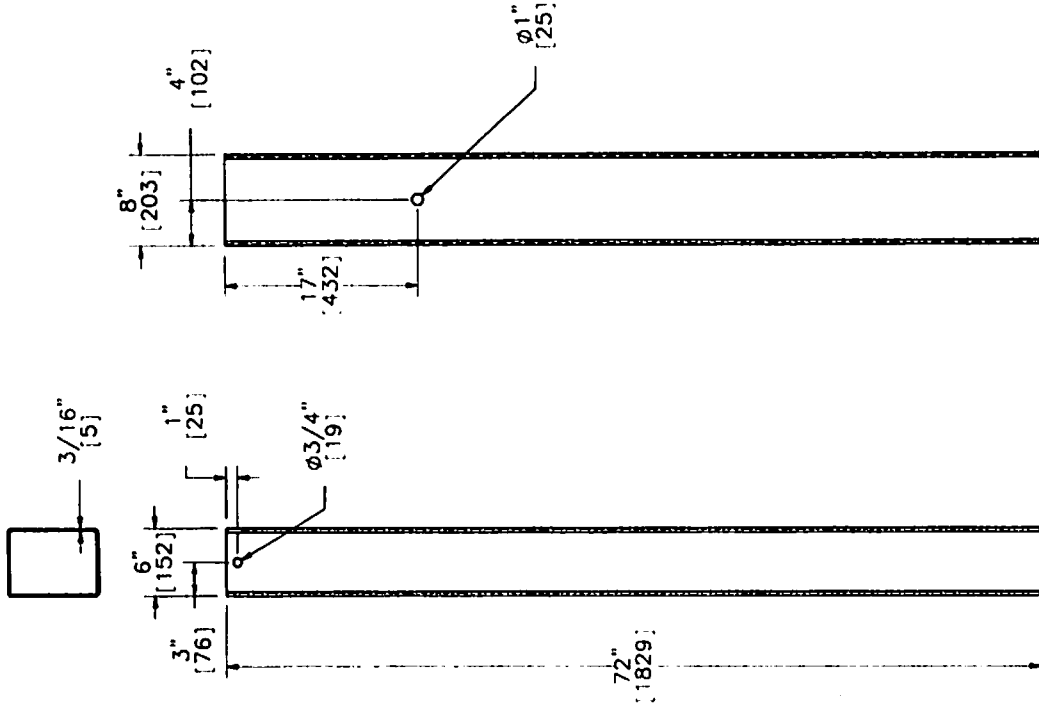


Alternate Blockout Option -
 6"x4"x14 1/4" [152x102x362] Blockout
 with 6"x8"x14 1/4" [152x203x362] Blockout

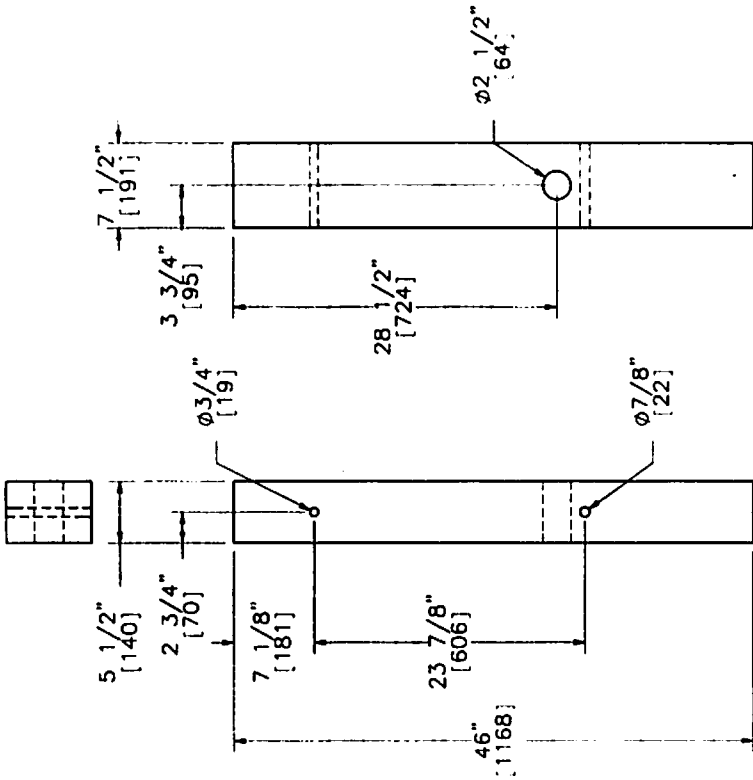


Blockout
Part 02

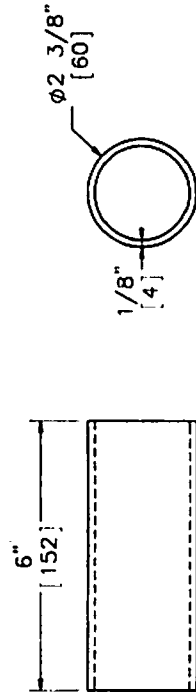




Foundation Tube
Part b1



BCT MGS Timber Post
Part b2



BCT Post Sleeve
Part b7
SCALE 1:4



Midwest Roadside
Safety Facility

MGS White Pine Wood
Posts

BCT Timber Post &
Foundation Tube Details

DWG. NAME:
MGSWP-1_R11

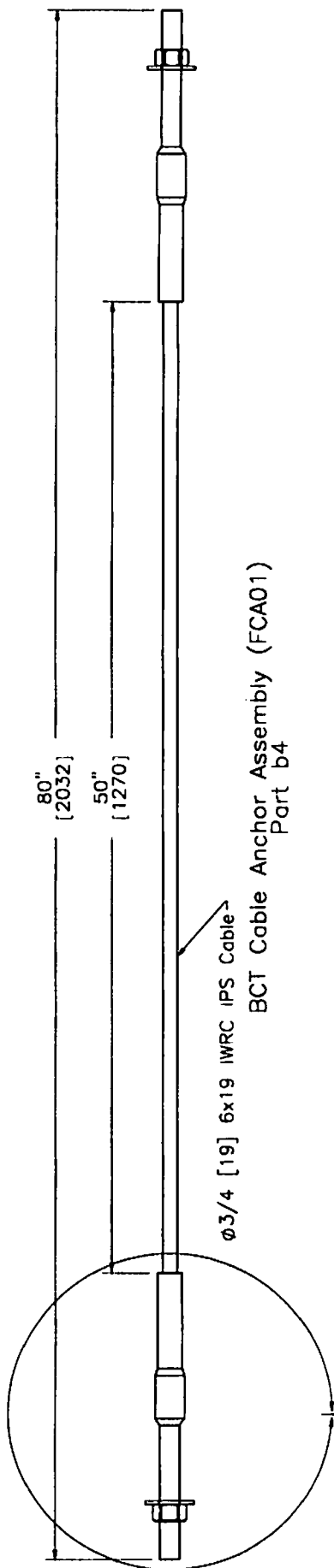
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UNITS: in, [mm]

REV. BY:
SKR/RWB/
CAL/RKF

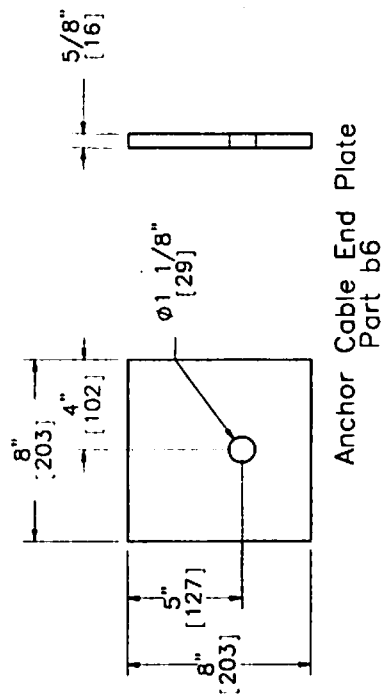
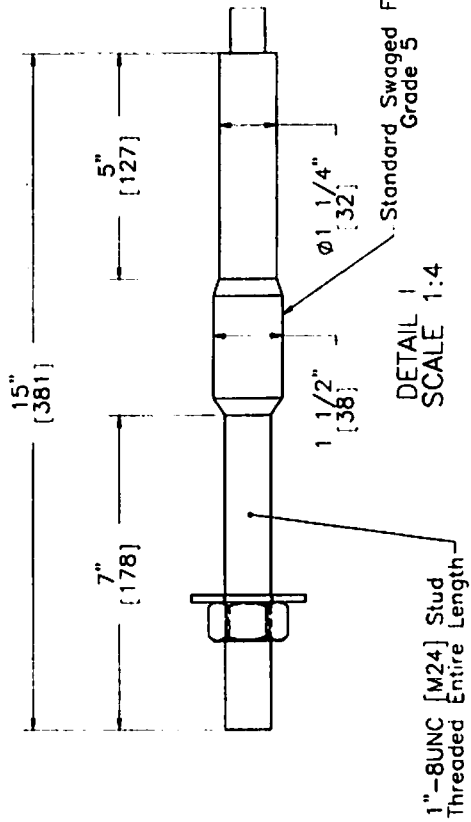
SHEET:
6 of 11

DATE:
05/16/2011

DRAWN BY:
MAM/PLT/
MDM/SP/D
VH




$\phi 3/4$ [19] 6x19 IWRC IPS Cable
 BCT Cable Anchor Assembly (FCA01)
 Part b4

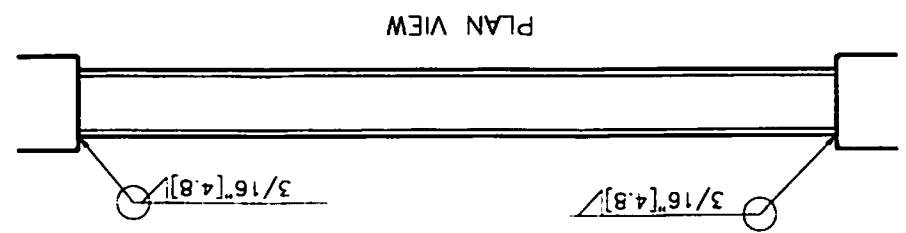
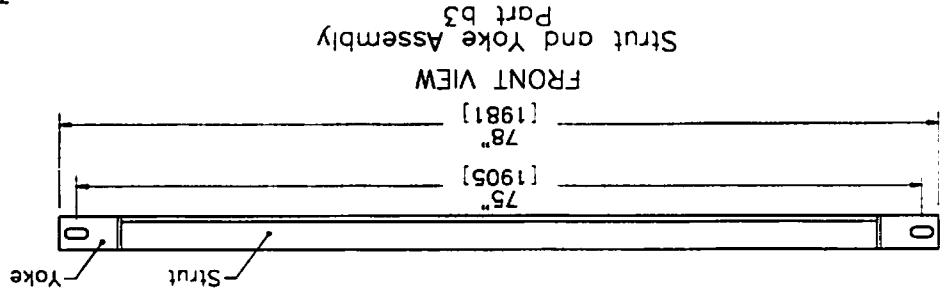
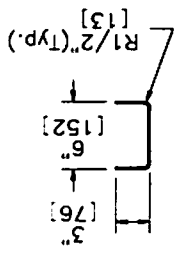
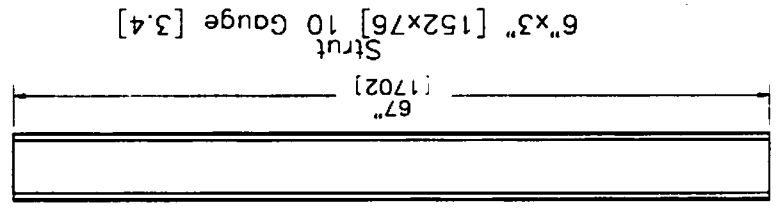
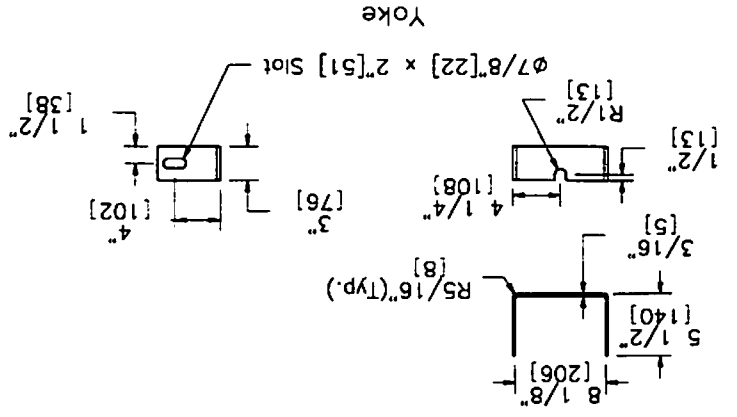


Midwest Roadside
 Safety Facility

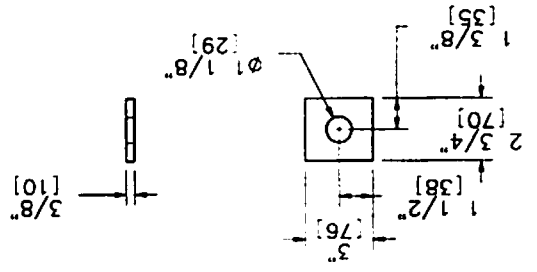
SHEET:	7 of 11
DATE:	06/16/2011
DRAWN BY:	MDW/JGP/S
CHK'D BY:	MH
REV BY:	SKR/RNB/ KAL/RKF
DWG. NAME:	MCSWP-1_R11
SCALE:	1:8
UNITS:	" [mm]
MGS White Pine Wood Posts	
BCT Anchor Cable	

Note: (1) 6x25 IWRC IPS cables meet the minimum breaking strength of 42.7 kips [190 kN] and may be substituted for the 6x19 IWRC IPS cables.

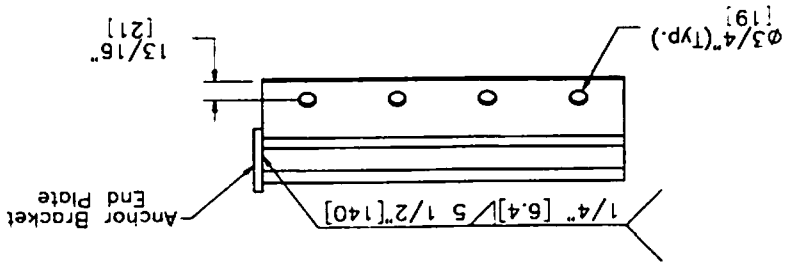
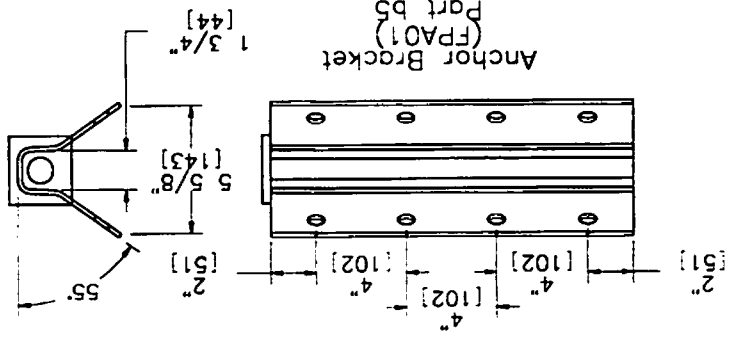
SHEET: 8 of 11	DATE: 06/16/2011	DRAWN BY: MAM/3/10	REV. BY: SKR/RWB/	UNITS: in [mm]	SCALE: 1:16	DWG. NAME: WCSWP-1311	 Midwest Safety Facility
	DATE: 06/16/2011	DRAWN BY: MAM/3/10	REV. BY: SKR/RWB/	UNITS: in [mm]	SCALE: 1:16	DWG. NAME: WCSWP-1311	

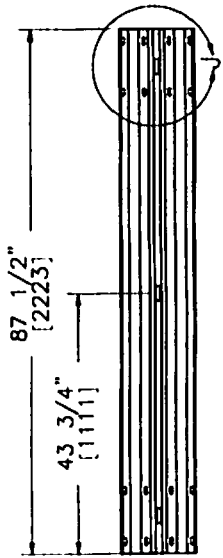


Anchor Bracket End Plate
SCALE 1:8

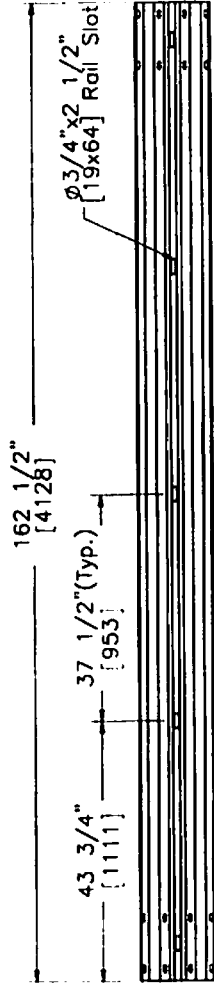


Anchor Bracket
(FPA01)
Part b5
SCALE 1:8

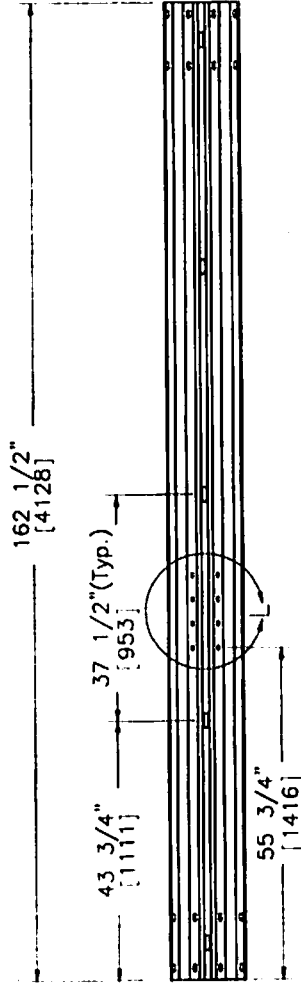




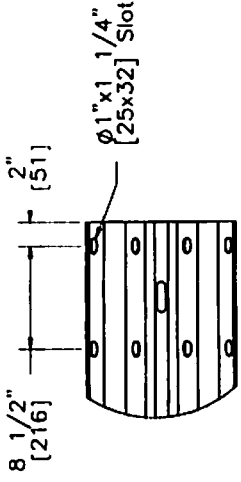
6'-3" [1905] W-Beam Section, 12 gauge [2.7]
Part a5



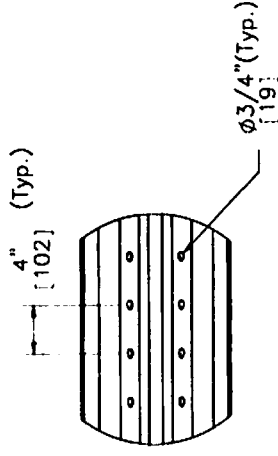
12'-6" [3810] W-Beam Section, 12 gauge [2.7]
Part a3




12'-6" [3810] W-Beam Section, 12 gauge [2.7], End Section
Part a4



DETAIL J
SCALE 1:15



DETAIL L
SCALE 1:15

	SHEET 9 of 11	
	DATE: 06/16/2011	
MGS with White Pine Wood Posts		DRAWN BY: MJK/RLT/ JSM/JSP/JO
Rail Section Details		SCALE: 1:30 UNITS: [mm]
Midwest Roadside Safety Facility		DWG. NAME: MSSWP-1_91
		REV. BY: SKR/RMG/ JA/RMG

Item No.	QTY.	Description	Material Specification	Hardware Guide
a1	25	6"x8"x72" [152x203x1829] White Pine Wood Post	Wisconsin <i>2009 Standard Specifications</i> Sections 614.2.4, 614.2.6, 507.2.2.3, and 507.2.2.4	-
a2	25	6"x12"x14 1/4" [152x305x362] Blockout	SYP Grade No.1 or better	PDB11a
a3	12	12'-6" [3810] W-Beam MGS Section	12 gauge [2.7] AASHTO M180	RWM04a
a4	2	12'-6" [3810] W-Beam MGS End Section	12 gauge [2.7] AASHTO M180	RWM14a
a5	1	6'-3" [1905] W-Beam MGS Section	12 gauge [2.7] AASHTO M180	RWM01a
a6	25	16D Double Head Nail	-	-
b1	4	72" [1829] Long Foundation Tube	ASTM A500 Gr. B	PTE06
b2	4	BCT Timber Post-MGS Height	SYP Grade No. 1 or better	PDF01
b3	2	Strut and Yoke Assembly	ASTM A36 Steel Galvanized	-
b4	4	BCT Cable Anchor Assembly	ø3/4" 6x19 IWRC IPS Galvanized Wire Rope	FCA01-02
b5	2	Anchor Bracket Assembly	ASTM A36 Galvanized	FPA01
b6	2	8"x8"x5/8" [203x203x16] Anchor Cable Bearing Plate	ASTM A36 Galvanized	FPB01
b7	2	2 3/8" [60] O.D. x 6" [152] Long BCT Post Sleeve	ASTM A53 Grade B Schedule 40	FMM02
b8	112	5/8" Dia. x 1 1/4" [M16x32] Long Guardrail Bolt and Nut	Bolt ASTM A563, Nut ASTM A563 DH	FBB01
b9	4	5/8" Dia. x 10" [M16x254] Long Guardrail Bolt and Nut	Bolt ASTM A563, Nut ASTM A563 DH	FBB03
b10	25	5/8" Dia. x 22" [M16x559] Long Guardrail Bolt and Nut	Bolt ASTM A563, Nut ASTM A563 DH	FBB07
b11	16	5/8" Dia. x 1 1/2" [M16x38] Long Hex Head Bolt and Nut	Bolt ASTM A563, Nut ASTM A563 DH	FBX16a
b12	4	5/8" Dia. x 9 1/2" [M16x241] Long Hex Head Bolt and Nut	Bolt ASTM A563, Nut ASTM A563 DH	FBX16a
b13	69	5/8" [16] Dia. Flat Washer	ASTM F436 Grade 1	FWC16a
b14	4	7/8" Dia. x 7 1/2" [M22x191] Long Hex Head Bolt and Nut	Bolt ASTM A563, Nut ASTM A563 DH	FBX22a
b15	8	7/8" [22] Dia. Flat Washer	ASTM F436 Grade 1	FWC22a



Midwest Roadside
Safety Facility

MGS with White Pine
Wood Posts

Bill of Materials

DWG. NAME:
MGSWP-1_R11

SCALE: None
UNITS: In [mm]

SHEET:
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DATE:
06/16/2011

DRAWN BY:
MJW/RJT/
MDM/JG/DWH

REV. BY:
SKR/RWB/
KAL/RKF

