



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

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

September 6, 2013

In Reply Refer To:  
HSST/ B-243

Ms. Karla Lechtenberg  
Midwest Roadside Safety Facility (MwRSF)  
130 Whittier Research Center  
2200 Vine Street  
Lincoln, NE 68583-0853

Dear Ms. Lechtenberg:

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: 31-inch Non-Blocked Midwest Guardrail System (MGS)  
Type of system: Longitudinal Barrier  
Test Level: AASHTO MASH TL3  
Testing conducted by: Midwest Roadside Safety Facility (MwRSF)  
Task Force 13 Designator: SGR41  
Date of request: October 5, 2012  
Date initially acknowledged: October 5, 2012  
Date of completed package: July 3, 2013

**Decision:**

The following device is eligible, with details provided in the form which is attached as an integral part of this letter:

- 31-inch Non-Blocked Midwest Guardrail System (MGS)

Based on a review of crash test results you submitted certifying the device described herein meets the crash test and evaluation 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: WLongstreet: sf.x60087: WLongstreet: 8/28/13

File: h://directory folder/HSST/B243\_Mid West Guardrail System MGS Non-blockout.docx  
cc: HSST Will Longstreet

**Requirements**

To be found eligible for Federal-aid funding, roadside safety devices should meet the crash test and evaluation criteria contained in the American Association of State Highway and Transportation Officials' Manual for Assessing Safety Hardware (MASH).

**Description**

The device and supporting documentation are described in the attached form.

**Summary and Standard Provisions**

Therefore, the system described and detailed in the attached form 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 does not cover other structural features of the systems, nor conformity with the Manual on Uniform Traffic Control Devices.
- Any changes that may influence system conformance with MASH 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 are expected to supply potential users with sufficient information on design and installation requirements to ensure proper performance.
- You are 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 test and evaluation criteria of the MASH.
- To prevent misunderstanding by others, this letter of eligibility is designated as number B-243 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 FHWA does not 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



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Washington, D.C. 20590

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2200 Vine Street  
Lincoln, NE 68583-0853

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- 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 FHWA does not 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

## Request for Federal Aid Reimbursement Eligibility Of Highway Safety Hardware

<b>Submitter</b>	Date of Request:	May 28, 2013	<input checked="" type="radio"/> New <input type="radio"/> Resubmission
	Name:	Karla Lechtenberg	Signature: <i>Karla Lechtenberg</i>
	Company:	Midwest Roadside Safety Facility (MwRSF)	
	Address:	130 Whittier Research Center, 2200 Vine Street, Lincoln, NE 68583-0853	
	Country:	USA	
	To:	Michael S. Griffith, Director FHWA, Office of Safety Technologies	

I request the following devices be considered eligible for reimbursement under the Federal-aid highway program.

System Type	Submission Type	Device Name / Variant	Testing Criterion	Test Level
'B': Barriers (Roadside, Median, Bridge Railings)	<input checked="" type="radio"/> Physical Crash Testing <input type="radio"/> FEA & V&V Analysis	Non-Blocked Midwest Guardrail System (MGS)	AASHTO MASH	TL3

By submitting this request for review and evaluation by the Federal Highway Administration, I certify that the product(s) was (were) tested in conformity with the AASHTO Manual for Assessing Safety Hardware and that the evaluation results meet the appropriate evaluation criteria in the MASH.

Identification of the individual or organization responsible for the product:

Contact Name:	Karla Lechtenberg	Same as Submitter <input checked="" type="checkbox"/>
Company Name:	Midwest Roadside Safety Facility (MwRSF)	Same as Submitter <input checked="" type="checkbox"/>
Address:	130 Whittier Research Center, 2200 Vine Street, Lincoln, NE 68583-	Same as Submitter <input checked="" type="checkbox"/>
Country:	USA	Same as Submitter <input checked="" type="checkbox"/>

### PRODUCT DESCRIPTION

New Hardware
<p>The non-blocked Midwest Guardrail System (MGS) (SGR41) consists of standard 12-gauge W-beam sections (RWM04a) installed with the top of the rail set at a nominal height of 31 inches. The rail is mounted on standard W6x8.5 (or W6x9) ASTM A992 or A36 steel posts that are 6-ft long (PWE06) and set at 75-in centers. The posts are embedded 40 inches in the ground. A 12-in. long, 12-gauge backup plate (RWB01a) is used to block the rail away from the front face of the steel post. The rail splices are located at mid-spans between adjacent posts. Standard splice bolts or ASTM A307 5/8-in. diameter x 1½-in. long guardrail bolts and nuts (FBB01) are used to attach the rail to the posts.</p>

### CRASH TESTING

A brief description of each crash test and its result:

Required Test Number	Narrative Description	Evaluation Results
3-10 (1100C)	<p>The results of test no. MGSNB-2 conducted on June 15, 2011 are found in MwRSF report no. TRP-03-262-12. A 2,578-lb small car with a simulated occupant seated in the right-front seat, impacted the non-blocked MGS, with its rail height set to the maximum tolerance of 32 inches, at a speed of 63.0 mph and at an angle of 25.5 degrees. After impact, the vehicle began to redirect, including a counter-clockwise yaw rotation. At 0.036 sec after impact, the vehicle snagged on a post causing the vehicle to essentially stop yawing. The vehicle continued to travel longitudinally down the system. At 0.404 sec, the vehicle exited the guardrail at an angle of 19.1 degrees and at a speed of 25.7 mph.</p> <p>Exterior vehicle damage was moderate, and the interior occupant compartment deformations were minimal, with a maximum deformation of 1¼ in. (32 mm), consequently not violating the limits established in MASH. Damage to the barrier was moderate, consisting mostly of deformed W-beam rail and steel guardrail posts as well as contact marks on guardrail and posts. The maximum lateral dynamic rail deflection was 29.1 inches. The working width of the system was 34.5 inches. All occupant risk measures were well below recommended values, and the test vehicle showed no tendency to roll over.</p>	PASS
3-11 (2270P)	<p>The results of test no. MGSNB-1 conducted on May 17, 2011 are found in MwRSF report no. TRP-03-262-12. A 5,181-lb pickup truck with a simulated occupant seated in the right-front seat, impacted the non-blocked MGS, with its rail height set to the nominal height of 31 inches, at a speed of 62.7 mph and at an angle of 24.7 degrees. At 0.248 sec after impact, the vehicle became parallel to the guardrail with a speed of 47.9 mph. At 0.504 sec, the vehicle exited the guardrail at an angle of 14.4 degrees and at a speed of 47.4 mph. The vehicle was smoothly redirected even though the right-front tire snagged on a post and was disengaged from the vehicle.</p> <p>Exterior vehicle damage was moderate, and the interior occupant compartment deformations were minimal, with a maximum of 1¼ in., consequently not violating the limits established in MASH. Damage to the barrier was also moderate, consisting mostly of deformed W-beam and guardrail posts as well as contact marks on guardrail and posts. The maximum lateral dynamic rail deflection was 34.1 inches. The working width of the system was 43.2 inches. All occupant risk measures were well below recommended values, and the test vehicle showed no tendency to roll over.</p>	PASS
3-20 (1100C)	Not applicable	WAIVER REQUESTED
3-21 (2270P)	Not applicable	WAIVER REQUESTED

Full Scale Crash Testing was done in compliance with MASH by the following accredited crash test laboratory (cite the laboratory's accreditation status as noted in the crash test reports.):



Laboratory Name:	Midwest Roadside Safety Facility		
Laboratory Contact:	Karla Lechtenberg	Same as Submitter <input checked="" type="checkbox"/>	
Address:	130 Whittier Research Center, 2200 Vine Street, Lincoln, NE 68583-0853	Same as Submitter <input checked="" type="checkbox"/>	
Country:	USA	Same as Submitter <input checked="" type="checkbox"/>	
Accreditation Certificate Number and Date:	A2LA Certificate Number: 2937.01, Valid to November 30, 2013		

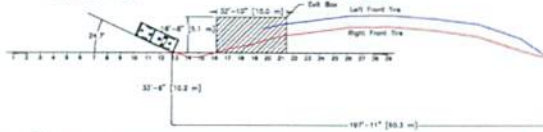
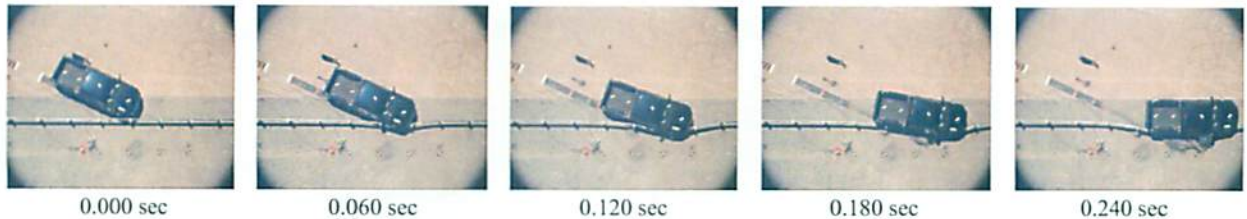
## ATTACHMENTS

Attach to this form:

- 1) A copy of the full test report, video, and a Test Data Summary Sheet for each test conducted in support of this request.
- 2) A drawing or drawings of the device(s) that conform to the Task Force-13 Drawing Specifications [[Hardware Guide Drawing Standards](#)]. For proprietary products, a single isometric line drawing is usually acceptable to illustrate the product, with detailed specifications, intended use, and contact information provided on the reverse. Additional drawings (not in TF-13 format) showing details that are key to understanding the performance of the device should also be submitted to facilitate our review.

FHWA Official Business Only:

Eligibility Letter		AASHTO TF13	
Number	Date	Designator	Key Words
B-243	August 30, 2013	SGR41	MASH, MGS, w-beam guardrail, nonblocked, generic



- Test Agency ..... MWRSE
- Test Number ..... MGSNB-1
- Date ..... 5/17/2011
- MASH Test Designation ..... 3-11
- Test Article ..... Non-Blocked MGS
- Total Length ..... 181 ft - 3 in. (55.3 m)
- Key Component Steel MGS Rail
  - Thickness ..... 12 gauge (2.66 mm)
  - Top Mounting Height ..... 31 in. (787 mm)
- Key Component Steel Posts
  - Post Type ..... W6x8.5 by 6' (W152x12.6 by 1,829 mm)
  - Post Spacing ..... 75 in. (1,905 mm)
- Key Component Steel W-beam Backup Plates
  - Thickness ..... 12 gauge (2.66 mm)
  - Length ..... 12 in. (305 mm)
- Soil Type ..... Grading B - AASHTO M 147-65 (1990)
- Vehicle Make / Model ..... 2004 Dodge Ram 1500 Quad Cab
  - Curb ..... 4,955 lb (2,248 kg)
  - Test Inertial ..... 5,011 lb (2,273 kg)
  - Gross Static ..... 5,181 lb (2,350 kg)
- Impact Conditions
  - Speed ..... 62.7 mph (100.9 km/h)
  - Angle ..... 24.7 deg
  - Impact Location ..... 14 ft - 3 in. (4.3 m) upstream of Post No. 15
- Exit Conditions
  - Speed ..... 47.4 mph (76.3 km/h)
  - Angle ..... 14.4 deg
- Exit Box Criterion ..... Pass
- Vehicle Stability ..... Satisfactory
- Vehicle Stopping Distance ..... 197 ft - 11 in. (60.3 m) downstream  
33 ft - 6 in. (10.2 m) laterally behind

- Vehicle Damage ..... Moderate
  - VDS<sup>(1)</sup> ..... 01-RFQ-4
  - CDC<sup>(14)</sup> ..... 01-RYEW-3
  - Maximum Interior Deformation ..... 1 1/4 in. (32 mm)
- Test Article Damage ..... Moderate
- Test Article Deflections
  - Permanent Set ..... 19.3/8 in. (492 mm)
  - Dynamic ..... 34.1 in. (867 mm)
  - Working Width ..... 43.2 in. (1,097 mm)
- Maximum Angular Displacements
  - Roll ..... 15.7° < 75°
  - Pitch ..... 5.3° < 75°
  - Yaw ..... 50.6°
- Impact Severity (IS) ..... 115.1 kip-ft (156.1 kJ) > 106 kip-ft (144 kJ)
- Transducer Data

Evaluation Criteria		Transducer		MASH Limit
		EDR-3	DTS	
OIV ft/s (m/s)	Longitudinal	-19.40 (-5.91)	-17.13 (-5.22)	≤ 40 (12.2)
	Lateral	-17.22 (-5.25)	-18.67 (-5.69)	≤ 40 (12.2)
ORA g's	Longitudinal	-11.20	-11.49	≤ 20.49
	Lateral	-8.51	-12.91	≤ 20.49
THIV - ft/s (m/s)		NA	24.09 (7.34)	not required
PHD - g's		NA	14.0	not required
ASI		0.86	0.90	not required

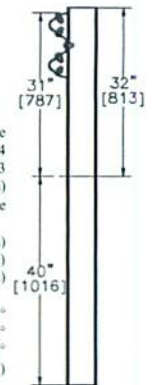
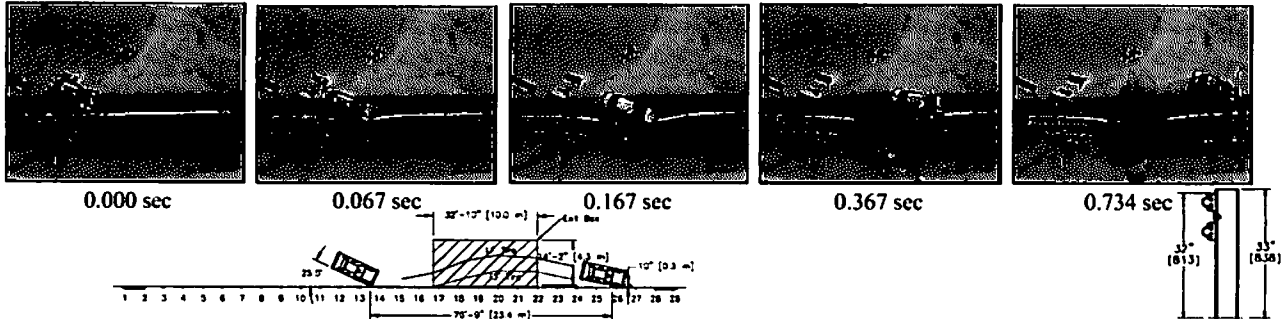


Figure 32. Summary of Test Results and Sequential Photographs, Test No. MGSNB-1



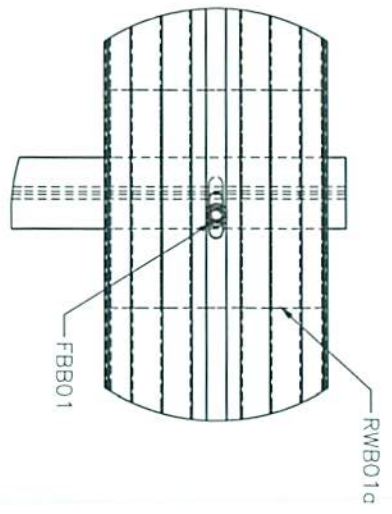
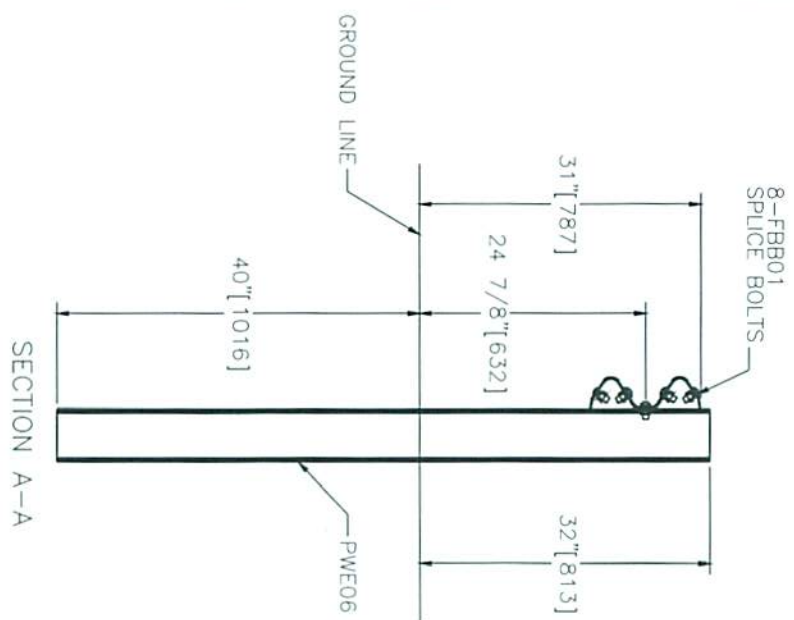
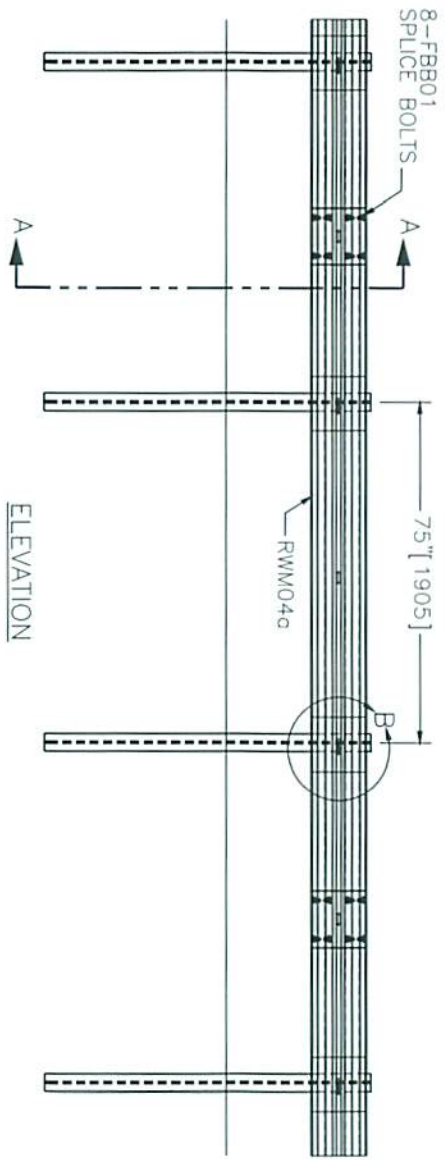
- Test Agency .....MWRSF
- Test Number.....MGSNB-2
- Date .....6/15/2011
- MASH Test Designation.....3-10
- Test Article.....Non-Blocked MGS
- Total Length.....181 ft - 3 in. (55.3 m)
- Key Component Steel MGS
  - Thickness.....12 gauge (2.66 mm)
  - Top Mounting Height.....32 in. (813 mm)
- Key Component Steel Posts
  - Post Type.....W6x8.5 by 6' (W152x12.6 by 1,829 mm)
  - Post Spacing.....75 in. (1,905 mm)
- Key Component Steel W-beam Backup Plates
  - Thickness.....12 gauge (2.66 mm)
  - Length.....12 in. (305 mm)
- Soil Type.....Grading B - AASHTO M 147-65 (1990)
- Vehicle Make -Model.....2005 Kia Rio
  - Curb.....2,375 lb (1,077 kg)
  - Test Inertial.....2,408 lb (1,092 kg)
  - Gross Static.....2,578 lb (1,169 kg)
- Impact Conditions
  - Speed.....63.0 mph (101.4 km/h)
  - Angle.....25.5 deg
  - Impact Location.....8 ft - 11 1/2 in. (2.7 m) upstream of Post No. 15
- Exit Conditions
  - Speed.....25.7 mph (41.4 km/h)
  - Angle.....19.1 deg
- Exit Box Criterion.....Pass
- Vehicle Stability.....Satisfactory
- Vehicle Stopping Distance.....76 ft-9 in. (23.4 m) downstream  
10 in. (0.3 M) laterally in front

- Vehicle Damage
  - VDS<sup>(11)</sup>.....01-RFQ-5
  - CDC<sup>(14)</sup>.....01-RYEW-4
  - Maximum Interior Deformation.....1 1/4 in. (32 mm)
- Test Article Damage.....Moderate
- Test Article Deflections
  - Permanent Set.....13 7/8 in. (352 mm)
  - Dynamic.....29.1 in. (740 mm)
  - Working Width.....34.5 in. (877 mm)
- Maximum Angular Displacements
  - Roll.....8.27° < 75°
  - Pitch.....3.98° < 75°
  - Yaw.....14.24°
- Impact Severity (IS).....59.3 kip-ft (80.4 kJ) > 51 kip-ft (69.7 kJ)
- Transducer Data

Evaluation Criteria	Transducer		MASH Limit
	EDR-3	DTS	
OIV ft/s (m/s)	Longitudinal	-31.17 (-9.81)    -31.26 (-9.53)	≤ 40 (12.2)
	Lateral	-15.46 (-4.71)    -15.83 (-4.82)	≤ 40 (12.2)
ORA g's	Longitudinal	-10.47    -10.20	≤ 20.49
	Lateral	-6.03    -6.30	≤ 20.49
THIV ft/s (m/s)	NA	34.65 (10.56)	not required
PHD g's	NA	10.21	not required
ASI	0.97	1.04	not required

January 24, 2013  
 MWRSF Report No. TRP-03-262-12

Figure 46. Summary of Test Results and Sequential Photographs, Test No. MGSNB-2



MIDWEST GUARDRAIL SYSTEM WITH NO BLOCKOUTS



SGR41

SHEET NO.	DATE:
1 of 2	9/8/2011

### INTENDED USE

The Midwest Guardrail System (MGS) with standard post spacing and no blockouts should be used in locations where the maximum dynamic deflection of 35 15/16" [913] or less is acceptable and where a working width of 47 1/2" [1207] is provided. MGS should be anchored and terminated using a suitable guardrail end treatment that is accepted with a 31" [787] top mounting height. Guardrail sections measuring 300" [7620] long can be used in lieu of the 150" [3810] long sections. The MGS with no blockouts has been tested under Test Level 3 (TL-3) test designation 3-10 and 3-11 conditions and deemed acceptable according to the Manual for Assessing Safety Hardware (MASH) performance criteria.

### COMPONENTS

Unit Length=150" [3810]

DESIGNATOR	COMPONENT	QUANTITY
FBB01	Guardrail post and splice bolts and nuts	10
PWE06	Wide-flange guardrail post	2
RWM04a	W-beam Rail	1
RWB01a	W-beam back-up plate	2

### ACCEPTANCE

Acceptance will be pursued.

### REFERENCES

Report in progress.

### CONTACT INFORMATION

Midwest Roadside Safety Facility  
Nebraska Transportation Center  
University of Nebraska-Lincoln  
130 Whittier Research Center  
2200 Vine Street  
Lincoln, NE 68583-0853  
(402) 472-0965  
Email: [mwrfsf@unl.edu](mailto:mwrfsf@unl.edu)  
Website: <http://mwrfsf.unl.edu/>



## MIDWEST GUARDRAIL SYSTEM WITH NO BLOCKOUTS

# SGR41

SHEET NO.

DATE:

2 of 2

9/8/2011

