



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

November 16, 2018

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

In Reply Refer To:
HSST-1/B-310

Mr. Steven J. Conway
Nucor Steel Marion, Inc.
912 Cheney Avenue
Marion, Ohio 43302

Dear Mr. Conway:

This letter is in response to your August 30, 2018 request for the Federal Highway Administration (FHWA) to review a roadside safety device, hardware, or system for eligibility for reimbursement under the Federal-aid highway program. This FHWA letter of eligibility is assigned FHWA control number B-310 and is valid until a subsequent letter is issued by FHWA that expressly references this device.

Decision

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

- Nu-Guard-31(5#) Barrier System

Scope of this Letter

To be found eligible for Federal-aid funding, new roadside safety devices should meet the crash test and evaluation criteria contained in the American Association of State Highway and Transportation Officials' (AASHTO) Manual for Assessing Safety Hardware (MASH). However, the FHWA, the Department of Transportation, and the United States Government do not regulate the manufacture of roadside safety devices. Eligibility for reimbursement under the Federal-aid highway program does not establish approval, certification or endorsement of the device for any particular purpose or use.

This letter is not a determination by the FHWA, the Department of Transportation, or the United States Government that a vehicle crash involving the device will result in any particular outcome, nor is it a guarantee of the in-service performance of this device. Proper manufacturing, installation, and maintenance are required in order for this device to function as tested.

This finding of eligibility is limited to the crashworthiness of the system and does not cover other structural features, nor conformity with the Manual on Uniform Traffic Control Devices.

Eligibility for Reimbursement

Based solely on a review of crash test results and certifications submitted by the manufacturer, and the crash test laboratory, FHWA agrees that the device described herein meets the crash test and evaluation criteria of the AASHTO's MASH. Therefore, the device is eligible for reimbursement under the Federal-aid highway program if installed under the range of tested conditions.

Name of system: Nu-Guard-31(5#) Barrier System
Type of system: Longitudinal Barrier
Test Level: MASH Test Level 3 (TL3)
Testing conducted by: Holmes Solutions
Date of request: August 30, 2018

FHWA concurs with the recommendation of the accredited crash testing laboratory within the length of need on the attached form.

Full Description of the Eligible Device

The device and supporting documentation, including reports of the crash tests or other testing done, videos of any crash testing, and/or drawings of the device, are described in the attached form.

Notice

This eligibility letter is issued for the subject device as tested. Modifications made to the device are not covered by this letter. Any modifications to this device should be submitted to the user (i.e., state DOT) as per their requirements.

You are expected to supply potential users with sufficient information on design, installation and maintenance 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 AASHTO's MASH.

Issuance of this letter does not convey property rights of any sort or any exclusive privilege. This letter is based on the premise that information and reports submitted by you are accurate and correct. We reserve the right to modify or revoke this letter if: (1) there are any inaccuracies in the information submitted in support of your request for this letter, (2) the qualification testing was flawed, (3) in-service performance or other information reveals safety problems, (4) the system is significantly different from the version that was crash tested, or (5) any other information indicates that the letter was issued in error or otherwise does not reflect full and complete information about the crashworthiness of the system.

Standard Provisions

- To prevent misunderstanding by others, this letter of eligibility designated as FHWA control number B-310 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 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.
- This FHWA eligibility letter is not an expression of any Agency view, position, or determination of validity, scope, or ownership of any intellectual property rights to a specific device or design. Further, this letter does not impute any distribution or licensing rights to the requester. This FHWA eligibility letter determination is made based solely on the crash-testing information submitted by the requester. The FHWA reserves the right to review and revoke an earlier eligibility determination after receipt of subsequent information related to crash testing.
- If the subject device is a patented product it may be considered to be proprietary. If proprietary systems are specified by a highway agency for use on Federal-aid projects: (a) they must be supplied through competitive bidding with equally suitable unpatented items; (b) the highway agency must certify that they are essential for synchronization with the existing highway facilities or that no equally suitable alternative exists; or (c) they must be used for research or for a distinctive type of construction on relatively short sections of road for experimental purposes. Our regulations concerning proprietary products are contained in Title 23, Code of Federal Regulations, Section 635.411.

Sincerely,



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

Enclosures

Request for Federal Aid Reimbursement Eligibility of Highway Safety Hardware

Submitter	Date of Request:	August 30, 2018	<input checked="" type="radio"/> New <input type="radio"/> Resubmission
	Name:	Steven J. Conway	
	Company:	Nucor Steel Marion, Inc.	
	Address:	912 Cheney Avenue, Marion, Ohio 43302	
	Country:	United States of America	
	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.

Device & Testing Criterion - Enter from right to left starting with Test Level

System Type	Submission Type	Device Name / Variant	Testing Criterion	Test Level
'B': Rigid/Semi-Rigid Barriers (Roadside, Median, Bridge Railings)	<input checked="" type="radio"/> Physical Crash Testing <input type="radio"/> Engineering Analysis	Nu-Guard-31(5#) Barrier System	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.

Individual or Organization responsible for the product:

Contact Name:	Steven J. Conway	Same as Submitter <input checked="" type="checkbox"/>
Company Name:	Nucor Steel Marion, Inc.	Same as Submitter <input checked="" type="checkbox"/>
Address:	912 Cheney Avenue, Marion, Ohio 43302	Same as Submitter <input checked="" type="checkbox"/>
Country:	United States of America	Same as Submitter <input checked="" type="checkbox"/>

Enter below all disclosures of financial interests as required by the FHWA 'Federal-Aid Reimbursement Eligibility Process for Safety Hardware Devices' document.

There are no shared financial interests in the Nu-Guard-31(5#) Barrier System between Nucor Steel Marion, Inc. and Holmes Solutions, other than the actual crash tests and reports for this submission to FHWA.

PRODUCT DESCRIPTION

- New Hardware or Significant Modification
 Modification to Existing Hardware

Longitudinal roadside barriers act to prevent vehicles that depart the road from conflicting with dangerous features and hazards on the sides of the roadway.

The Nu-Guard-31(5#) Barrier System comprises of all typical Nu_Guard-31 System components. there are no modified parts. The W-Beam guardrail height remains the same at 790.0 mm. The height of the post changes from the 810.0 mm to 780.0 mm, a difference of 30.0 mm. This means the post bolt sits slightly higher in the post slot compared to the configuration installation.

In summary, the Nu-Guard-31(5#) Barrier System consists of a W-Beam guardrail, supported on a U section posts at 1905 mm centers. The height to the top of the guardrail is specified as a nominal 790.0 mm (31.1"), and for testing purposes installed with an allowable tolerance of +20 mm / -0 mm. As per the requirements of MASH, the test article for Test 3-10 was installed with the rail at the higher tolerance limit and the test article of Test 3-11 was installed with the rail at the lower tolerance limit. For the purposes of this tests, all posts were driven in AASHTO standard soil. The depth of embedment of the posts was increased to maintain the post height below the W-Beam guardrail height.

The W-Beam rail elements were connected to the posts using M16 x 90 mm bolts. The lap joints in the rail were at 3081 centers, always on a post location. The lap joints were formed with 8 x M16 splice bolts and nuts.

CRASH TESTING

By signature below, the Engineer affiliated with the testing laboratory, agrees in support of this submission that all of the critical and relevant crash tests for this device listed above were conducted to meet the MASH test criteria. The Engineer has determined that no other crash tests are necessary to determine the device meets the MASH criteria.

Engineer Name:	Emerson Ryder	
Engineer Signature:	Emerson Ryder	Digitally signed by Emerson Ryder Date: 2018.08.31 08:35:44 +12'00'
Address:	Level 2, 254 Montreal Street, Christchurch 8013	Same as Submitter <input type="checkbox"/>
Country:	New Zealand	Same as Submitter <input type="checkbox"/>

A brief description of each crash test and its result:

Required Test Number	Narrative Description	Evaluation Results
3-10 (1100C)	The CSP Pacific Nu_Guard-31(5#) longitudinal barrier with reduced post height, successfully contained and redirected an 1100C test vehicle impacting the test article at 24.5 degrees and a velocity of 98.0 km/h (60.9 mph). No debris or detached elements penetrated or showed potential to penetrate the occupant compartment. The trajectory of the vehicle was such that it did not present and undue hazard to other traffic, pedestrians or work zone personnel. The vehicle remained upright during and after impact and vehicle stability was considered satisfactory. Occupant risk factors satisfied the test criteria and the vehicle exit trajectory remained within acceptable limits. A link will be sent later to Mr. Griffith containing Test Reports, Videos and Drawing.	PASS
3-11 (2270P)	The CSP Pacific Nu-Guard-31(5#) longitudinal barrier with reduced post height, successfully contained and redirected a 2270P test vehicle impacting the test article at 24.9 degrees and a velocity of 97.2 km/h (60.4 mph). No debris or detached elements penetrated or showed potential to penetrate the occupant compartment. The trajectory of the vehicle was such that it did not present and undue hazard to other traffic, pedestrians or work zone personnel. The vehicle remained upright during and after the impact and vehicle stability was considered satisfactory. Occupant risk factors satisfied the test criteria and the vehicle exit trajectory remained within acceptable limits. A link will be sent later to Mr. Griffith containing Test Reports, Videos and Drawing.	PASS
3-20 (1100C)		Non-Relevant Test, not conducted
3-21 (2270P)		Non-Relevant Test, not conducted

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:	Holmes Solutions	
Laboratory Signature:	Emerson Ryder	Digitally signed by Emerson Ryder Date: 2018.08.31 08:37:46 +12'00'
Address:	Level 2, Montreal Street, Christchurch 8013	Same as Submitter <input type="checkbox"/>
Country:	New Zealand	Same as Submitter <input type="checkbox"/>
Accreditation Certificate Number and Dates of current Accreditation period :	ISO/IEC 17025:2005;IANZ Certificate Number;1022 23 July to Present Day	

Submitter Signature*:

Digitally signed by Steven J.
Conway
Date: 2018.08.30 10:31:37 -04'00'

Submit Form

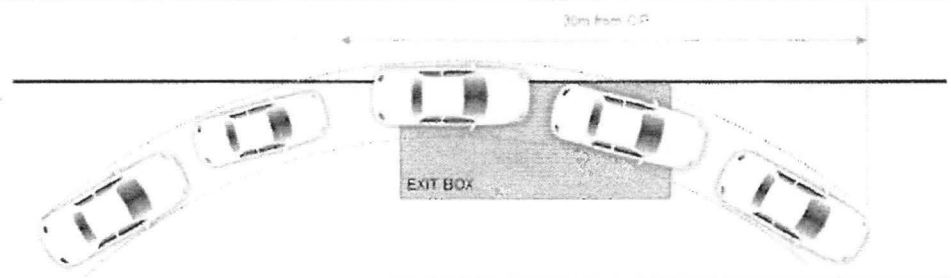
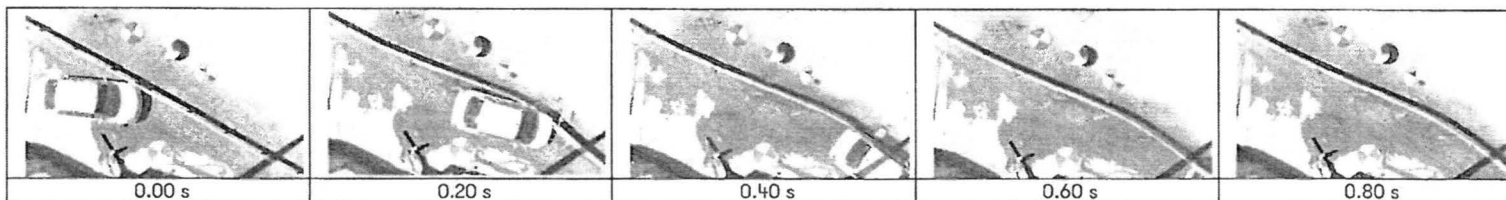
ATTACHMENTS

Attach to this form:

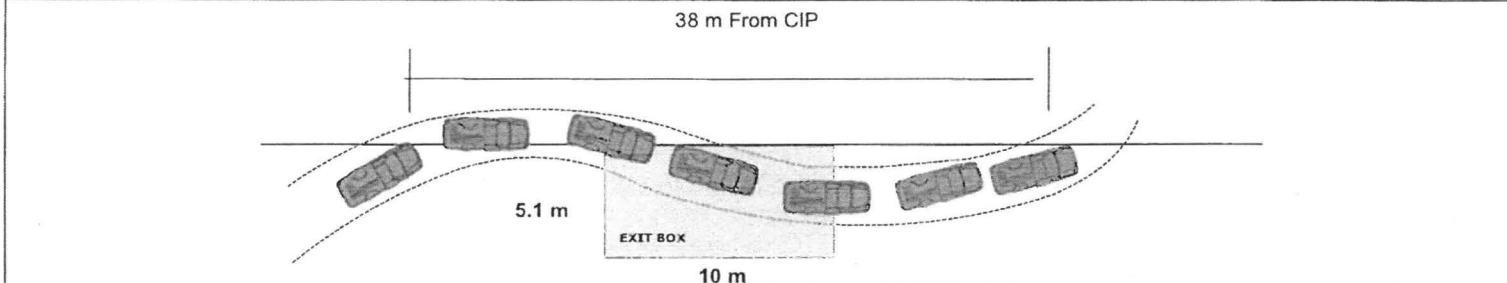
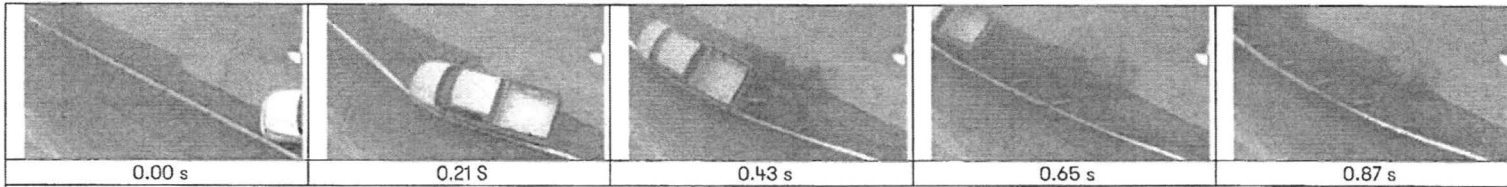
- 1) Additional disclosures of related financial interest as indicated above.
- 2) A copy of the full test report, video, and a Test Data Summary Sheet for each test conducted in support of this request.
- 3) A drawing or drawings of the device(s) that conform to the Task Force-13 Drawing Specifications [[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 relevant to understanding the dimensions and performance of the device should also be submitted to facilitate our review.

FHWA Official Business Only:

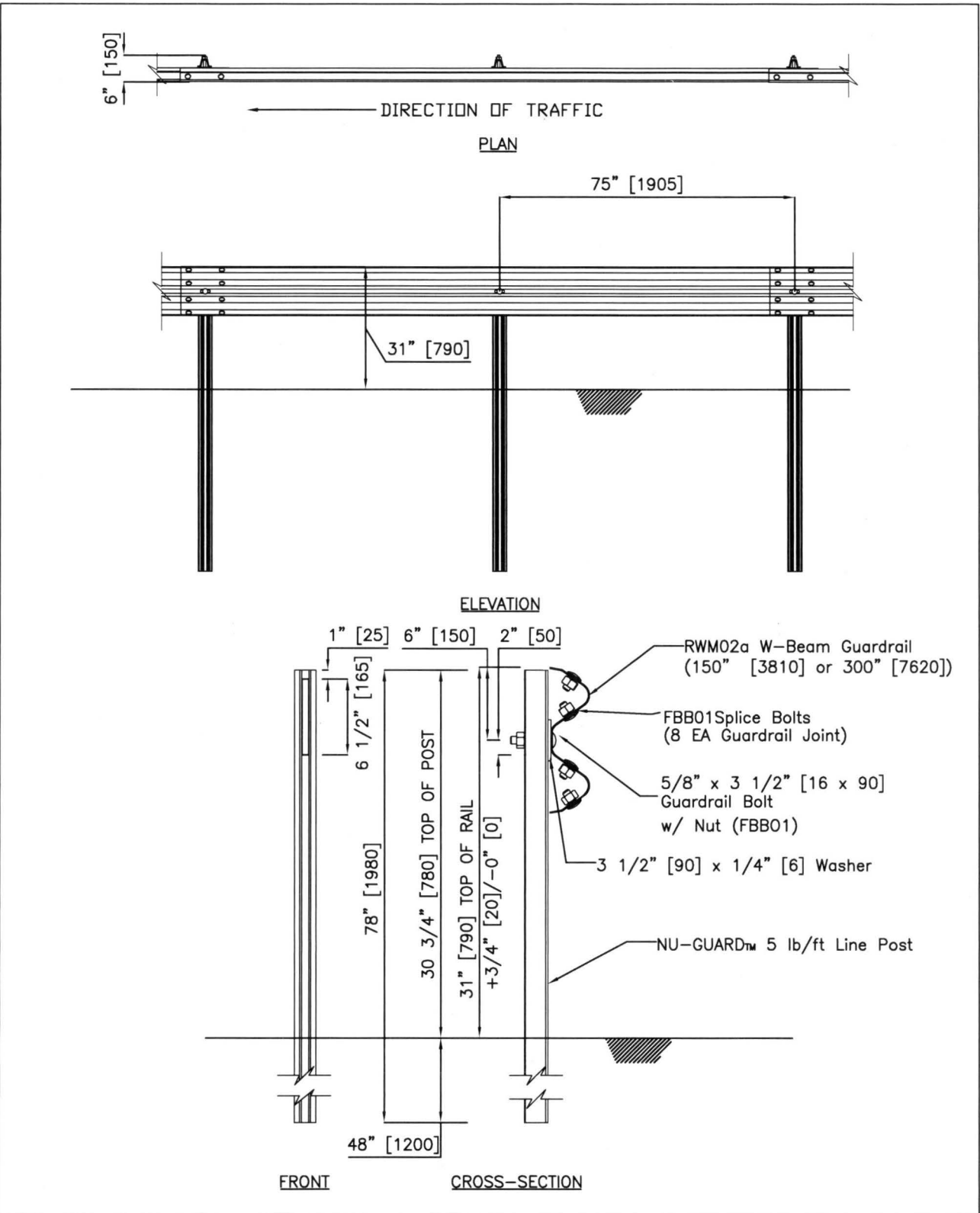
Eligibility Letter		
Number	Date	Key Words



Test Article	CSP Pacific Nu-Guard 31 W-beam Barrier	Post Impact Vehicle Behaviour	
Total Length	90.0 m	Vehicle Stability	Good
Key Elements - Barrier	Test 3-10 11 th December 2017	Stopping Distance	30.0 m from CIP
Description	Nu-Guard 31 with reduced post height	Vehicle Snagging	None
Length of Barrier Installation	86.0 m Long (LON)	Vehicle Pocketing	None
Nominal Rail Height	790 mm (31.1")	Occupant Impact Velocity m/s	at 0.1414 seconds
Nominal Post Height	780 mm (30.7")	Longitudinal	5.2
Test Vehicle		Lateral (optional)	-3.9
Designation	1100C	Occupant Ride-down Deceleration	
Make/Model	Nissan Tiida	X-direction (g)	-7.3 (0.1889 - 0.1989 seconds)
Dimensions (LxWxH)	4295 mm x 1698 mm x 1545 mm	Y-direction (g)	6.8 (0.1508 - 0.1608 seconds)
Curb Wt	1088.5 kg	THIV (optional)(m/s)	6.7 (0.1417 seconds)
Test Inertial Wt	1103.0 kg	PHD (optional) (g)	8.4 (0.1628 - 0.1728 seconds)
Gross Static	1178.0 kg	ASI (optional)	0.76 (0.1289 - 0.1789 seconds)
Impact Conditions		Test Article Damage	Moderate
Speed	98.0 km/h	Test Article Deflections	
Angle	24.5°	Dynamic	1.18 m
Impact Point	350 mm Before steel line post 15	Permanent	0.61 m
Exit Conditions		Working Width	1.18 m
Exit Speed:	61.2 km/h	Vehicle Damage Exterior	
Exit Angle:	12.0°	VDS	11FL-2
		CDC	11LFEE2
		Maximum Deformation	200 mm



Test Article:	CSP Pacific Nu-Guard 31 W-beam Barrier	Post Impact Vehicle Behaviour	
Total Length	78.1 m	Vehicle Stability	Good
Key Elements - Barrier	Test 3-11 5 th July 2017	Stopping Distance	38.0 m from CIP
Description	Nu-Guard 31 with reduced post height	Vehicle Snagging	None
Length of Barrier Installation	70.5 m Lon	Vehicle Pocketing	None
Nominal Rail Height	787 mm (30.9")	Occupant Impact Velocity m/s	at 0.1761 seconds
Nominal Post Height	780 mm (30.7")	Longitudinal	4.6
Test Vehicle		Lateral (optional)	-4.2
Designation	2270P	Occupant Ride-down Deceleration	
Make/Model	Dodge Ram 1500 Quad Cab	X-direction [g]	-7.7 [2.2883 - 2.2983 seconds]
Dimensions (LxWxH)	5810 mm x 1995 mm x 1945 mm	Y-direction [g]	6.9 [0.2411 - 0.2511 seconds]
Curb Wt	2141.5 kg	THIV (optional) (m/s)	5.8 [0.1712 seconds]
Test Inertial Wt	2262.0 kg	PHD (optional) [g]	8.4 [2.2883 - 2.2983 seconds]
Gross Static	2262.0 kg	ASI (optional)	0.58 [0.2290 - 0.2790 seconds]
Impact Conditions		Test Article Damage	Moderate
Speed	97.2 km/h	Test Article Deflections	
Angle	24.9°	Dynamic	1.30 m
Impact Point	400 mm Before steel line post 13	Permanent	1.28 m
Exit Conditions		Working Width	1.33 m
Exit Speed:	36 km/h	Vehicle Damage Exterior	
Exit Angle:	6.0°	VDS	11FL-2
		CDC	11LFEE2
		Maximum Deformation	125 mm



NU-GUARD-31™ CSP ROADSIDE BARRIER

SGR33e

SHEET NO.

DATE:

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06/20/2018

INTENDED USE

The NU-GUARD-31™ CSP system is a corrugated metal w-beam barrier for use on national, state and local roadways to prevent collisions with hazards as required by safety design standards. The system is designed for roadside applications as an alternate to SGR04, and equivalent to other 31" [790] mounting height w-beam barriers (such as SGR20), for strong or weak post applications. The system may be connected to any crashworthy 31" [790] mounting height guardrail terminal or transition system. The system is to be installed on approach slopes no greater than 10H:1V, wherever a maximum working deflection of 51" [1300] is required for TL-3 applications.

COMPONENTS

The posts are Rib-Bak U-Channel sign posts 5 lb/ft [7.4 kg/m] fabricated from hot rolled carbon steel bars conforming to the requirements of ASTM A1075-12 with a minimum yield point of 80,000 psi [552 Mpa]

Unit length = 150" [3810]

Designator	Component	Number
RWM02a	W-beam rail	1
	NU-GUARD™ 5 lb/ft Line Post	2
	3 1/2" [90] x 1/4" [6] Washer	2
	3 1/2" [90] Guardrail-post bolt and nut	2
FBB01	Splice bolt and nut	8

The system meets MASH TL-3 requirements as a longitudinal barrier.

AGENCY ACCEPTANCE

N/A

CONTACT INFORMATION

Nucor Steel Marion Inc.
 912 Cheney Avenue
 Marion, Ohio 43301-1801
 (800) 333-4011
 (740) 383-6429 Fax
www.nucorhighway.com

NU-GUARD-31™ CSP ROADSIDE BARRIER SYSTEM

SGR33e

NUCOR

BAR MILL GROUP

NUCOR STEEL MARION, INC.

SHEET NO.

DATE

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06/20/2018

All Nucor Steel Marion Inc. products are produced from 100% recycled steel.