U.S. Department of Transportation
Federal Highway Administration

July 19, 2024

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

In Reply Refer To:
HSST-1/WZ-455

Eric Willetts
MDI Worldwide
38271 West Twelve Mile Road
Farmington Hills, MI 48331

Dear Mr. Willetts:

We received your correspondence of February 6, 2023, requesting issuance of a reimbursement eligibility letter under the Federal-aid highway program for the roadside safety system, device, design, product, or hardware (collectively "device") described below. This letter is assigned Federal Highway Administration (FHWA) control number WZ-455.

ELIGIBILITY LETTERS

The FHWA issues Federal-aid reimbursement eligibility letters for new roadside safety devices that are crash tested in accordance with the industry standard of the American Association of State Highway and Transportation Officials (AASHTO) Manual for Assessing Safety Hardware (MASH).

FHWA, the Department of Transportation, and the United States (government) do not regulate roadside safety devices, crash test facilities, or the manufacturing industry. Issuance of eligibility letters is discretionary and provided only as a service to the states. FHWA may, at its discretion, decline to issue, revise, or rescind an eligibility letter. Eligibility letters are only issued by the FHWA headquarters Office of Safety.

Eligibility letters are issued only as notice to the states that a device is eligible for reimbursement under the Federal-aid highway program. They do not establish approval or certification for any other purpose. Issuance of an eligibility letter is not a prerequisite or requirement for state transportation agencies seeking to use Federal-aid funds for roadside safety devices. State agencies may use a device for which an eligibility letter has not been issued and seek Federal-aid reimbursement.

FEDERAL-AID REIMBURSEMENT

The request for issuance of this letter certified the device was crash tested in accordance with the industry standard of AASHTO's MASH. This eligibility letter is based on that certification and the material offered in support of its issuance. The device described below is eligible for reimbursement under the Federal-aid highway program.

Name of system: StackMaster Sign Stand with 48'x48' Roll-Up Sign
Type of system: Work Zone
Test Level: Test Level 3
Testing conducted by: Applus IDIADA KARCO Engineering, LLC
Date of request: February 6, 2023

Information about the device, including material such as the eligibility request, crash test reports, drawings, or images are included in one or more attachment(s) to this letter.

Eligibility letter WZ-455 is inapplicable to devices, optional equipment, alternate materials, or other features that were not crash tested in accordance with AASHTO's MASH.

This letter is issued only for the subject device as crash tested under AASHTO's MASH. Later modification(s) of the device are not eligible for Federal-aid reimbursement under this letter. Notice of later modification(s) should be given to transportation agencies, facility owners, and operators (collectively "agencies").

Agencies should be provided appropriate information about the device's design, installation, maintenance, materials, and mechanical properties.

Issuance of this letter is discretionary, and it may be revised or rescinded at FHWA's discretion. This letter is not a determination of compliance with the Manual on Uniform Traffic Control Devices for Streets and Highways (MUTCD) or ownership of any intellectual property rights.

This eligibility letter is not a determination by the government that a crash involving the subject device will result in any particular outcome. It is limited to only the device's eligibility for Federal-aid reimbursement.

INTELLECTUAL PROPERTY

Issuance of this eligibility letter does not convey property rights of any sort nor any exclusive privilege. This letter is not authorization or consent by the government for the use, manufacture, or sale of any patented or proprietary system, device, design, product, or hardware for which the requester is not the patent owner. Eligibility letters are not an expression of any view, position, or determination by the government as to the validity, scope, or ownership of any intellectual property rights to a specific device. These letters do not grant, impute, suggest, or otherwise establish any ownership, distribution, or licensing rights to the requester. The government expresses no opinion about the intellectual property rights relating to any device for which this or any other eligibility letter is issued.

PUBLIC DISCLOSURE

To prevent any misunderstanding, and as discussed above, this eligibility letter is assigned FHWA control number WZ-455. It should only be reproduced in full with its attachment(s). This letter and the material offered by the requester supporting its issuance is public information. All eligibility letters and supporting material are subject to public disclosure under the Freedom

of Information Act (FOIA). Eligibility letters are available to the public at https://safety.fhwa.dot.gov/roadway_dept/countermeasures/reduce_crash_severity/.

If you have any questions please contact Aimee Zhang at Aimee.Zhang@dot.gov.

Sincerely,

Amy S. Fox
Acting Director, Office of Safety Technologies
Office of Safety

Enclosures

Request for Federal Aid Reimbursement Eligibility of Highway Safety Hardware

Submitter	Date of Request:	February 6, 2023	◉ New ○ Resubmission
	Name:	Eric Willetts	
	Company:	MDI Worldwide	
	Address:	38271 W. Twelve Mile Road, Farmington Hills, MI 48331	
	Country:	United States	
	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
'WZ': Crash Worthy Work Zone Traffic Control Devices	◉ Physical Crash Testing ○ Engineering Analysis	MDI Worldwide STACKMASTER Sign Stand with 48" x 48" Roll-Up Sign	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:	Eric Willetts	Same as Submitter ☒
Company Name	MDI Worldwide	Same As Submitter ☒
Address:	38271 W. Twelve Mile Road, Farmington Hills, MI 48331	Same as Submitter ☒
Country:	United States	Same as Submitter ☒

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

Marketing Displays, Inc., doing business as MDI Worldwide ("MDI"), whose principal place of business is 38271 West Twelve Mile Road, Farmington Hills, Michigan 48331-3041, and Karco Engineering, LLC., whose principal place of business is 9270 Holly Road, Adelanto, CA 92301share no ($0.00) financial interests between the two organizations. This includes no ($0.00) financial interest but not limited to:
i. Compensation, including wages, salaries, commissions, professional fees, or fees for business referrals (dollar values are not needed);
ii. Consulting relationships;
iii. Research funding or other forms of research support;
iv. Patents, copyrights, and other intellectual property interests;
v. Licenses or contractual relationships; or
vi. Business ownership and investment interest.

PRODUCT DESCRIPTION

(●) New Hardware or Significant Modification ( ) Modification to Existing Hardware

Product Description of STACKMASTER
(Reference Drawing ZA-08111)
The STACKMASTER temporary sign stand is a work-zone traffic control device used to display traffic control signs.
Further Description:
The STACKMASTER temporary sign support is a portable/fold-up sign stand consisting of a rubber base assembly and a steel collapsible upright. The upright is constructed of 1-1/4" square tube. A roll up sign is attached to the upright with the use of a drop and lock channel at a fixed height of 12".
The overall height of the stand is 16.5". The total weight of the stand is approximately 30 lbs.

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:	Antonio Reyes	
Engineer Signature:	Antonio Reyes — Digitally signed by Antonio Reyes DN: cn=Antonio Reyes, o=Applus Idiada, ou email=Antonio.Reyes@idiada.com, c=US Date: 2023.02.06 14:16:19 -08'00'	
Address:	9270 Holly Road, Adelanto, CA 92301	Same as Submitter ☐
Country:	United States of America	Same as Submitter ☐

A brief description of each crash test and its result:

Required Test Number	Narrative Description	Evaluation Results
3-70 (1100C)	Designed to evaluate the ability of a small vehicle to activate any breakaway, fracture, or yielding mechanism. Is considered optional for work-zone traffic control devices weighing less than 220 lbs (100 kg).	Non-Relevant Test, not conducted
3-71 (1100C)	An 1100C test vehicle approached the test article at a nominal speed of 62 mph. The first STACKMASTER stand impacted was oriented at 0° and the second test article at 90°. Upon impact the sign face separated from the upright causing the sign face to make contact with the windshield but did not tear the plastic liner or cause excessive deformation. There was no penetration into the test vehicles occupant compartment nor were the deformation limits exceeded. The devices did not induce any vehicle instability. The STACKMASTER met all the requirements for MASH Test 3-71.	PASS

Required Test Number	Narrative Description	Evaluation Results
3-72 (2270P)	A 2270P test vehicle approached the test article at a nominal speed of 62 mph. The first STACKMASTER stand impacted was oriented at 0° and the second at 90°. Upon impact sign face separated from the upright causing the sign face to make contact with the hood of the vehicle. There was no penetration into the test vehicles occupant compartment nor were the deformation limits exceeded. The devices did not induce any vehicle instability. The STACKMASTER met all the requirements for MASH Test 3-72.	PASS

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:	Applus IDIADA KARCO Engineering, LLC.	
Laboratory Signature:	Antonio Reyes — Digitally signed by Antonio Reyes DN: cn=Antonio Reyes, o=Applus Idiada, ou email=Antonio.Reyes@idiada.com, c=US Date: 2023.02.06 14:16:19 -08'00'	
Address:	9270 Holly Road, Adelanto, CA 92301	Same as Submitter ☐
Country:	United States of America	Same as Submitter ☐
Accreditation Certificate Number and Dates of current Accreditation period :	International Accreditation Services (IAS) ISO 17025 Accreditation Certificate #TL-371 Expires April 27, 2023	

Submitter Signature*: Eric Willetts — Digitally signed by Eric Willetts Date: 2021.12.08 11:32:32 -05'00'

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.

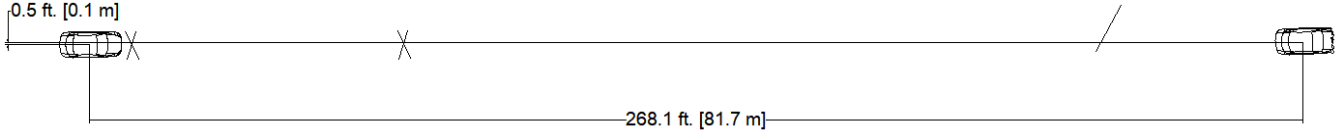
FHWA Official Business Only:

Eligibility Letter		
Number	Date	Key Words

MASH 2016 Test 3-71 Summary

0° CIA **90° CIA**

0.000 seconds 0.100 seconds 0.200 seconds 0.655 seconds 0.755 seconds 0.855 seconds



GENERAL INFORMATION

Test Agency	Applus IDIADA KARCO
Test Number	P39280-01
Test Designation	3-71
Test Date	09/20/19

TEST ARTICLE

Name / Model	MDI Worldwide StackMaster Sign Stand with 48" x 48" Roll-Up Sign
Type	Work-Zone Traffic Device
Device Height	6.7 ft. (2.0 m)
Key Elements	Rubber Stand Base, Aluminum Upright, Roll-Up Sign
Road Surface	Smooth clean concrete

TEST VEHICLE

Type / Designation	1100C
Year, Make, and Model	2009 Kia Rio
Curb Mass	2,335.8 lbs (1,059.5 kg)
Test Inertial Mass	2,399.7 lbs (1,088.5 kg)
Gross Static Mass	2,565.0 lbs (1,163.5 kg)

Impact Conditions

Impact Velocity Device 1	62.45 mph (100.50 km/h)
Impact Velocity Device 2	61.76 mph (99.40 km/h)
Device 1 Angle	0.0°
Device 2 Angle	90.0°
Location/ Orientation Device 1	17.3 in. (440 mm) From Vehicle Centerline to Passenger Side
Location/ Orientation Device 2	9.7 in. (246 mm) From Vehicle Centerline to Driver Side
Device 1 Kinetic Energy	312.8 kip-feet (424.2 Kilojoules)
Device 2 Kinetic Energy	306.0 kip-feet (414.9 Kilojoules)
Minimum KE Required	288.0 kip-feet (390.0 Kilojoules)

Exit Conditions

Device 1 Exit Velocity	62.20 mph (100.10 km/h)
Device 2 Exit Velocity	60.40 mph (97.20 km/h)
Vehicle Resting Position	268.1 ft. (81.7 m) Downstream 0.5 ft. (0.2 m) Left
0° - Vehicle Stability	Satisfactory
90° - Vehicle Stability	Satisfactory
0° - Maximum Roll Angle	Did Not Exceed 75°
0° - Maximum Pitch Angle	Did Not Exceed 75°
90° - Maximum Roll Angle	Did Not Exceed 75°
90° - Maximum Pitch Angle	Did Not Exceed 75°

Occupant Risk

Longitudinal OIV	Not Applicable*
Lateral OIV	Not Applicable*
Longitudinal RA	Not Applicable*
Lateral RA	Not Applicable*
THIV	Not Applicable*
PHD	Not Applicable*
ASI	Not Applicable*

Test Article Deflections

0° - Debris Field (longitudinal)	30.9 ft. (8.2 m)
0° - Debris Field (lateral)	8.2 ft. (2.5 m)
90° - Debris Field (longitudinal)	156.1 ft. (47.6 m)
90° - Debris Field (lateral)	4.2 ft. (1.3 m)

Vehicle Damage

Vehicle Damage Scale	12-FD-1
CDC	12FDAW1
0° - Maximum Deformation	0.3 in. (8 mm) Windshield
90° - Maximum Deformation	MASH Deformation Limits Not Exceeded (0.0 in.) 0 mm

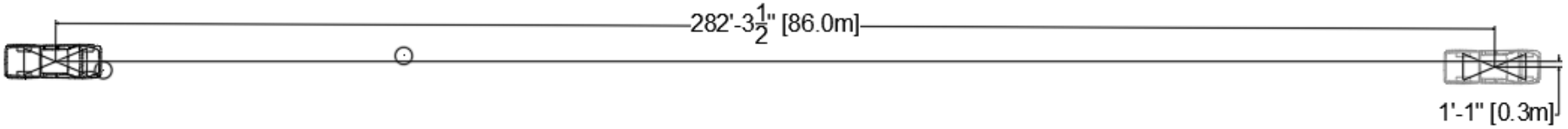
* Not Applicable, device weighs less than 220 lbs (100 kg)

Figure 2 Summary of Test 3-71

MASH 2016 Test 3-72 Summary

0° CIA | **90° CIA**

0.000 seconds | 0.060 seconds | 0.120 seconds | 0.640 seconds | 0.710 seconds | 0.780 seconds



GENERAL INFORMATION

Test Agency	Applus IDIADA KARCO
Test Number	P41142-01
Test Designation	3-72
Test Date	5/10/21

TEST ARTICLE

Name / Model	MDI Worldwide StackMaster Sign Stand with 48" x 48" Roll-up Sign
Type	Work-Zone Traffic Device
Device Height	6.7 ft. (2.0 m)
Key Elements	Roll up sign, Aluminum Upright, Rubber Stand Base
Road Surface	Smooth clean concrete

TEST VEHICLE

Type / Designation	2270P
Year, Make, and Model	2013 RAM 1500
Curb Mass	4,894.2 lbs (2,229.5 kg)
Test Inertial Mass	5,002.2 lbs (2269.0 kg)
Gross Static Mass	5,002.2 lbs (2,269.0 kg)

Impact Conditions

Impact Velocity Device 1	61.29 mph (100.50 km/h)
Impact Velocity Device 2	60.09 mph (96.71 km/h)
Device 1 Angle	0.0°
Device 2 Angle	90.0°
Location/ Orientation Device 1	19.7 in. (501 mm) From Vehicle Centerline to Passenger Side
Location/ Orientation Device 2	16.1 in. (408 mm) From Vehicle Centerline to Driver Side
Device 1 Kinetic Energy	628.2 kip-feet (851.7 Kilojoules)
Device 2 Kinetic Energy	603.9 kip-feet (818.7 Kilojoules)
Minimum KE Required	594 kip-feet (806 Kilojoules)

Exit Conditions

Device 1 Exit Velocity	60.84 mph (97.9 km/h)
Device 2 Exit Velocity	60.00 mph (96.6 km/h)
Vehicle Resting Position	283.3 ft. (86.0 m) Downstream 1.1 ft. (0.3 m) Right
0° - Vehicle Stability	Satisfactory
90° - Vehicle Stability	Satisfactory
0° - Maximum Roll Angle	Did Not Exceed 75°
0° - Maximum Pitch Angle	Did Not Exceed 75°
90° - Maximum Roll Angle	Did Not Exceed 75°
90° - Maximum Pitch Angle	Did Not Exceed 75°

Occupant Risk

Longitudinal OIV	Not Applicable*
Lateral OIV	Not Applicable*
Longitudinal RA	Not Applicable*
Lateral RA	Not Applicable*
THIV	Not Applicable*
PHD	Not Applicable*
ASI	Not Applicable*

Test Article Deflections

0° Device Debris Field (longitudinal)	37.2 ft. (11.3 m)
0° Device Debris Field (lateral)	1.4 ft. (0.4 m)
90° Device Debris Field (longitudinal)	168.7 ft (51.4 m)
90° Device Debris Field (lateral)	0.8 ft. (0.2 m)

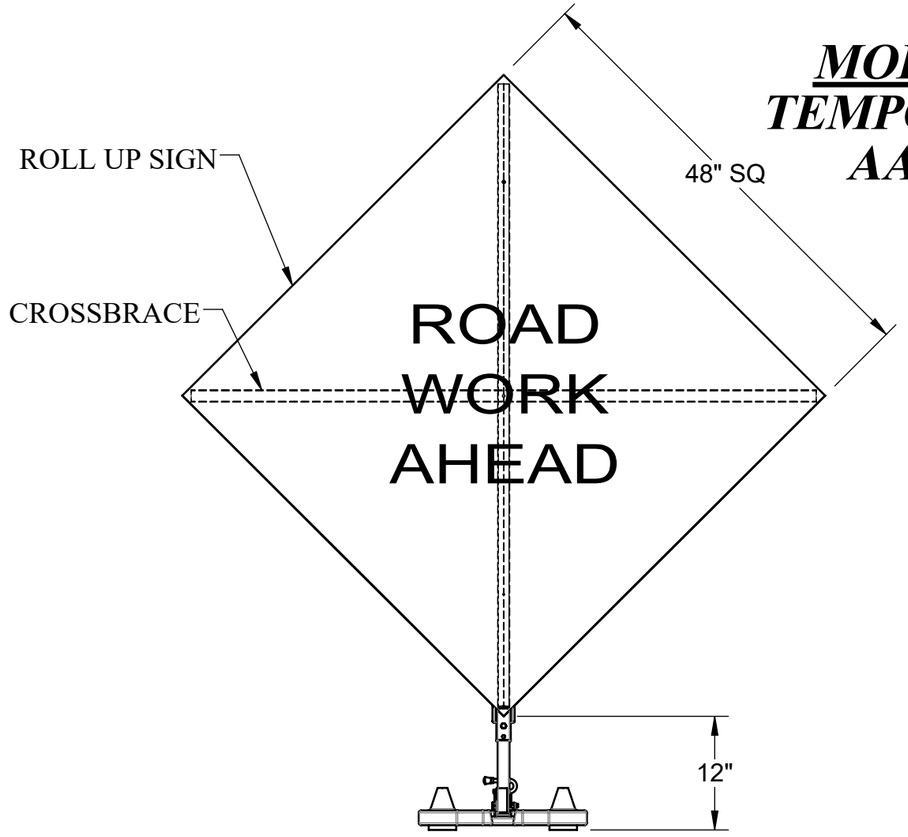
Vehicle Damage

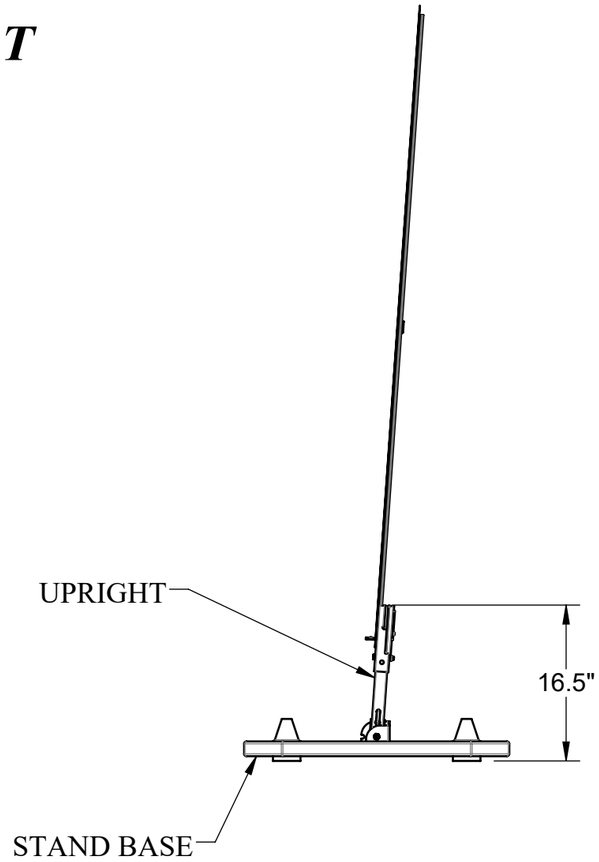
Vehicle Damage Scale	12-FC-1
CDC	12FDEW1
0° - Maximum Deformation	MASH Deformation Limits Not Exceeded (0.0 in.) 0 mm
90° - Maximum Deformation	MASH Deformation Limits Not Exceeded (0.0 in.) 0 mm

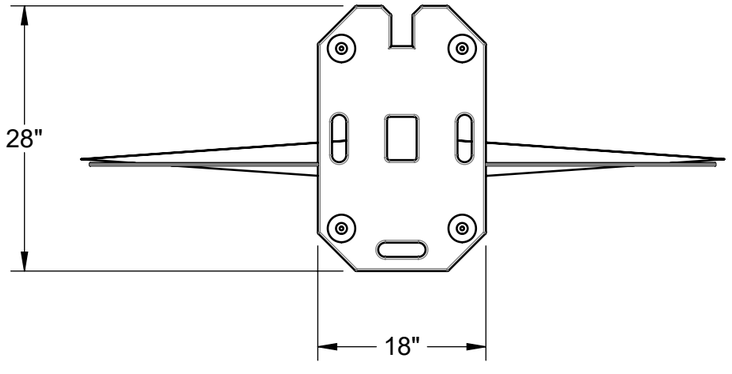
* Not Applicable, device weighs less than 220 lbs (100 kg)

Figure 2 Summary of Test 3-72

MODEL: STACKMASTER
TEMPORARY SIGN SUPPORT
AASHTO MASH (TL-3)







NOTES:
-DIMENSIONS SHOWN ARE PER THE DESIGN INTENT AND ARE SHOWN FOR REFERENCE ONLY.

STACKMASTER SIGN STAND

OVERALL WEIGHT: APPROX.	30.0 lbs. (NO SIGN)
OVERALL DIMENSIONS: APPROX.	18" X 28" X 16.5"

MDI WORLDWIDE

MDI Traffic Control Products, 38271 West 12 Mile Road, Farmington Hills, MI 48331-3041 800-521-6776

ZA-08111

ZA-08111

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