



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

October 12, 2022

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

In Reply Refer To:
HSST-1/WZ-449

Ben Cohen
Bone Safety
6450 Industrial Way
Alpharetta, GA 30004
USA

Dear Mr. Cohen:

We received your correspondence of April 2, 2021 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-449.

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: SZ-412-S
Type of system: Work Zone Sign Stand
Test Level: Test Level 3
Testing conducted by: Calspan Corporation
Date of request: April 2, 2021

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-449 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-449. 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,

A handwritten signature in blue ink that reads "Louis M. Ward". The signature is written in a cursive style.

for 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:	April 02, 2021	<input checked="" type="radio"/> New <input type="radio"/> Resubmission
	Name:	Ben Cohen	
	Company:	Bone Safety	
	Address:	6450 Industrial Way, Alpharetta, GA 30004	
	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.

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	<input checked="" type="radio"/> Physical Crash Testing <input type="radio"/> Engineering Analysis	SZ-412-S	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:	Ben Cohen	Same as Submitter <input checked="" type="checkbox"/>
Company Name:	Bone Safety	Same as Submitter <input checked="" type="checkbox"/>
Address:	6450 Industrial Way, Alpharetta, GA 30004	Same as Submitter <input checked="" type="checkbox"/>
Country:	USA	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.		
Bone Safety of Alpharetta, GA and Calspan Corporation share no financial interests between the two organizations. This includes no shared financial interest but not limited to: i. Compensation including wages, salaries, commissions, professional fees, or fees for business referrals iii. Research funding or other forms of research support; iv. Patents, copyrights, licenses, and other intellectual property interests; vi. Business ownership and investment interests;		

PRODUCT DESCRIPTION

- New Hardware or Significant Modification
 Modification to Existing Hardware

The SZ-412-S work zone safety sign stand attached a roll-up sign at 48" by 48" in size and a bottom height of 18". It is manufactured from steel component parts which have been powder-coated and clear zinc-plated to minimize corrosion. The sign stand is designed using basic nut & bolt construction, so that all component parts may be readily replaced if worn or damaged.

Legs have both a pull-pin and kick release mechanism for releasing legs. The sign stand measures 6.50" x 6.50" x 24" when folded for storage and have a total weight of 23 lbs. Two sand bags can be placed on the sign stand legs if wind conditions require. This occurred only during the 0 degree impact for the 3-71 test.

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:	Mark Parisi	
Engineer Signature:	Mark J. Parisi	Digitally signed by Mark J. Parisi Date: 2021.04.02 13:10:12 -04'00'
Address:	4455 Genesee Street, Cheektowaga, NY 14225	Same as Submitter <input type="checkbox"/>
Country:	USA	Same as Submitter <input type="checkbox"/>

A brief description of each crash test and its result:

Required Test Number	Narrative Description	Evaluation Results
3-70 (1100C)	Designated to evaluate the ability of a small vehicle to activate any breakaway, fracture, or yielding mechanism. Is considered optional for work zone traffic control weighting less than 220 lb (100 kg)	Non-Relevant Test, not conducted

Required Test Number	Narrative Description	Evaluation Results
3-71 (1100C)	<p>For this test, two Bone Safety road signs were impacted. Two different 1100C vehicles were used in this testing. Only during the 0° test were two sand bags used (due to wind condition).</p> <p>Lightweight devices such as the Bone Safety sign cannot cause sufficient velocity change that would result in exceeding occupant risk criteria limits. Therefore Test 71 was conducted without instrumentation for evaluating occupant risk values OIV and RA per MASH test description.</p> <p>The 0° test was conducted using a commercially available 2014 Kia Rio 4 door sedan with a test inertia mass of 2,445 lbs (1,109 kg). The sign stand had two sand bags near the end of legs. The test vehicle impacted the first sign stand (orientated at 0°) at a velocity of 63.8 mph (102.9 km/hr). Upon impact the roll up sign released the sign stand and folded over the front end of the vehicle. No identifiable damage to the vehicle occurred beyond the front clip.</p> <p>The 90° test was conducted using a commercially available 2014 Kia Rio 4 door sedan with a test inertia mass of 2,458 lbs (1,115 kg). The test vehicle impacted the second sign stand (oriented at 90°) at a velocity of 62 mph (99.8 km/ hr). Upon impact the roll up sign released from the sign stand and folded over the front end of the vehicle. No identifiable damage to the vehicle occurred beyond the front clip.</p> <p>In both tests, the vehicle's occupant compartment was not penetrated by the test articles and there was NO cab/ passenger compartment deformation.</p> <p>Debris from the test articles did not block the driver's vision after initial impact. The vehicle remained upright and did not have any roll and pitch throughout the test. The vehicle did not leave its lane and its trajectory was stable after both sign stands were impacted.</p> <p>TEST RESULT = PASS</p>	

3-72 (2270P)	<p>For this test, two Bone Safety Signs Stands were impacted. The first test article was aligned at 0° and the second test article was aligned at 90° to the test vehicle's direction of travel. No Sand bags were required.</p> <p>Lightweight devices such as the Bone Safety Sign cannot cause sufficient velocity change that would result in exceeding occupant risk criteria limits. Therefore, Test 72 was conducted without instrumentation for evaluating occupant risk values OIV and RA per MASH test description.</p> <p>The test was conducted using a commercially available 2009 Ram 1500 Pickup Truck with a test inertia mass of 5022 lbs (2,278 kg).</p> <p>The test vehicle impacted the first sign stand (oriented at 0°) at a velocity of 61.6 mph (99.1 km/hr). Upon impact, the roll up sign released from the sign stand and folded over the front end of the vehicle. The top of the vertical cross frame impacted the lower portion of the windshield, but did not damage the glass. The test vehicle continued along its path and impacted the second sign stand (oriented at 90°) at a velocity of 60.7 mph (97.7 km/hr). Upon impact, the roll up sign released from the sign stand and folded over the front end of the vehicle. The top of the vertical cross frame impacted the middle of the hood. The test vehicle's occupant compartment was not penetrated by the test articles and there was NO inner cab/passenger compartment deformation.</p> <p>Debris from the test article did not cause a hazard to the driver's vision. The vehicle remained upright and did not have any roll and pitch throughout the test. The vehicle did not leave its lane and its trajectory was stable after both sign stands were impacted</p> <p>TEST RESULT = PASS</p>	
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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:	Calspan Corporation	
Laboratory Signature:	Mark J. Parisi	Digitally signed by Mark J. Parisi Date: 2021.04.02 13:14:25 -04'00'
Address:	4455 Genesee Street, Cheektowaga, NY 14225	Same as Submitter <input type="checkbox"/>
Country:	USA	Same as Submitter <input type="checkbox"/>
Accreditation Certificate Number and Dates of current Accreditation period :	L20-602 December 31, 2022	

Submitter Signature*: **Ben F. Cohen** Digitally signed by Ben F. Cohen
Date: 2021.04.19 16:55:55 -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		Key Words
Number	Date	

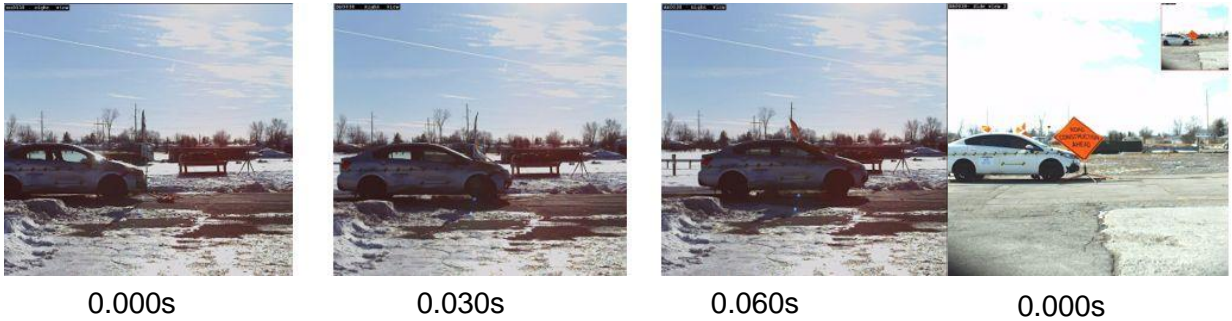
**SECTION 4
MASH TEST 3-71 SUMMARY**

Test Article: SZ-412-S
 Test Program: MASH 3-71

Project No. BR0038
 Test Date: 2/12/2021 & 03/4/2021

SEQUENTIAL PHOTOGRAPHS

0° Orientation Side View 1



90° Orientation Side view 2



PLAN VIEW

-15 ft 0 ft 15 ft 30 ft 45 ft 60 ft 75 ft 90 ft 105 ft 120 ft 135 ft 150 ft 165 ft 180 ft 195 ft 210 ft 225 ft 240 ft 255 ft 270 ft 285 ft

BR0038 2/12/2021



Vehicle Stopped



BR0038 3/4/2021



BR0038 2/12/2021 Vehicle at 63.8 MPH &
 BR0038 3/4/2021 at 62 MPH

SECTION 4... (CONTINUED)
MASHTEST 3-71 SUMMARY

Test Article: SZ-412-S

Project No. BR0038

Test Program: MASH 3-71

Test Date: 2/12/2021 & 03/4/2021

SUMMARY TABLE

GENERAL INFORMATION		IMPACT CONDITIONS		
TEST AGENCY	Calspan Corporation	IMPACT VELOCITY(0°)	63.8 mph (102.9 km/h)	
TEST NUMBER	Cal BR0038	IMPACT VELOCITY (90°)	62.0 mph (99.8 km/h)	
TEST DESIGNATION	3-71	IMPACT SEVERITY (0°)	451.0 KJ	
TEST DATE	2/12/2021 & 3/4/2021	IMPACT SEVERITY (90°)	428.2 KJ	
		IMPACT LOCATION (0 DEG)	535 mm (21.1 in) from Centerline to Psgr	
		IMPACT LOCATION (90 DEG)	440 mm (17.3 in) from Centerline to Drvr	
TEST ARTICLE		EXIT CONDITIONS		
NAME / MODEL	SZ-412-S Spring Stand	EXIT VELOCITY (0°)	63.8 mph (102.9 km/h)	
TYPE	Work-Zone Traffic Control Device	EXIT VELOCITY (90°)	62.0 mph (99.8 km/h)	
KEY ELEMENTS	Single coil spring Powder -coated and zinc plated for maximum corrosion resistance	FINAL RESTING POSITION	180 ft. downstream	
OVERALL HEIGHT	112 in. (2844.8 mm)	VEHICLE STABILITY	Satisfactory	
OVERALL WIDTH	48.25 in. (1225.5 mm)	VEHICLE SNAGGING	None	
BASE WEIGHT	23 lbs. (10.43 kg)	VEHICLE POCKETING	None	
SIGN WEIGHT	< 5 lbs. (2.27 kg)	OCCUPANT RISK VALUES 1		
ROAD SURFACE	Asphalt	OCCUPANT IMPACT VELOCITY	Longitudinal	N/A
			Lateral	N/A
		RIDEDOWN ACCELERATION	Longitudinal	N/A
			Lateral	N/A
TEST VEHICLE		TEST ARTICLE POST-IMPACT		
TYPE / DESIGNATION	1100C	ARTICLE DAMAGE	Base Deformation/Upper separation	
YEAR , MAKE AND MODEL	2014 KIA RIO			
CURB MASS	BR0038 2/12/2021 2526.5 lbs. (1146 kg) BR0038 3/4/2021 2530.9 lbs. (1148 kg)	VEHICLE DAMAGE		
TEST INERTIAL MASS	BR0038 2/12/2021 2445 lbs. (1109 kg) BR0038 3/4/2021 2458 lbs. (1115 kg)	VEHICLE DAMAGE SCALE	FL-1 ; FR-2	
GROSS STATIC MASS	BR0038 2/12/2021 2445 lbs. (1109 kg) BR0038 3/4/2021 2458 lbs. (1115 kg)	COLLISION DAMAGE CLASSIFICATION	12FLEN01 12FREN01	
		MAXIMUM DEFORMATION	Negligible	

¹Values not calculated due to test article weight being less than 220 lbs. (100 kg)

SECTION 4

MASH TEST 3-72 SUMMARY

Test Article: SZ-412-S

Project No. BR0049

Test Program: MASH 3-72

Test Date: 3/2/2021

SEQUENTIAL PHOTOGRAPHS

0° Orientation Side View 1



0.000s



0.030s



0.060s



0.000s



0.030s



0.060s

PLAN VIEW

-15 ft 0 ft 15 ft 30 ft 45 ft 60 ft 75 ft 90 ft 105 ft 120 ft 135 ft 150 ft 165 ft 180 ft 195 ft 210 ft 225 ft 240 ft 255 ft 270 ft



BR0049 3/2/2021
Vehicle at 61.6 MPH &
60.7 MPH



Vehicle Stopped

SECTION 4... (CONTINUED)
MASHTEST 3-72 SUMMARY

Test Article: SZ-412-S
Test Program: MASH 3-72

Project No. BR0049
Test Date: 3/2/2021

SUMMARY TABLE

GENERAL INFORMATION		IMPACT CONDITIONS		
TEST AGENCY	Calspan Corporation	IMPACT VELOCITY (0°)	61.6 mph (99.1 km/h)	
TEST NUMBER	BR0049	IMPACT VELOCITY (90°)	60.7 mph (97.7 km/h)	
TEST DESIGNATION	3-72	KINETIC ENERGY (0°)	863.7 KJ	
TEST DATE	3/2/2021	KINETIC ENERGY (90°)	838.7 KJ	
		IMPACT LOCATION (0 DEG)	490 mm (19.3 in) from Centerline to Drvr	
		IMPACT LOCATION (90 DEG)	499 mm (19.6 in) from Centerline to Psgr	
TEST ARTICLE		EXIT CONDITIONS		
NAME / MODEL	SZ-412-S Spring Stand	EXIT VELOCITY (0°)	61.6 mph (99.1 km/h)	
TYPE	Work-Zone Traffic Control Device	EXIT VELOCITY (90°)	60.7 mph (97.7 km/h)	
KEY ELEMENTS	Single coil spring Powder -coated and zinc plated for maximum corrosion resistance	FINAL RESTING POSITION	186 ft. downstream	
OVERALL HEIGHT	112 in. (2844.8 mm)	VEHICLE STABILITY	Satisfactory	
OVERALL WIDTH	48.25 in. (1225.5 mm)	VEHICLE SNAGGING	None	
BASE WEIGHT	23 lbs. (10.43 kg)	VEHICLE POCKETING	None	
SIGN WEIGHT	< 5 lbs. (2.27 kg)	OCCUPANT RISK VALUES		
ROAD SURFACE	Asphalt	OCCUPANT IMPACT VELOCITY	Longitudinal	N/A
			Lateral	N/A
		RIDEDOWN ACCELERATION	Longitudinal	N/A
			Lateral	N/A
TEST VEHICLE		TEST ARTICLE POST-IMPACT		
TYPE / DESIGNATION	2270P	ARTICLE DAMAGE	XXXX	
YEAR, MAKE AND MODEL	2009 Dodge Ram 1500			
CURB MASS	5022 lbs. (2278 kg)	VEHICLE DAMAGE		
TEST INERTIAL MASS	5022 lbs. (2278 kg)	VEHICLE DAMAGE SCALE	FL-1 ; FR-1	
GROSS STATIC MASS	5022 lbs. (2278 kg)	COLLISION DAMAGE CLASSIFICATION	12FLEN01 12FREN01	
		MAXIMUM DEFORMATION	Negligible	

¹Values not calculated due to test article weight being less than 220 lbs. (100 kg)

APPENDIX C – TEST ARTICLE DRAWINGS:

Model SZ-412-S Spring Stand

