U.S. Department of Transportation
Federal Highway Administration

June 19, 2020

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

In Reply Refer To:
HSST-1/B-232C

Greg Neece
Trinity Highway Products, LLC
2525 North Stemmons Freeway
Dallas, Texas 75207

Dear Mr. Neece:

On November 30, 2012, the Federal Highway Administration's Office of Safety issued eligibility letter B-232A for the CASS S3 MASH. The Office of Safety has recently made updates to its eligibility letter website to be more consistent with the 2nd Edition of American Association of State Highway and Transportation Officials'(AASHTO) Manual for Assessing Safety Hardware (MASH) and the additional test matrices for cable barriers therein. These updates have necessitated the modification of certain eligibility letters including B-232A. The modification for B-232A consists of adding the phrase "TL4 on Level Terrain" after the original description of the device to indicate the as-tested conditions for the device. Additionally, the language of this eligibility letter has been updated to be consistent with current Office of Safety policy for the issuance of eligibility letters.

Please note that this modification to letter B-232A will in no way affect the eligibility for the associated device as was determined on November 30, 2012. This FHWA letter of eligibility is assigned FHWA control number B-232C and is valid until a subsequent letter is issued by FHWA that expressly references this device. This letter will supersede the original B-232A letter in full.

Additionally, in accordance with original letter B-232A, this system is eligible only when installed on the as-tested level terrain under MASH TL4 criteria and excludes 1V:6H or flatter as requested on the attached form under project development.

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:

- CASS S3 MASH TL-4 on Level Terrain

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: CASS S3 TL4 on Level Terrain
Type of system: Longitudinal Barrier
Test Level: MASH Test Level 4 (TL4)
Testing conducted by: Texas Transportation Institute
Date of request: August 28, 2012

FHWA concurs with the recommendation of the accredited crash testing laboratory 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-232C 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.

Sincerely,

Michael S. Griffith

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 28, 2012
	Name:	Brian Smith
	Company:	Trinity Highway Products, LLC
	Address:	2525 N. Stemmons Freeway Dallas, Texas 75207
	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	Device Name / Variant	Testing Criterion	Test Level
'B': Barriers (Roadside, Median, Bridge	CASS S3 MASH	AASHTO MASH	TL4

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 test / evaluation results meet the appropriate evaluation criteria in the MASH.

Identification of the individual or organization responsible for the product:

Contact Name:	Brian Smith
Company Name:	Trinity Highway Products, LLC
Address 1:	2525 N. Stemmons Freeway
Address 2:	
City/State/Zip:	Dallas, TX 75207
Country:	USA

PRODUCT DESCRIPTION

Modification to Existing Hardware null

In its HSST/B-232 letter of May 4, 2012, the Federal Highway Administration (FHWA) confirmed that the CASS S3 MASH System is eligible for reimbursement under the Federal-aid highway program under AASHTO MASH Test Level 3 criteria.

Successful full-scale MASH Test Level 4 crash testing was recently conducted by the Texas Transportation Institute (TTI) on Trinity's CASS S3 MASH installed on flat terrain. Trinity Highway Products, LLC is seeking eligibility reimbursement status under the Federal-aid highway program for CASS S3 MASH on 1V:6H slopes or flatter under AASHTO MASH Test Level 4 criteria.

CASS S3 MASH is a tensioned, four-cable barrier system that was tested with standard (non-prestretched) cables. The top two cables are positioned within a wave-shaped slot in the web of S75x8 (S3x5.7#) structural I-beam posts. The bottom two cables are supported on flanges of the I-beam post by 8mm (5/16 inch) hook bolts having the open end down, with the lowest cable located on the median-side flange and the next lowest cable located on the traffic-side flange.

The proprietary S75x8 (S3x5.7#) posts were installed in steel tube sleeves set in 305mm (12 inch) diameter x 762mm (30 inch) deep concrete footings at 3.2 meters (10-foot 6-inch) spacings. The cables within the wave-shaped slot are separated by a plastic spacer. A stainless steel strap is mounted on the outside of the post above the top cable.

The 19mm (3/4 inch) diameter standard (non-prestretched) cables were set at heights of 450mm, 755mm, 960 and 1070mm (17.75, 29.75, 37.875, and 42.125 inches) above the ground surface, measured to the center of each cable. Tension of the cables was set at 18.7 to 18.9 kN (4,200 to 4,260 pounds force) for the tests.

Although testing was conducted with standard (non-prestretched) cables, Trinity also requests eligibility reimbursement under the Federal-aid highway program under AASHTO MASH Test Level 4 criteria of CASS S3 MASH with prestretched cables.

The 195m (640 foot) test installations were anchored by TTI Breakaway Cable Anchor Terminals, accepted by FHWA on August 29, 2002 (CC-76) and April 23, 2007 (B-157).

CRASH TESTING

A brief description of each crash test and its result:

Required Test Number	Narrative Description	Evaluation Results
4-10 (1100C)	In its HSST/B-232 letter of May 4, 2012, the Federal Highway Administration (FHWA) confirmed that the CASS S3 MASH System is eligible for reimbursement under the Federal-aid highway program under AASHTO MASH Test Level 3 criteria. This was based on full-scale crash test with the 1100C in 3-10 backslope testing installed in a 9.1m (30 foot 0 inch) wide depressed median with 4H:1V side slopes on 3.2m (10 foot 6 inch) post spacing. Addiitonally, in its HSSD/B-141F letter, FHWA accepted CASS barrier systems described above as acceptable for use on the designated 1V:4H or flatter slopes under NCHRP Report 350 Test Level 3 or 4 conditions. This was based on full-scale crash test with the 820C in 3-10 foreslope testing installed in a 9.1m (30 foot 0 inch) wide depressed median with 4H:1V side slopes on 3.2m (10 foot 6 inch) post spacing.	WAIVER REQUES
4-11 (2270P)	In its HSST/B-232 letter of May 4, 2012, the Federal Highway Administration (FHWA) confirmed that the CASS S3 MASH System is eligible for reimbursement under the Federal-aid highway program under AASHTO MASH Test Level 3 criteria. This was based on full-scale crash test with the 2270P in 3-11 foreslope testing installed in a 9.1m (30 foot 0 inch) wide depressed median with 4H:1V side slopes on 3.2m (10 foot 6 inch) post spacing.	WAIVER REQUES

Required Test Number	Narrative Description	Evaluation Results
4-12 (10000S)	MASH Test 4-12 involves a 10000S single-unit box-van weighing 22,000 lb impacting the CIP of the LON at an impact speed an angle of 90 km/h (56 mi/h) and 15 degrees, respectively. This test is intended to evaluate the strength of the LON in containing and redirecting the heavy test vehicle. Summary of Results: Trinity CASS S3 MASH TL-4 contained and captured the 10000S SUT. The SUT rode over the lower two cables, however, the top two cables contained the vehicle. Maximum dynamic deflection of Trinity CASS S3 TL-4 during the test was 4.9m (16.1 ft). No detached elements, fragments, or other debris were present to penetrate the occupant compartment, or present undue hazard to others in the area. No occupant compartment deformation was noted. The SUT remained upright during and after the collision event. Maximum roll angle was 0 degrees. The 10000S SUT remained within the system.	PASS
4-20 (1100C)	Transition testing was not addressed with this longitudinal barrier	WAIVER REQUES
4-21 (2270P)	Transition testing was not addressed with this longitudinal barrier	WAIVER REQUES
4-22 (10000S)	Transition testing was not addressed with this longitudinal barrier	WAIVER REQUES

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:	Texas Transportation Institute
Laboratory Contact:	Dean Alberson
Address:	Texas A&M Riverside Campus Building 7091 3100 State Highway 47 Bryan, TX 77807
Country:	USA
Accreditation Certificate Number and Date:	Mechanical 2821.01 30 April 2013

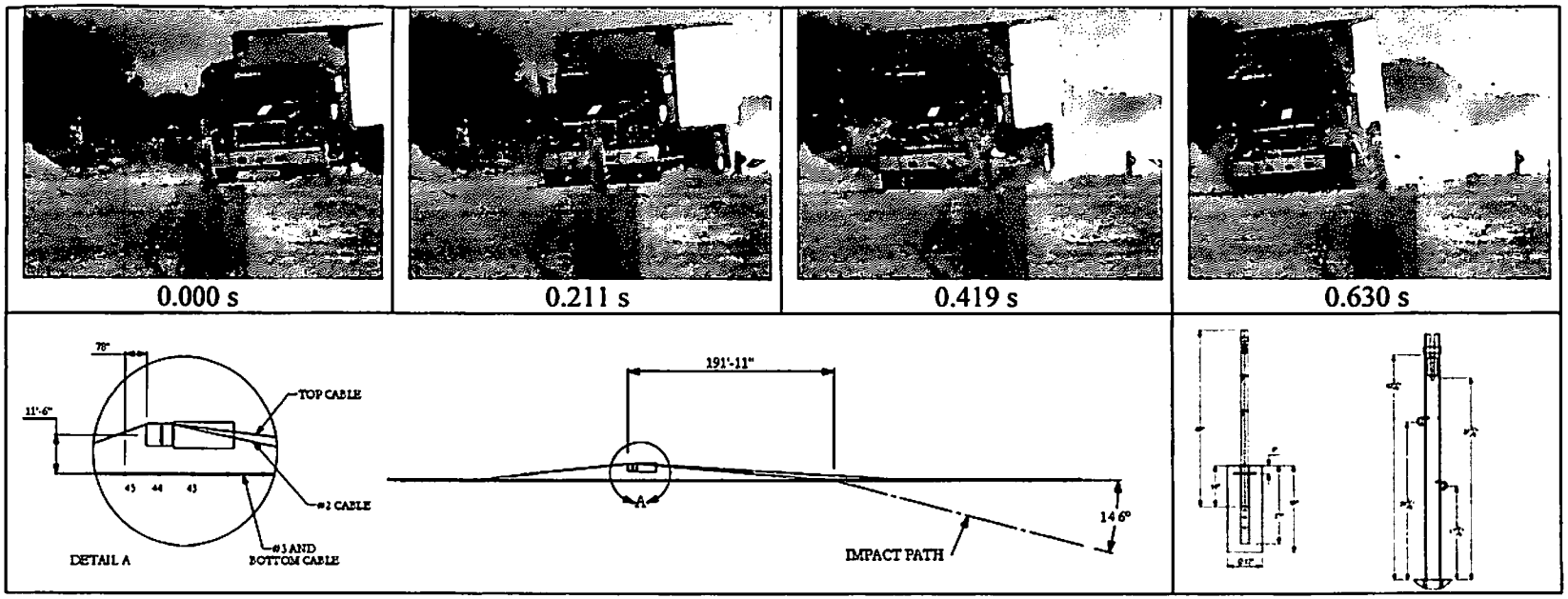
ATTACHMENTS

Attach to this form:

1) A copy of the 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-232A	October 11, 2012	SGM36b	TL4 Median & Roadside Barrier on Flat Terrain, Tensioned Four-Cable Barrier, Non-prestretched Cables, Structural I-beam Posts, Steel Tube Sleeves, Concrete Footings, Plastic Cable Spacer.



General Information
- Test Agency ..... Texas Transportation Institute (TTI)
- Test Standard Test No. ..... MASH Test 4-12
- TTI Test No. 400001-TCR42
- Date 2010-06-25

Test Article
- Type ..... Longitudinal Barrier
- Name ..... Trinity Cable Safety System (CASS)
- Installation Length ..... 640 ft
- Material or Key Elements .....

Soil Type and Condition ..... Concrete footing in crush limestone, dry

Test Vehicle
- Type/Designation 10000S
- Make and Model ..... 1995 Freightliner F160
- Curb 12820
- Test Inertial 22,550
- Dummy ..... No dummy
- Gross Static 22,500

Impact Conditions
- Speed ..... 57.8 mi/h
- Angle ..... 14.6 degrees
- Location/Orientation .....

Exit Conditions
- Speed ..... Remained in
- Angle ..... system

Occupant Risk Values
- Impact Velocity
  - Longitudinal ..... 3.0 ft/s
  - Lateral ..... 5.2 ft/s
- Ridedown Accelerations
  - Longitudinal ..... -2.0 G
  - Lateral ..... 1.7 G
- THIV ..... 6.4 km/h
- PHD ..... 2.1 G
- ASI 0.15
- Max. 0.050-s Average
  - Longitudinal ..... -1.3 G
  - Lateral ..... 1.3 G
  - Vertical ..... 1.2 G

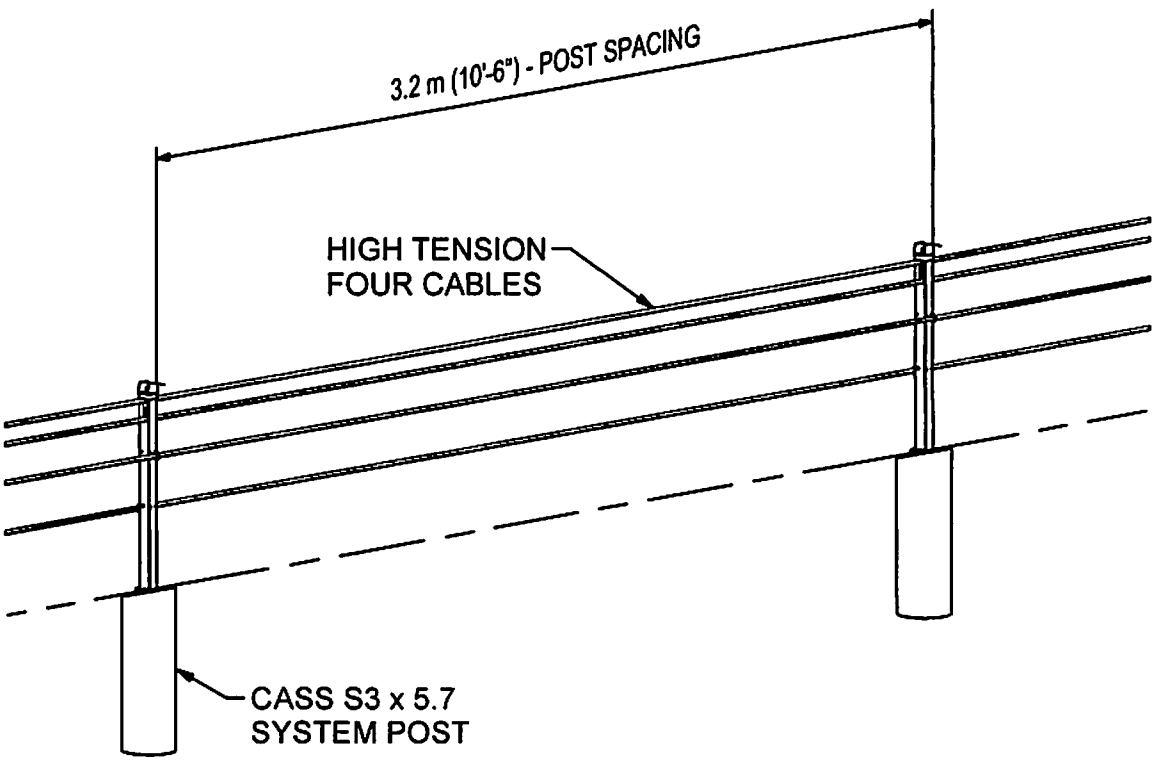
Post-Impact Trajectory
- Stopping Distance ..... 195 ft dwnstrm Within cables

Vehicle Stability
- Maximum Yaw Angle ..... 23 degrees
- Maximum Pitch Angle ..... -2 degrees
- Maximum Roll Angle ..... 10 degrees
- Vehicle Snagging ..... No
- Vehicle Pocketing ..... No

Test Article Deflections
- Dynamic ..... 16.2 ft
- Permanent ..... 14..5 ft
- Working Width ..... 17.2 ft

Vehicle Damage
- VDS 01RFQ2
- CDC 01FREN2
- Max. Exterior Deformation ..... 6.0 inches
- Max. Occupant Compartment Deformation 0

Figure 5.7. Summary of results for *MASH* test 4-12 on the Trinity Cable Safety System (CASS).



CASS S3 MASH SYSTEM

TRINITY HIGHWAY PRODUCTS, LLC

SHEET NO.	DATE
1 OF 1	7/12/2012