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

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

In Reply Refer To:
HSST-1/CC-112C

SEP 21 2016

Mr. Bret Eckert P.E.
Engineering Applications Manager
Trinity Highway Products
3617 Cincinnati Avenue
Rocklin, CA. 95677

Dear Mr. Eckert:

This letter is in response to your December 16, 2015 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 CC-112C and is valid until a subsequent letter is issued by FHWA that expressly references this device.

## Decision

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

- QuadGuard® M10 Modification

## 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' 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

FHWA previously issued an eligibility letter for the roadside safety system described in your pending request. Your pending request now identifies a modification to that roadside safety system.

The original roadside safety device information is:

Name of system: QuadGuard M10
Type of system: Crash Cushion
Date of original request: May 3, 2010
Date of original FHWA eligibility letter: February 9, 2011
FHWA Control number: CC-112

The modification(s) to the QuadGuard covered by this letter are:

1. The assembly drawing for the QuadGuard® M10 has the wrong length bolt holding the pull out tabs on the front diaphragm. A 2 1/2" long bolt is required to provide full engagement of the nut threads during assembly.

FHWA concurs with the recommendation of the accredited crash testing laboratory as stated within 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

If a manufacturer makes any modification to any of their roadside safety hardware that has an existing eligibility letter from FHWA, the manufacturer must notify FHWA of such modification with a request for continued eligibility for reimbursement. The notice of all modifications to a device must be accompanied by:

- Significant modifications – For these modifications, crash test results must be submitted with accompanying documentation and videos.
- Non-signification modifications – For these modifications, a statement from the crash test laboratory on the potential effect of the modification on the ability of the device to meet the relevant crash test criteria.

FHWA's determination of continued eligibility for the modified hardware will be based on whether the modified hardware will continue to meet the relevant crash test criteria.

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 the 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 CC-112C 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.

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.

Our regulations concerning proprietary products are contained in Title 23, Code of Federal Regulations, Section 635.411.

Sincerely yours,

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: | December 16, 2015 | ◉ New ○ Resubmission |
| | Name: | Bret R. Eckert, P.E. | |
| | Company: | Trinity Highway Products, LLC | |
| | Address: | 3617 Cincinnati Ave., Rocklin, CA 95765 | |
| | Country: | USA | |
| | To: | Michael S. Griffith, Director<br>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 |
|---|---|---|---|---|
| 'CC': Crash Cushions, Attenuators, & Terminals | ◉ Physical Crash Testing<br>○ Engineering Analysis | QuadGuard® M10 | 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: | Jim Thonn | Same as Submitter ☐ |
| Company Name: | Trinity Highway Products, LLC | Same as Submitter ☒ |
| Address: | 70 West Madison Street, Suite 2350, Chicago, IL 60602 | Same as Submitter ☐ |
| Country: | USA | 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.

The QuadGuard® M10 technology is the commercial embodiment of intellectual property that is protected by patents that are owned by THP. THP does not pay royalties for sales of the QuadGuard® M10 system. The QuadGuard® M10 system was designed and developed by engineers at Energy Absorption Systems Inc. (EAS). The patent holders of record for the QuadGuard® M10 system are Sean Thompson, Aaron J. Cox, and Patrick A. Leonhardt and Mr. Thompson, Mr. Cox, and Mr. Leonhardt were employed by EAS. The associated United States Patent Office patent number (8,469,626) is assigned to Energy Absorption Systems, Inc. / Trinity Industries, Inc.

EAS sponsored certain crash tests of the QuadGuard® M10 system; such tests were conducted by E-Tech Testing Services, an independent, wholly-owned subsidiary of THP. E-Tech Testing Services is an International Standards Organization ("ISO") 17025 accredited laboratory with American Association for Laboratory Accreditation (A2LA) Mechanical Testing certificate 989.01. Full-scale crash testing on the QuadGuard® M10 system was performed in accordance with testing criteria, as set forth by the American Association of State Highway and Transportation Officials ("AASHTO") in the Manual for assessing Safety Hardware ("MASH")(2009).

# PRODUCT DESCRIPTION

| ○ New Hardware or Significant Modification | ◉ Modification to Existing Hardware | Non-Significant |
|---|---|---|

The 6-bay QuadGuard® M10 and M10 Wide were originally accepted on February 9, 2011 with FHWA eligibility letter HSST/CC-112 as MASH Crash Cushions. A 6-bay construction Zone (CZ) version was subsequently accepted on March 8, 2012 with FHWA eligibility letter HSST/CC-112B and as a 3-bay narrow and wide TL-2 device on July 30, 2012 with FHWA eligibility letter HSST/CC-121. The QuadGuard® M10 systems are redirective, non-gating crash cushions.

This request for continued eligibility is to notify the FHWA of necessary modifications that have occurred since May 18, 2015. All revisions have been justified through engineering analysis and judgement and have been determined to be non-significant and will have no bearing on the as-tested performance of the system. These modifications include the following:

1. The assembly drawing for the Narrow QuadGuard® M10 has the wrong length bolt holding the pull out tabs on the front diaphragm. A 2 1/2" long bolt is required to provide full engagement of the nut threads during assembly. (4116)

# CRASH TESTING

A brief description of each crash test and its result:

| Required Test Number | Narrative Description | Evaluation Results |
|---|---|---|
| 3-30 (1100C) | Test 3-30 was waived for the QuadGuard® M10 in FHWA Eligibility letter HSST/CC-112 based on Test 3-32 being worst case conditions for the 1100C vehicle. The non-significant modifications described in the Product Description will have no bearing on the as-tested performance of the system. | Non-Critical, not conducted |
| 3-31 (2270P) | Test No. 01-3044-004, Test Date Feburary 25, 2010, Test Report "MASH TL-3 Crash Test Results for the QuadGuard® M10 System, Report #357 dated April 2010. The non-significant modifications for the QuadGuard® M10 as described in the Product Description will have no bearing on the as-tested performance of the system. | PASS |
| 3-32 (1100C) | Test No. 01-3044-003, Test Date December 3, 2009, Test Report "MASH TL-3 Crash Test Results for the QuadGuard® M10 System, Report #357 dated April 2010. The non-significant modifications for the QuadGuard® M10 as described in the Product Description will have no bearing on the as-tested performance of the system. | PASS |
| 3-33 (2270P) | Test 3-33 was waived for the QuadGuard® M10 in FHWA Eligibility letter HSST/CC-112 based on Test 3-31 testing system capacity for 2270P and is considered worst case. The non-significant modifications described in the Product Description will have no bearing on the as-tested performance of the system. | Non-Critical, not conducted |

| Required Test Number | Narrative Description | Evaluation Results |
|---|---|---|
| 3-34 (1100C) | Test No. 01-3044-001, Test Date August 4, 2006, Test Report "MASH TL-3 Crash Test Results for the QuadGuard® M10 System, Report #357 dated April 2010. The non-significant modifications for the QuadGuard® M10 as described in the Product Description will have no bearing on the as-tested performance of the system. | PASS |
| 3-35 (2270P) | Test 3-35 was waived for the QuadGuard® M10 in FHWA Eligibility letter HSST/CC-112 due to the lateral stiffness of the QuadGuard® M10, this test is the same as test 3-36 and can be waived. The non-significant modifications described in the Product Description will have no bearing on the as-tested performance of the system. | Non-Critical, not conducted |
| 3-36 (2270P) | Test No. 01-3044-002, Test Date August 23, 2006, Test Report "MASH TL-3 Crash Test Results for the QuadGuard® M10 System, Report #357 dated April 2010. The non-significant modifications for the QuadGuard® M10 as described in the Product Description will have no bearing on the as-tested performance of the system. | PASS |
| 3-37 (2270P) | Test No. 01-3044-005, Test Date April 1, 2010, Test Report "MASH TL-3 Crash Test Results for the QuadGuard® M10 System, Report #357 dated April 2010. The non-significant modifications for the QuadGuard® M10 as described in the Product Description will have no bearing on the as-tested performance of the system. | PASS |
| 3-38 (1500A) | Simulated. Test Report "MASH TL-3 Crash Test Results for the QuadGuard® M10 System, Report #357 dated April 2010. The non-significant modifications for the QuadGuard® M10 as described in the Product Description will have no bearing on the as-tested performance of the system. | PASS |
| 3-40 (1100C) | Not Applicable. Test 3-40 is for nonredirective, gating devices and not applicable for Quadguard® M10 system eligibility. | |
| 3-41 (2270P) | Not Applicable. Test 3-41 is for nonredirective, gating devices and not applicable for Quadguard® M10 system eligibility. | |
| 3-42 (1100C) | Not Applicable. Test 3-42 is for nonredirective, gating devices and not applicable for Quadguard® M10 system eligibility. | |
| 3-43 (2270P) | Not Applicable. Test 3-43 is for nonredirective, gating devices and not applicable for Quadguard® M10 system eligibility. | |
| 3-44 (2270P) | Not Applicable. Test 3-44 is for nonredirective, gating devices and not applicable for Quadguard® M10 system eligibility. | |
| 3-45 (1500A) | Not Applicable. Test 3-45 is for nonredirective, gating devices and not applicable for Quadguard® M10 system eligibility. | |

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.):

| Testing Laboratory's signature concurs that these modifications are considered Non-Significant. | | |
|---|---|---|
| Laboratory Name: | E-Tech Testing Services, Inc. | |
| Laboratory Signature: | Paul Kruse — Digitally signed by Paul Kruse DN: cn=Paul Kruse, o=E-TECH Testing Services, ou=Plant 1574, email=paul.kruse@trin.net, c=US Date: 2015.12.21 08:43:47 -08'00' | |
| Address: | 3617B Cincinnati Ave., Rocklin, CA 95765 | Same as Submitter ☐ |
| Country: | USA | Same as Submitter ☒ |
| Accreditation Certificate Number and Dates of current Accreditation period : | A2LA Certificate# 989.01, November 30, 2017 | |

Submitter Signature*: Bret Eckert — Digitally signed by bret.eckert@trin.net DN: cn=bret.eckert@trin.net Date: 2015.12.21 09:09:54 -08'00'

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 | | AASHTO TF13 | |
|---|---|---|---|
| Number | Date | Designator | Key Words |
| | | | |