



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

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

March 8, 2012

In Reply Refer To:
HSST/CC-112B

Mr. Barry D. Stephens, P.E.
Sr. Vice President Engineering
Energy Absorption Systems, Inc.
3617 Cincinnati Avenue
Rocklin, CA 95678

Dear Mr. Stephens:

This letter is in response to your request for the Federal Highway Administration (FHWA) to review a roadside safety system for eligibility for reimbursement under the Federal-aid highway program.

Name of system: 2-bay to 6-bay QuadGuard[®] M10 CZ (24", 30" and 36")
Type of system: Impact Attenuator with Transitions
Test Level: AASHTO Manual for Assessing Safety Hardware (MASH)
Test Level 3 (TL-3)
Testing conducted by: E-Tech Testing Services, Inc.
Task Force 13 Designator: SCI26b
Date of request: March 11, 2011
Date initially acknowledged: March 11, 2011
Date of completed package: February 10, 2012

Decision:

The following devices are eligible, with details provided:

- 2 to 6-bay QuadGuard M10 CZ (24", 30" and 36" wide system)

Based on a review of crash test results submitted by the manufacturer certifying the device described herein meets the crashworthiness criteria of the American Association of State Highway and Transportation Officials' Manual for Assessing Safety Hardware (MASH), the device is eligible for reimbursement under the Federal-aid highway program. Eligibility for reimbursement under the Federal-aid highway program does not establish approval or endorsement by the FHWA for any particular purpose or use.

The FHWA, the Department of Transportation, and the United States Government do not endorse products or services and the issuance of a reimbursement eligibility letter is not an endorsement of any product or service.

Requirements

FHWA: HSST: WLongstreet: sf 60087:2/16/12: sf.: Updated 3/8/12
File: h://directory folder/HSST/ CC-112B_QuadM10CZ with Asphalt
Anchors EAS (3) docx.

Roadside safety devices should meet the guidelines contained in the MASH.

Description

The 6-bay QuadGuard (QG) M10 CZ is identical to the 6-bay QuadGuard M10 except for its anchoring system. The QG M10 CZ is installed using the “MP-3 Longbolt System,” which uses a two-part polyester grout to anchor ¾-inch diameter by 18 inches long threaded rods to a foundation of 6 inches deep asphalt over a 6 inches deep compacted sub-base. The rods are to be embedded to a minimum depth of 16 inches into 7/8-inch diameter drilled holes. A total of 50 anchors are needed. The anchoring system and one-page test summary are included as an enclosure to this correspondence.

Crash Testing

The following MASH Test 3-35 was completed for FHWA review of the QG M10 CZ 610 mm [24 inch] Parallel system:


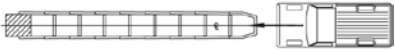
QuadGuard M10 CZ

- Test 3-35 (2270P/ 100kph / 25° / B.L.O.N.)
Impact speed = 100.4 km/h, Long. ΔV = 5.78 m/s, Long. Ridedown = -6.4 g

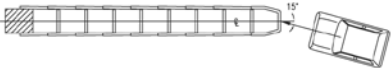

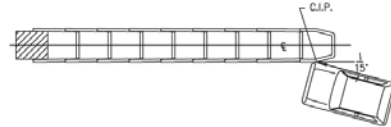
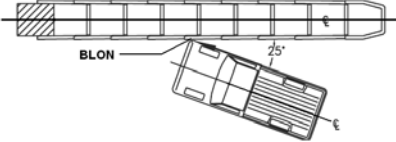
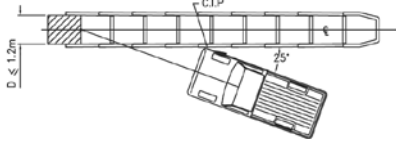
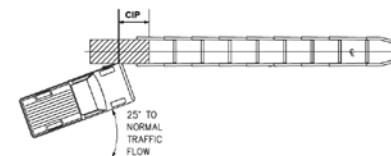
The summary of the above test is included as an enclosure to this correspondence.

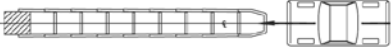
The following lists all required tests for TL3 as per the MASH. In addition, crash test 3-35 was the only physical test conducted with asphalt anchorage as this specific test is considered the worst case, or greatest loading, on the asphalt anchors. All other MASH Tests are as referenced in existing FHWA eligibility letter HSST/CC-112 dated February 9, 2011.

QuadGuard M10 CZ, Test Matrix

MASH Test Illustration	MASH Test #	Completed	Notes
	3-30	NO	Test 3-32 was completed as Worst Case for 1100C.
	3-31	YES*	Passed all ORV's. 6-Bay 610 mm [24 inches] Narrow System was tested and passed all Occupant Risk Values. This test was completed on concrete. Test 3-35 is the worst case for asphalt.

*FHWA eligibility letter HSST/CC-112 dated February 9, 2011

MASH Test Illustration	MASH Test #	Completed	Notes
	3-32	YES*	Passed all ORV's. 5-Bay 914 mm [36 inches] Narrow System was tested. This test was completed on concrete. Test 3-35 below is the worst case for asphalt.
	3-33	NO	Test 3-31 tested system capacity for 2270P and is considered worst case. Test 3-35 below is worst case for asphalt.
	3-34	YES*	Passed all ORV's. 5-Bay 610 mm [24 inches] Narrow System was tested. This test was completed on concrete. Test 3-35 below is the worst case for asphalt.
	3-35	YES	This test was completed on asphalt. This test exerts the most intense forces on the anchors.
	3-36	YES*	Passed all ORV's. 5-Bay 610 mm [24 inches] Narrow System with no new nose brackets was tested. Test was completed on concrete. This test applies the force on the anchors as test 3-35.
	3-37	YES*	Passed all ORV's. 6-Bay 610 mm [24 inches] Narrow System attached to a w-beam transition. This test was completed on concrete. Test 3-35 is the worst case for asphalt.

MASH Test Illustration	MASH Test #	Completed	Notes
	3-38	YES*	The recommended MASH analysis was completed and all calculated ORV's passed. This test was completed on concrete. Test 3-35 is the worst case for asphalt.

*FHWA eligibility letter HSST/CC-112 dated February 9, 2011

Findings:

- I. 6-bay QuadGuard M10 CZ Narrow Systems 6-bay 610 millimeters (24 inches), 762 millimeters (30 inches), and 914 millimeters (36 inches):
Based on a review of previous QuadGuard testing, Test 3-35 (2270 kg pickup truck at 100 km/h impact at 25 degrees at the beginning of the attenuator length of need) is the most severe test of the anchoring system. Testing results of the MASH Test 3-35 as conducted on the as described system meets the evaluation criteria for a MASH redirective, non-gating crash cushion at TL-3 impact conditions. In addition, submitted static computations indicate this test is the worst case for impact loadings translated to anchorage bolts. In regards to other required testing as per MASH, this submission provides the required documentation for requesting waiver of these tests. Therefore the 6-bay QuadGuard M10 CZ Narrow Systems 6-bay 610 millimeters (24 inches), 762 millimeters (30 inches), and 914 millimeters (36 inches) meet the evaluation criteria for a MASH redirective, non-gating crash cushion at TL-3 impact conditions are eligible for reimbursement under the Federal-aid highway program when such use is acceptable to the contracting authority.
- II. 2-bay to 5-bay QuadGuard M10 CZ Narrow Systems 610 millimeters (24 inches), 762 millimeters (30 inches), and 914 millimeters (36 inches):
Both as submitted and as referenced testing indicate these devices as described herein shall also be eligible for reimbursement under the Federal-aid highway program to a highway agency wishing to specify an attenuator with capacity for use at speeds from 40 to 90 km/h.

Please note the following standard provisions that apply to the FHWA letters of acceptance:

- This letter provides a AASHTO/ARTBA/AGC Task Force 13 designator that should be used for the purpose of the creation of a new and/or the update of existing Task Force 13 drawing for posting on the on-line 'Guide to Standardized Highway Barrier Hardware' currently referenced in AASHTO Roadside Design Guide.
- This acceptance is limited to the crashworthiness characteristics of the devices and does not cover their structural features, nor conformity with the Manual on Uniform Traffic Control Devices.
- Any changes that may adversely influence the crashworthiness of the device will require a new acceptance letter.
- Should the FHWA discover that the qualification testing was flawed, that in-service performance reveals unacceptable safety problems, or that the device being marketed is significantly different from the version that was crash tested, we reserve the right to modify or revoke our acceptance.

- You will be expected to supply potential users with sufficient information on design and installation requirements to ensure proper performance.
- You will be expected to certify to potential users that the hardware furnished has essentially the same chemistry, mechanical properties, and geometry as that submitted for acceptance, and that it will meet the crashworthiness requirements of the FHWA and the MASH.
- To prevent misunderstanding by others, this letter of acceptance is designated as number CC-112B, and 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 at our office upon request.
- The QuadGuard[®] M10 CZ attenuators are patented products and considered proprietary. If proprietary devices are specified by highway agency for use on Federal-aid projects, except exempt, non-NHS 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.
- This acceptance letter shall not be construed as authorization or consent by the FHWA to use, manufacture, or sell any patented device for which the applicant is not the patent holder. The acceptance letter is limited to the crashworthiness characteristics of the candidate device, and the FHWA is neither prepared nor required to become involved in issues concerning patent law. Patent issues, if any, are to be resolved by the applicant.

Sincerely yours,

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

Enclosures:

One-Page Test Summary
Drawings of QuadGuard M10

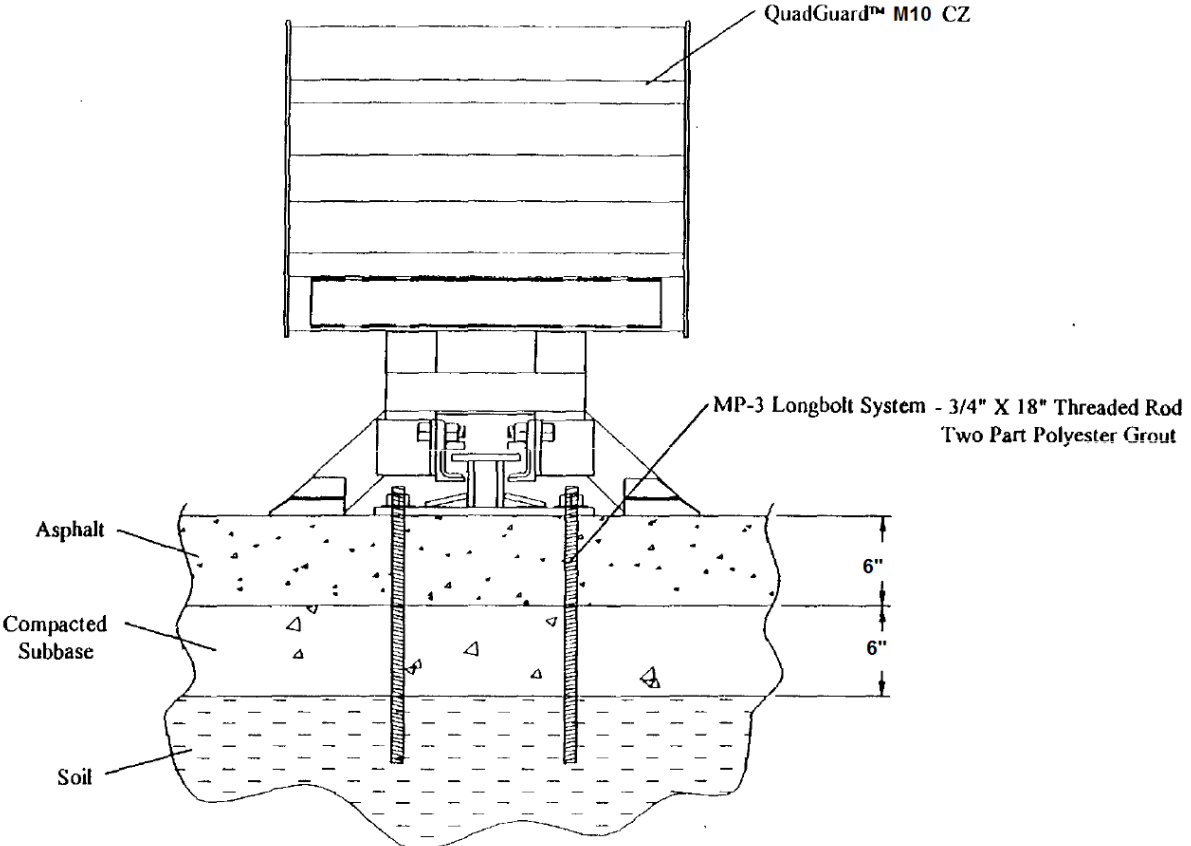


Figure 1. Anchoring Details - QuadGuard™ M10 MASH Test 3-37