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

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

May 6, 2016

In Reply Refer To:
HSST-1/B-260

Mr. Dean Takiguchi
State of Hawaii Department of Transportation
Highways Division
601 Kamokila Boulevard, Room 611
Honolulu, Hawaii 95819-4612

Dear Mr. Takiguchi:

This letter is in response to your January 24, 2014 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 B-260 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:

- Typical Cement Rubble Masonry (CRM) Guardrail Wall

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

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 American Association of State Highway and Transportation Officials' Manual for Assessing Safety Hardware (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: Typical Cement Rubble Masonry (CRM) Guardrail Wall
Type of system: Longitudinal Barrier
Test Level: MASH Test Level 1
Testing conducted by: Texas A&M Transportation Institute (TamTI)
Date of request: March 12, 2014
Date of completed package: March 22, 2016

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 B-260 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.

Sincerely yours,

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:	January 24, 2014	◉ New ○ Resubmission
	Name:	Dean Takiguchi	
	Company:	State of Hawaii Department of Transportation, Highways Division	
	Address:	601 Kamokila Boulevard, Room 611	
	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.

System Type	Submission Type	Device Name / Variant	Testing Criterion	Test Level
'B': Barriers (Roadside, Median, Bridge Railings)	◉ Physical Crash Testing ○ Engineering Analysis	Hawaii DOT Concrete Rubble Masonry (CRM) Wall	AASHTO MASH	TL1

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:	Dean Takiguchi	Same as Submitter ☐
Company Name:	State of Hawaii Department of Transportation, Highways Division	Same as Submitter ☐
Address:	601 Kamokila Boulevard, Room 611	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.		
None, Product is Non-Proprietary		

PRODUCT DESCRIPTION

(●) New Hardware or Significant Modification ( ) Modification to Existing Hardware	
Concrete Rubble Masonry Wall. Cross Section: height above grade 2'-0", depth below grade 1'-0", wall thickness at top 1'-4", wall thickness at base 2'-4", front traffic side batter 1H:12V, and back side batter 3H:12V	

CRASH TESTING

A brief description of each crash test and its result:

Required Test Number	Narrative Description	Evaluation Results
1-10 (1100C)	TTI Determined Not Critical	Non-Critical, not conducted
1-11 (2270P)	TTI Test Report Number TM 479070-1, Crash Test Date: November 13, 2012. MASH (2009) Test 1-11	PASS
1-20 (1100C)	CRM Rail is only allowed to flare outside of clear zone. No transitions to other rail type is allowed.	Non-Critical, not conducted
1-21 (2270P)	See above.	Non-Critical, not conducted

Full Scale Crash Testing was done in compliance with MASH by the following accredited crash test Laboratory. By signature below, the Laboratory agrees in support of this submission that all critical and relevant crash tests for the device listed above were conducted to meet the MASH criteria (cite the laboratory's accreditation status as noted in the crash test reports.):

Laboratory Name:	Texas Transportation Institute	
Laboratory Signature:	Richard A. Zimmer Digitally signed by Richard A. Zimmer Date: 2016.03.03 09:29:30 -06'00'	
Address:	Texas A&M Transportation Institute Proving Ground 3135 TAMU College Station, TX 77843-3135	Same as Submitter ☐
Country:	United States	Same as Submitter ☐
Accreditation Certificate Number and Dates of current Accreditation period :	American Association for Laboratry Accreditation ISO 17025 Laboratory Mechanical Testing Certificate #2821.01 Valid to April 30, 2017	

Submitter Signature*: Dean Takiguchi Digitally signed by Dean Takiguchi DN: cn=Dean Takiguchi, c=US, o=State of Hawaii DOT, ou=Highways Division Bridge Section, email=dean.takiguchi@hawaii.gov Reason: I am the author of this document Date: 2016.03.03 13:41:47 -10'00'

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

From: Alberson, Dean
To: Longstreet, Will (FHWA)
Subject: Fwd: Crash Test CRM Research Hawaii DOT
Date: Tuesday, April 12, 2016 3:16:15 PM

Sent from my Verizon Wireless 4G LTE smartphone

-------- Original message --------
From: "Alberson, Dean" <d-alberson@tti.tamu.edu>
Date: 03/22/2016 4:07 PM (GMT-06:00)
To: Dean.Takiguchi@hawaii.gov, d-alberson@tamu.edu
Cc: "Chatham, Linda" <l-chatham@tti.tamu.edu>, "Menges, Wanda" <W-Menges@tti.tamu.edu>
Subject: RE: Crash Test CRM Research Hawaii DOT

Hi Dean,

Absolutely.

We did not run 1-10 because test 1-10 is such a low energy test, there is nothing that can be learned from running that test. The Pickup is the critical test for both stability of the vehicle and the strength of the barrier. There is very little or no concern for occupant compartment deformation and occupant risk, on the small car or the pickup, because of the low-speed nature of the test. This speed is at or below the test speeds conducted on this vehicle by NHTSA. So there is no compelling reason to run test 1-10.

Regards,

Dean

Texas A&M Transportation Institute

Dean C. Alberson, Ph.D., P.E.

Assistant Agency Director/ Senior Research Engineer

Texas A&M Transportation Institute

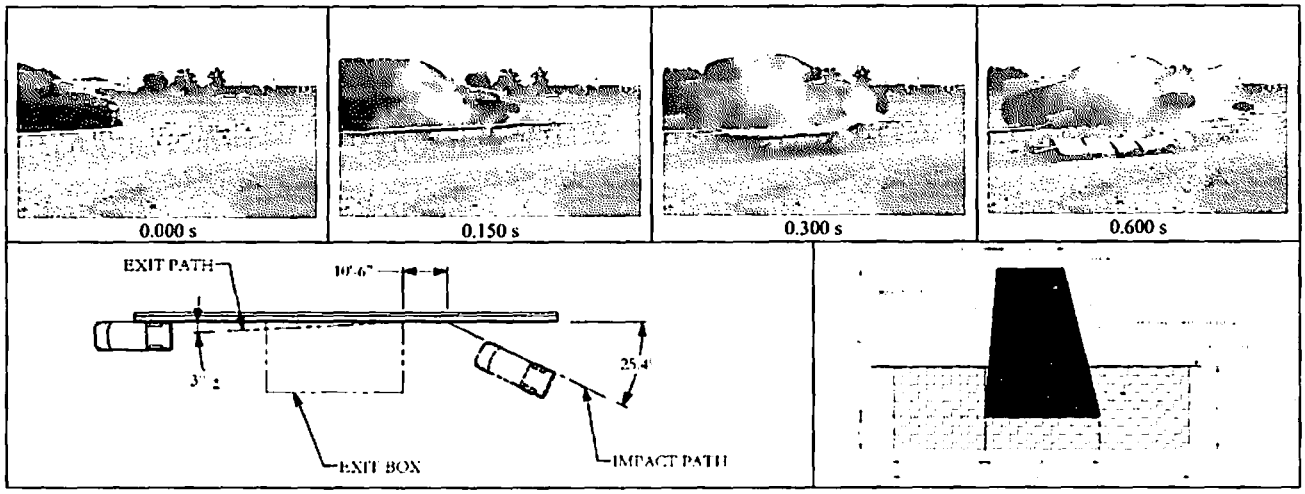
Roadside Safety & Physical Security Division

d-alberson@tamu.edu

979 458-3874

From: Dean.Takiguchi@hawaii.gov [mailto:Dean.Takiguchi@hawaii.gov]
Sent: Tuesday, March 22, 2016 1:35 PM
To: d-alberson@tamu.edu
Subject: Crash Test CRM Research Hawaii DOT

I wonder if you could help me.
FHWA wants a narrative explanation why crash test 1-10 was not conducted.



General Information
- Test Agency: Texas A&M Transportation Institute (TTI)
- Test Standard Test No: AASHTO MASH 1-11
- Test Agency Test No: 479070-1
- Test Date: 2012-11-13

Test Article
- Type: Longitudinal Barrier
- Name: Hawaii Masonry Wall
- Installation Length: 100 ft
- Material or Key Elements: Cement rubble masonry

Soil Type and Condition: Crushed Limestone, dry

Test Vehicle
- Designation: 2270P
- Model: 2008 Dodge Ram 1500 pickup
- Mass
  - Curb: 4761 lb
  - Test Inertial: 5039 lb
  - Dummy: No dummy
  - Gross Static: 5039 lb

Impact Conditions
- Speed: 31.1 mi/h
- Angle: 25.4 degrees
- Impact Location: 26 ft dwnstrm from end

Exit Conditions
- Speed: Out of view
- Angle: Out of view

Occupant Risk Values
- Impact Velocity
  - Longitudinal: 11.5 ft/s
  - Lateral: 10.2 ft/s
- THIV: 16.3 km/h
- Ridedown Accelerations
  - Longitudinal: 6.5 G
  - Lateral: 4.5 G
- PHD: 7.2 G
- ASI: 0.68
- Max. 0.050-s Average
  - Longitudinal: -5.1 G
  - Lateral: -4.6 G
  - Vertical: 2.8 G

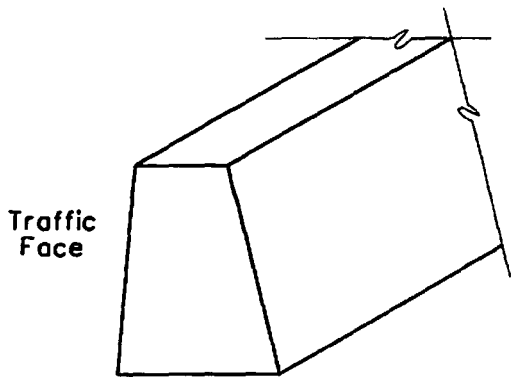
Post-Impact Trajectory
- Stopping Distance: 83.5 ft dwnstrm Adjacent to wall

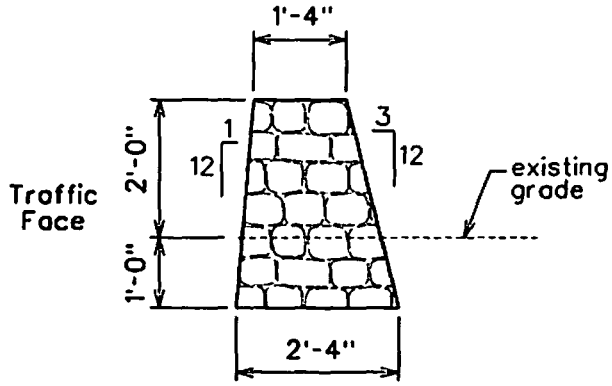
Vehicle Stability
- Maximum Yaw Angle: 22 degrees
- Maximum Pitch Angle: 4 degrees
- Maximum Roll Angle: 12 degrees
- Vehicle Snagging: No
- Vehicle Pocketing: No

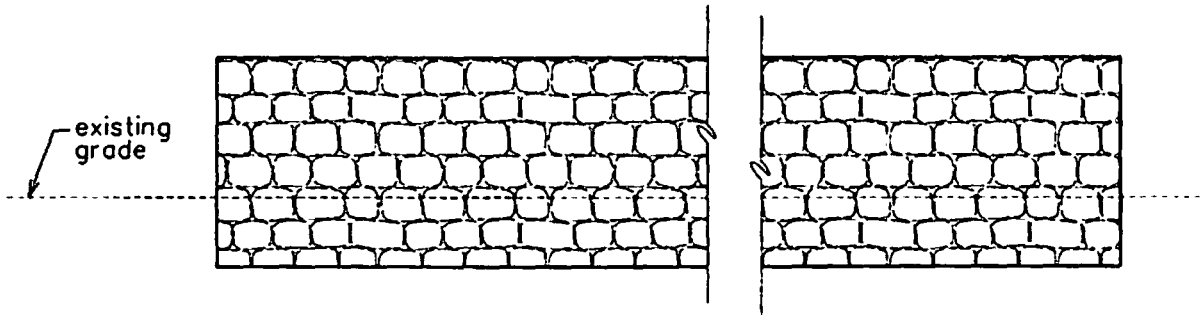
Test Article Deflections
- Dynamic: Not Obtainable
- Permanent: None
- Working Width: 83.8 inches
- Vehicle Intrusion: 26.8 inches

Vehicle Damage
- VDS: 01RFQ2
- CDC: 01FREW2
- Max. Exterior Deformation: 9.0 inches
- OCDI: RF0010000
- Max. Occupant Compartment Deformation: 0.75 inch

Figure 5. Summary of results for *MASH* test 1-11 on the Hawaii Masonry Wall.







ELEVATION
SCALE: 3/8" = 1'-0"

HAWAII DOT TYPICAL CRM WALL

MASH TL-1

DATE:	REF. NO.

TEST ARTICLE SPECIFICATIONS

The stone used to construct the wall was clean, hard, sound and durable. The individual stones had a minimum thickness not less than 6 inches and minimum width not less than 1-1/2 times the thickness and not less than 12 inches. With the exception of header stones, the minimum length was 1-1/2 times the stone's width. The largest stones were used on the bottom course, after which the stones were graded to decrease in width from bottom to top of the wall. The fascia stones were uniformly distributed by size. The wall was finished with a 2-inch mortar cap.

The stones were fully embedded in mortar. The mortar mix contained 1 part cement and 2 parts sand and/or fine aggregate by volume. The mortar was placed within 30 minutes of water being added. A minimum overlap of 6 inches was specified where the stones overlapped.

FOR FUTHER INFORMATION EMAIL:
DEAN TAKIGUCHI
BRIDGE DESIGN SECTION
DESIGN BRANCH
HIGHWAYS DIVISION
DEPARTMENT OF TRANSPORTATION
STATE OF HAWAII
at
DEAN.TAKIGUCHI@HAWAII.GOV

HAWAII DOT TYPICAL CRM WALL

MASH TL-1

REF. NO.	DATE: