



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

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

November 18, 2011

In Reply Refer To:
HSST/B-226

Hemal Shah, PE
Conti Enterprises, Inc
2045, Lincoln Highway
Edison, NJ 08817

Dear Mr. Shah:

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:	Conti Half Shape Concrete Bridge Rail
Type of system:	Temporary bridge railing
Test Level:	MASH Test Level 3
Testing conducted by:	Pennsylvania Transportation Institute
Date of request:	October 28, 2011
Date initially acknowledged:	October 28, 2011

You certify that the device described herein meets the crashworthiness criteria of the American Association of State Highway and Transportation Association's (AASHTO) Manual on Assessing Safety Hardware (MASH). Based on your testing you asked that we find the device(s) 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.

Decision:

The following device is eligible, with details provided below:

- Conti Half Shape Concrete Bridge Rail

Requirements

Roadside safety devices should meet the guidelines contained in the American Association of State Highway and Transportation Officials' Manual for Assessing Safety Hardware (MASH). The FHWA Memorandum "Identifying Acceptable Highway Safety Features" of July 25, 1997 provides further guidance on crash testing requirements of longitudinal barriers.

This Conti designed half section concrete barrier is a pre-cast steel reinforced concrete barrier with following critical dimensions

- Width at Base = 15"
- Width at top = 6"
- Length of each Section = 19'-8"
- 5" X 5" Anchor Bolt Pockets at Base = 7-Ea within each section
- Reinforcement: Structural steel rebar and Light weight wide flange section beams
- Approximate Weight: 6,350-lbs per section
- Approximate Volume: 41-cuft

Please refer to the enclosed drawing, "Exhibit-A" for the detailed fabrication shop drawing. This shop drawing provides all necessary details to fabricate and to inspect and verify the barrier being used during application. Concrete within the pre-cast barrier is 4000-psi design strength (28-days).

During the preparation of the crash test it was determined that the HS-1 barrier system needed to be tested according to the MASH guidance at TL-3. The TL-3 test level is designed to document the safety system's capability to safely contain and redirect vehicles traveling at high speeds. The MASH 3-11 test uses a pickup truck designated as vehicle 2270P (2270 kg). The vehicle impacts the determined critical impact point of the length of need barrier at a designated impact speed of 100 km/h at a nominal angle of 25 degrees.

The length of need (LON) of the constructed barrier system at the crash testing facility was 98 ft, consisting of 5 consecutive HS-1 barrier sections pinned together and each section was bolted onto a simulated 9-inch concrete bridge deck constructed at the test facility. The critical impact point (CIP) on the constructed barrier system was determined to be 4.3 ft downstream of the joint between the third (middle) and fourth barrier sections. The approach angle of the vehicle was set at 25 degrees. The test vehicle was a 2002 Dodge RAM 1500 Quad Cab 2WD, meeting the MASH criteria for the 2270P vehicle.

The test vehicle impacted the barrier system at a speed of 98.2 km/h (61 mi/h) and a 24.08-degree angle 5.1 ft from the joint of the third and fourth barrier. The test vehicle was safely redirected by the barrier system with an exit angle of 4.8 degrees well within the designated exit box. The test vehicle suffered minor damage throughout the impact. No measurable deformation of the passenger compartment was detected. No penetration of any kind or obstruction of view of the driver was detected. The test article had suffered minor damage and very small deformation. The impacted barrier segment developed a crack in the lower left corner of the barrier at the joint between the impacted (third) and adjacent upstream (fourth) barrier. Maximum permanent and dynamic penetrations occurred at the same location and were measured at 0.012 m (0.47 in).

Findings

Therefore, the system described and detailed in the attached form is eligible for reimbursement and should be installed under the range of conditions tested, when such use is acceptable to a highway agency.

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

- This finding of eligibility is limited to the crashworthiness characteristics of the systems 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 system will require a new letter.
- Should the FHWA discover that the qualification testing was flawed, that in-service performance reveals unacceptable safety problems, or that the system being marketed is significantly different from the version that was crash tested, we reserve the right to modify or revoke this letter.
- 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 review, and that it will meet the crashworthiness requirements of the FHWA and the Manual for Assessing Safety Hardware.
- To prevent misunderstanding by others, this letter of eligibility is designated as number B-226 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.
- 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. The finding of eligibility is limited to the crashworthiness characteristics of the candidate system, 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.
- The Conti HS barrier is not yet patented, but you consider the design as proprietary intellectual property. If proprietary systems are specified by a 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.

Sincerely yours,

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

Enclosures



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of Transportation
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Washington, D.C. 20590

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Sincerely yours,

A handwritten signature in blue ink, reading "Michael S. Griffith". The signature is fluid and cursive, with the first name "Michael" being the most prominent.

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

Enclosures

REINFORCEMENT SCHEDULE

NO.	ZONE	REVISION DESCRIPTION	BY	DATE	APPD.
1					
2					
3					
4					
5					
6					
7					
8					

CONCRETE KEY

SECTION X

SECTION Y

BAR BENDING DIAGRAM

E401

E402

E403

ENLARGE POCKET DETAIL @ 1 1/2" DIA HOLE

SECTION A

SECTION B

SECTION C

SECTION D

SECTION E

SECTION F

SECTION G

SECTION H

SECTION I

SECTION J

SECTION K

SECTION L

SECTION M

SECTION N

SECTION O

SECTION P

SECTION Q

SECTION R

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SECTION JW

**CRASH TESTING OF
CONTI ENTERPRISES, Inc. HS-1 HALF SHAPE NJ BARRIER
PER MASH-2009**

**FULL-SCALE CRASH TEST
SUMMARY DATA**

Prepared for
Conti Enterprises, Inc.

By
Ms. Robin Tallon
Dr. Zoltan Rado
The Pennsylvania State University, USA
*The Pennsylvania Transportation Institute
Vehicle Systems and Safety Program*

September 26, 2011

This work was sponsored by Conti Enterprises, Inc. and is submitted to the Federal Highway Administration. The contents of this report reflect the views of the authors, who are responsible for the facts and the accuracy of the data presented herein. The contents do not necessarily reflect the official views or policies of Conti Enterprises, Inc., or the Federal Highway Administration at the time of publication. This report does not constitute a standard, specification, or regulation.

LTI 2012-01

Table 1. Risk assessment table.

Evaluation Criteria	Test Results	Assessment
Structural Adequacy		
A. Test article should contain and redirect the vehicle; the vehicle should not penetrate, underride, or override the installation although controlled lateral deflection of the test article is acceptable.	The HS-1 half shaped New Jersey barrier mounted on a 9 in reinforced bridge deck structure redirected the 2270P vehicle. The vehicle did not penetrate, underride, or override the installation. The barrier system had developed minor stress related cracks in the joint grouting and in the closest joint to the CIP upstream. The maximum permanent deformation was caused by the shift of the impacted and joint upstream barrier at their joint and was measured to be 0.012 m (0.47 in).	PASS
Occupant Risk		
D. Detached elements, fragments or other debris from the test article should not penetrate or show potential for penetrating the occupant compartment, or present an undue hazard to other traffic, pedestrians, or personnel in a work zone. Deformations of, or intrusions into, the occupant compartment that could cause serious injuries should not be permitted.	No penetration to the passenger compartment was detected. The passenger compartment of the test vehicle developed no measurable deformation. A minor tear on the driver door was caused by the joint key connecting two barrier segments.	PASS
F. The vehicle should remain upright during and after collision although moderate roll, pitching, and yawing are acceptable.	The vehicle remained upright during and after the impact. The maximum roll angle was 17.9 degrees and the maximum pitch angle was 7.8 degrees	PASS
Vehicle Trajectory		
K. After collision it is preferable that the vehicle's trajectory not intrude into adjacent traffic lanes.	Vehicle exit was within the exit box. The exit angle was 4.8 degrees with a speed of 62.5 km/h (38.9 mph). The post impact vehicle trajectory did not intrude into adjacent traffic.	PASS
L. The occupant impact velocity in the longitudinal direction should not exceed 12 m/sec and the occupant ridedown acceleration in the longitudinal direction should not exceed 20 G's.	Occupant impact velocity in the longitudinal direction was 5.93 m/s and in the lateral direction 8.27 m/s while the ridedown accelerations were 11.0 g and 17.3 g respectively.	PASS
M. The exit angle from the test article preferably should be less than 60 percent of test impact angle, measured at time of vehicle loss of contact with test device.	Vehicle exit was within the exit box. The exit angle was 4.8 degrees with a speed of 62.5 km/h (38.9 mph). The post impact vehicle trajectory did not intrude into adjacent traffic.	PASS

Vehicle Trajectory Hazard

The 2270P vehicle exited within the designated exit box. The vehicle exit angle was 4.8 degrees and the measured exit speed was 62.5 km/h (38.9 mph). The impact, vehicle trajectory, and exit conditions are shown in Figure 2.

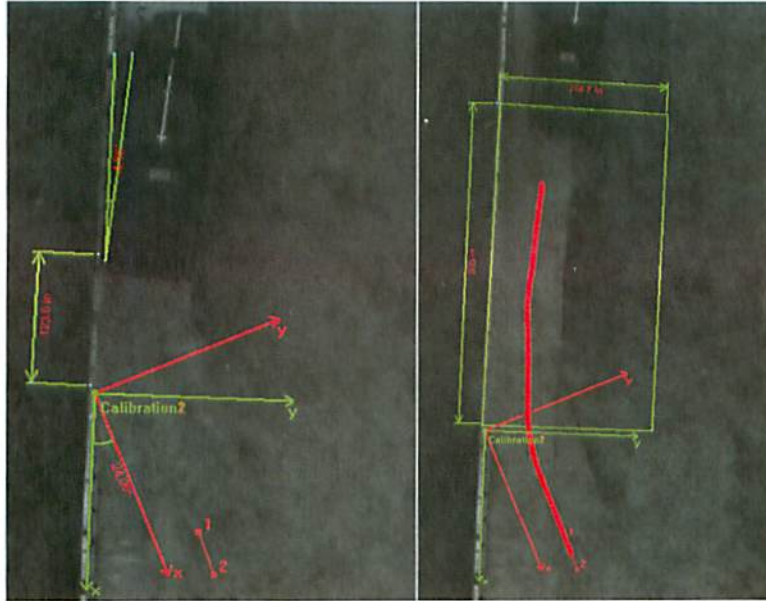


Figure 2. Vehicle trajectory, impact and exit conditions.

Occupant Risk

All calculated occupant risk measurements had been below the designated threshold levels contained in MASH-2009, chapter 5, Table 5.1. The calculated longitudinal ride-down acceleration is 11.03 g's as shown in Figure 3, while the lateral ride down acceleration is 17.27 g's, as shown in Figure 4. The computed occupant impact velocities in the longitudinal and lateral directions are 5.93 m/s and 8.27 m/s, respectively, shown in Figure 5.

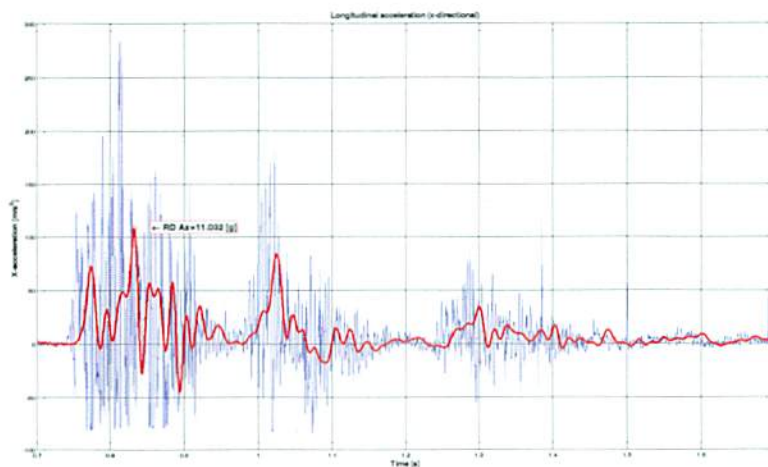


Figure 3. Occupant longitudinal ride-down acceleration.

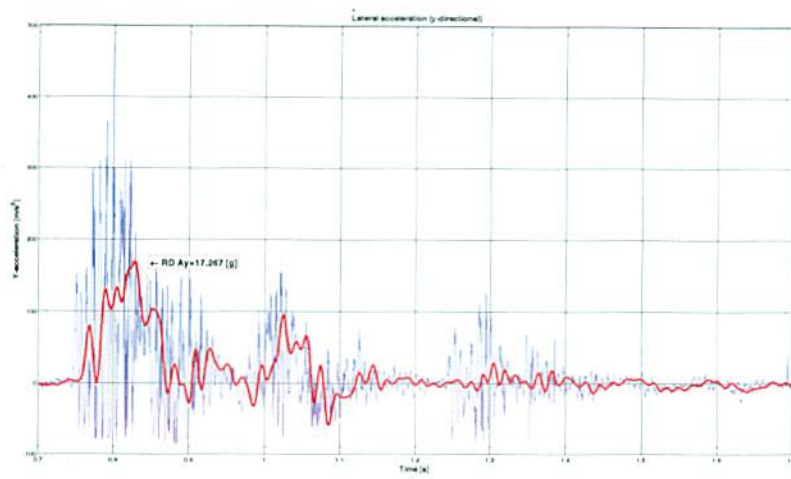


Figure 4. Occupant lateral ride-down acceleration.

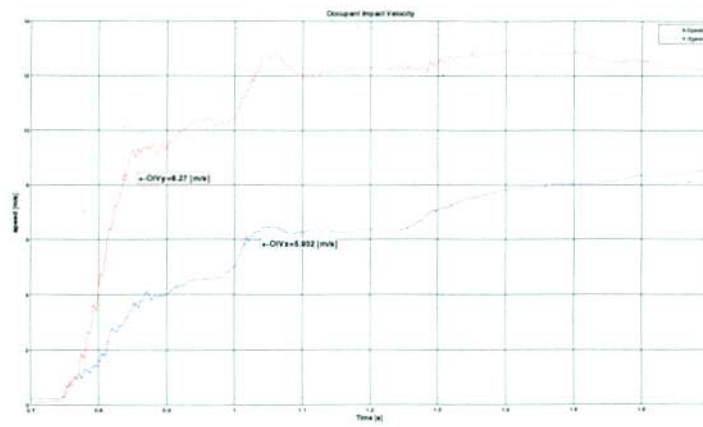


Figure 5. Lateral and longitudinal occupant impact velocity.

