



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

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

July 6, 2017

In Reply Refer To:
HSST-1/ B-281

Mr. Ben Powell
Powell Contracting Limited
180 Ram Forest Road
Stouffville, Ontario, L4A 2G8
Canada

Dear Mr. Powell:

This letter is in response to your November 30, 2016 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-281 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:

- Metal Transition for Branching Concrete Barrier

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 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: Metal Transition for Branching Concrete Barrier
Type of system: Longitudinal Barrier - Transition
Test Level: MASH Test Level 3
Testing conducted by: Texas A&M Transportation Institute
Date of request: November 30, 2016
Date of completed package: April 20, 2017

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

This eligibility letter is issued for the subject device as tested. Modifications made to the device are not covered by this letter and will need to be tested in accordance with all recommended tests in AASHTO's MASH as part of a new and separate submittal.

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-281 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,

A handwritten signature in blue ink that reads "Robert Ritter". The signature is fluid and cursive, with the first name "Robert" being larger and more prominent than the last name "Ritter".

Robert Ritter
Acting Director, Office of Safety
Technologies
Office of Safety

Enclosures

Request for Federal Aid Reimbursement Eligibility of Highway Safety Hardware

Submitter	Date of Request:	November 30, 2016	<input checked="" type="radio"/> New <input type="radio"/> Resubmission
	Name:	Ben Powell	
	Company:	Powell Contracting Limited	
	Address:	180 Ram Forest Road, Stouffville, Ontario, L4A 2G8	
	Country:	Canada	
	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.

Device & Testing Criterion - Enter from right to left starting with Test Level

1-1-1

System Type	Submission Type	Device Name / Variant	Testing Criterion	Test Level
'B': Rigid/Semi-Rigid Barriers (Roadside, Median, Bridge Railings)	<input checked="" type="radio"/> Physical Crash Testing <input type="radio"/> Engineering Analysis	Metal Transition for Branching Concrete Barrier	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.

Individual or Organization responsible for the product:

Contact Name:	Ben Powell	Same as Submitter <input checked="" type="checkbox"/>
Company Name:	Powell Contracting Limited	Same as Submitter <input checked="" type="checkbox"/>
Address:	180 Ram Forest Road, Stouffville, Ontario, L4A 2G8	Same as Submitter <input checked="" type="checkbox"/>
Country:	Canada	Same as Submitter <input checked="" type="checkbox"/>

Enter below all disclosures of financial interests as required by the FHWA 'Federal-Aid Reimbursement Eligibility Process for Safety Hardware Devices' document.

Texas A&M Transportation Institute was contracted by Powell Contracting Ltd. to assist with the design and performance of full-scale crash testing of the metal transition for branching concrete barrier. TTI staff received compensation in the form of wages and/or salaries for the completion of the work under this contract. Furthermore, Powell Contracting Ltd. is currently pursuing a patent for the transition and one of the TTI engineers is going to be a named coinventor, which may result in financial benefits to the engineer, TTI, and the Texas A&M University System.

PRODUCT DESCRIPTION

- New Hardware or Significant Modification
 Modification to Existing Hardware

This eligibility request is for a steel transition barrier section that connects a temporary concrete barrier to a permanent concrete barrier, such that the temporary barrier branches off from the permanent barrier and forms a row of temporary barrier installed parallel to the permanent barrier.

The test installation consisted of a series of pre-cast permanent concrete median barriers (CMBs), transitional temporary concrete barriers (TCBs), and offset TCBs positioned to allow for the installation of a portable variable message sign (PVMS) and its support structure. A steel transition barrier section provided the connection between the permanent pre-cast CMBs and the offset TCBs. The total length of the installed system was 60 m. The installation was constructed on an approximately 3350 mm wide x 75 mm thick hot mix asphalt concrete.

The permanent median barrier was a keyed-in 1125 mm tall New Jersey (NJ) Tall Wall barrier. The transitional TCBs were pinned down F-shape concrete barrier segments with cross-bolted connections. These transitional TCBs were connected to the permanent NJ Tall Wall barrier using a fabricated steel transition attachment that was 10895 mm long x 802 mm tall. It provided a smooth transition between the permanent CMBs and the first transitional TCB. The traffic side face of the transition was a smooth panel that conformed to the profile of the concrete barriers. This panel was reinforced with four HSS tubes and lateral supports.

CRASH TESTING

By signature below, the Engineer affiliated with the testing laboratory, agrees in support of this submission that all of the critical and relevant crash tests for this device listed above were conducted to meet the MASH test criteria. The Engineer has determined that no other crash tests are necessary to determine the device meets the MASH criteria.

Engineer Name:	Roger P. Bligh, P. E.	
Engineer Signature:	Bligh, Roger P	Digitally signed by Bligh, Roger P DN: postalCode=77843, o=TAMU-SIGN, street=Texas A&M University, st=TX, l=College Station, c=US, cn=Bligh, Roger P, email=rbligh@tamu.edu Date: 2016.11.30 16:14:48 -06'00'
Address:	TTI, TAMUS MS 3135, College Station, TX 77843-3135	Same as Submitter <input type="checkbox"/>
Country:	USA	Same as Submitter <input type="checkbox"/>

A brief description of each crash test and its result:

Required Test Number	Narrative Description	Evaluation Results
3-10 (1100C)	Device is a transition. LON test not relevant.	Non-Relevant Test, not conducted
3-11 (2270P)	Device is a transition. LON test not relevant.	Non-Relevant Test, not conducted

Required Test Number	Narrative Description	Evaluation Results
3-20 (1100C)	<p>Test No. 690902-PCL2 Performed May 31, 2016</p> <p>A 2010 Kia Rio, traveling at an impact speed of 100.4 km/h, contacted the steel transition at an impact angle of 25.1 degrees measured to the permanent barriers. The steel transition contained and redirected the 1100C vehicle. The vehicle did not penetrate, underride, or override the installation. Maximum dynamic deflection during the test was 30 mm at the top of the barrier. No detached elements, fragments, or other debris were present to penetrate or show potential for penetrating the occupant compartment or to present hazard to others in the area. Maximum occupant compartment deformation was 76 mm in the left front firewall and floor pan area. The 1100C vehicle remained upright during and after the collision event. Maximum roll and pitch angles were 23 degrees and 11 degrees, respectively. Occupant risk factors were within the limits specified in MASH.</p>	PASS
3-21 (2270P)	<p>Test No. 690902-PCL2. Performed June 1, 2016.</p> <p>A 2010 Dodge RAM 1500 pickup, traveling at an impact speed of 99.8 km/h, contacted the steel transition at an impact angle of 24.9 degrees measured to the permanent barriers. The steel transition contained and redirected the 2270P vehicle. The vehicle did not penetrate, underride, or override the installation. Maximum dynamic deflection during the test was 40 mm. No detached elements, fragments, or other debris were present to penetrate or show potential for penetrating the occupant compartment or to present hazard to others in the area. Maximum occupant compartment deformation was 127 mm in the left front kickpanel area. The 2270P vehicle remained upright during and after the collision event. Maximum roll and pitch angles were 16 degrees and 8 degrees, respectively. Occupant risk factors were within the preferred limits specified in MASH.</p>	PASS

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 AM Transportation Institute	
Laboratory Signature:	<i>Darrell L Kuhn</i>	Digitally signed by Darrell L. Kuhn DN: cn=Darrell L. Kuhn, o=Texas A&M Transportation Institute, ou=Proving Ground, email=d.kuhn@tti.tamu.edu, c=US Date: 2016.12.02 09:28:34 -06'00'
Address:	TTI, TAMUS MS 3135, College Station, TX 77843-3135	Same as Submitter <input type="checkbox"/>
Country:	USA	Same as Submitter <input type="checkbox"/>
Accreditation Certificate Number and Dates of current Accreditation period :	Certificate Number: 2821.01 Valid To: April 30, 2017	

Submitter Signature*:

Benjamin Powell

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		Key Words
Number	Date	

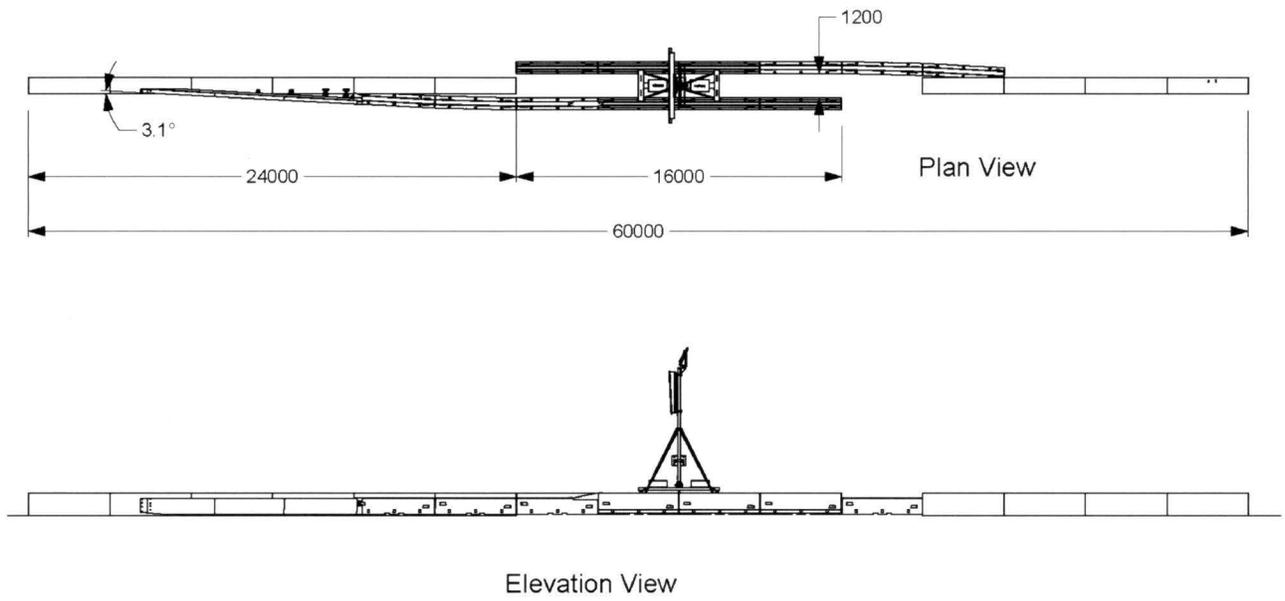
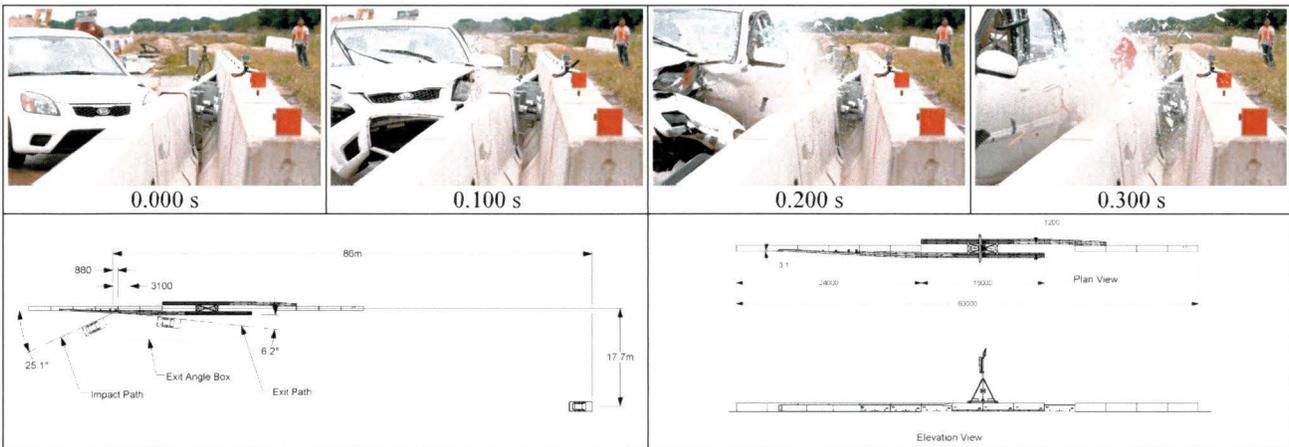


Figure 2.2. Layout of the Branching Transition and Barrier Mounted Sign Installation.



General Information

Test Agency..... Texas A&M Transportation Institute (TTI)
 Test Standard Test No..... MASH Test 3-20
 TTI Test No..... 690902-PCL1
 Test Date..... 2016-05-31

Test Article

Type..... Transition
 Name..... Transition from NJ-Shape Concrete
 Barrier to Offset Cross-Bolted F-Shape
 Installation Length..... 60 m
 Material or Key Elements..... Ten permanent 1125 mm tall x 4000 mm
 long NJ Tall Wall Keyed-in style barriers
 with I-Lock connections, transitional
 CMBs, and supplemental offset CMBs

Soil Type and Condition

3350 mm wide x 150 mm thick HMA
 Type D hotmix asphalt overlay on top of
 300 mm thick Type A, Grade 1 road base

Test Vehicle

Type/Designation..... 1100C
 Make and Model..... 2010 Kia Rio
 Curb..... 1120 kg
 Test Inertial..... 1117 kg
 Dummy..... 75 kg
 Gross Static..... 1192 kg

Impact Conditions

Speed.....100.4 km/h
 Angle (to permanent barriers).....25.1 degrees
 Location/Orientation.....880 mm upstream of
 Barrier #7

Impact Severity

.....78 kJ

Exit Conditions

Speed.....80.0 km/h
 Angle (to permanent barriers).....6.2 degrees

Occupant Risk Values

Longitudinal OIV.....6.6 m/s
 Lateral OIV.....10.1 m/s
 Longitudinal Ridedown.....3.7 g
 Lateral Ridedown.....10.6 g
 THIV.....43.5 km/h
 PHD.....10.9 g
 ASI.....2.86
 Max. 0.050-s Average
 Longitudinal.....-12.1 g
 Lateral.....19.7 g
 Vertical.....-5.7 g

Post-Impact Trajectory

Stopping Distance.....86.0 m downstream
 17.7 m toward traffic

Vehicle Stability

Maximum Yaw Angle.....99 degrees
 Maximum Pitch Angle.....11 degrees
 Maximum Roll Angle.....23 degrees
 Vehicle Snagging.....No
 Vehicle Pocketing.....No

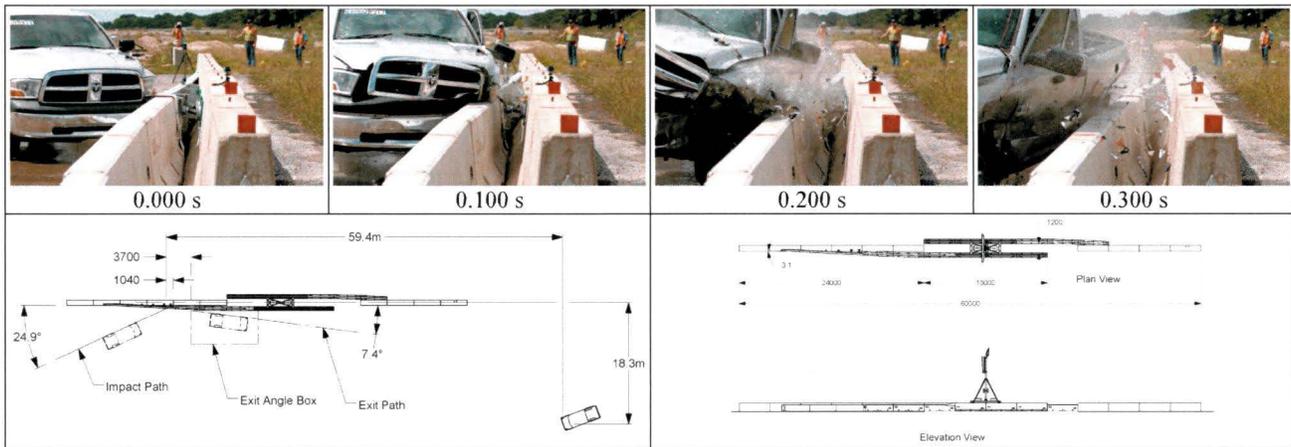
Test Article Deflections

Dynamic.....30 mm at top
 Permanent.....None measureable
 Working Width.....220 mm

Vehicle Damage

VDS.....11LFQ4
 CDC.....11FLEW4
 Max. Exterior Deformation.....178 mm
 OCDI.....LF0011000
 Max. Occupant Compartment
 Deformation.....76 mm

Figure 5.6. Summary of Results for MASH Test 3-20 on the Branching Transition and Barrier Mounted Sign.



General Information
 Test Agency..... Texas A&M Transportation Institute (TTI)
 Test Standard Test No..... MASH Test 3-21
 TTI Test No..... 690902-PCL2
 Test Date..... 2016-06-01

Test Article
 Type..... Transition
 Name..... Transition from NJ-Shape Concrete Barrier to Offset Cross-Bolted F-Shape
 Installation Length..... 60 m
 Material or Key Elements..... ten permanent 1125 mm tall x 4000 mm long NJ Tall Wall Keyed-in style barriers with I-Lock connections, transitional CMBs, and supplemental offset CMBs

Soil Type and Condition..... 3350 mm wide x 150 mm thick HMAAC
 Type D hotmix asphalt overlay on top of 300 mm thick Type A, Grade 1 road base

Test Vehicle
 Type/Designation..... 2270P
 Make and Model..... 2010 Dodge Ram 1500 Pickup
 Curb..... 2248 kg
 Test Inertial..... 2273 kg
 Dummy..... No dummy
 Gross Static..... 2273 kg

Impact Conditions
 Speed.....99.8 km/h
 Angle (to permanent barriers).....24.9 degrees
 Location/Orientation.....1040 mm upstream of Barrier #7

Impact Severity.....155 kJ

Exit Conditions
 Speed.....82.6 km/h
 Angle (to permanent barriers).....7.4 degrees

Occupant Risk Values
 Longitudinal OIV.....5.4 m/s
 Lateral OIV.....9.0 m/s
 Longitudinal Ridedown.....4.4 g
 Lateral Ridedown.....11.8 g
 THIV.....38.8 km/h
 PHD.....11.8 g
 ASI.....2.25
 Max. 0.050-s Average
 Longitudinal.....-9.1 g
 Lateral.....16.6 g
 Vertical.....-5.0 g

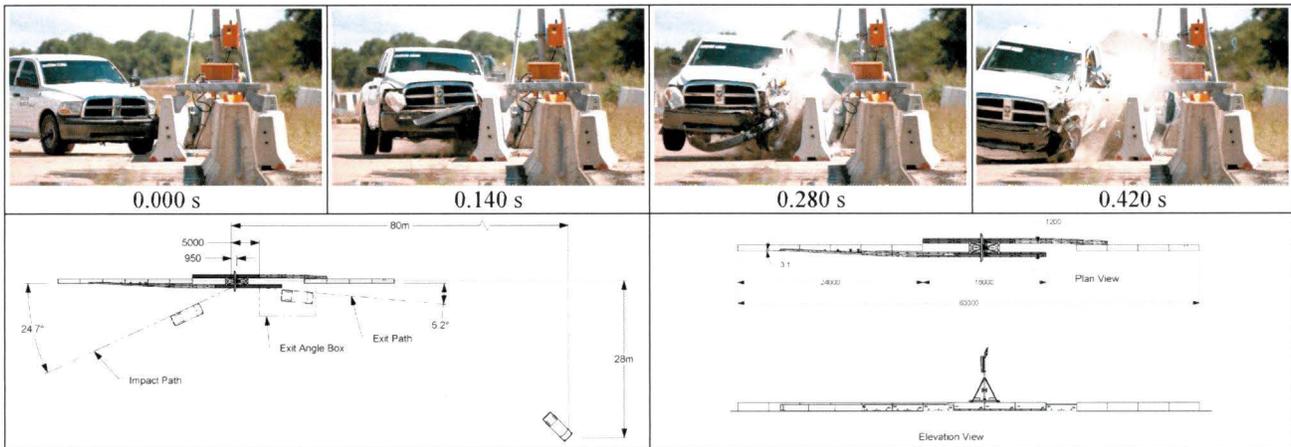
Post-Impact Trajectory
 Stopping Distance.....59.4 m downstream
 18.3 m toward traffic

Vehicle Stability
 Maximum Yaw Angle.....86 degrees
 Maximum Pitch Angle.....8 degrees
 Maximum Roll Angle.....16 degrees
 Vehicle Snagging.....No
 Vehicle Pocketing.....No

Test Article Deflections
 Dynamic.....40 mm at top
 Permanent.....None measureable
 Working Width.....425 mm

Vehicle Damage
 VDS.....11LFQ5
 CDC.....11FLEW4
 Max. Exterior Deformation.....356 mm
 OCDC.....LF0020000
 Max. Occupant Compartment Deformation.....127 mm

Figure 6.7. Summary of Results for MASH Test 3-21 on the Branching Transition and Barrier Mounted Sign.



General Information

Test Agency Texas A&M Transportation Institute (TTI)
 Test Standard Test No MASH Test 3-11
 TTI Test No 690902-PCL3
 Test Date 2016-06-02

Test Article

Type Transition
 Name Transition from NJ-Shape CMB to Offset Cross-Bolted F-Shape CMB
 Installation Length 60 m
 Material or Key Elements Ten permanent 1125 mm tall x 4000 mm long NJ Tall Wall Keyed-in style barriers with I-Lock connections, transitional CMBs, and supplemental offset CMBs
 Soil Type and Condition 3350 mm wide x 150 mm thick HMAC Type D hotmix asphalt overlay on top of 300 mm thick Type A, Grade 1 road base

Test Vehicle

Type/Designation 2270P
 Make and Model 2010 Dodge Ram 1500 Pickup
 Curb 2200 kg
 Test Inertial 2276 kg
 Dummy 75 kg
 Gross Static 2351 kg

Impact Conditions

Speed 100.7 km/h
 Angle 24.7 degrees
 Location/Orientation 1460 mm upstream of Barrier #11

Impact Severity

..... 156 kJ

Exit Conditions
 Speed 86.4 km/h
 Angle 5.2 degrees

Occupant Risk Values

Longitudinal OIV 4.6 m/s
 Lateral OIV 7.5 m/s
 Longitudinal Ridedown 5.1 g
 Lateral Ridedown 13.1 g
 THIV 32.2 km/h
 PHD 13.8 g
 ASI 1.71
 Max. 0.050-s Average
 Longitudinal -6.8 g
 Lateral 13.2 g
 Vertical -3.6 g

Post-Impact Trajectory

Stopping Distance 80.0 m downstream
 28.0 m toward traffic

Vehicle Stability

Maximum Yaw Angle 73 degrees
 Maximum Pitch Angle 11 degrees
 Maximum Roll Angle 10 degrees
 Vehicle Snagging No
 Vehicle Pocketing No

Test Article Deflections

Dynamic 86 mm at top
 Permanent None measurable
 Working Width 220 mm

Vehicle Damage

VDS 11LFQ4
 CDC 11FLEW4
 Max. Exterior Deformation 330 mm
 OCDI LF0000000
 Max. Occupant Compartment Deformation None

Figure 7.6. Summary of Results for MASH Test 3-11 on the Branching Transition and Barrier Mounted Sign.