



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

November 21, 2019

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

In Reply Refer To:  
HSST-1/CC-154

Mr. Gerrit Dyke, P.E.  
Lindsay Transportation Solutions  
180 River Road  
Rio Vista, CA 94571

Dear Mr. Dyke:

This letter is in response to your June 24, 2019 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-154 and is valid until a subsequent letter is issued by FHWA that expressly references this device.

### **Decision**

The following device is eligible within the length-of-need, with details provided in the form which is attached as an integral part of this letter:

- ABSORB-M TL2

### **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 AASHTO's 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: ABSORB-M TL2  
Type of system: Crash Cushion  
Test Level: MASH Test Level 2 (TL2)  
Testing conducted by: Safety Technologies  
Date of request: June 24, 2019

FHWA concurs with the recommendation of the accredited crash testing laboratory on 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. Any modifications to this device should be submitted to the user (i.e., state DOT) as per their requirements.

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 CC-154 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.
- This FHWA eligibility letter is not an expression of any Agency view, position, or determination of validity, scope, or ownership of any intellectual property rights to a specific device or design. Further, this letter does not impute any distribution or licensing rights to the requester. This FHWA eligibility letter determination is made based solely on the crash-testing information submitted by the requester. The FHWA reserves the right to review and revoke an earlier eligibility determination after receipt of subsequent information related to crash testing.

Sincerely,

A handwritten signature in blue ink that reads "Michael S. Griffith". The signature is written in a cursive, flowing style.

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

Enclosures



## Request for Federal Aid Reimbursement Eligibility of Highway Safety Hardware

<b>Submitter</b>	Date of Request:	June 24, 2019	<input checked="" type="radio"/> New <input type="radio"/> Resubmission
	Name:	Gerrit A. Dyke, P.E.	
	Company:	Lindsay Transportation Solutions, Inc.	
	Address:	180 River Road, Rio Vista, CA 94571	
	Country:	United States of America	
	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

!-!-!

System Type	Submission Type	Device Name / Variant	Testing Criterion	Test Level
'CC': Crash Cushions, Attenuators, & Terminals	<input checked="" type="radio"/> Physical Crash Testing <input type="radio"/> Engineering Analysis	ABSORB-M	AASHTO MASH	TL2

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:	Gerrit A. Dyke, P.E.	Same as Submitter <input checked="" type="checkbox"/>
Company Name:	Lindsay Transportation Solutions, Inc.	Same as Submitter <input checked="" type="checkbox"/>
Address:	180 River Road, Rio Vista, CA 94571	Same as Submitter <input checked="" type="checkbox"/>
Country:	United States of America	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.

Safe Technologies, Inc. (STI) performs testing and analysis services for Lindsay Transportation Solutions, Inc. (LTS). STI is a wholly owned subsidiary of LTS. STI is a fully accredited crash test facility to ISO 17025 by A2LA and is recognized by the US Federal Highway Administration (FHWA) to perform full scale crash tests per NCHRP Report 350 and MASH criteria.

The STI laboratory manager, technicians, and laborers are compensated by LTS for salaries and wages. STI and staff does not receive any incentives, compensation, commissions, or professional fees corresponding to the outcome of any testing or analysis.

STI or staff does not receive any research funding or other research support from LTS. STI and staff also do not have any financial interest in patents, copyrights, or other intellectual property associated with the products they test or analyze.

KARCO Engineering, LLC. was contracted by LTS to collaborate with STI for this testing program. KARCO provided guidance, recommendations, and suggestions for testing and reporting practices. KARCO reviewed test data and reports to ensure accuracy and correct representation of test parameters and results. KARCO nor any KARCO employee has any financial interest in LTS, STI, or the product being tested.

## PRODUCT DESCRIPTION

- ☒ New Hardware or Significant Modification
 ☐ Modification to Existing Hardware

The ABSORB-M™ is a non-redirective, gating crash cushion designed to meet the latest test standards defined in the Manual for Assessing Safety Hardware (MASH), Second Edition, 2016. The ABSORB-M utilizes water, thermoplastic elements (elements), tension straps, a midnose, and a transition to absorb kinetic energy and safely contain or control the trajectory of impacting vehicles. The MASH Test Level 2 system is comprised of a nose plate, two elements, eight pin assemblies, a midnose, a transition, and six mechanical anchors attaching to the barrier system. Of the two elements, the element in the rear is filled with water and the front element is empty. Each element is pre-assembled using four tension straps secured with eight bolts and thread locking compound. The system has a nominal 42" [1098mm] height, 24" [673mm] width, and an effective length of approximately 175 1/2" [4.5m]. The ABSORB-M is designed to attach directly to longitudinal roadside safety barrier systems and does not attach to a foundation.

More details about the ABSORB-M are provided in Enclosure A titled "ABSORB-M MASH TL-2 Crash Cushion System".

Manufacturing drawings may be adjusted to ensure manufacturing capability and consistency with MASH tested and certified product.

## 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:	Joseph Nagy	
Engineer Signature:	<b>Joseph Nagy</b>	Digitally signed by Joseph Nagy Date: 2019.06.24 16:18:31 -07'00'
Address:	170 River Road, Rio Vista, CA 94571	Same as Submitter <input type="checkbox"/>
Country:	United States of America	Same as Submitter <input type="checkbox"/>

A brief description of each crash test and its result:

Required Test Number	Narrative Description	Evaluation Results
2-30 (1100C)	NA	Non-Relevant Test, not conducted
2-31 (2270P)	NA	Non-Relevant Test, not conducted
2-32 (1100C)	NA	Non-Relevant Test, not conducted
2-33 (2270P)	NA	Non-Relevant Test, not conducted
2-34 (1100C)	NA	Non-Relevant Test, not conducted
2-35 (2270P)	NA	Non-Relevant Test, not conducted
2-36 (2270P)	NA	Non-Relevant Test, not conducted
2-37 (2270P)	NA	Non-Relevant Test, not conducted
2-38 (1500A)	NA	Non-Relevant Test, not conducted

Required Test Number	Narrative Description	Evaluation Results
2-40 (1100C)	<p>The ABSORB-M was determined to have successfully met all of the evaluation criteria for MASH Test 2-40 for gating, non-redirective crash cushions.</p> <p>The ABSORB-M crash cushion satisfied the MASH structural adequacy criteria for its intended function as a gating, non-redirective crash cushion. The test article captured the 1100C vehicle in a controlled manner. The vehicle did not penetrate, underride, or override the installation.</p> <p>All of the occupant risk criteria were satisfied in testing the ABSORB-M crash cushion. Theoretical OIVs in the longitudinal and lateral directions were below the preferred limit of 30.0 ft/s (9.1 m/s). ORAs in the longitudinal and lateral directions were below the preferred limit of 15.0 G. Some debris were propelled from the impacted system but due to their soft nature and light weight these fragments did not pose a threat to occupants of the vehicle, pedestrians or personnel in a work zone.</p> <p>There was minimal deformation to the occupant compartment of the 1100C test vehicle. There was no intrusion into the occupant compartment. The test vehicle remained upright during and after the collision with minor roll and pitch.</p> <p>The ABSORB-M crash cushion was judged as satisfying the applicable MASH vehicle trajectory criteria.</p>	PASS

2-41 (2270P)	<p>The ABSORB-M was determined to have successfully met all of the evaluation criteria for MASH Test 2-41 for gating, non-redirective crash cushions.</p> <p>The ABSORB-M crash cushion satisfied the MASH structural adequacy criteria for its intended function as a gating, non-redirective crash cushion. The test article captured the 2270P vehicle in a controlled manner. The vehicle did not penetrate, underide, or override the installation.</p> <p>All of the occupant risk criteria were satisfied in testing the ABSORB-M crash cushion. Theoretical OIVs in the longitudinal and lateral directions were below the preferred limit of 30.0 ft/s (9.1 m/s). ORAs in the longitudinal and lateral directions were below the preferred limit of 15.0 G. Some debris were propelled from the impacted system but due to their soft nature and light weight these fragments did not pose a threat to occupants of the vehicle, pedestrians or personnel in a work zone.</p> <p>There was minimal deformation to the occupant compartment of the 2270P test vehicle. There was no intrusion into the occupant compartment. The test vehicle remained upright during and after the collision with minor roll and pitch.</p> <p>The ABSORB-M crash cushion was judged as satisfying the applicable MASH vehicle trajectory criteria.</p>	PASS
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2-42 (1100C)	<p>The ABSORB-M was determined to have successfully met all of the evaluation criteria for MASH Test 2-42 for gating, non-redirective crash cushions.</p> <p>The ABSORB-M crash cushion satisfied the MASH structural adequacy criteria for its intended function as a gating, non-redirective crash cushion. The test article captured the 1100C vehicle in a controlled manner. The vehicle did not penetrate, underride, or override the installation.</p> <p>All of the occupant risk criteria were satisfied in testing the ABSORB-M crash cushion. Theoretical OIVs in the longitudinal and lateral directions were below the preferred limit of 30.0 ft/s (9.1 m/s). ORAs in the longitudinal and lateral directions were below the preferred limit of 15.0 G. Some debris were propelled from the impacted system but due to their soft nature and light weight these fragments did not pose a threat to occupants of the vehicle, pedestrians or personnel in a work zone.</p> <p>There was minimal deformation to the occupant compartment of the 1100C test vehicle. There was no intrusion into the occupant compartment. The test vehicle remained upright during and after the collision with minor roll and pitch.</p> <p>The ABSORB-M crash cushion was judged as satisfying the applicable MASH vehicle trajectory criteria.</p>	PASS
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2-43 (2270P)	<p>The ABSORB-M was determined to have successfully met all of the evaluation criteria for MASH Test 2-43 for gating, non-redirective crash cushions.</p> <p>The ABSORB-M crash cushion satisfied the MASH structural adequacy criteria for its intended function as a gating, non-redirective crash cushion. The test article captured the 2270P vehicle in a controlled manner. The vehicle did not penetrate, underride, or override the installation.</p> <p>All of the occupant risk criteria were satisfied in testing the ABSORB-M crash cushion. Theoretical OIVs in the longitudinal and lateral directions were below the preferred limit of 30.0 ft/s (9.1 m/s). ORAs in the longitudinal and lateral directions were below the preferred limit of 15.0 G. Some debris were propelled from the impacted system but due to their soft nature and light weight these fragments did not pose a threat to occupants of the vehicle, pedestrians or personnel in a work zone.</p> <p>There was minimal deformation to the occupant compartment of the 2270P test vehicle. There was no intrusion into the occupant compartment. The test vehicle remained upright during and after the collision with minor roll and pitch.</p> <p>The ABSORB-M crash cushion was judged as satisfying the applicable MASH vehicle trajectory criteria.</p>	PASS
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2-44 (2270P)	<p>The ABSORB-M was determined to have successfully met all of the evaluation criteria for MASH Test 2-44 for gating, non-redirective crash cushions.</p> <p>The ABSORB-M crash cushion satisfied the MASH structural adequacy criteria for its intended function as a gating, non-redirective crash cushion. The test article captured the 2270P vehicle in a controlled manner. The vehicle did not penetrate, underide, or override the installation.</p> <p>All of the occupant risk criteria were satisfied in testing the ABSORB-M crash cushion. Some debris were propelled from the impacted system but due to their soft nature and light weight these fragments did not pose a threat to occupants of the vehicle, pedestrians or personnel in a work zone.</p> <p>There was minimal deformation to the occupant compartment of the 2270P test vehicle. The deformation was measured to be within the allowable limits. There was no intrusion into the occupant compartment. The test vehicle remained upright during and after the collision with minor roll and pitch.</p> <p>The ABSORB-M crash cushion was judged as satisfying the applicable MASH vehicle trajectory criteria.</p>	PASS
2-45 (1500A)	<p>Calculations performed to demonstrate acceptable occupant risk values per MASH evaluation criteria. Reference Enclosure A, "ABSORB-M MASH TL-2 Crash Cushion System" section titled "1500A Vehicle (MASH Test 2-45)".</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:	Safe Technologies Inc.	
Laboratory Signature:	<b>Joseph Nagy</b>	Digitally signed by Joseph Nagy Date: 2019.06.24 16:22:20 -07'00'
Address:	170 River Road, Rio Vista, CA 94571	Same as Submitter <input type="checkbox"/>
Country:	United States of America	Same as Submitter <input type="checkbox"/>
Accreditation Certificate Number and Dates of current Accreditation period :	A2LA 1851.01 Valid through March 31, 2020	

Submitter Signature\*: **Gerrit Dyke**Digitally signed by Gerrit Dyke  
Date: 2019.06.24 16:23:02  
+07'00'**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		
Number	Date	Key Words



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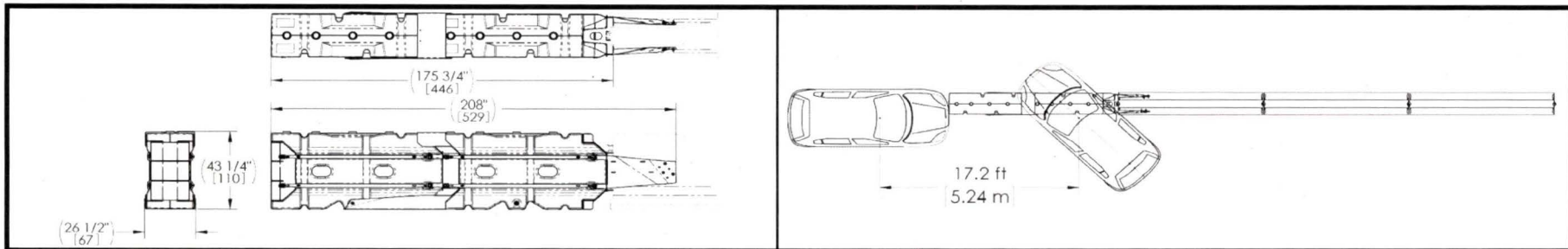
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#### General Information

Test Agency ..... **SAFE TECHNOLOGIES, INC.**  
 Test Number ..... MACC240-C1  
 Test Designation ..... MASH 2-40  
 Date ..... 4/18/2019

#### Test Article

Name ..... ABSORB-M, TL-2  
 Type ..... Non-redirective, Gating Crash Cushion  
 Installation Length ..... 208 in (529 cm)  
 Width ..... 26 1/2 in (67 cm)  
 Height ..... 43 1/4 in (110 cm)

#### Test Vehicle

Type / Designation ..... 1100C  
 Make and Model ..... 2011 Hyundai Accent  
 Curb Weight ..... 2,414 lb (1,095 kg)  
 Test Inertial Weight ..... 2,425 lb (1,100 kg)  
 Gross Static Weight ..... 2,590 lb (1,175 kg)

#### Impact Conditions

Speed ..... 43.9 mph (70.6 km/h)  
 Angle ..... 0.1 deg  
 Location / Orientation ..... 17.4 in (44.2 cm) Offset, driver's side

#### Exit Conditions

Speed ..... N/A  
 Angle ..... N/A

#### Post Impact Trajectory

Vehicle Stability ..... Satisfactory  
 Longitudinal Stopping Distance (CG) ..... 17.2 ft (5.24 m)  
 Vehicle Snagging/Pocketing ..... N/A

#### Occupant Risk Values

Longitudinal OIV ..... 27.2 ft/s (8.3 m/s)  
 Lateral OIV ..... 0.98 ft/s (0.3 m/s)  
 Longitudinal ORA ..... 6.4 G  
 Lateral ORA ..... 3.5 G  
 THIV ..... 27.6 ft/s (8.4 m/s)  
 PHD ..... 6.7 G  
 ASI ..... 0.54

#### Test Article Damage:

Substantial

#### Test Article Deflection

Longitudinal System Stroke ..... 9.65 ft (2.94 m)  
 Permanent Lateral Deflection ..... N/A  
 Dynamic Lateral Deflection ..... N/A  
 Debris Field  
     Longitudinal from Nose Plate ..... 19.0 ft (5.79 m)  
     Lateral from System's Centerline ..... 4.53 ft (1.38 m)

#### Vehicle Damage

VDS ..... 12-FL-4, 3-RP-1  
 CDC ..... 12FDAK1, 03RPAW1  
 Maximum Interior Deformation ..... 2 1/4 in (57.2 mm) - passenger's side door area





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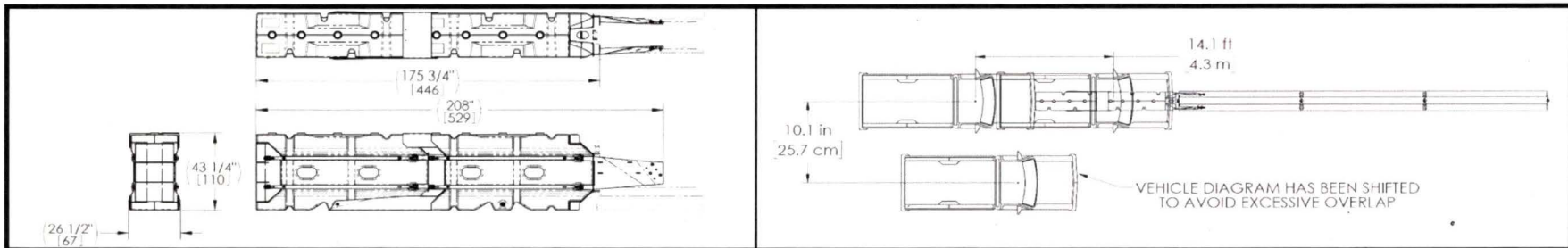
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#### General Information

Test Agency ..... SAFE TECHNOLOGIES, INC.  
 Test Number ..... MACC241-C1  
 Test Designation ..... MASH 2-41  
 Date ..... 4/15/2019

#### Test Article

Name ..... ABSORB-M, TL-2  
 Type ..... Non-redirective, Gating Crash Cushion  
 Installation Length ..... 208 in (529 cm)  
 Width ..... 26 1/2 in (67 cm)  
 Height ..... 43 1/4 in (110 cm)

#### Test Vehicle

Type / Designation ..... 2270P  
 Make and Model ..... 2013 Dodge Ram 1500  
 Curb Weight ..... 5,031 lb (2,282 kg)  
 Test Inertial Weight ..... 5,025 lb (2,279.5 kg)  
 Gross Static Weight ..... 5,025 lb (2,279.5 kg)

#### Impact Conditions

Speed ..... 43.2 mph (69.5 km/h)  
 Angle ..... 0 deg  
 Location / Orientation ..... Front/Center

#### Exit Conditions

Speed ..... N/A  
 Angle ..... N/A

#### Post Impact Trajectory

Vehicle Stability ..... Satisfactory  
 Longitudinal Stopping Distance (CG) ..... 14.1 ft (4.30 m)  
 Vehicle Snagging/Pocketing ..... N/A

#### Occupant Risk Values

Longitudinal OIV ..... 22.6 ft/s (6.9 m/s)  
 Lateral OIV ..... 2.30 ft/s (0.7 m/s)  
 Longitudinal ORA ..... 14.5 G  
 Lateral ORA ..... 2.9 G  
 THIV ..... 22.6 ft/s (6.9 m/s)  
 PHD ..... 14.5 G  
 ASI ..... 0.91

#### Test Article Damage:

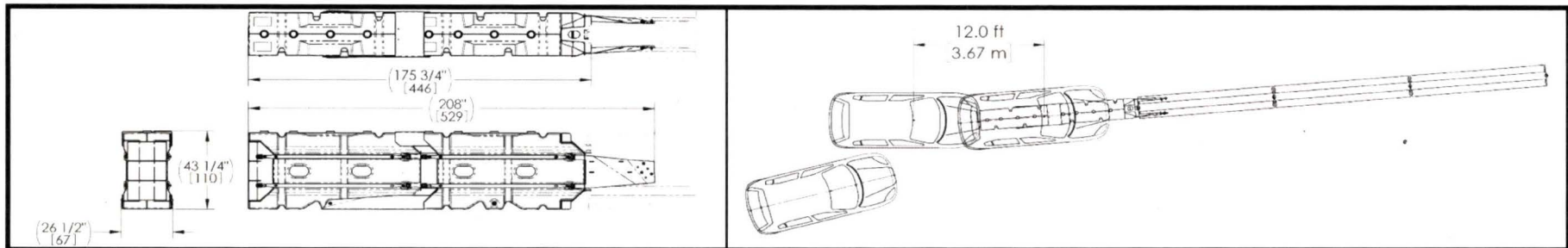
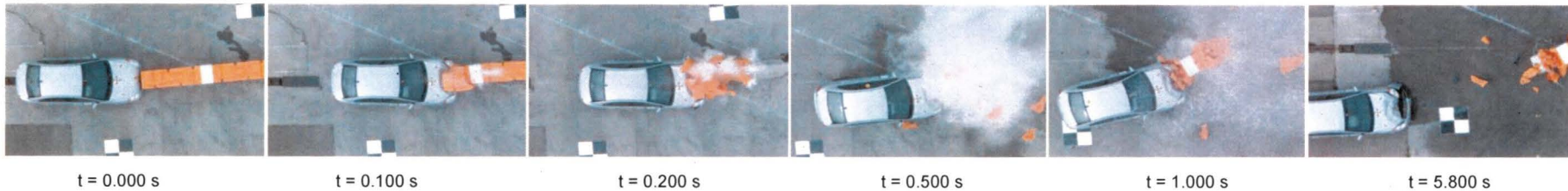
Substantial

#### Test Article Deflection

Longitudinal System Stroke ..... 15.9 ft (4.86 m)  
 Permanent Lateral Deflection ..... N/A  
 Dynamic Lateral Deflection ..... N/A  
 Debris Field  
     Longitudinal from Nose Plate ..... 65.6 ft (20.0 m)  
     Lateral from System's Centerline ..... 34.4 ft (10.5 m)

#### Vehicle Damage

VDS ..... 12-FC-4  
 CDC ..... 12FDEW1  
 Maximum Interior Deformation ..... 1/2 in (12.7 mm) - passenger's side roof area



#### General Information

Test Agency.....SAFE TECHNOLOGIES, INC.  
 Test Number.....MACC242-C1  
 Test Designation .....MASH 2-42  
 Date.....4/11/2019

#### Test Article

Name ..... ABSORB-M, TL-2  
 Type ..... Non-redirective, Gating Crash Cushion  
 Installation Length ..... 208 in (529 cm)  
 Width ..... 26 1/2 in (67 cm)  
 Height ..... 43 1/4 in (110 cm)

#### Test Vehicle

Type / Designation ..... 1100C  
 Make and Model ..... 2010 Hyundai Accent  
 Curb Weight ..... 2,422 lb (1,098.5 kg)  
 Test Inertial Weight ..... 2,425 lb (1,100 kg)  
 Gross Static Weight ..... 2,590 lb (1,175 kg)

#### Impact Conditions

Speed ..... 43.9 mph (70.7 km/h)  
 Angle ..... 5.05 deg  
 Location / Orientation ..... Front/Center, vehicle's centerline 0.77 in (1.96 cm) to the left of nose's midpoint

#### Exit Conditions

Speed.....N/A  
 Angle.....N/A

#### Post Impact Trajectory

Vehicle Stability ..... Satisfactory  
 Longitudinal Stopping Distance (CG) ..... 12.0 ft (3.67 m)  
 Vehicle Snagging/Pocketing ..... N/A

#### Occupant Risk Values

Longitudinal OIV ..... 28.2 ft/s (8.6 m/s)  
 Lateral OIV ..... 3.61 ft/s (1.1 m/s)  
 Longitudinal ORA ..... 13.2 G  
 Lateral ORA ..... 2.2 G  
 THIV ..... 28.5 ft/s (8.7 m/s)  
 PHD ..... 13.2 G  
 ASI ..... 0.99

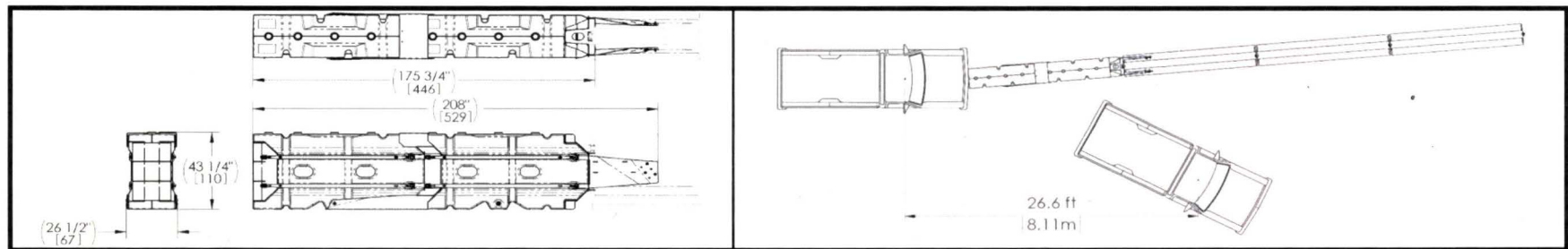
Test Article Damage:..... Substantial

#### Test Article Deflection

Longitudinal System Stroke..... 12.0 ft (3.65 m)  
 Permanent Lateral Deflection ..... N/A  
 Dynamic Lateral Deflection ..... N/A  
 Debris Field  
     Longitudinal from Nose Plate..... 86.5 ft (26.4 m)  
     Lateral from System's Centerline..... 29.0 ft (8.84 m)

#### Vehicle Damage

VDS..... 12-FC-3  
 CDC..... 12FDEW1  
 Maximum Interior Deformation ..... 3/8 in (9.53 mm) - driver's side floor pan area



#### General Information

Test Agency..... **SAFE TECHNOLOGIES, INC.**  
 Test Number..... **MACC243-C2**  
 Test Designation ..... **MASH 2-43**  
 Date..... **4/3/2019**

#### Test Article

Name ..... **ABSORB-M, TL-2**  
 Type ..... **Non-redirective, Gating Crash Cushion**  
 Installation Length ..... **208 in (529 cm)**  
 Width ..... **26 1/2 in (67 cm)**  
 Height ..... **43 1/4 in (110 cm)**

#### Test Vehicle

Type / Designation ..... **2270P**  
 Make and Model ..... **2012 Dodge Ram 1500**  
 Curb Weight ..... **4,991 lb (2,264 kg)**  
 Test Inertial Weight ..... **4,993 lb (2,265 kg)**  
 Gross Static Weight ..... **4,993 lb (2,265 kg)**

#### Impact Conditions

Speed ..... **42.7 mph (68.7 km/h)**  
 Angle ..... **4.5 deg**  
 Location / Orientation ..... **Front/Center, vehicle's centerline 0.38 in (0.96 cm) to the left of nose's midpoint**

#### Exit Conditions

Speed..... **N/A**  
 Angle..... **N/A**

#### Post Impact Trajectory

Vehicle Stability ..... **Satisfactory**  
 Longitudinal Stopping Distance (CG) ..... **26.6 ft (8.11 m)**  
 Vehicle Snagging/Pocketing ..... **N/A**

#### Occupant Risk Values

Longitudinal OIV ..... **23.0 ft/s (7.0 m/s)**  
 Lateral OIV ..... **2.30 ft/s (0.7 m/s)**  
 Longitudinal ORA ..... **11.7 G**  
 Lateral ORA ..... **4.9 G**  
 THIV ..... **23.3 ft/s (7.1 m/s)**  
 PHD ..... **11.9 G**  
 ASI ..... **0.83**

Test Article Damage:..... **Substantial**

#### Test Article Deflection

Longitudinal System Stroke..... **15.1 ft (4.59 m)**  
 Permanent Lateral Deflection ..... **N/A**  
 Dynamic Lateral Deflection ..... **N/A**

#### Debris Field

Longitudinal from Nose Plate..... **60.1 ft (18.3 m)**  
 Lateral from System's Centerline..... **36.2 ft (11.0 m)**

#### Vehicle Damage

VDS..... **12-FC-4**  
 CDC..... **12FDEW1**  
 Maximum Interior Deformation ..... **3/4 in (19.1 mm) - driver and passenger's side door area**





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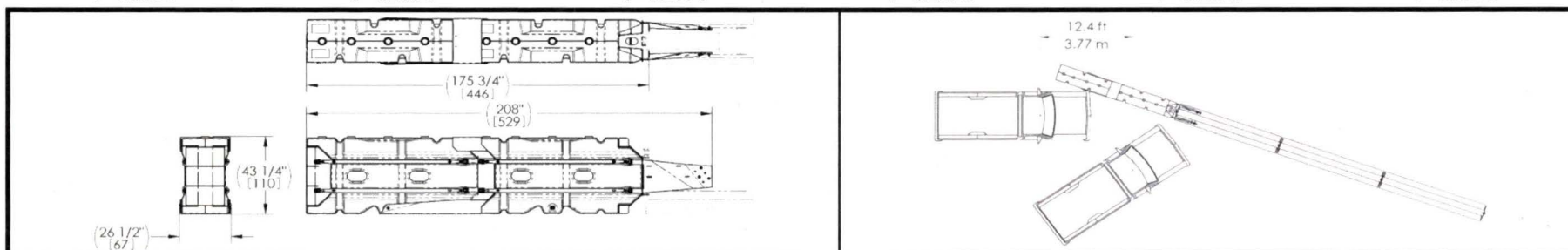
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#### General Information

Test Agency.....SAFE TECHNOLOGIES, INC.  
 Test Number.....MACC244-C1  
 Test Designation .....MASH 2-44  
 Date.....4/22/2019

#### Test Article

Name .....ABSORB-M, TL-2  
 Type .....Non-redirective, Gating Crash Cushion  
 Installation Length .....208 in (529 cm)  
 Width .....26 1/2 in (67 cm)  
 Height .....43 1/4 in (110 cm)

#### Test Vehicle

Type / Designation .....2270P  
 Make and Model .....2013 Dodge Ram 1500  
 Curb Weight .....4,830 lb (2,191 kg)  
 Test Inertial Weight .....5,025 lb (2,279.5 kg)  
 Gross Static Weight .....5,025 lb (2,279.5 kg)

#### Impact Conditions

Speed .....42.9 mph (69.0 km/h)  
 Angle .....20.1 deg  
 Location / Orientation .....CIP, 4.30 ft (1.31 m) downstream  
 from upstream end

#### Exit Conditions

Speed.....N/A  
 Angle.....N/A

#### Post Impact Trajectory

Vehicle Stability .....Satisfactory  
 Longitudinal Stopping Distance (CG) .....12.4 ft (3.77 m)  
 Vehicle Snagging/Pocketing .....Substantial

#### Occupant Risk Values (Shown for Reference)

Longitudinal OIV .....31.2 ft/s (9.5 m/s)  
 Lateral OIV .....1.31 ft/s (0.4 m/s)  
 Longitudinal ORA .....20.2 G  
 Lateral ORA .....4.3 G  
 THIV .....32.2 ft/s (9.8 m/s)  
 PHD .....20.3 G  
 ASI .....1.40

#### Test Article Damage:.....Substantial

#### Test Article Deflection

Longitudinal System Stroke.....N/A  
 Permanent Lateral Deflection .....N/A  
 Dynamic Lateral Deflection .....N/A

#### Debris Field

Longitudinal from Nose Plate.....11.8 ft (3.59 m)  
 Lateral from System's Centerline.....33.7 in (85.6 cm)

#### Vehicle Damage

VDS.....11-FL-6  
 CDC.....11FDEW3  
 Maximum Interior Deformation .....1 5/16 in (33.3 mm) - driver's  
 side toe pan area

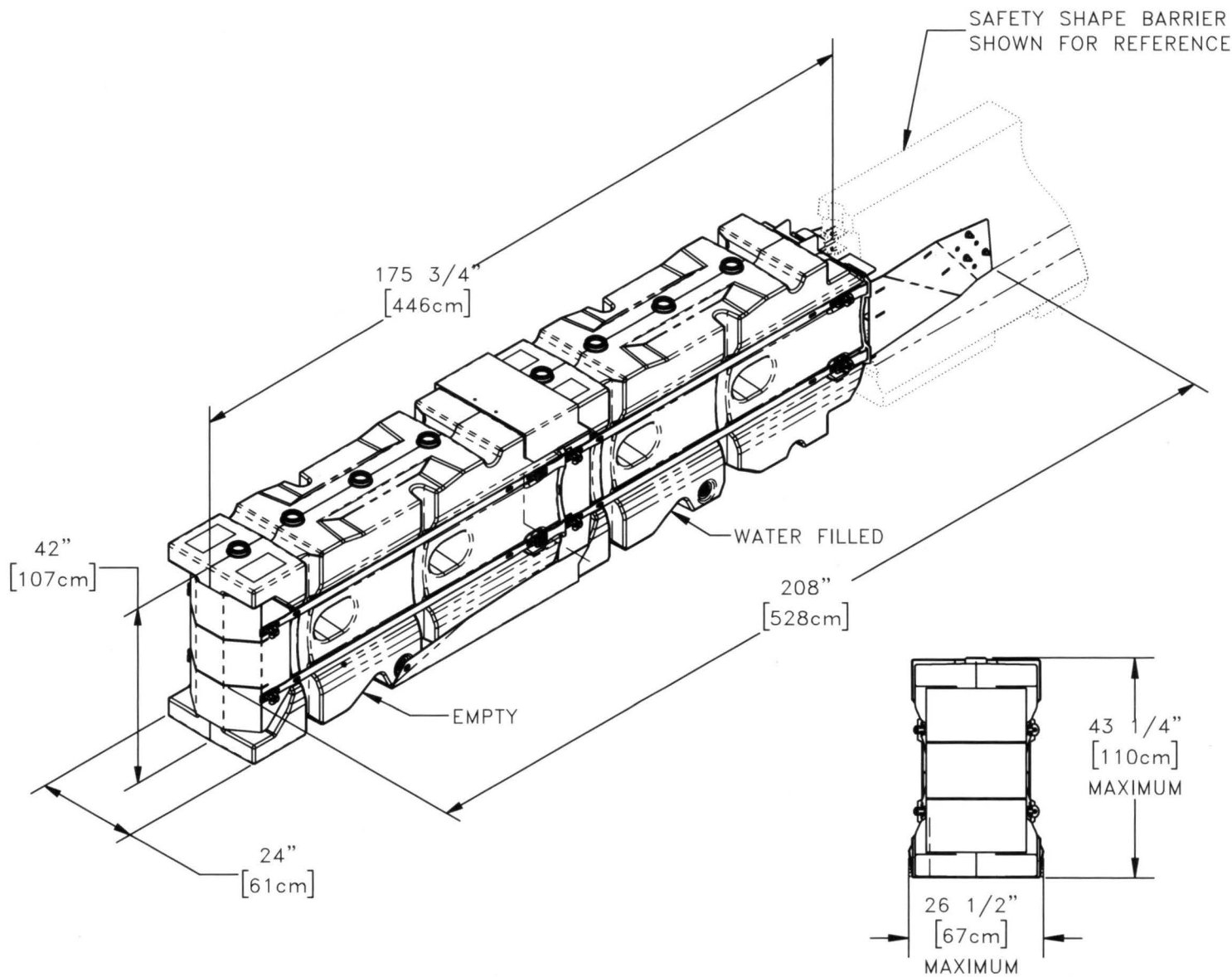




Lindsay Transportation Solutions, 180 River Rd., Rio Vista CA. 94571, 888-800-3691  
www.theroadzipper.com

## ABSORB-M™ TL-2

SHEET NO. 1 OF 2  
DATE: 04/22/19



## INTENDED USE

The ABSORB-M™ is a non-redirective, gating crash cushion designed to meet the latest test standards defined in the Manual for Assessing Safety Hardware (MASH), Second Edition, 2016. The ABSORB-M system utilizes water, thermoplastic elements (elements), tension straps, a midnose, and a transition to absorb kinetic energy and safely contain or control the trajectory of impacting vehicles. The MASH Test Level 2 system is comprised of a nose plate, two elements, eight pin assemblies, a midnose, a transition, and six mechanical anchors attaching to the barrier system. Of the two elements, the rearmost is filled with water and the front element is empty. Each element is pre-assembled using four tension straps secured with eight bolts and thread locking compound. The system has a nominal 42" [1070mm] height, 24" [610mm] width, and an effective length of approximately 175 3/4" [4.46m]. The ABSORB-M is designed to attach directly to longitudinal roadside safety barrier systems and does not attach to a foundation.

## APPROVALS

The ABSORB-M™ system has been fully tested in conformance with MASH, 2016 Test Level 2 and is determined eligible for Federal reimbursement by FHWA.

FHWA Eligibility Letter:CC-XXX

## CONTACT INFORMATION

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ABSORB-M™ TL2

			
SHEET NO.	DATE:		
2 OF 2		Lindsay Transportation Solutions, 180 River Rd., Rio Vista CA. 94571, 888-800-3691 <a href="http://www.theroadzipper.com">www.theroadzipper.com</a>	