



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

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

April 1, 2020

In Reply Refer To:
HSST-1/CC-160

Mr. Michael J. Buehler
Trinity Highway Products, LLC
3617 Cincinnati Ave.
Rocklin, California 95765

Dear Mr. Buehler:

This letter is in response to your December 12, 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-160 and is valid until a subsequent letter is issued by FHWA that expressly references this device.

Decision

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

- SMT™

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: SMT™

Type of system: Truck-Trailer Mounted Attenuator (TTMA)

Test Level: MASH Test Level 3 (TL3)

Testing conducted by: KARCO

Date of request: December 12, 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-160 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 black 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

Submitter	Date of Request:	December 12, 2019	<input checked="" type="radio"/> New <input type="radio"/> Resubmission
	Name:	Bret R. Eckert, P.E.	
	Company:	Trinity Highway Products, LLC	
	Address:	3617 Cincinnati Ave., Rocklin CA 95765	
	Country:	USA	
	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': Truck-Mounted Attenuator	<input checked="" type="radio"/> Physical Crash Testing <input type="radio"/> Engineering Analysis	SMT™	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:	Michael J. Buehler, P.E.	Same as Submitter <input type="checkbox"/>
Company Name:	Trinity Highway Products, LLC	Same as Submitter <input checked="" type="checkbox"/>
Address:	3617 Cincinnati Ave., Rocklin CA 95765	Same as Submitter <input checked="" type="checkbox"/>
Country:	USA	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.

The SMT™ Trailer Mounted Attenuator ("SMT™") system technology is the commercial embodiment of intellectual property that is protected by patents owned by Trinity Highway Products, LLC ("THP"). THP does not pay royalties for sales of the SMT™. The SMT™ system was designed and developed by engineers and employees at THP. The patent holders of record for the SMT™ system are Michael J. Buehler, P.E., Patrick A. Leonhardt, P.E., and Sean Thompson; and all are employed by THP. The associated United States patent, number 9,399,845 (Dated Sept. 11, 2013), is assigned to Trinity Highway Products, LLC.

Applus IDIADA Karco Engineering, LLC (KARCO) conducted the certification tests of the SMT™ system. KARCO is an internationally accredited third party crash testing laboratory. Full-scale crash testing on the SMT™ system was performed in accordance with testing criteria, set forth by the American Association of State Highway and Transportation Officials (AASHTO) in the Manual for Assessing Safety Hardware ("MASH") (2016). Other than fees paid to KARCO to conduct the tests and then analyze and report the test results, KARCO and THP do not share financial interests.

PRODUCT DESCRIPTION

Help

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

The SMT™ is a mobile crash cushion attached to the rear of a support vehicle. It is a towable system designed to be used on shadow or advanced warning vehicles upstream of moving operations or as a barrier vehicle for stationary work zones. The SMT™ is designed to be used on support vehicles with a minimum weight of 12,000 lb. and a maximum weight of 25,000 lb.

The SMT™ consists of a frame, axle, energy absorbing cartridges, lighting, face plate, optional spare tire, and optional arrow board / message board. The frame is a structural tube steel space frame that is bolted together in sections consisting of an Impact Frame, Rear Arms, Center Frame, Forward Arms, and Tongue Section. There is also a flanged pintle lunette ring that bolts into location on the front of the system. This ring has two possible positions to provide the customer adjustability in hitch height on the rear of the support truck. The frame is powder coated and has factory installed decals, name-plate, and VIN tag.

The SMT™ is 242" long by 82" wide. The system is 44" high, including the nominal height above the ground of 12" ± 1" at the rear of the system. A system without the optional arrow board weighs approximately 2620 lbs. The axle is a torsion axle with hubs containing 14" trailer wheels and tires. The axle is equipped with an emergency breakaway braking system. This axle fastens to the bottom of the center frame in four locations using 5/8-11 bolts and nuts. The wheels and tires are shrouded by fenders.

There are two energy absorbing cartridges, the rear cartridge "Cartridge A" and the forward cartridge "Cartridge B". Both cartridges consist of aluminum cells separated by aluminum sheet diaphragms. The sides, top and bottom, and end are aluminum sheet. The rear of each cartridge is a steel sheet "strong-back" that contains features for attachment to the Center or Tongue sections. Standard lighting consists of LED stop, turn, tail, and clearance lights. The lighting may be LED or incandescent and can be manufactured by different lighting supply vendors. The unique design of the impact face and frame arms are designed to limit rotation of the SMT™ without the need for additional equipment connected to the tongue or support vehicle. The aluminum face plate is a light-weight assembly designed to cover the rear of the system and improve driver visibility. It is a 0.040" thick aluminum sheet with fabricated bends to fit the Impact Frame.

The energy absorbing and structural portions of the SMT™ consist of the frame, frame arms, and cartridges. The other ancillary portions of the system, such as the electrical lighting do not absorb appreciable amounts of impact energy therefore changes to these components will not affect the performance of the SMT™ during an impact event. For instance, various vendors may supply electronic controls and electrical lighting components that perform the same function as the components that were present during testing. The spare tire, arrow board, and battery box were present during testing, however, these items are not required for proper performance of the SMT™. The impact face may also be any color and striped with any reflective or non-reflective tape of any color, depending upon customer requirements.

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:	Steven Matsusaka	
Engineer Signature:	<div style="text-align: center;">  </div> <div style="font-size: small; margin-top: 5px;"> DN: cn=Steven Matsusaka, email=steven.matsusaka@jdiada.com, c=US Digitally signed by Steven Matsusaka Date: 2019.12.02 11:33:45 -08'00' </div>	
Address:	9270 Holly Road, Adelanto, CA. 92301	Same as Submitter <input type="checkbox"/>
Country:	USA	Same as Submitter <input checked="" type="checkbox"/>


A brief description of each crash test and its result: [Help](#)

Required Test Number	Narrative Description	Evaluation Results
3-50 (1100C)	<p>Applus IDIADA KARCOTest No. P39122-03. Test Date June 5, 2019. Crash Test Report No. TR-P39122-03_D for MASH Test 3-50 Crash Test of Trinity Highway Products SMT.</p> <p>The Trailer Mounted Attenuator (TMA) was impacted by a 2009 Kia Rio 4-door sedan. The test vehicle impacted the SMT TMA at a velocity of 62.78 mph (101.03 km/h) and an impact angle of 0.5°. The SMT brought the vehicle to a controlled stop. The maximum dynamic deflection of the system was 6.4 ft. (2.0 m). The impact was absorbed by the TMA and the support truck was pushed forward until it came to rest 2.8 ft. (0.9 m) downstream. The vehicle came to rest 7.3 ft. (2.2 m) downstream and 1.1 ft. (0.3 m) right from its initial position. The test vehicle sustained damage to its front end. The hood crushed and creased near its center; the front bumper, front fenders, and headlights were crushed; and the engine was pushed rearward toward the firewall. The occupant compartment was not penetrated and the deformation limits were not exceeded. The Trinity Highway Products SMT MASH Trailer Attenuator met all the requirements for MASH 2016 Test 3-50.</p>	PASS

Required Test Number	Narrative Description	Evaluation Results
3-51 (2270P)	<p>Applus IDIADA KARCOTest No. P39123-02. Test Date June 28, 2019. Crash Test Report No. TR-P39123-02_B for MASH Test 3-51 Crash Test of Trinity Highway Products SMT.</p> <p>The Trailer-Mounted Attenuator (TMA) was impacted by a 2013 RAM 1500 4-door pickup truck. The test vehicle impacted the SMT TMA at a velocity of 63.64 mph (102.42 km/h) and an impact angle of 0.4°. The SMT TMA brought the vehicle to a controlled stop. The maximum dynamic deflection of the system was 13.0 ft. (4.0 m). The impact was absorbed by the TMA and the support truck was pushed forward 8.9 ft. (2.7 m) before coming to rest. The test vehicle sustained damage to its front end. The front bumper was crushed, the grill partially detached, and the left headlight detached from the vehicle. The left front tire was deflated. The occupant compartment was not penetrated and the deformation limits were not exceeded. The Trinity Highway Products SMT MASH Trailer Attenuator met all the requirements for MASH 2016 Test 3-51.</p>	PASS
3-52 (2270P)	<p>Applus IDIADA KARCOTest No. P39124-01. Test Date June 06, 2019. Crash Test Report No. TR-P39124-01_B for MASH Test 3-52 Crash Test of Trinity Highway Products SMT.</p> <p>The Trailer Mounted Attenuator (TMA) was impacted by a 2013 Ram 1500 4-door pick-up truck. The test vehicle impacted the SMT TMA at a velocity of 62.58 mph (100.71 km/h) and an impact angle of 0.3°. The SMT brought the vehicle to a controlled stop. The maximum measured dynamic deflection of the system was 12.2 ft. (3.7 m). The roll ahead distance of the support truck was 8.2 ft (2.5 m). The test vehicle sustained damage to its front end. The front bumper, hood, and left and right quarter panels were deformed as a result of the impact. The grill and both headlights detached from the vehicle. The right front wheel was flattened and its suspension components were damaged. The occupant compartment was not penetrated and the deformation limits were not exceeded. The Trinity Highway Products SMT MASH Trailer Attenuator met all the requirements for MASH 2016 Test 3-52.</p>	PASS

3-53 (2270P)	<p>AppluSIDIADAKARCOTestNo.P39125-01. TestDateJuly19,2019. CrashTestReport No. TR-P39125-01_B for MASHTest3-53 CrashTestofTrinityHighwayProductsSMT.</p> <p>The Trailer-Mounted Attenuator (TMA) was impacted by a 2013 RAM 1500 4-door pickup truck. The test vehicle impacted the SMTTMA at a velocity of 63.48 mph (102.16 km/h) and an impact angle of 9.5°. The SMT absorbed the vehicle's energy and deflected its trajectory, causing the vehicle to spin about its yaw axis before coming to rest 74.4 ft. (22.7 m) downstream and 37.0 ft. (11.3 m) left from its position at its initial point of contact with the TMA. The support truck rolled forward 22.9 ft. (7.0 m) before coming to rest. The test vehicle sustained damage to its front end, with most of the damage occurring on the right side. The front bumper, hood, and right front quarter panel were crushed; the grill and headlights detached from the vehicle; and the right wheel was flattened and its suspension components damaged. The occupant compartment was not penetrated and the deformation limits were not exceeded. The Trinity Highway Products SMT MASH Trailer Attenuator met all the requirements for MASH2016 Test 3-53.</p>	PASS
3-54 (1500A)	Per MASH, this test is optional.	Non-Relevant Test, not conducted

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:	KARCO Engineering, INC	
Laboratory Signature:	 <small>DN: cn=Steven Matsusaka, email=steven.matsusaka@idiada.com, c=US Digitally signed by Steven Matsusaka Date: 2019.12.02 11:34:15 -08'00'</small>	
Address:	9270 Holly Road, Adelanto, CA 92301	Same as Submitter <input type="checkbox"/>
Country:	USA	Same as Submitter <input checked="" type="checkbox"/>
Accreditation Certificate Number and Dates of current Accreditation period :	International Accreditation Services (IAS) ISO 17025 Accreditation Certificate #TL-371 Cert. 1: Expires July 1, 2019 Cert. 2: Expires July 1, 2022	

Submitter Signature*: Bret Eckert, P.E.

Digitally signed by Bret Eckert, P.E.
DN: cn=Bret Eckert, P.E., o=Trinity
Highway Products,
email=bret.eckert@trinity.net, c=US
Date: 2019.12.02 12:24:08 -08'00'

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.

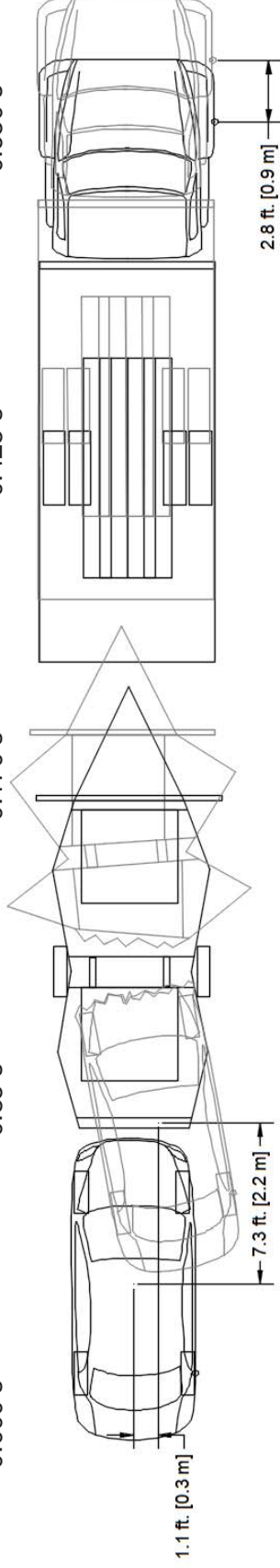
FHWA Official Business Only:

Eligibility Letter		
Number	Date	Key Words

MASH 2016 Test 3-50 Summary



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GENERAL INFORMATION

Test Agency..... Aplius IDIADA KARCO
Test No..... P39122-03
Test Designation..... 3-50
Test Date..... 06/05/19

TEST ARTICLE

Name / Model..... SMT MASH Trailer Attenuator
Type..... Trailer Mounted Attenuator
Support Vehicle Length..... 28.2 ft. (8.6 m)
TMA Length..... 20.4 ft. (6.2 m)
Road Surface..... Smooth, Clean Concrete
Support Vehicle Restraint.... 2nd gear, parking brake engaged

TEST VEHICLE

Type / Designation..... 1100C
Year, Make, and Model.... 2009 Kia Rio
Curb Mass..... 2,520.9 lbs (1,143.5 kg)
Test Inertial Mass..... 2,452.6 lbs (1,112.5 kg)
Gross Static Mass..... 2,619.0 lbs (1,188.0 kg)

Impact Conditions

Impact Velocity..... 62.78 mph (101.03 km/h)
Impact Angle..... 0.5°
Location / Orientation..... 1.1 in (29 mm) Left of TMA Centerline
Kinetic Energy..... 323.1 kip-ft (438.1 kJ)

Exit Conditions

Exit Velocity..... N/A
Exit Angle..... N/A
Final Vehicle Position..... 7.3 ft. (2.2 m) Downstream
1.1 ft. (0.3 m) Right
Support Vehicle Roll Ahead.. 2.8 ft. (0.9 m)
Vehicle Snagging..... None
Vehicle Pocketing..... None
Vehicle Stability..... Satisfactory
Maximum Roll Angle..... -7.4°
Maximum Pitch Angle..... 3.2°
Maximum Yaw Angle..... 7.0°

Occupant Risk

Longitudinal OIV..... 35.8 ft/s (10.9 m/s)
Lateral OIV..... -1.3 ft/s (-0.4 m/s)
Longitudinal RA..... -19.1 g
Lateral RA..... -2.7 g
THIV..... 35.8 ft/s (10.9 m/s)
PHD..... 19.2 g
ASI..... 1.29

Test Article Deflections

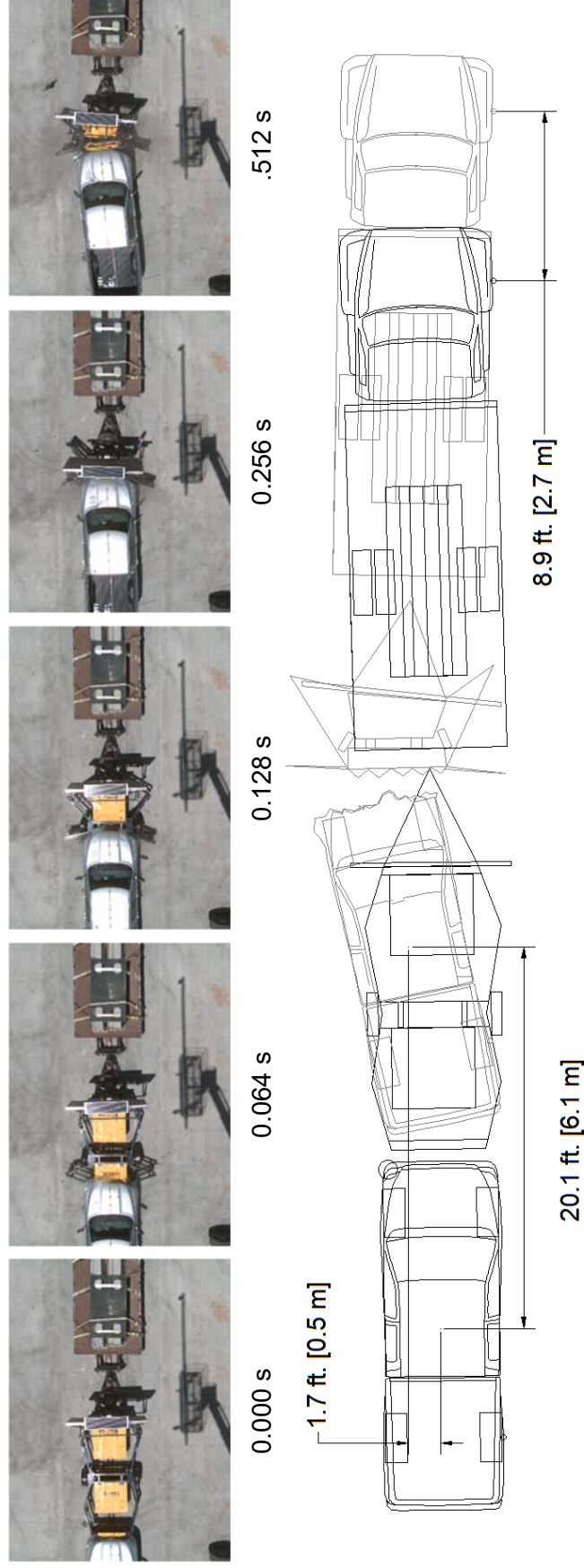
Static..... 6.3 ft. (1.9 m)
Dynamic..... 9.1 ft. (2.8 m)
Working Width..... N/A
Debris Field..... N/A

Vehicle Damage

Vehicle Damage Scale..... 12-FD-5
CDC..... 12FDEW2
Maximum Intrusion..... 0.4 in. (11 mm) at footwell

Figure 3 Summary of Test 3-50

MASH 2016 Test 3-51 Summary



GENERAL INFORMATION	
Test Agency.....	Applus IDIADA KARCO
Test No.....	P39123-02
Test Designation.....	3-51
Test Date.....	06/28/19
TEST ARTICLE	
Name / Model.....	SMT MASH Trailer Attenuator
Type.....	Trailer Mounted Attenuator
Support Vehicle Length.....	28.2 ft. (8.6 m)
TMA Length.....	20.4 ft. (6.2 m)
Road Surface.....	Smooth, Clean Concrete
Support Vehicle Restraint.....	2nd gear, Parking Brakes Engaged
TEST VEHICLE	
Type / Designation.....	2270P
Year, Make, and Model.....	2013 RAM 1500
Curb Mass.....	5,072.8 lbs (2,301.0 kg)
Test Inertial Mass.....	4,994.5 lbs (2,265.5 kg)
Gross Static Mass.....	4,994.5 lbs (2,265.5 kg)

Impact Conditions	
Impact Velocity.....	63.64 mph (102.42 km/h)
Impact Angle.....	0.4°
Location / Orientation.....	0.47 in. (12 mm) Right of TMA CL
Kinetic Energy.....	676.2 kip-ft (916.8 kJ)
Exit Conditions	
Exit Velocity.....	N/A
Exit Angle.....	N/A
Final Vehicle Position.....	20.1 ft. (6.1 m) Downstream
Support Vehicle Roll ahead.....	1.7 ft. (0.5 m) Left
Vehicle Snagging.....	None
Vehicle Pocketing.....	None
Vehicle Stability.....	Satisfactory
Maximum Roll Angle.....	1.9°
Maximum Pitch Angle.....	-2.5°
Maximum Yaw Angle.....	4.9°

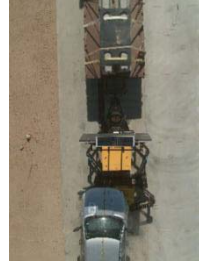
Occupant Risk	
Longitudinal OIV.....	35.1 ft/s (10.7 m/s)
Lateral OIV.....	-1.3 ft/s (-0.4 m/s)
Longitudinal RA.....	-16.7 g
Lateral RA.....	-1.4 g
THIV.....	35.1 ft/s (10.7 m/s)
PHD.....	16.7 g
ASI.....	1.20
Test Article Deflections	
Static.....	10.8 ft. (3.3 m)
Dynamic.....	13.0 ft. (4.0 m)
Working Width.....	N/A
Debris Field.....	N/A
Vehicle Damage	
Vehicle Damage Scale.....	12-FD-4
CDC.....	12FDEW1
Maximum Intrusion.....	0.2 in. (5 mm) at foot well

Figure 3 Summary of Test 3-51

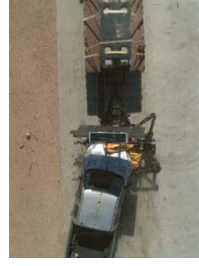
MASH 2016 Test 3-52 Summary



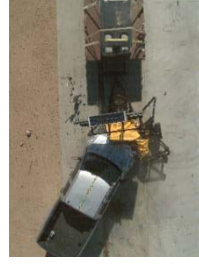
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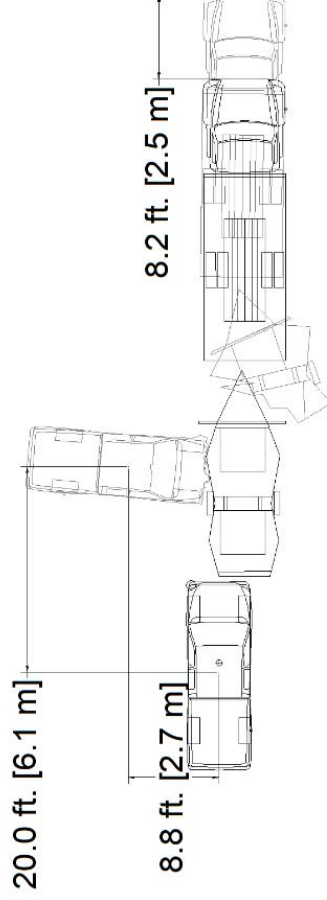
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GENERAL INFORMATION

Test Agency.....	Applus IDIADA KARCO
Test No.....	P39124-01
Test Designation.....	3-52
Test Date.....	06/06/19
TEST ARTICLE	
Name / Model.....	SMT MASH Trailer Attenuator
Type.....	Trailer Mounted Attenuator
Support Vehicle Length.....	28.2 ft. (8.6 m)
TMA Length.....	20.4 ft. (6.2 m)
Road Surface.....	Smooth, Clean Concrete
Support Vehicle Restraint....	2nd gear, parking brake engaged
TEST VEHICLE	
Type / Designation.....	2270P
Year, Make, and Model....	2013 RAM 1500
Curb Mass.....	4,793.9 lbs (2,174.5 kg)
Test Inertial Mass.....	4,973.5 lbs (2,256.0 kg)
Gross Static Mass.....	4,973.5 lbs (2,256.0 kg)

Impact Conditions

Impact Velocity.....	62.58 mph (100.71 km/h)
Impact Angle.....	0.3°
Location / Orientation.....	2.1 ft (640 mm) Left of TMA Centerline
Kinetic Energy.....	651.1 kip-ft (882.8 kJ)
Exit Conditions	
Exit Velocity.....	N/A
Exit Angle.....	N/A
Final Vehicle Position.....	20.0 ft. (6.1 m) Downstream
Support Vehicle Roll Ahead....	8.8 ft. (2.7 m) Left
Vehicle Snagging.....	8.2 ft. (2.5 m)
Vehicle Pocketing.....	None
Vehicle Stability.....	None
Vehicle Roll Angle.....	Satisfactory
Maximum Pitch Angle.....	6.0°
Maximum Yaw Angle.....	-3.8°
	-86.1°

Occupant Risk

Longitudinal OIV.....	33.5 ft/s (10.2 m/s)
Lateral OIV.....	-1.0 ft/s (-0.3 m/s)
Longitudinal RA.....	-12.4 g
Lateral RA.....	3.1 g
THIV.....	33.5 ft/s (10.2 ft/s)
PHD.....	12.7
ASI.....	0.89

Test Article Deflections

Static.....	8.9 ft. (2.7 m)
Dynamic.....	12.2 ft. (3.7 m)
Working Width.....	N/A
Debris Field.....	N/A

Vehicle Damage

Vehicle Damage Scale.....	12-FD-5
CDC.....	12FDEW3
Maximum Intrusion.....	0.4 in (9 mm) at foot well

Figure 3 Summary of Test 3-52

MASH 2016 Test 3-53 Summary



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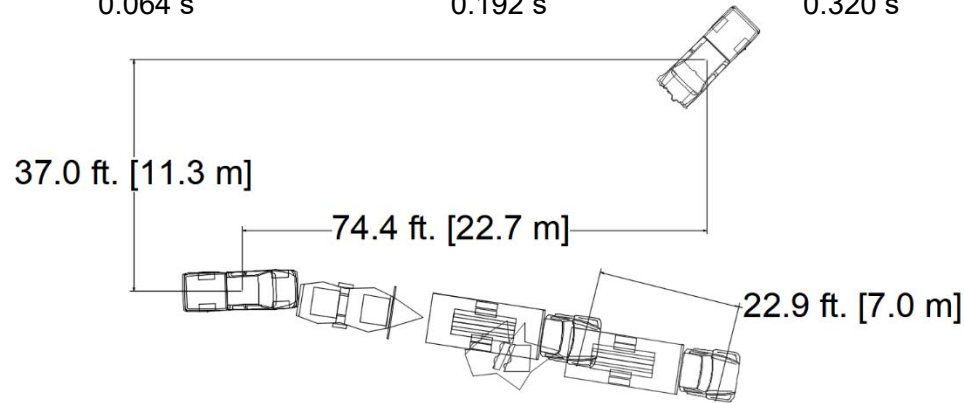
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GENERAL INFORMATION

Test Agency..... Applus IDIADA KARCO
 Test No..... P39125-01
 Test Designation..... 3-53
 Test Date..... 07/19/19

TEST ARTICLE

Name / Model..... SMT MASH Trailer Attenuator
 Type..... Trailer Mounted Attenuator
 Support Vehicle Length..... 28.2 ft. (8.6 m)
 TMA Length..... 20.4 ft. (6.2 m)
 Road Surface..... Smooth, Clean Concrete
 Support Vehicle Restraint.... 2nd gear, Parking Brakes Engaged

TEST VEHICLE

Type / Designation..... 2270P
 Year, Make, and Model.... 2013 RAM 1500
 Curb Mass..... 4,862.2 lbs (2,205.5 kg)
 Test Inertial Mass..... 5,009.9 lbs (2,272.5 kg)
 Gross Static Mass..... 5,009.9 lbs (2,272.5 kg)

Impact Conditions

Impact Velocity..... 63.48 mph (102.16 km/h)
 Impact Angle..... 9.5°
 Location / Orientation..... 18.0 in. (457 mm) Left of TMA CL
 Kinetic Energy..... 674.9 kip-ft (915.0 kJ)

Exit Conditions

Exit Velocity..... N/A
 Heading Angle..... N/A
 Final Vehicle Position..... 74.4 ft. (22.7 m) Downstream
 Support Vehicle Roll Ahead..... 22.9 ft. (7.0 m)
 Vehicle Snagging..... None
 Vehicle Pocketing..... None
 Vehicle Stability..... Satisfactory
 Maximum Roll Angle..... 5.2 °
 Maximum Pitch Angle..... 7.0 °
 Maximum Yaw Angle..... -117.0 °

Occupant Risk

Longitudinal OIV..... 34.1 ft/s (10.4 m/s)
 Lateral OIV..... 2.3 ft/s (0.7 m/s)
 Longitudinal RA..... -10.2 g
 Lateral RA..... -4.5 g
 THIV..... 34.4 ft/s (10.5 m/s)
 PHD..... 10.2 g
 ASI..... 1.09

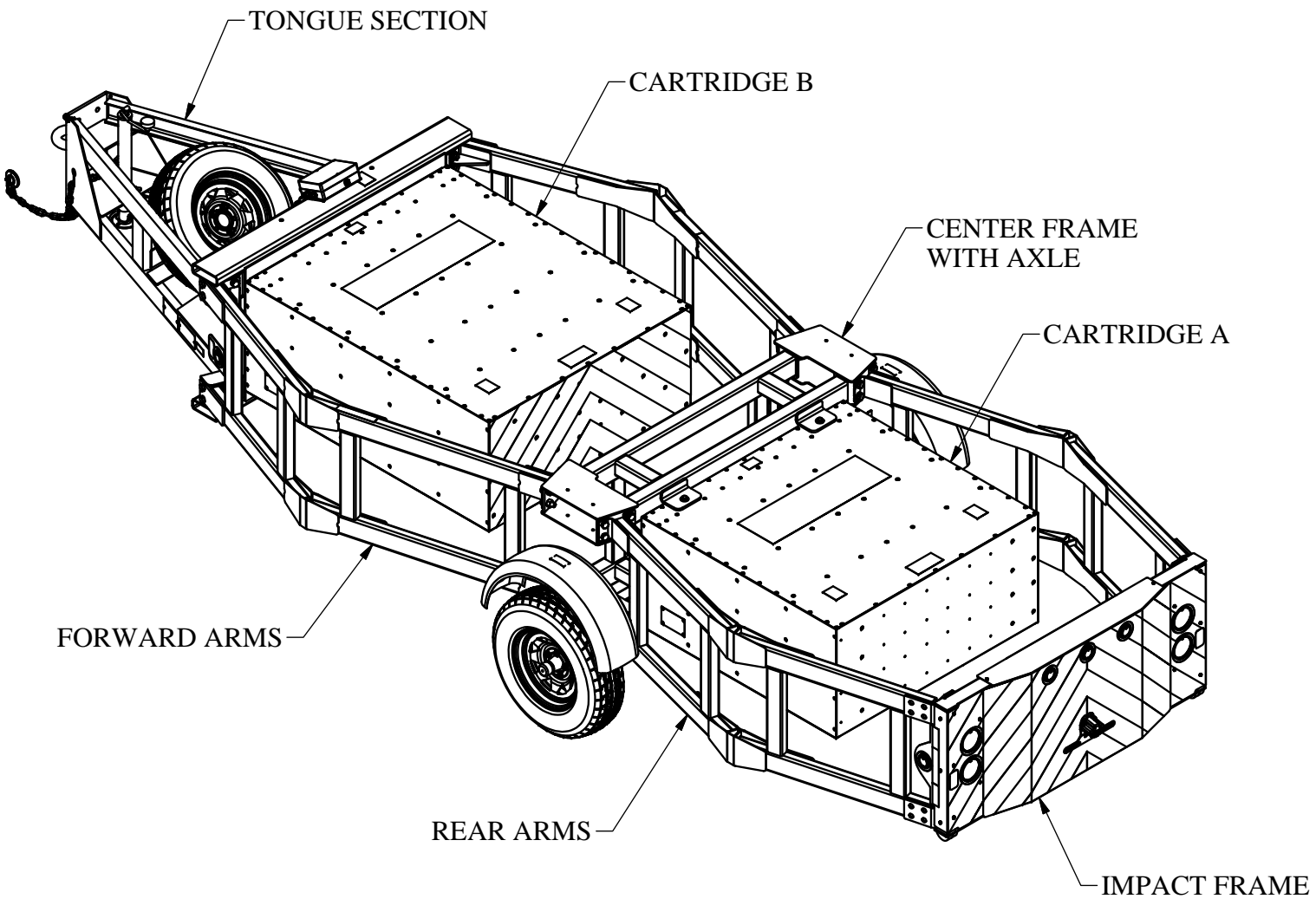
Test Article Deflections

Static..... 10.2 ft. (3.1 m)
 Dynamic..... 12.9 ft. (3.9 m)
 Working Width..... 18.7 ft. (5.7 m)
 Debris Field..... N/A

Vehicle Damage

Vehicle Damage Scale..... 12-FD-4
 CDC..... 12FDEW2
 Maximum Intrusion..... 0.6 in (14 mm) at foot well

Figure 3 Summary of Test 3-53



2019

SMT TRAILER MOUNTED ATTENUATOR



TRINITY
HIGHWAY

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INTENDED USE

The SMT™ is a mobile crash cushion attached to the rear of a support vehicle. It is a towable system designed to be used on shadow or advanced warning vehicles upstream of moving operations or as a barrier vehicle for stationary work zones. The SMT™ is designed to be used on support vehicles with a minimum weight of 12,000 lb. and a maximum weight of 25,000 lb.

FEATURES

The SMT™ consists of a frame, axle, energy absorbing cartridges, lighting, face plate, optional spare tire, and optional arrow board / message board. The frame is a structural tube steel space frame that is bolted together in sections consisting of an Impact Frame, Rear Arms, Center Frame, Forward Arms, and Tongue Section. There is also a flanged pintle lunette ring that bolts into location on the front of the system. This ring has two possible positions to provide the customer adjustability in hitch height on the rear of the support truck.

SPECIFICATIONS

- The SMT™ is 242" long.
- Width is 82" wide.
- Height is 44" high, including the nominal height above the ground of $12" \pm 1"$ at the rear of the system.
- A system without the optional arrow board weighs approximately 2620 lbs.

ELIGIBILITY

The SMT™ TMA has been tested in conformance to MASH 2016 Test Level 3 and is determined eligible for Federal-aid reimbursement by FHWA.

FHWA Eligibility Letter(s): CC-#### dated _____ for MASH 2016 Test Level 3

REFERENCES

Manual for Assessing Safety Hardware (MASH), American Association of State Highway and Transportation Officials (AASHTO), 2016

CONTACT INFORMATION

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