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

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

February 1, 2017

In Reply Refer To:
HSST-1/B-271

Mr. Felipe Almanza
TrafFix Devices Inc.
160 Avenida La Pata
San Clemente, CA 92673

Dear Mr. Almanza:

This letter is in response to your September 26, 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-271 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:

- MASH TrafFix Water Wall TL-1

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 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: MASH TrafFix Water Wall
Type of system: Longitudinal Barrier
Test Level: MASH Test Level 1 (TL1)
Testing conducted by: KARCO
Date of request: September 28, 2016
Date initially acknowledged: October 2, 2016
Date of completed package: December 16, 2016

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

If a manufacturer makes any modification to any of their roadside safety hardware that has an existing eligibility letter from FHWA, the manufacturer must notify FHWA of such modification with a request for continued eligibility for reimbursement. The notice of all modifications to a device must be accompanied by:

- Significant modifications – For these modifications, crash test results must be submitted with accompanying documentation and videos.
- Non-signification modifications – For these modifications, a statement from the crash test laboratory on the potential effect of the modification on the ability of the device to meet the relevant crash test criteria.

FHWA's determination of continued eligibility for the modified hardware will be based on whether the modified hardware will continue to meet the relevant crash test criteria.

Any user or agency relying on this eligibility letter is expected to use the same designs, specifications, drawings, installation and maintenance instructions as those submitted for review.

You are expected to certify to potential users that the hardware furnished has the same chemistry, mechanical properties, and geometry as that submitted for review, and that it will meet the test and evaluation criteria of the AASHTO 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-271 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,

Scott T. Johnson

Scott T. Johnson
Acting Director, Office of Safety
Technologies
Office of Safety

Enclosures

Request for Federal Aid Reimbursement Eligibility of Highway Safety Hardware

Submitter	Date of Request:	September 26, 2016	◉ New ○ Resubmission
	Name:	Felipe Almanza	
	Company:	TrafFix Devices Inc.	
	Address:	160 Avenida La Pata	
	Country:	United States	
	To:	Michael S. Griffith, Director FHWA, Office of Safety Technologies	

I request the following devices be considered eligible for reimbursement under the Federal-aid highway program.

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

!-!-!

System Type	Submission Type	Device Name / Variant	Testing Criterion	Test Level
'B': Rigid/Semi-Rigid Barriers (Roadside, Median, Bridge Railings)	◉ Physical Crash Testing ○ Engineering Analysis	MASH TrafFix Water Wall TL-1	AASHTO MASH	TL1

By submitting this request for review and evaluation by the Federal Highway Administration, I certify that the product(s) was (were) tested in conformity with the AASHTO Manual for Assessing Safety Hardware and that the evaluation results meet the appropriate evaluation criteria in the MASH.

Individual or Organization responsible for the product:

Contact Name:	Felipe Almanza	Same as Submitter ☒
Company Name:	TrafFix Devices Inc.	Same as Submitter ☒
Address:	160 Avenida La Pata	Same as Submitter ☒
Country:	United States	Same as Submitter ☒
Enter below all disclosures of financial interests as required by the FHWA `Federal-Aid Reimbursement Eligibility Process for Safety Hardware Devices' document.		
TrafFix Devices Inc. and Karco Engineering LLC share no financial interests between the two organizations. This includes no shared financial interest but not limited to: i. Compensation included wages, salaries, commissions, professional fees, or fees for business referrals iii. Research funding or other forms of research support; iv. Patents, copyrights, licenses, and other intellectual property interests; vi. Business ownership and investment interests;		

PRODUCT DESCRIPTION

(•) New Hardware or Significant Modification ( ) Modification to Existing Hardware

The MASH TrafFix Water Wall TL-1 is a longitudinal barrier designed to contain, redirect, and shield vehicles from roadside obstacles while providing positive protection and separation between the traveling public and the personnel in the work zone. The MASH TrafFix Water Wall is free standing, does not require anchoring to the road surface, can be used on concrete, asphalt, gravel, and dirt surfaces. The surfaces used for these tests were concrete and dirt.

A water wall system consists of a series of individual water filled modules that are connected to adjacent modules creating a continuous barrier wall. Adjoining modules can rotate up to 30 degrees at the connection, allowing the barrier wall to contour to varying road curvature.

Individual modules have overall dimensions of 73 in (1.9 m) long, pin to pin X 18 in (0.46 m) wide X 32 in (0.8 m) tall. An empty module weights approx. 90 lbs. (41 kgs) and 1070.3 lbs. (485.5 kgs) when filled with water. The modules are manufactured from polyethylene that is UV stabilized that is orange and white in color. Orange and white barrier modules were the as tested colors the product may be produced in other colors.

Permanently molded within the plastic modules are three corrosion resistant cables. The modules are designed with knuckles at the ends which contain a series of vertically aligned concentric holes that allow a steel t-pin to be inserted to connect adjacent modules together. When modules are pinned together there are a total of eight knuckles aligned with the steel t-pin inserted. This provides a positive connection between adjacent modules.

Upon impact the plastic modules rupture, dispersing the contained water, simultaneously engaging and tightening the internal molded-in cable barrier.

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:	Balbino A. Beltran	
Engineer Signature:	Balbino A. Beltran Digitally signed by Balbino A. Beltran DN: cn=Balbino A. Beltran, o=KARCO Engineering, LLC, ou, email=abeltran@karco.com, c=US Date: 2016.09.23 18:27:41 -07'00'	
Address:	9270 Holly Road, Adelanto CA 92301	Same as Submitter ☐
Country:	United States	Same as Submitter ☐

A brief description of each crash test and its result:

Required Test Number	Narrative Description	Evaluation Results
1-10 (1100C)	The TrafFix Water Wall was angled 25° from the direction of the impacting vehicle. The side angle impact examines the barrier's ability to contain, re-direct, or bring the vehicle to a controlled stop. The vehicle should not penetrate the installation while controlled lateral deflection of the test article is acceptable. The test was conducted using a commercially available 2013 Kia Rio 4-door sedan with a test inertial mass of 2,428.3 lbs (1,110.5 kg). The test vehicle impacted the barrier at a velocity of 32.45 mph (52.22 km/hr) and at an impact angle of 24.7°. The as tested MASH Water Wall TL-1 consisted of 25 water filled modules pinned together measuring 151.8 ft (46.3 m) long, pin to pin. Upon initial contact with the first module the vehicle moved forward, impacted the adjacent module causing the module to rupture, dispersing the contained water, simultaneously engaging and tightening the internal molded-in cable barrier. The vehicle was contained on the traffic side of the barrier and was brought to a controlled stop 46.3 ft. (14.1 m) longitudinally (downstream) and 2.3 ft. (0.7 m) lateral (toward non traffic side) from the initial point of contact. The barrier had a maximum working width of 8.9 ft (2.7 m) and a maximum dynamic deflection of 6.9 ft. (2.1 m). The vehicle remained upright throughout the impact event. The test vehicle's occupant compartment was not penetrated and there was no measureable in cab deformation. The maximum roll and pitch angle did not exceed 75° and occupant risk values were within limits per MASH specifications for Occupant impact Velocity (OIV) and Ridedown Acceleration (RA)	PASS

Required Test Number	Narrative Description	Evaluation Results
1-11 (2270P)	The TrafFix Water Wall was angled 25° from the direction of the impacting vehicle. The side angle impact examines the barrier's ability to contain, re-direct, or bring the vehicle to a controlled stop. The vehicle should not penetrate the installation while controlled lateral deflection of the test article is acceptable. The test was conducted using a commercially available 2012 RAM 1500 4-door with a test inertial mass of 5,021.0 lbs. (2,277.5 kg). The test vehicle impacted the barrier at a velocity of 31.21 mph (50.23 km/hr) and at an impact angle of 24.9°. The as tested MASH Water Wall TL-1 consisted of 25 water filled modules pinned together, measuring 151.8 ft. (46.3 m) long, pin to pin. Upon initial contact with the first module the vehicle moved forward, impacted the adjacent module causing the module to rupture, dispersing the contained water, simultaneously engaging and tightening the internal molded-in cable barrier. The vehicle was contained on the traffic side of the barrier and was brought to a controlled stop 42.8 ft. (13.0 m) longitudinally (downstream) and 16.7 ft. (5.1 m) lateral (toward non traffic side) from the point of impact. The barrier had a maximum working width of 18.7 ft. (5.7 m) and a maximum dynamic deflection of 17.1 ft. (5.2 m). The vehicle remained upright throughout the impact event. The test vehicle's occupant compartment was not penetrated and there was no measureable in cab deformation. The maximum roll and pitch angle did not exceed 75° and occupant risk values were within limits per MASH specifications for Occupant impact Velocity (OIV) and Ridedown Acceleration (RA)	PASS
1-20 (1100C)	Test for transition is not applicable for the MASH TrafFix Water Wall TL-1.	Non-Relevant Test, not conducted
1-21 (2270P)	Test for transition is not applicable for the MASH TrafFix Water Wall TL-1.	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:	Balbino A. Beltran — Digitally signed by Balbino A. Beltran DN: cn=Balbino A. Beltran, o=KARCO Engineering, LLC, ou, email=abeltran@karco.com, c=US Date: 2016.09.23 18:28:22 -07'00'	
Address:	9270 Holly Road, Adelanto CA 92301	Same as Submitter ☐
Country:	United States	Same as Submitter ☐
Accreditation Certificate Number and Dates of current Accreditation period :	TL-371; December 18, 2015 through December 18, 2017	

Submitter Signature*: Felipe Almanza — Digitally signed by Felipe Almanza DN: cn=Felipe Almanza, o=Traffic Devices Inc., ou, email=falmanza@trafficinc.com, c=US Date: 2016.09.20 11:17:17 -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

SECTION 4

MASH TEST 1-10 SUMMARY

Test Article:	TrafFix Devices Water Cable Barrier	Project No.	P36145-01
Test Program:	MASH 1-10	Test Date:	05/20/16

SEQUENTIAL PHOTOGRAPHS

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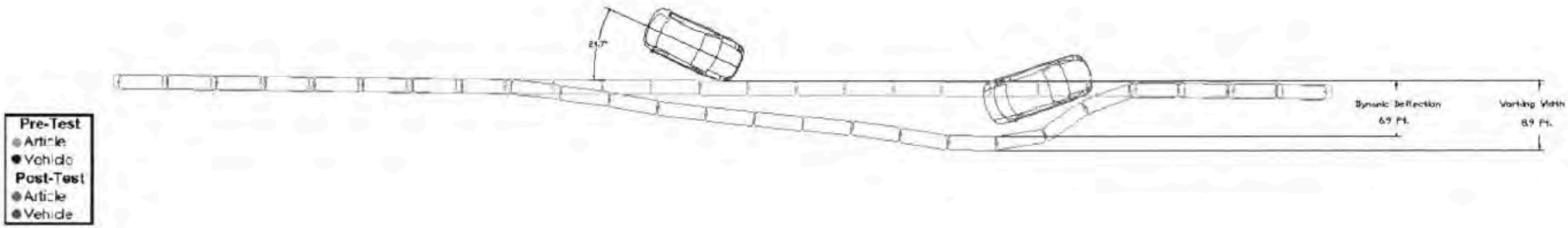
PLAN VIEW



SECTION 4 ... (CONTINUED)

MASH TEST 1-10 SUMMARY

Test Article: TrafFix Devices Water Cable Barrier — Project No. P36145-01

Test Program: MASH 1-10 — Test Date: 05/20/16

GENERAL INFORMATION	
TEST AGENCY	KARCO Engineering, LLC.
TEST NUMBER	P36145-01
TEST DESIGNATION	1-10
TEST DATE	5/20/16
TEST ARTICLE	
NAME / MODEL	Water Cable Barrier
TYPE	Longitudinal Barrier
KEY ELEMENTS	Water Barrier, Internal Cables, Drop T-Pins
MODULE LENGTH	73.0 in. (1,854 mm)
TOTAL INSTALLATION LENGTH	152.7 ft. (46.6 m)
HEIGHT	32.0 in. (813 mm)
MAXIMUM WIDTH	18.0 in. (457 mm)
ROAD SURFACE	Concrete
TEST VEHICLE	
TYPE / DESIGNATION	1100C
YEAR, MAKE AND MODEL	2013 Kia Rio
CURB MASS	2,588.1 lbs (1,174.0 kg)
TEST INERTIAL MASS	2,428.3 lbs (1,101.5 kg)
GROSS STATIC MASS	2,590.4 lbs (1,175.0 kg)
IMPACT CONDITIONS	
IMPACT VELOCITY	32.45 mph (52.22 km/h)
IMPACT ANGLE	24.7°
IMPACT LOCATION / ORIENTATION	3.5 ft. (1.1 m) upstream from the joint connecting modules 13 and 14

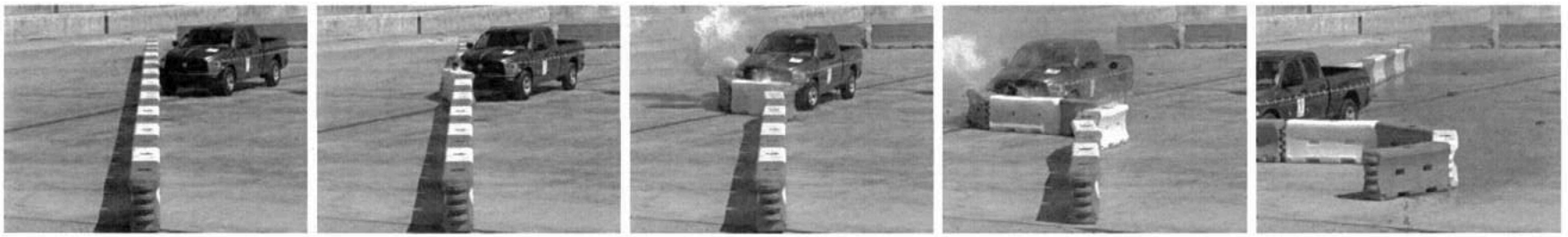
EXIT CONDITIONS		
EXIT VELOCITY		N/A
EXIT ANGLE		N/A
VEHICLE STABILITY		Satisfactory
FINAL VEHICLE POSITION		46.3 ft. (14.1 m) downstream and 2.3 ft. (0.7 m) toward the non-traffic side
VEHICLE SNAGGING		None
VEHICLE POCKETING		None
MAXIMUM ROLL ANGLE		-8.5°
MAXIMUM PITCH ANGLE		1.8°
MAXIMUM YAW ANGLE		-15.7°
IMPACT SEVERITY		14.9 kip-ft (20.2 kJ)
OCCUPANT RISK VALUES		
OCCUPANT IMPACT VELOCITY	Longitudinal	17.4 ft/s (5.3 m/s)
	Lateral	6.6 ft/s (2.0 m/s)
RIDEDOWN ACCELERATION	Longitudinal	-1.9 g
	Lateral	-1.4 g
THIV		18.0 ft/s (5.5 m/s)
PHD		2.0 g
ASI		0.40
TEST ARTICLE DEFLECTIONS		
WORKING WIDTH		8.9 ft. (2.7 m)
DYNAMIC DEFLECTION		6.9 ft. (2.1 m)
ARTICLE DAMAGE		Module 13 Ruptured, Cosmetic Damage to Module 14 through 21
VEHICLE DAMAGE		
VEHICLE DAMAGE SCALE		1-FRQ-1
COLLISION DAMAGE CLASSIFICATION		01FZEW1

SECTION 4

MASH TEST 1-11 SUMMARY

Test Article:	TrafFix Devices Water Cable Barrier	Project No.	P36064-01
Test Program:	MASH 1-11	Test Date:	03/14/16

SEQUENTIAL PHOTOGRAPHS



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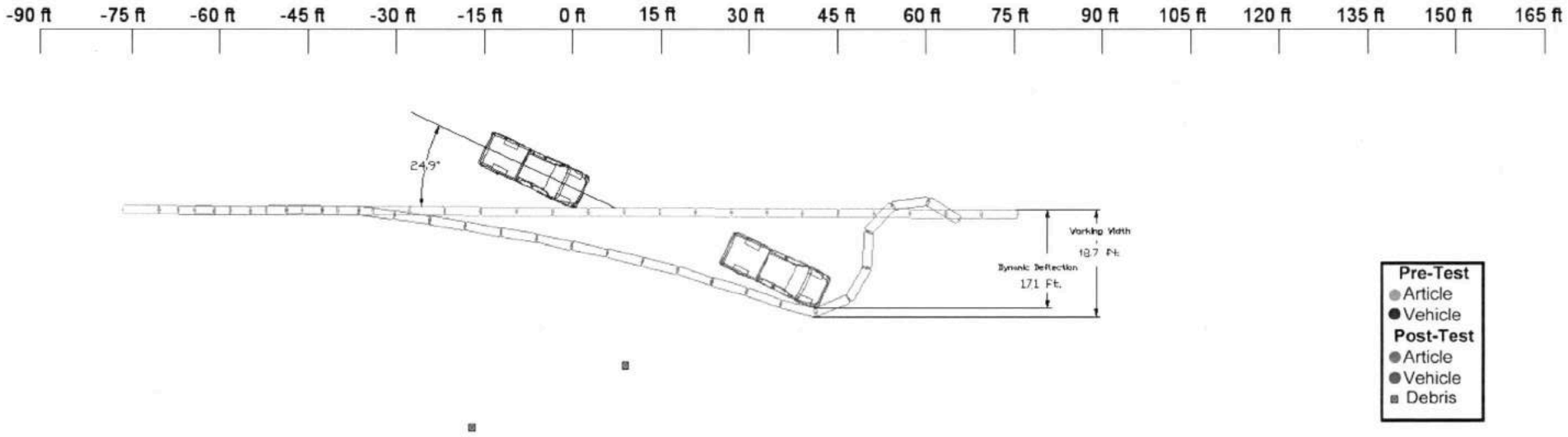
PLAN VIEW



SECTION 4 ... (CONTINUED)

MASH TEST 1-11 SUMMARY

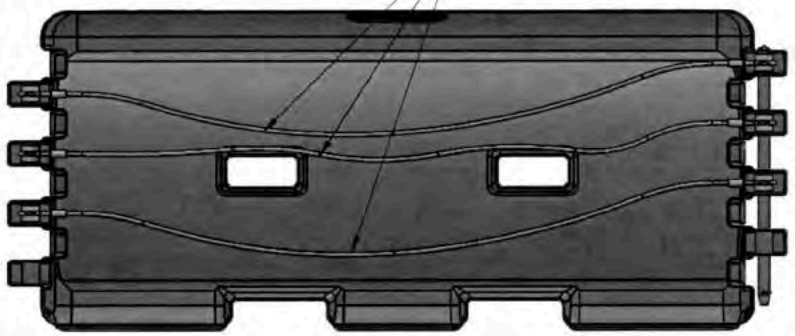
Test Article: TrafFix Devices Water Cable Barrier Project No. P36064-01

Test Program: MASH 1-11 Test Date: 03/14/16

GENERAL INFORMATION	
TEST AGENCY	KARCO Engineering, LLC.
TEST NUMBER	P36064-01
TEST DESIGNATION	1-11
TEST DATE	3/14/16
TEST ARTICLE	
NAME / MODEL	Water Cable Barrier
TYPE	Longitudinal Barrier
KEY ELEMENTS	Water Barrier, Internal Cables, Drop Pins
MODULE LENGTH	73.0 in. (1854 mm)
TOTAL INSTALLATION LENGTH	151.9 ft. (46.3 m)
HEIGHT	32.0 in. (813 mm)
MAXIMUM WIDTH	18.0 in. (457 mm)
ROAD SURFACE	Concrete
TEST VEHICLE	
TYPE / DESIGNATION	2270P
YEAR, MAKE AND MODEL	2012 RAM 1500
CURB MASS	5,038.5 lbs (2,285.5 kg)
TEST INERTIAL MASS	5,021.0 lbs (2,277.5 kg)
GROSS STATIC MASS	5,021.0 lbs (2,277.5 kg)
IMPACT CONDITIONS	
IMPACT VELOCITY	31.21 mph (50.23 km/h)
IMPACT ANGLE (°)	24.9
IMPACT LOCATION / ORIENTATION	2.7 ft. (0.8 m) upstream from the joint connecting modules 13 and 14

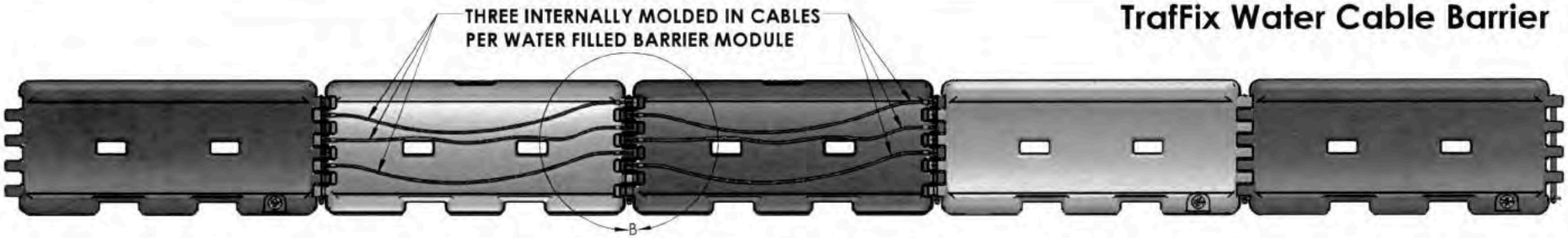
EXIT CONDITIONS		
EXIT VELOCITY		N/A
EXIT ANGLE		N/A
VEHICLE STABILITY		Satisfactory
FINAL VEHICLE POSITION		42.8 ft. (13.0 m) downstream, 16.7 ft. (5.1 m) toward non-traffic side
VEHICLE SNAGGING		None
VEHICLE POCKETING		Yes
MAXIMUM ROLL ANGLE		-4.5°
MAXIMUM PITCH ANGLE		9.3°
MAXIMUM YAW ANGLE		6.1°
IMPACT SEVERITY		29.0 kip-ft (39.3 kJ)
OCCUPANT RISK VALUES		
OCCUPANT IMPACT VELOCITY	Longitudinal	10.8 ft/s (3.3 m/s)
	Lateral	5.2 ft/s (1.6 m/s)
RIDEDOWN ACCELERATION	Longitudinal	-3.9 g
	Lateral	-2.2 g
THIV		13.1 ft/s (4.0 m/s)
PHD		4.5 g
ASI		0.33
TEST ARTICLE DEFLECTIONS		
WORKING WIDTH		18.7 ft (5.7 m)
DYNAMIC DEFLECTION		17.1 ft. (5.2 m)
ARTICLE DAMAGE		Cosmetic Damage to modules 13 through 17
VEHICLE DAMAGE		
VEHICLE DAMAGE SCALE		1-FR-1
COLLISION DAMAGE CLASSIFICATION		01FRLW1

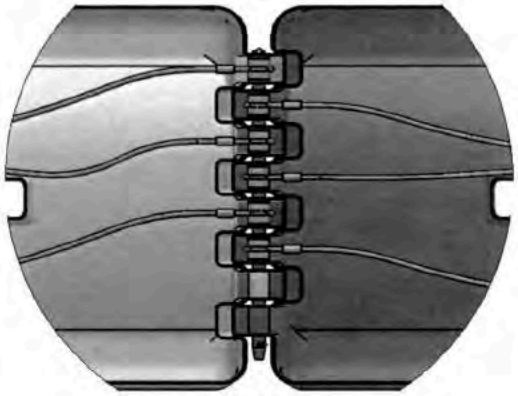
WATER FILLED MODULE WITH INTERNAL CABLES



SECTION A-A

TrafFix Water Cable Barrier





DETAIL B

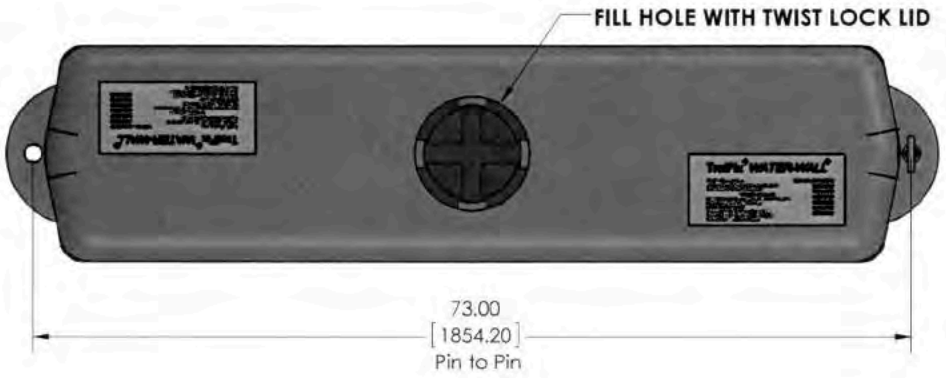
UNLESS OTHERWISE SPECIFIED:
ALL DIMENSIONS ARE IN INCHES [mm].
TOLERANCES:
FRACTIONAL: X/X ± 1/16" [1.6mm]
DECIMAL: X.X ± .062"
X.XX ± .032"
X.XXX ± .015"
DEGREES: ± 0.5°

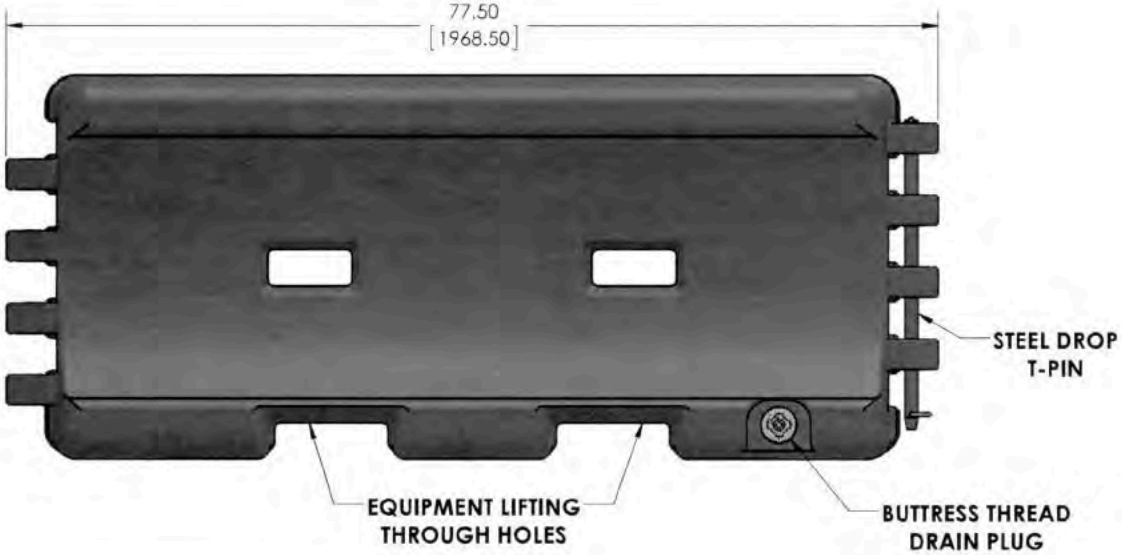
TrafFix Devices Inc.
160 Avenida La Pata
San Clemente, CA 92673
(949) 361-5663
FAX (949) 361-9205
www.traffixdevices.com

TITLE:
TrafFix Water Cable Barrier
Array With Internal
Molded in Cables

DRAWN BY: Ben Langston	DATE: 3/7/16	SIZE: B	DWG. NO.: 300-235
CHECKED BY: FA	DATE: 3/7/16		REV: B
APPROVED BY: FA	DATE: 3/7/16		SHEET 1 OF 1

TrafFix Water Cable Barrier





TrafFix Water Cable Barrier TL-1 & TL-2
Color: Orange and White
Material: Plastic Polyethlene

UNLESS OTHERWISE SPECIFIED:
ALL DIMENSIONS ARE IN INCHES[mm].
TOLERANCES:
FRACTIONAL X/X ± 1/16" [1.6mm]
DECIMAL: X.X ± .062"
X.XX ± .032"
X.XXX ± .015"
DEGREES: ± 0.5°

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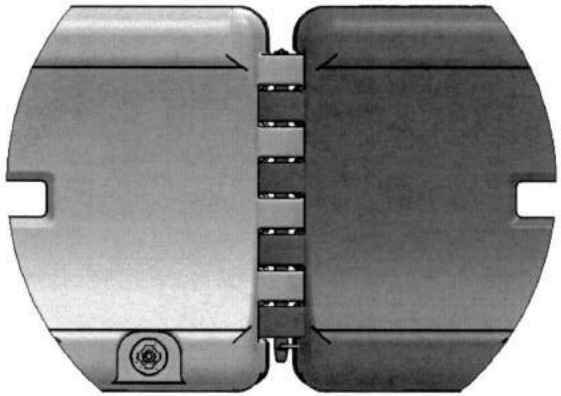
(949) 361-5663
FAX (949) 361-9205
www.traffixdevices.com

TITLE:
TrafFix Water Cable Barrier With Internal Molded in Cables

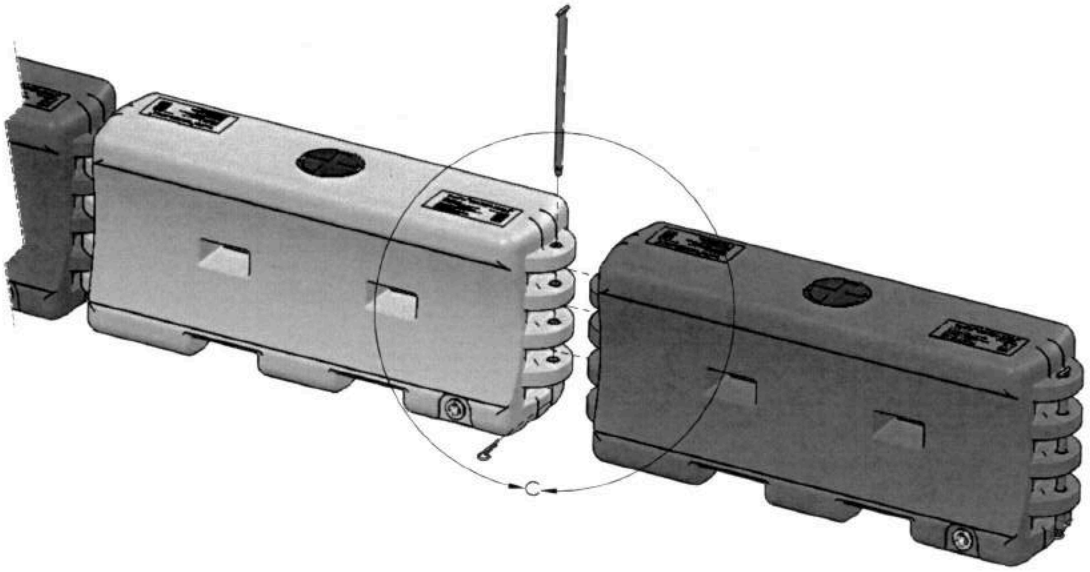
DRAWN BY:	DATE:	SIZE	DWG. NO.	REV
Ben Langdon	3/7/16	B	300-236	B
CHECKED BY: FA	DATE: 3/7/16			
APPROVED BY: FA	DATE: 3/7/16			

SHEET 1 OF 1



MODULES PINNED TOGETHER

DETAIL C



UNLESS OTHERWISE SPECIFIED:
ALL DIMENSIONS ARE IN INCHES[mm].
TOLERANCES:
FRACTIONAL: X/X ± 1/16" [1.6mm]
DECIMAL: X.X ± .0625"
X.XX ± .032"
X.XXX ± .015"
DEGREES: ± 0.5°

TrafFix Devices Inc.
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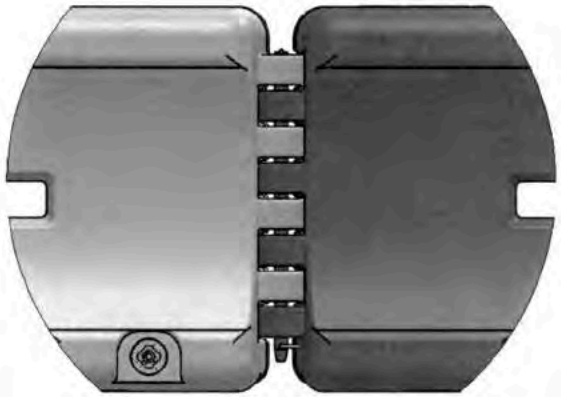
San Clemente, CA 92673
(949) 361-5663
FAX (949) 361-9205
www.traffixdevices.com

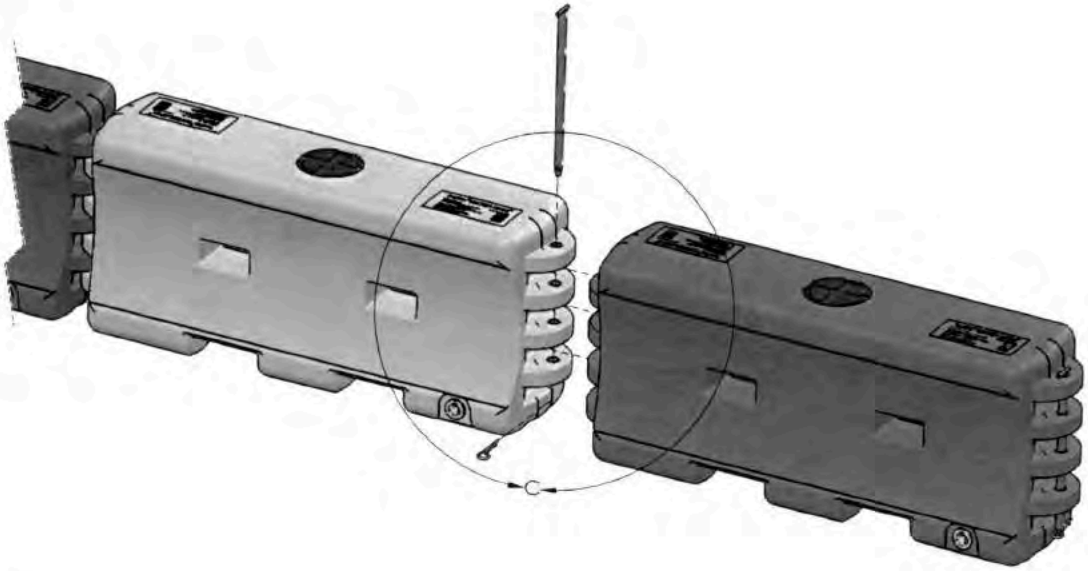
TITLE: TrafFix Water Cable Barrier Array With Internal Molded in Cables

DRAWN BY: Ben Langdon	DATE: 3/7/16	SIZE B	DWG. NO. 300-237	REV A	
CHECKED BY: FA	DATE: 3/7/16				
APPROVED BY: FA	DATE: 3/7/16				SHEET 2 OF 2



MODULES PINNED TOGETHER

DETAIL C



UNLESS OTHERWISE SPECIFIED:
ALL DIMENSIONS ARE IN INCHES [mm]
TOLERANCES:
FRACTIONAL: XX ± 1/16 [1.6mm]
DECIMAL: X.X ± .0625"
X.XX ± .032"
X.XXX ± .015"
DEGREES: ± 0.5°

TrafFix Devices Inc.
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TITLE: TrafFix Water Cable Barrier Array With Internal Molded in Cables

DRAWN BY:	DATE:
Ben Langdon	3/7/16
CHECKED BY:	DATE:
FA	3/7/16
APPROVED BY:	DATE:
FA	3/7/16

SIZE B | DWG. NO. 300-237 | REV A