



January 2, 2019

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

In Reply Refer To:
HSST-1/WZ-363

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

Dear Mr. Almanza:

This letter is in response to your October 25, 2018 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 WZ-363 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:

- Zephyr Sign Stand

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: Zephyr Sign Stand
Type of system: Work Zone
Test Level: MASH Test Level 3 (TL3)
Testing conducted by: KARCO
Date of request: October 25, 2018

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 WZ-363 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.
- 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,



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:	October 24, 2018	☒ New ☐ Resubmission
	Name:	Felipe Almanza	
	Company:	TrafFix Devices Inc.	
	Address:	160 Avenida La Pata San Clemente California 92673	
	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

1 - 1 - 1

System Type	Submission Type	Device Name / Variant	Testing Criterion	Test Level
'WZ': Crash Worthy Work Zone Traffic Control Devices	☒ Physical Crash Testing ☐ Engineering Analysis	Zephyr Sign Stand	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:	Felipe Almanza	Same as Submitter ☒
Company Name:	TrafFix Devices Inc.	Same as Submitter ☒
Address:	160 Avenida La Pata San Clemente California 92673	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 including 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 Traffix Devices Zephyr Sign Stand is a temporary work-zone device consisting of three major components: one rubber base assembly with molded-in steel plate, one steel latch bracket, and one roll up sign. The rubber base is manufactured with a steel plate permanently molded within the rubber base. The steel plate is designed with a set of vertical brackets used to bolt the latch bracket to the base.

The rubber base with the Latch Bracket has overall dimensions of approx. 28.25 in [0.72 m] X 17.25 in [0.44 m] X 14.25 in [0.36 m] and weighs approx. 38 lbs [17.2 kg].

The roll-up sign utilizes a flexible fiberglass frame which is inserted into corner pockets attached to the back side of the sign material.

The latch bracket is designed to allow the corner pocket to be inserted and locked into the latch bracket component of the base assembly. The sign is removed by disengaging the latch which unlocks the sign allowing it to be lifted and removed from the base.

The Zephyr sign stand can be used with diamond, rectangular, octagon, and triangle shaped roll up signs. Other roll up sign shapes are available for use with the Zephyr sign stand. The test was conducted with a diamond shaped sign. The Zephyr sign stand can be use used on concrete, asphalt, gravel, or dirt surfaces. The test was conducted on a concrete surface. The Zephyr sign stand can be used with or without flags. Flags were installed for these tests.

The overall dimensions of the Zephyr Sign Stand with the roll up sign installed is approx. 28.25 in (0.72 m) X 17.25 in (0.44 m) X 78.5 in (2.0 m).

The MASH tested and passed Zephyr Sign Stand, described above, is the same products as the previously tested and passed NCHRP-350 Zephyr Sign Stand (Reference WZ-46 and WZ-73). The design, manufacturing process, and installation are identical between the MASH and NCHRP-350 tested products. Existing inventory is interchangeable as no design changes have been made since the inception of the Zephyr in July 2000.

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:	Robert Ramirez	
Engineer Signature:	Robert Ramirez	Digitally signed by Robert Ramirez DN: cn=Robert Ramirez, o=KARGO Engineering, ou=Project Engineer, email=ramirez@kargo.com, c=US Date: 2018.10.18 10:23:27 -0700
Address:	9270 Holly Rd. Adelanto, CA 92301	Same as Submitter ☐
Country:	United States	Same as Submitter ☐

A brief description of each crash test and its result:

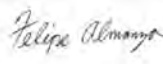
Required Test Number	Narrative Description	Evaluation Results
3-70 (1100C)	Designated to evaluate the ability of a small vehicle to activate any breakaway, fracture, or yielding mechanism. Is considered optional for work zone traffic control weighting less than 220 lb (100 kg)	Non-Relevant Test, not conducted

Required Test Number	Narrative Description	Evaluation Results
3-71 (1100C)	For this test, two Zephyr Signs Stands were impacted. The first test article was aligned at 0° and the second test article was aligned at 90° to the impacting vehicle's direction of travel. This test is intended to evaluate the sign stand's behavior when impacted. The primary evaluation is based on intrusion into the occupant compartment, windshield damage, and vehicle stability. Lightweight devices such as the Zephyr Sign Stand cannot cause sufficient velocity change that would result in exceeding occupant risk criteria limits. Therefore Test 71 was conducted without instrumentation for evaluating occupant risk values OIV and RA per MASH test description. The test was conducted using a commercially available 2013 Kia Rio 4 door sedan with a test inertia mass of 2,410.7 lbs (1093.5 kg). The test vehicle impacted the first sign stand (orientated at 0°) at a velocity of 65.59 mph (105.55 km/hr). Upon impact the roll up sign released from the Latch Bracket and folded over the front end of the vehicle. The top of the vertical cross frame impacted the top of the windshield. The test vehicle continued along its path and impacted the second sign stand (oriented at 90°) at a velocity of 62.63 mph (100.79 km/hr). Upon impact the roll up sign released from the Latch Bracket and folded over the front end of the vehicle. The top of the vertical cross frame impacted the top of the windshield. The test vehicle's occupant compartment was not penetrated by the test articles and there was negligible in cab deformation. Debris from the test articles did not block the driver's vision. The vehicle remained upright and did not exceed 75° roll and pitch throughout the test. The vehicle did not leave its lane and its trajectory was stable after both sign stands were impacted.	PASS

3-72 (2270P)	For this test, two Zephyr Signs Stands were impacted. The first test article was aligned at 0° and the second test article was aligned at 90° to the test vehicle's direction of travel. This test is intended to evaluate the sign stand's behavior when impacted. The primary evaluation is based on intrusion into the occupant compartment, windshield damage, and vehicle stability. Lightweight devices such as the Zephyr Sign Stand cannot cause sufficient velocity change that would result in exceeding occupant risk criteria limits. Therefore Test 72 was conducted without instrumentation for evaluating occupant risk values OIV and RA per MASH test description. The test was conducted using a commercially available 2010 Ram 1500 Pickup Truck with a test inertia mass of 5001.1 lbs (2,268.5 kg). The test vehicle impacted the first sign stand (oriented at 0°) at a velocity of 64.83 mph (104.33 km/hr). Upon impact the roll up sign released from the Latch Bracket and folded over the front end of the vehicle. The top of the vertical cross frame impacted the top of the windshield. The test vehicle continued along its path and impacted the second sign stand (oriented at 90°) at a velocity of 64.29 mph (103.46 km/hr). Upon impact the roll up sign released from the Latch Bracket and folded over the front end of the vehicle. The top of the vertical cross frame impacted the top of the windshield. The test vehicle's occupant compartment was not penetrated by the test articles and there was no measurable in cab deformation. Debris from the test article did not cause a hazard to the driver's vision. The vehicle remained upright and did not exceed 75° roll and pitch through out the test. The vehicle did not leave its lane and its trajectory was stable after both sign stands were impacted.	PASS
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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:	Applus IDIADA KARCO Engineering	
Laboratory Signature:		Digitally signed by Alex Beltran DN: cn=Alex Beltran, o=KARCO Engineering, ou=Testing Laboratory, email=abeltran@karco.com, c=US Date: 2018.10.25 11:43:23 -0700
Address:	9270 Holly Rd. Adelanto, CA 92301	Same as Submitter ☐
Country:	United States	Same as Submitter ☐
Accreditation Certificate Number and Dates of current Accreditation period :	TL-371 valid to July 1, 2019	

Submitter Signature*: 

Digitally signed by Felipe Almaraz
DN: cn=Felipe Almaraz, o=Traffic Devices,
ou=Engineering,
email=felipealmaraz@trafficdevices.com, c=US
Date: 2018.10.25 15:52:23 -0700

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 3-71 SUMMARY

Test Article: TraFFix Devices Zephyr Stand
Test Program: MASH 3-71

Project No. P36209-01
Test Date: 09/06/16

SEQUENTIAL PHOTOGRAPHS

0° Orientation



0.000 s

0.075 s

0.150 s

90° Orientation

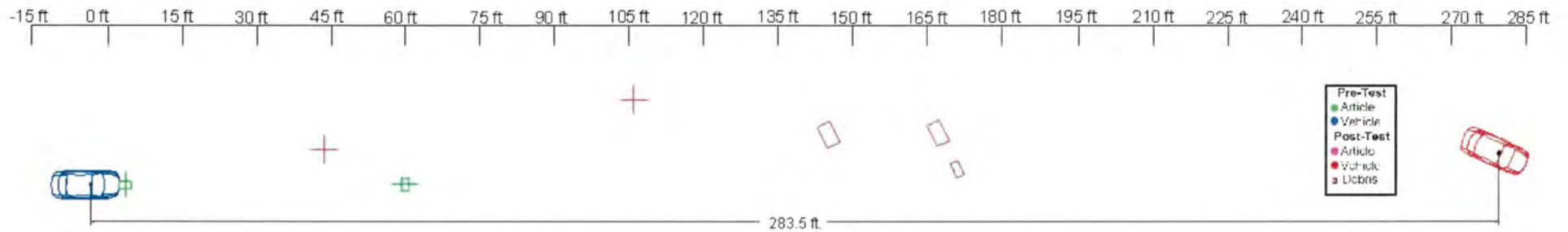


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0.075 s

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PLAN VIEW



SECTION 4... (CONTINUED)

MASH TEST 3-71 SUMMARY

Test Article: TraFFix Devices Zephyr Stand

Project No. P36209-01

Test Program: MASH 3-71

Test Date: 09/06/16

SUMMARY TABLE

GENERAL INFORMATION		IMPACT CONDITIONS		
TEST AGENCY	KARCO Engineering, LLC.	IMPACT VELOCITY (0°)		65.59 mph (105.55 km/h)
TEST NUMBER	P36209-01	IMPACT VELOCITY (90°)		62.63 mph (100.79 km/h)
TEST DESIGNATION	3-71	IMPACT SEVERITY (0°)		346.7 kip-ft (470.0 kJ)
TEST DATE	09/06/16	IMPACT SEVERITY (90°)		316.1 kip-ft (428.6 kJ)
TEST ARTICLE		EXIT CONDITIONS		
NAME / MODEL	Zephyr Stand	EXIT VELOCITY (0°)		64.63 mph (104.01 km/h)
TYPE	Work-Zone Traffic Control Device	EXIT VELOCITY (90°)		61.18 mph (98.46 km/h)
KEY ELEMENTS	Sign Stand, Rubber Base, Roll Up Sign, Warning Flag	FINAL RESTING POSITION		283.5 ft. (86.4 m) downstream, 6.6 ft. (2.0 m) left from point of impact.
OVERALL HEIGHT	78.5 in. (1994 mm)	VEHICLE STABILITY		Satisfactory
OVERALL WIDTH	66.0 in. (1676 mm)	VEHICLE SNAGGING		None
BASE WEIGHT	38.0 lbs (17.2 kg)	VEHICLE POCKETING		None
SIGN WEIGHT	6.0 lbs (2.7 kg)	OCCUPANT RISK VALUES		
ROAD SURFACE	Concrete	OCCUPANT IMPACT VELOCITY	Longitudinal	
TEST VEHICLE			Lateral	
TYPE / DESIGNATION	1100C	RIDEDOWN ACCELERATION	Longitudinal	
YEAR, MAKE AND MODEL	2013 Kia Rio		Lateral	
CURB MASS	2,430.6 lbs (1,102.5 kg)	TEST ARTICLE POST-IMPACT		
		ARTICLE DAMAGE		Base Deformation
TEST INERTIAL MASS	2,410.7 lbs (1,093.5 kg)	VEHICLE DAMAGE		
		VEHICLE DAMAGE SCALE		FC-0
GROSS STATIC MASS	2,570.5 lbs (1,166.0 kg)	COLLISION DAMAGE CLASSIFICATION		12FCGN1
		MAXIMUM DEFORMATION		0.97 in. (25 mm)

¹Values not calculated due to test article weight being less than 220 lbs (100 kg)

SECTION 4

MASH TEST 3-72 SUMMARY

Test Article: TraFFix Devices Zephyr Stand
Test Program: MASH 3-72

Project No. P36210-01
Test Date: 09/06/16

SEQUENTIAL PHOTOGRAPHS

0° Orientation



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0.050 s

0.150 s

90° Orientation

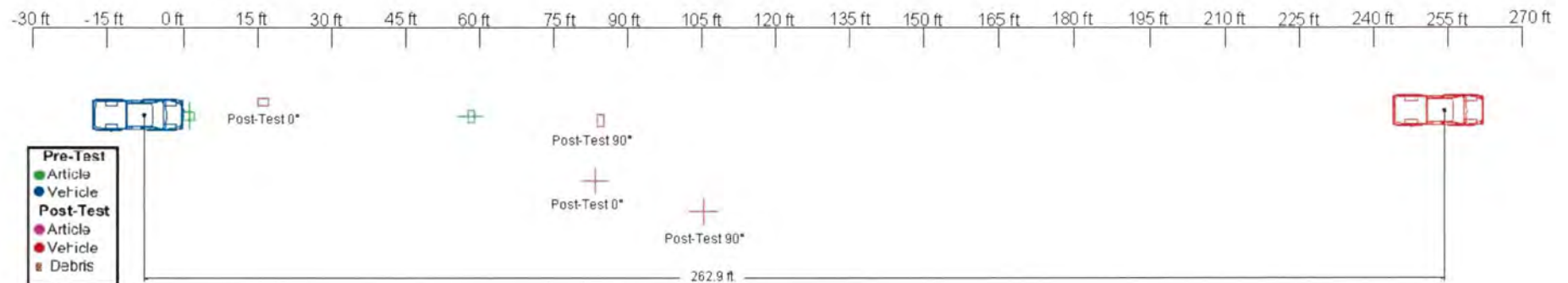


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PLAN VIEW



SECTION 4... (CONTINUED)

MASH TEST 3-72 SUMMARY

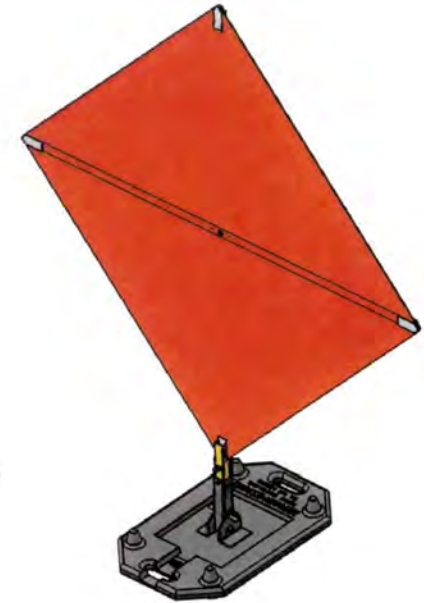
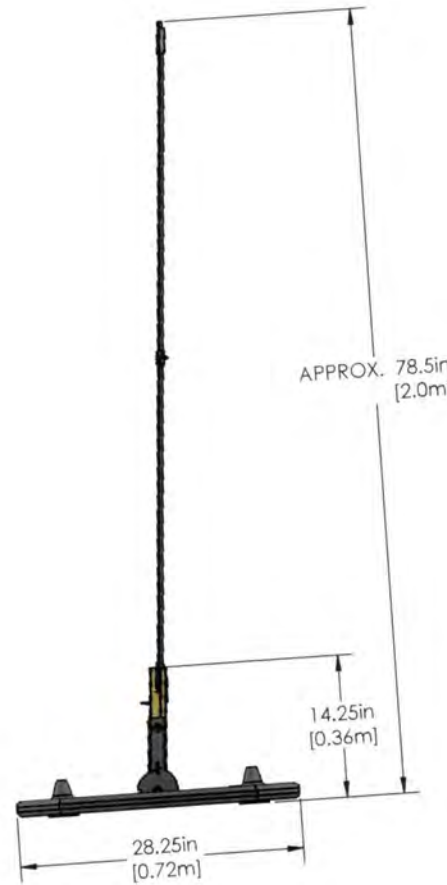
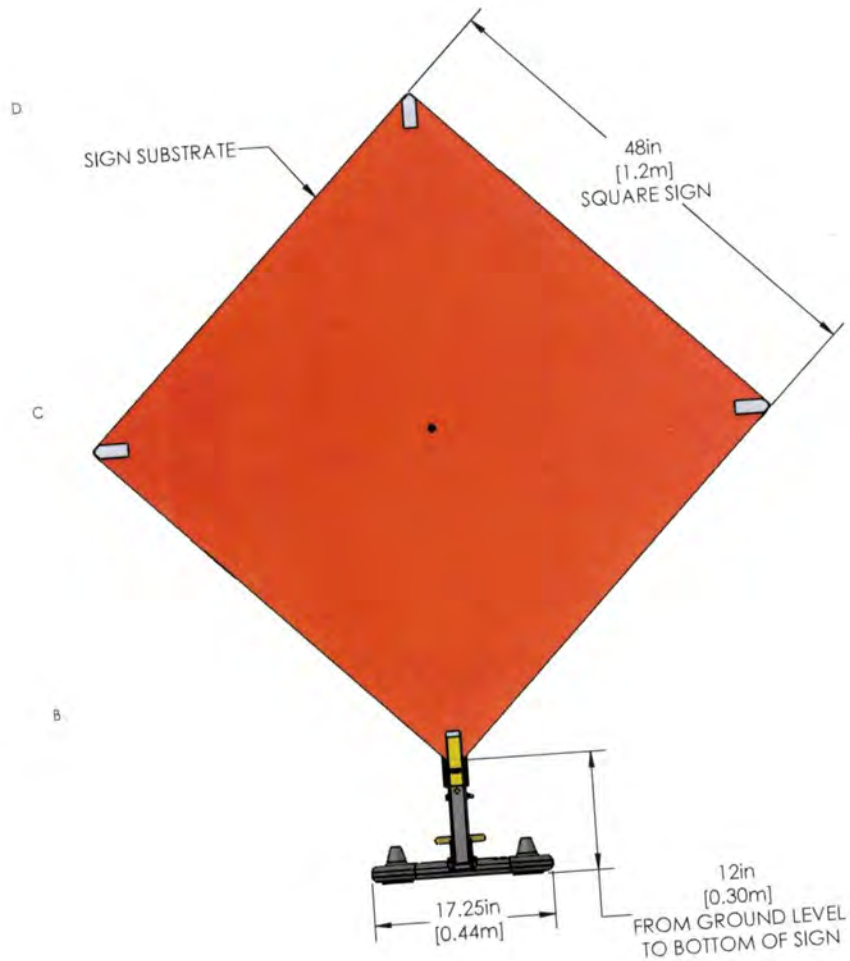
Test Article: TraFFix Devices Zephyr Stand
 Test Program: MASH 3-72

Project No. P36210-01
 Test Date: 09/06/16

SUMMARY TABLE

GENERAL INFORMATION		IMPACT CONDITIONS	
TEST AGENCY	KARCO Engineering, LLC.	IMPACT VELOCITY (0°)	64.83 mph (104.33 km/h)
TEST NUMBER	P36210-01	IMPACT VELOCITY (90°)	64.29 mph (103.46 km/h)
TEST DESIGNATION	3-72	KINETIC ENERGY (0°)	702.7 kip-ft (952.7 kJ)
TEST DATE	09/06/16	KINETIC ENERGY (90°)	683.8 kip-ft (927.1 kJ)
TEST ARTICLE		EXIT CONDITIONS	
NAME / MODEL	Zephyr Stand	EXIT VELOCITY (0°)	64.56 mph (103.90 km/h)
TYPE	Work-Zone Traffic Control Device	EXIT VELOCITY (90°)	63.16 mph (101.64 km/h)
KEY ELEMENTS	Sign Stand, Rubber Base, Roll Up Sign, Warning Flag	FINAL RESTING POSITION	262.8 ft. (80.1 m) downstream, 1.0 ft (0.3 m) left from first point of impact.
OVERALL HEIGHT	78.5 in. (1994 mm)	VEHICLE STABILITY	Satisfactory
OVERALL WIDTH	66.0 in. (1676 mm)	VEHICLE SNAGGING	None
BASE WEIGHT	38.0 lbs (17.2 kg)	VEHICLE POCKETING	None
SIGN WEIGHT	6.0 lbs (2.7 kg)	OCCUPANT RISK VALUES	
ROAD SURFACE	Concrete	OCCUPANT IMPACT VELOCITY	Longitudinal
TEST VEHICLE			Lateral
TYPE / DESIGNATION	2270P	RIDEDOWN ACCELERATION	Longitudinal
YEAR, MAKE AND MODEL	2010 RAM 1500		Lateral
CURB MASS	5,004.4 lbs (2,270.0 kg)	TEST ARTICLE POST-IMPACT	
		ARTICLE DAMAGE	Base Deformation
TEST INERTIAL MASS	5,001.1 lbs (2,268.5 kg)	VEHICLE DAMAGE	
		VEHICLE DAMAGE SCALE	N/A
GROSS STATIC MASS	5,001.1 lbs (2,268.5 kg)	COLLISION DAMAGE CLASSIFICATION	N/A
		MAXIMUM DEFORMATION	Negligible

¹Values not calculated due to test article weight being less than 220 lbs (100 kg)



ZEPHYR SIGN STAND
 Overall Weight: 43 lbs. [19.5 kg] (WITH SIGN)
 Overall Dimensions: Approximately 17.25" [0.44m] x 28.25" [0.72m] x 14.25" [0.36m]
 Base Material: Rubber
NOTES: UNLESS OTHERWISE SPECIFIED

UNLESS OTHERWISE SPECIFIED:
 ALL DIMENSIONS ARE IN INCHES (mm).

TrafFix
Devices Inc.

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

TITLE:

Zephyr Sign Stand

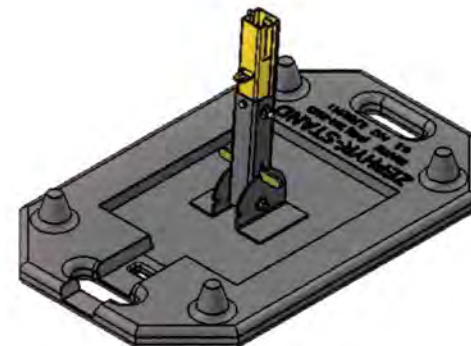
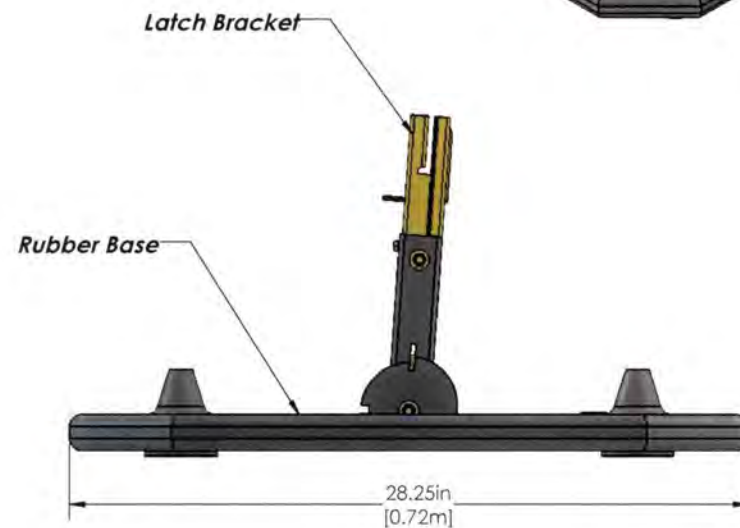
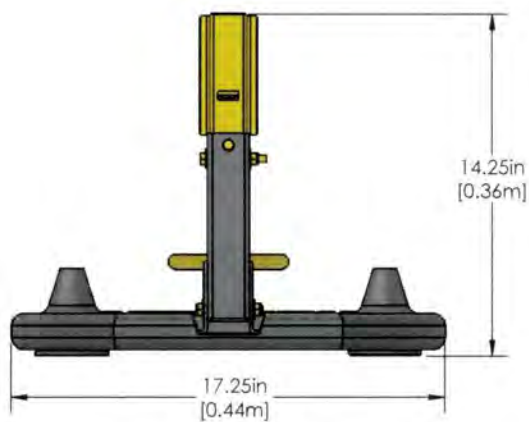
DRAWN BY:
 CHECKED BY:
 FA
 APPROVED BY:
 FA

DATE:
 8/16/16
 DATE:
 8/16/16
 DATE:
 8/16/16

SIZE
B

DWG. NO.
 500-195

REV
A
 SHEET 1 OF 1



UNLESS OTHERWISE SPECIFIED:
ALL DIMENSIONS ARE IN INCHES (mm).

**Traffix
Devices Inc.**



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

TITLE:

Zephyr Sign Stand Base

ZEPHYR SIGN STAND BASE

Overall Weight: 38 lbs. [17.2 kg] (NO SIGN)

Overall Base Dimensions: Approximately 17.25" [0.44m] x 28.25" [0.72m] x 14.25" [0.36m]

Base Material: Rubber

NOTES: UNLESS OTHERWISE SPECIFIED

DRAWN BY:
Christopher Jaime
CHECKED BY:
JA
APPROVED BY:
JA

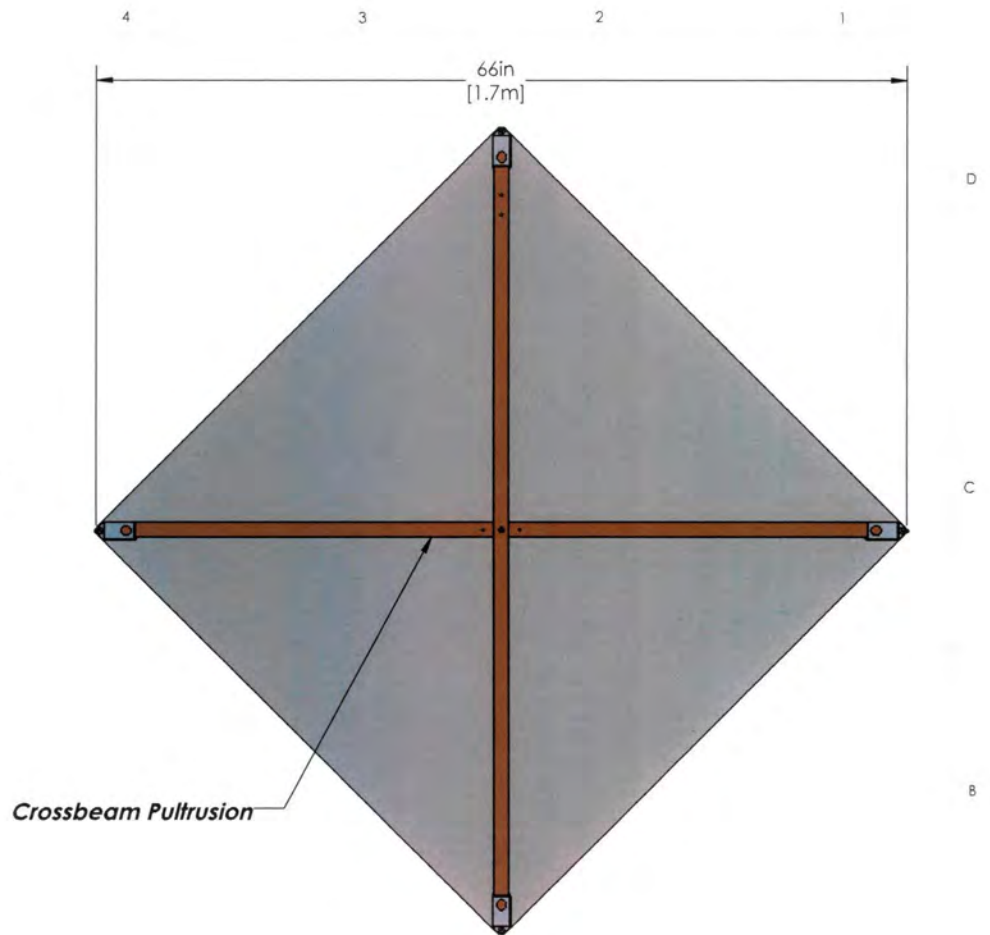
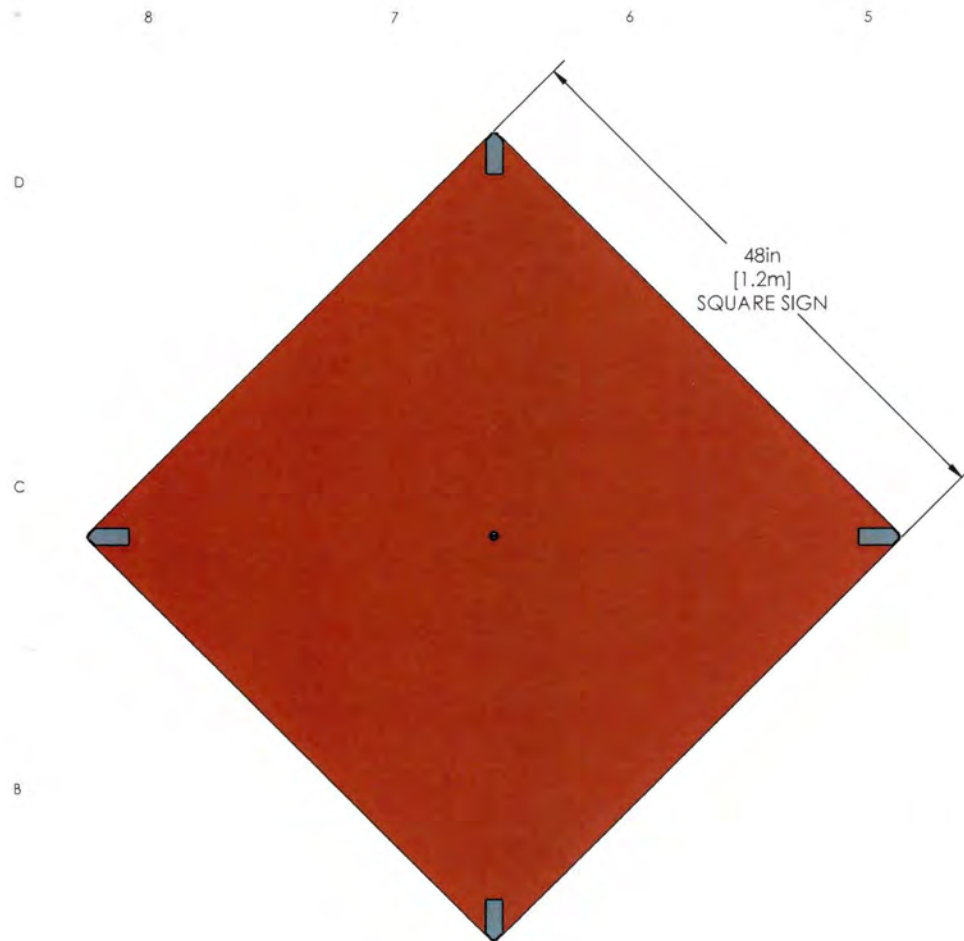
DATE:
8/17/16
DATE:
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DATE:
8/17/16

SIZE
B

DWG. NO.
500-196

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SHEET 1 OF 1



Roll-Up Sign
 Overall Weight: 5 lbs. [2.3 kg]
 Overall Sign Dimensions: 48" [1.2m] x 48" [1.2m]
NOTES: UNLESS OTHERWISE SPECIFIED

UNLESS OTHERWISE SPECIFIED:
 ALL DIMENSIONS ARE IN INCHES [mm].

TrafFix
Devices Inc.



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

TITLE:

Roll-Up Sign Substrate

DRAWN BY:
 Christopher Jaime
 CHECKED BY:
 FA
 APPROVED BY:
 FA

DATE:
 8/17/16
 DATE:
 8/17/16
 DATE:
 8/17/16

SIZE
B

DWG. NO.
 500-197

REV
A

SHEET 1 OF 1