



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

May 21, 2019

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

In Reply Refer To:  
HSST-1/SS-180 REVISED

Mr. Greg Kirchgerner  
Accessories Squared  
P.O. Box 135  
Auburn, IL 62615

Dear Mr. Kirchgerner:

This letter supersedes the original eligibility letter SS-180 dated April 15, 2016, and is in response to your May 7, 2019 resubmittal of the same device 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 SS-180 REVISED 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:

- MASSH-400 Sign Support

### **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: MASSH-400 Sign Support

Type of system: Sign Support

Test Level: MASH TL-3

Testing conducted by: TTI

Date of original request: January 26, 2016

Date of resubmission: May 7, 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 SS-180 REVISED 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

<b>Submitter</b>	Date of Request:	May 06, 2019	<input type="radio"/> New <input checked="" type="radio"/> Resubmission
	Name:	Greg Kirchgerner	
	Company:	Xcessories Squared and Allied Tube & Conduit	
	Address:	P.O. Box 135 Auburn, IL 62615 and 16100 South Lathrop Ave. Harvey, IL 60426	
	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

1-1-1

System Type	Submission Type	Device Name / Variant	Testing Criterion	Test Level
'SS': Breakaway Sign Supports, Mailboxes, & other small sign supports	<input checked="" type="radio"/> Physical Crash Testing <input type="radio"/> Engineering Analysis	MASSH-400	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:	Greg Kirchgerner	Same as Submitter <input checked="" type="checkbox"/>
Company Name:	Xcessories Squared and Allied Tube & Conduit	Same as Submitter <input checked="" type="checkbox"/>
Address:	P.O. Box 135 Auburn, IL 62615 and 16100 South Lathrop Ave. Harvey, IL 60426	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.

Texas A&M Transportation Institute (TTI) was contracted by Xcessories Squared and Allied Tube & Conduit to perform full-scale crash testing of the MASSH-400 system. There are no shared financial interests in the MASSH-400 system by TTI, or between Xcessories Squared and Allied Tube & Conduit and TTI, other than costs involved in the actual crash tests and reports for this submission to FHWA.

## PRODUCT DESCRIPTION


<input checked="" type="radio"/> New Hardware or Significant Modification <input type="radio"/> Modification to Existing Hardware	
<p>The MASSH-400 is a Multi-directionally Activated Sign Support Hardware system for 4" square sign posts. The crash tested system included two 13" triangular slip bases spaced 96" apart, each holding a 4" x 8ga x 6' galvanized steel post, an omni-directional hinge joining the bottom post and a 4" x 8ga x 6'-6" galvanized steel top post. A 144" x 72" aluminum extruded sign panel was secured to each post using 7 stainless steel clamps with stainless steel bolts. All other hardware in the assembly was structural grade steel. All steel materials were hot dip galvanized with the exception of the posts which were flo-coat galvanized then coated with chromate conversion coating and clear organic polymer topcoat.</p>	
<h3>CRASH TESTING</h3>	
<p>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.</p>	
Engineer Name:	Roger Bligh
Engineer Signature:	<b>Roger Bligh</b> <small>Digitally signed by Roger Bligh Date: 2019.05.07 09:00:12 -05'00'</small>
Address:	TTI, 3135 TAMU, College Station, TX 77843-3135 <input type="checkbox"/> Same as Submitter
Country:	USA <input type="checkbox"/> Same as Submitter

A brief description of each crash test and its result:

Required Test Number	Narrative Description	Evaluation Results
3-60 (1100C)	<p>TTI test report No. 690900-XSD1-3 provides details and results of this test run as crash test no. 690900-XSD1 on October 28, 2015. The 1100C vehicle used in this test was a 2009 Kia Rio weighing 2435 lbs. The impact speed was 19.5 mph and the impact angle was 0 degrees. The impact point was the right quarter-point of the vehicle aligned with the centerline of the left sign support. The MASSH-400 slip base readily activated and released the impacted support post from its foundation. The sign panel and released support rotated about the hinge assembly on the opposite support post, thus rotating away from the vehicle. The sign support did not penetrate or show potential for penetrating the occupant compartment, or to present undue hazard to others in the area. No occupant compartment deformation or intrusion occurred. The 1100C remained upright during and after the collision event. Maximum roll and pitch angles were each 2 degrees. Occupant risk factors were within the preferred limit specified in MASH. The 1100C vehicle came to rest behind the sign support system 75 ft. from the point of impact.</p>	PASS
3-61 (1100C)	<p>TTI test report No. 690900-XSD1-3 provides details and results of this test run as crash test no. 690900-XSD2 on October 28, 2015. The 1100C vehicle used in this test was a 2009 Kia Rio weighing 2435 lbs. The impact speed was 61.7 mph and the impact angle was 0 degrees. The impact point was the right quarter-point of the vehicle aligned with the centerline of the left sign support. The MASSH-400 slip base readily activated and the hinge assembly on the impacted post activated as designed. The sign panel twisted, rotated about the hinge assembly on the opposite support, and then detached from the support. The sign support did not penetrate or show potential for penetrating the occupant compartment, or to present undue hazard to others. No occupant compartment deformation or intrusion occurred. The 1100C remained upright during and after the collision event. Maximum roll and pitch angles were each 2 degrees. Occupant risk factors were within the preferred limit specified in MASH. The 1100C vehicle came to rest behind the sign support system 286 ft. from the point of impact.</p>	PASS

Required Test Number	Narrative Description	Evaluation Results
3-62 (2270P)	<p>TTI test report No. 690900-XSD1-3 provides details and results of this test run as crash test no. 690900-XSD3 on October 29, 2015. The 2270P vehicle used in this test was a 2010 Dodge Ram weighing 5006 lbs. The impact speed was 63.1 mph and the impact angle was 0 degrees. The impact point was the right quarter-point of the vehicle aligned with the centerline of the left sign support. The MASSH-400 slip base readily activated and the hinge assembly activated as designed. The sign panel twisted and rotated about the hinge assembly on the opposite support. The impacted sign support and top two sections of the sign panel detached from the sign panel and, subsequently, the remaining sign panel sections and upper portion of the support on the opposite side of impact detached from the lower support at the hinge point. The detached pieces did not penetrate or show potential for penetrating the occupant compartment, or to present undue hazard to others in the area. No occupant compartment deformation or intrusion occurred. The 2270P remained upright during and after the collision event. Maximum roll and pitch angles were 1 and 2 degrees, respectively. Occupant risk factors were within the preferred limit specified in MASH. The 2270P vehicle came to rest behind the sign support system 320 ft. from the point of impact.</p>	PASS

Full Scale Crash Testing was done in compliance with MASH by the following accredited crash test laboratory (cite the laboratory's accreditation status as noted in the crash test reports.):

Laboratory Name:	Texas A&M Transportation Institute	
Laboratory Signature:	Digitally signed by Darrell L. Kuhn 'Date: 2019.05.07 10:37:16 -05'00	
Address:	Texas A&M Transportation Institute 3135 TAMU College Station, TX 77843-3135	Same as Submitter <input type="checkbox"/>
Country:	USA	Same as Submitter <input type="checkbox"/>
Accreditation Certificate Number and Dates of current Accreditation period :	ISO 17025 Laboratory A2LA Certificate Number 2821.01 Valid until April 30, 2019	

Submitter Signature\*: Gregory  
Kirchgesner

Digitally signed by Gregory Kirchgesner  
DN: cn=Gregory Kirchgesner, o=Xcessores  
Signed, our Engineering,  
email=gregkirchgesner@xcessores.com, c=US  
Date: 2019.05.07 11:26:24 -0500

Submit Form

## ATTACHMENTS

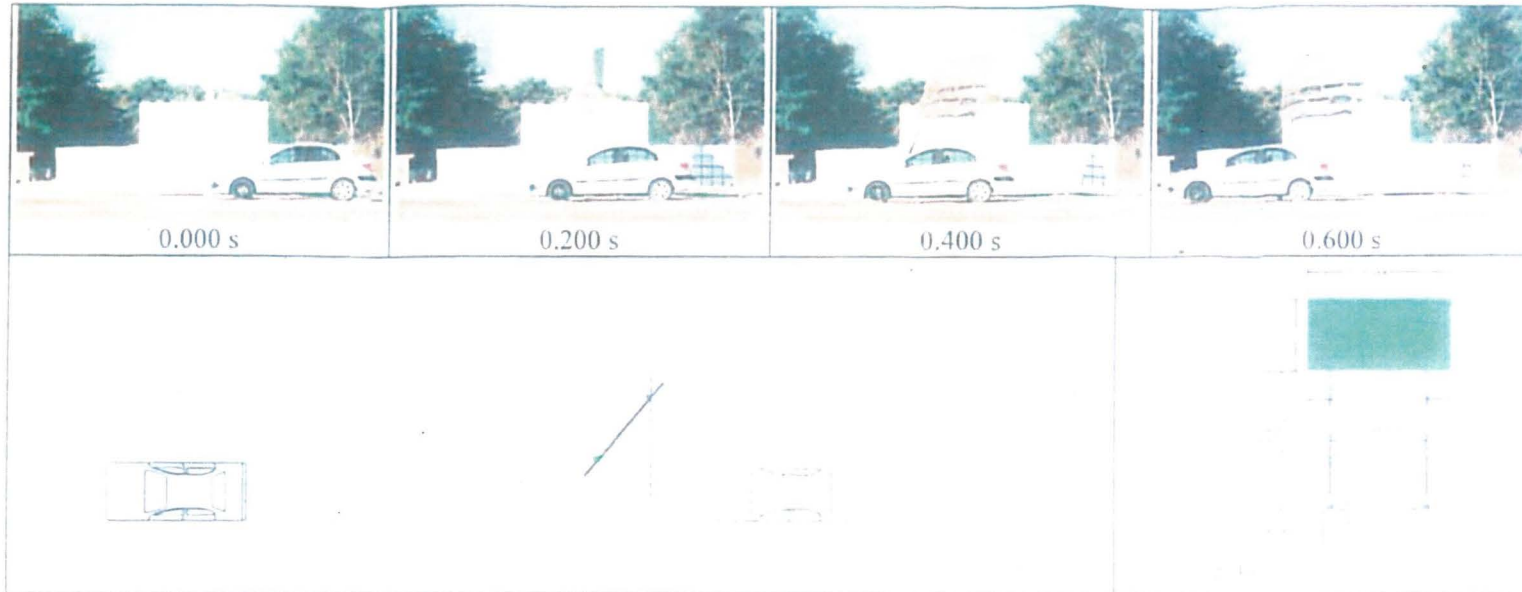
Attach to this form:

- 1) Additional disclosures of related financial interest as indicated above.
- 2) A copy of the full test report, video, and a Test Data Summary Sheet for each test conducted in support of this request.
- 3) A drawing or drawings of the device(s) that conform to the Task Force-13 Drawing Specifications [Hardware Guide Drawing Standards]. For proprietary products, a single isometric line drawing is usually acceptable to illustrate the product, with detailed specifications, intended use, and contact information provided on the reverse. Additional drawings (not in TF-13 format) showing details that are relevant to understanding the dimensions and performance of the device should also be submitted to facilitate our review.

FHWA Official Business Only:

Eligibility Letter		Key Words
Number	Date	





**General Information**

Test Agency..... Texas Transportation Institute (TTI)  
 Test Standard Test No ..... MASH Test 3-60  
 TTI Test No. .... 690900-XSD1  
 Test Date ..... 2015-10-28

**Test Article**

Type ..... Sign Support  
 Name ..... MASSH-400 Sign System  
 Installation Height ..... 7 ft 4 inches to bottom of sign panel  
 Material or Key Elements ..... Two 4-inch square steel posts spaced at 8 ft w/12-ft wide x 6 ft tall sign panel

**Soil Type and Condition**

Drilled shaft foundation in AASHTO M147-65(2004) Grade B Soil

**Test Vehicle**

Type/Designation..... 1100C  
 Make and Model ..... 2009 Kia Rio  
 Curb..... 2480 lb  
 Test Inertial..... 2435 lb  
 Dummy ..... 165 lb  
 Gross Static ..... 2600 lb

**Impact Conditions**

Speed ..... 19.5 mi/h  
 Angle ..... 0 degree  
 Location/Orientation..... Right qtr-pt w/CL left support

**Kinetic Energy**

..... 31 kip-ft

**Occupant Risk Values**

Longitudinal OIV ..... 3.3 ft/s  
 Lateral OIV ..... 1.6 ft/s  
 Longitudinal Ridedown ..... 0.2 g  
 Lateral Ridedown ..... 0.3 g  
 THIV ..... 4.1 km/h  
 PHD ..... 0.3 g  
 ASI ..... 0.09

**Max. 0.050-s Average**

Longitudinal ..... -0.7 g  
 Lateral ..... 0.3 g  
 Vertical ..... -0.3 g

**Exit Conditions**

Speed ..... 16.8 mi/h  
 Angle ..... 0 degree

**Post-Impact Trajectory**

Stopping Distance ..... 75 ft

**Vehicle Stability**

Maximum Yaw Angle ..... 1 degree  
 Maximum Pitch Angle ..... 2 degrees  
 Maximum Roll Angle ..... 2 degrees

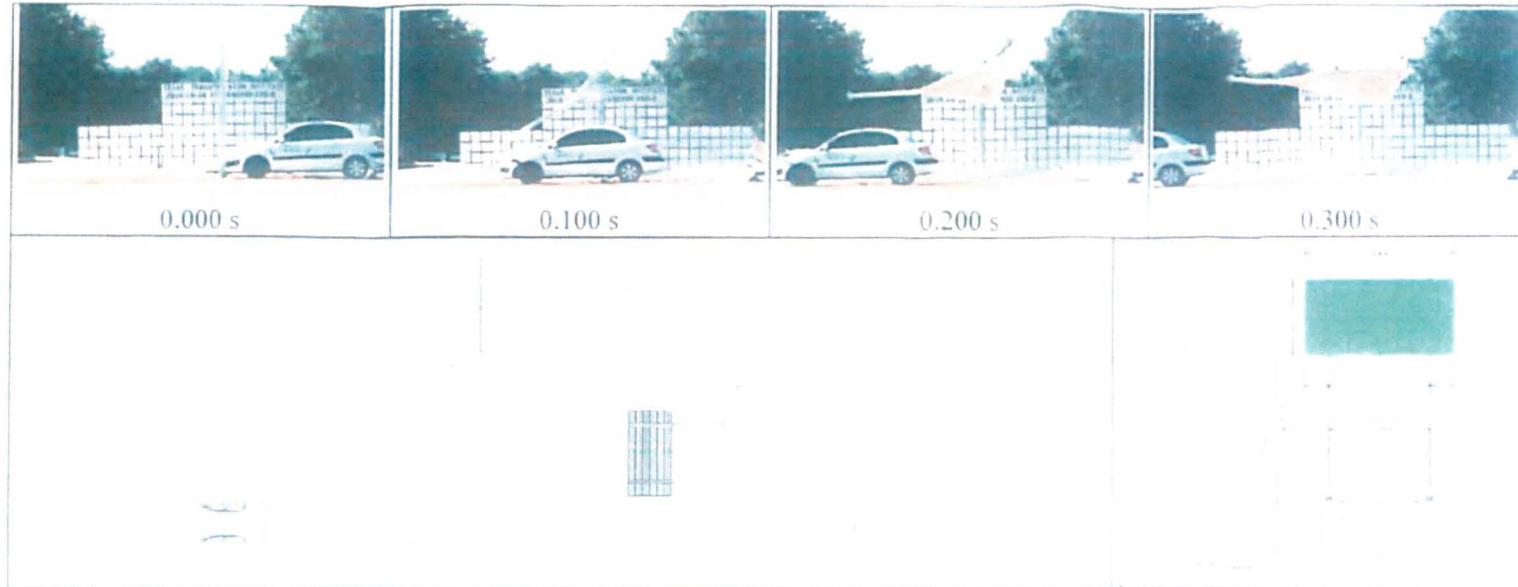
**Test Article Debris Scatter**

Longitudinal ..... 10 ft  
 Lateral ..... 12 ft

**Vehicle Damage**

VDS ..... 12FR1  
 CDC ..... 12FREN1  
 Max. Exterior Deformation ..... Not measurable  
 OCDI ..... RF0000000  
 Max. Occupant Compartment Deformation ..... None

**Figure 5.5. Summary of Results for MASH Test 3-60 on the Allied Tube and Conduit® and Xcessories Squared MASSH-400 Sign Support.**



**General Information**

Test Agency..... Texas Transportation Institute (TTI)  
 Test Standard Test No..... MASH Test 3-61  
 TTI Test No..... 690900-XSD2  
 Test Date..... 2015-10-28

**Test Article**

Type..... Sign Support  
 Name..... MASSH-400 Sign System  
 Installation Height..... 7 ft 4 inches to bottom of sign panel  
 Material or Key Elements..... Two 4-inch square steel posts spaced at 8 ft w/12-ft wide x 6 ft tall sign panel  
 Soil Type and Condition..... Drilled shaft foundation in AASHTO M147-65(2004) Grade B Soil

**Test Vehicle**

Type/Designation..... 1100C  
 Make and Model..... 2009 Kia Rio  
 Curb..... 2480 lb  
 Test Inertial..... 2435 lb  
 Dummy..... 165 lb  
 Gross Static..... 2600 lb

**Impact Conditions**

Speed..... 61.7 m/h  
 Angle..... 0 degree  
 Location/Orientation.....

**Kinetic Energy**..... 310 kip\*ft

**Occupant Risk Values**

Longitudinal OIV..... 3.3 ft/s  
 Lateral OIV..... 0.7 ft/s  
 Longitudinal Ridedown..... 0.2 g  
 Lateral Ridedown..... 0.6 g  
 THIV..... 3.9 km/h  
 PHD..... 0.6 g  
 ASI..... 0.21  
 Max. 0.050-s Average  
 Longitudinal..... -1.9 g  
 Lateral..... -0.6 g  
 Vertical..... 0.6 g

**Exit Conditions**

Speed..... 60.4 m/h  
 Angle..... 0 degree

**Post-Impact Trajectory**

Stopping Distance..... 286 ft

**Vehicle Stability**

Maximum Yaw Angle..... 2 degrees  
 Maximum Pitch Angle..... 2 degrees  
 Maximum Roll Angle..... 2 degrees

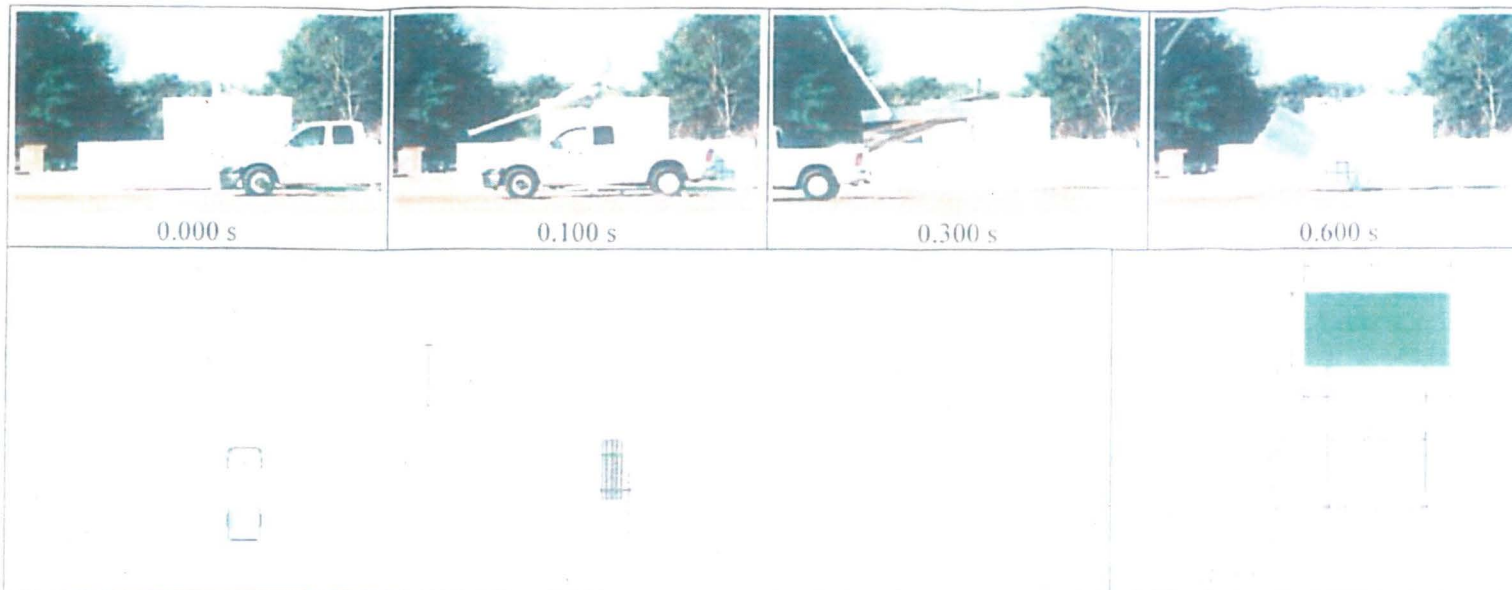
**Test Article Debris Scatter**

Longitudinal..... 6 ft  
 Lateral..... 16 ft

**Vehicle Damage**

VDS..... 12FR1  
 CDC..... 12FREN1  
 Max. Exterior Deformation..... 1.5 inches  
 OCCDI..... RF0000000  
 Max. Occupant Compartment Deformation..... None

**Figure 6.6. Summary of Results for MASH Test 3-61 on the Allied Tube and Conduit® and Xcessories Squared MASSH-400 Sign Support.**



**General Information**

Test Agency..... Texas Transportation Institute (TTI)  
 Test Standard Test No..... MASH Test 3-62  
 TTI Test No..... 690900-XSD3  
 Test Date..... 2015-10-29

**Test Article**

Type..... Sign Support  
 Name..... MASSH-400 Sign System  
 Installation Height..... 7 ft 4 inches to bottom of sign panel  
 Material or Key Elements..... Two 4-inch square steel posts spaced at 8 ft w/12-ft wide x 6 ft tall sign panel

**Soil Type and Condition**

Drilled shaft foundation in AASHTO M147-65(2004) Grade B Soil

**Test Vehicle**

Type/Designation..... 2270P  
 Make and Model..... 2010 Dodge Ram 1500 Pickup  
 Curb..... 5242 lb  
 Test Inertial..... 5006 lb  
 Dummy..... No dummy  
 Gross Static..... 5006 lb

**Impact Conditions**

Speed..... 63.1 mi/h  
 Angle..... 0 degree  
 Location/Orientation..... Rt qtr-pt w/CL left support

**Kinetic Energy**

..... 666 kip\*ft

**Occupant Risk Values**

Longitudinal OIV..... 1.6 ft/s  
 Lateral OIV..... 2.6 ft/s  
 Longitudinal RDA..... 0.1 g  
 Lateral RDA..... 0.5 g  
 THIV..... 3.8 km/h  
 PHD..... 0.5 g  
 ASI..... 0.18

**Max. 0.050-s Average**

Longitudinal..... -1.0 g  
 Lateral..... 0.6 g  
 Vertical..... 0.5 g

**Exit Conditions**

Speed..... 62.4 mi/h  
 Angle..... 0 degree

**Post-Impact Trajectory**

Stepping Distance..... 320 ft

**Vehicle Stability**

Maximum Yaw Angle..... 3 degrees  
 Maximum Pitch Angle..... 2 degrees  
 Maximum Roll Angle..... 1 degree

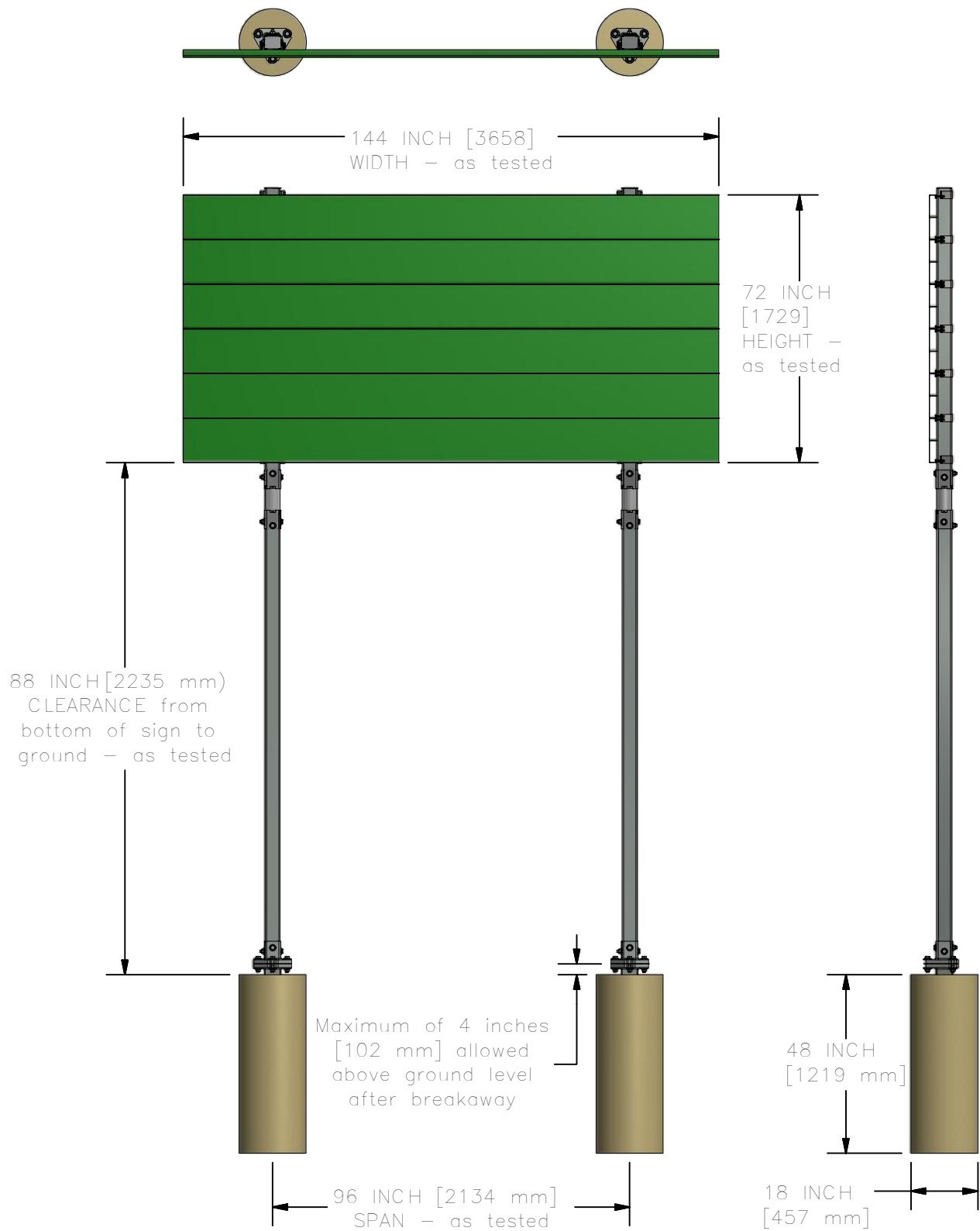
**Test Article Debris Scatter**

Longitudinal..... 40 ft  
 Lateral..... 25 ft

**Vehicle Damage**

VDS..... 12FR1  
 CDC..... 12FREN1  
 Max. Exterior Deformation..... 2.75 inches  
 OCDC..... RF0000000  
 Max. Occupant Compartment Deformation..... None

**Figure 7.6. Summary of Results for MASH Test 3-62 on the Allied Tube and Conduit® and Xcessories Squared MASSH-400 Sign Support.**



Multi-directionally Activated Sign Support Hardware System



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## INTENDED USE

The Xcessories Squared and Allied Tube & Conduit Multi-directionally Activated Sign Support Hardware System may be used in place of many sign assembly installations that would typically use beam posts. The system is unique because it contains an Xcessories Squared omni-directional slip base assembly and omni-directional hinge assembly. It is designed to hold an Allied Tube 4" x minimum 8ga solid wall square steel post. When properly installed, the clamping force of the slip base hardware holds the slip base top half to the slip base bottom half to meet or exceed the wind load capability of the sign support, while still allowing the two matching slip plates to disengage upon impact, below the maximum Change of Velocity allowed under MASH TL3 requirements. For multiple post installations, a sign post hinge assembly attaches between the bottom sign post and top sign post, just beneath the sign panel, and allows the bottom post to bend/pivot out of the way of an impacting vehicle.

Product was tested using a 2 post installation (spaced at 96 inch [2438 mm] apart) and met the MASH TL3 break away requirements.

## COMPONENTS

The Xcessories Squared and Allied Tube & Conduit Multi-directionally Activated Sign Support Hardware System consists of a triangular slip base bottom anchor, slip base match plate hardware, a triangular slip base sign post receiver, a multi-directionally activated sign hinge assembly, and sign panel bracket assemblies to hold sign panels all from Xcessories Squared, and solid wall square steel tube sign posts from Allied Tube & Conduit. The unibase anchor installs into a concrete footer. The bottom sign post and top sign post attaches to the sign post hinge using structural threaded bolts, washers, and nuts.

- A Slip Base Match Plate Hardware Set
- B Slip Base Top - Sign Post Receiver
- C Uni-Base Anchor for concrete installation
- D Multi-directionally Activated Sign Hinge Assembly
- E Sign Panel Bracket Assembly
- F Sign Post Hardware Set
- G Square Sign Post

## APPROVALS

FHWA Eligibility Letter SS-180 revised May, 21, 2019.

## CONTACT INFORMATION

Xcessories Squared Development & Mfg., Inc.  
P.O. Box 135  
Auburn, IL 62615  
800-621-7948  
www.x-sqrd.com

Allied Tube & Conduit  
16100 South Lathrop Avenue  
Harvey, IL 60426  
800-882-5543  
www.atkore.com

## Multi-directionally Activated Sign Support Hardware System

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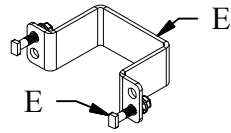
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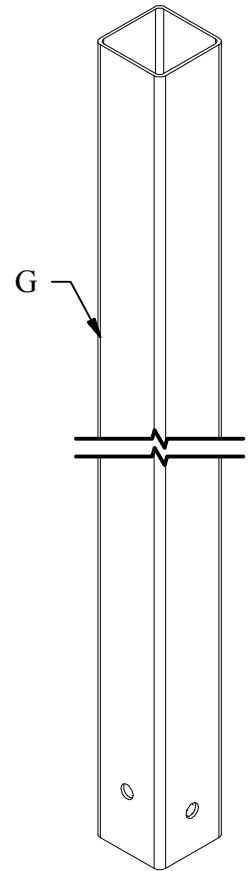
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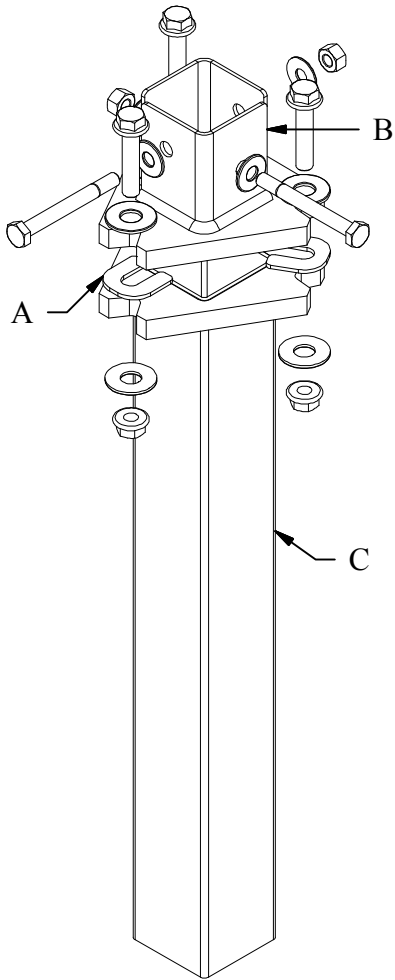




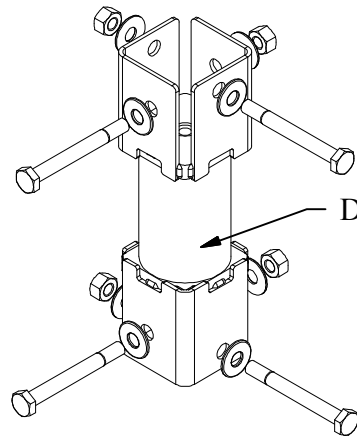
Sign Panel  
Clamp Set



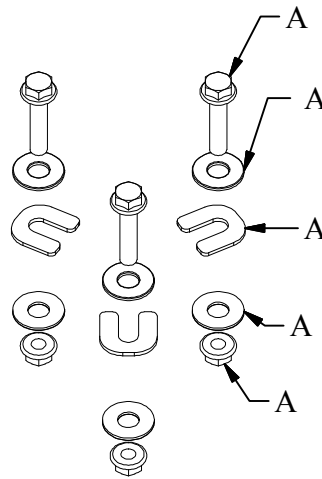
Square Sign Post



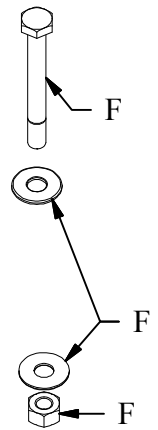
Complete Slip Base  
Assembly for  
Concrete Installation



Multi-directionally  
Activated  
Sign  
Support  
Hinge



Slip Base Match  
Plate Hardware Set



Sign Post  
Hardware Set

Multi-directionally Activated Sign Support Hardware System



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