



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

December 21, 2020

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

In Reply Refer To:  
HSST-1/B-353

Mr. Bret R. Eckert  
Trinity Highway Products, LLC.  
3617 Cincinnati Avenue  
Rocklin, CA 95765  
USA

Dear Mr. Eckert:

This letter is in response to your November 12, 2020 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-353 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:

- 12-inch King MASH16 Composite Block on 31" MGS

### **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: 12-inch King MASH16 Composite Block on 31" MGS

Type of system: Longitudinal Barrier

Test Level: TL3

Testing conducted by: Texas A&M Transportation Institute (TTI)

Date of request: November 12, 2020

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 B-353 shall not be reproduced except in full. This letter and the test documentation upon which it is based are public information. All such letters and documentation may be reviewed upon request.
- This letter shall not be construed as authorization or consent by the FHWA to use, manufacture, or sell any patented system for which the applicant is not the patent holder.
- This FHWA eligibility letter is not an expression of any Agency view, position, or determination of validity, scope, or ownership of any intellectual property rights to a specific device or design. Further, this letter does not impute any distribution or licensing rights to the requester. This FHWA eligibility letter determination is made based solely on the crash-testing information submitted by the requester. The FHWA reserves the right to review and revoke an earlier eligibility determination after receipt of subsequent information related to crash testing.

Sincerely,

A handwritten signature in blue ink that reads "Michael S. Griffith". The signature is written in a cursive style with a large initial "M" and "G".

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:	November 12, 2020	<input checked="" type="radio"/> New <input type="radio"/> Resubmission
	Name:	Bret R.Eckert, P.E.	
	Company:	Trinity Highway Products, LLC.	
	Address:	3617 Cincinnati Avenue, Rocklin, California 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
'B':Rigid/Semi-Rigid Barriers (Roadside, Median, Bridge Railings)	<input checked="" type="radio"/> Physical Crash Testing <input type="radio"/> Engineering Analysis	12-inch King MASH16 Composite Block on 31" MGS	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:	Gregory A. Neece	Same as Submitter <input checked="" type="checkbox"/>
Company Name:	Trinity Highway Products, LLC.	Same as Submitter <input checked="" type="checkbox"/>
Address:	2525 N. Stemmons Freeway, Dallas, Texas 75207	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 Trinity Highway Products, LLC. ("THP") to perform full-scale crash testing of the KESS Corporation's ("KESS") 12-inch King MASH16 Composite Block on the 31-inch Midwest Guardrail System ("MGS"). The 12" King MASH16 Composite Block was designed and developed by KESS, and it is the commercial embodiment of intellectual property that is owned by KESS. There are no shared financial interests in the 12-inch King MASH16 Composite Block on 31" MGS between KESS and TTI. Neither KESS nor THP pay royalties to the Texas A&M University System ("TAMUS", of which TTI is a member agency), for direct sales of the 12" King MASH16 Composite Block. However, THP does pay royalties to TAMUS (and thus TTI) in connection with sales of certain other proprietary products and systems, some of which use composite blocks and may include the 12" King MASH16 Composite Block in the future. The fees paid by THP to TTI, an internationally accredited third party crash testing laboratory, to conduct full-scale crash testing, analyze, and report the test results of the 12" King MASH16 Composite Block were not dependent or contingent on the results of the testing.

## PRODUCT DESCRIPTION

<a href="#">Help</a>	
<p> <input checked="" type="radio"/> New Hardware or Significant Modification                  <input type="radio"/> Modification to Existing Hardware         </p> <p>             The test installation consisted of 162.5 ft of 12-gauge W-beam guardrail sections supported by 6-ft long W6x8.5 steel posts, with a TxDOT Downstream Anchor Terminal (DAT) on each end, for a total length of 181.25 ft. The top of the W-beam guardrail was located 31 inches above grade, and the posts were spaced at 75 inches. W-beam guardrail splices were located mid-span between posts. All steel was galvanized per ASTM International (ASTM) A123 or ASTM A153 specification. The rails were held off the posts in the length of need with 12-inch King MASH16 composite blockouts and secured with 14-inch guardrail bolts and nuts. The guardrail posts were embedded 40 inches. The supplied 12-inch King MASH16 composite blocks were formed using 99% recycled high-density polyethylene (HDPE) - blowing agent. The 12-inch King MASH16 Composite Blocks are an alternate choice to be used in conjunction with the 31-inch Midwest Guardrail System ("MGS").         </p> <p style="text-align: center;"><b>CRASH TESTING</b></p> <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:	D. Lance Bullard, Jr. P.E.
Engineer Signature:	<b>D. Lance Bullard, Jr.</b> Digitally signed by D. Lance Bullard, Jr. Date: 2020.11.02 18:51:21 -06'00'
Address:	3100 SH 47, Bldg 7091, Bryan, Texas 77807 TTI, TAMU 3135, College Station, TX 77843-3135
Country:	USA
A brief description of each crash test and its result:	

[Help](#)

Required Test Number	Narrative Description	Evaluation Results
3-10 (1100C)	<p>Test 3-10 involves an 1100C vehicle impacting the test article at a target impact speed of 62 mi/h and target angle of 25°. The target CIP for the right corner of the front bumper was 8.5 ft upstream of the centerline of Post #12.</p> <p>The results of the test conducted on September 7, 2020 are found in TTI Test Report No. 690900-KES4-5. The test vehicle was traveling at a speed of 63.4 mi/h as it made contact with the 31-inch MGS Guardrail with 12-inch King MASH16 Composite Blocks 8.2 ft upstream of the centerline of Post #12 and at an impact angle of 24.6°. After loss of contact with the barrier, the vehicle came to rest 97 ft downstream of the impact point and 14 ft toward the traffic side.</p> <p>The 31-inch MGS Guardrail with 12-inch King MASH16 Composite Blocks contained and redirected the 1100C vehicle. The vehicle did not penetrate, underride, or override the installation. The vehicle exited within the exit box criteria defined in MASH. Maximum dynamic deflection of the rail during the test was 29.5 inches. Maximum permanent deformation was 16.0 inches. Working width was 43.0 inches, and height of working width was 6.7 inches.</p> <p>The 1100C vehicle remained upright during and after the collision event. Maximum roll and pitch angles were 13° and 7°, respectively.</p> <p>Longitudinal OIV was 19.0 ft/s and lateral OIV was 18.0 ft/s. Maximum longitudinal occupant ridedown acceleration was 10.9 g, and maximum lateral occupant ridedown acceleration was 11.1 g. Occupant risk factors were within the preferred limits specified in MASH.</p> <p>Maximum exterior crush to the vehicle was 7 inches in the side plane at the right front corner at bumper height. Maximum occupant compartment deformation was 0.5 inch in the right kick panel area.</p> <p>The 31-inch MGS Guardrail with 12-inch King MASH16 Composite Blocks performed acceptably for MASH test 3-10.</p>	PASS

Required Test Number	Narrative Description	Evaluation Results
3-11 (2270P)	<p>Test 3-11 involves a 2270P vehicle impacting the test article at a target impact speed of 62 mi/h and target angle of 25°. The target CIP for the right corner of the front bumper was the centerline of the face of post 14.</p> <p>The results of the test conducted on July 9, 2020 are found in TTITest Report No. 690900-KES 4-5. The test vehicle was traveling at a speed of 61.9 mi/h as it made contact with the 31-inch MGS Guardrail with 12-inch King MASH16 Composite Blocks 4.5 inches downstream of the centerline of Post #14 and at an impact angle of 25.1°. After loss of contact with the barrier, the vehicle came to rest 153 ft downstream of the impact point and 25 ft toward the field side.</p> <p>The 31-inch MGS Guardrail with 12-inch King MASH16 Composite Blocks contained and redirected the 2270P vehicle. The vehicle did not penetrate, underride, or override the installation. The vehicle exited within the exit box criteria defined in MASH.</p> <p>Maximum dynamic deflection during the test was 46.0 inches. Maximum permanent deformation was 36.4 inches. Working width was 69.2 inches, and the height of working width was 52.8 inches.</p> <p>The 2270P vehicle remained upright during and after the collision event. Maximum roll and pitch angles were 10° and 6°, respectively.</p> <p>Longitudinal OIV was 17.4 ft/s and lateral OIV was 11.8 ft/s. Maximum longitudinal occupant ridedown acceleration was 5.5 g and maximum lateral occupant ridedown acceleration was 6.7 g. Occupant risk factors were within the preferred limits specified in MASH.</p> <p>Maximum exterior crush to the vehicle was 10.0 inches in the side plane at the right front corner at bumper height. Maximum occupant compartment deformation was 2.0 inches in the right front firewall/floor pan area.</p> <p>The 31-inch MGS Guardrail with 12-inch King MASH16 Composite Blocks performed acceptably for MASH test 3-11.</p>	PASS

3-20 (1100C)	This product is not a transition system.	Non-Relevant Test, not conducted
3-21 (2270P)	This product is not a transition system.	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:	Texas A&M Transportation Institute	
Laboratory Signature:	Digitally signed by Darrell L. Kuhn 'Date: 2020.11.11 11:10:40 -06'00	
Address:	3100 SH 47, Bldg 7091, Bryan, Texas 77807 TTI, TAMU 3135, 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 17025-2017 Laboratory A2LA Certificate Number: 2821.01 Valid To: April 30, 2021	

Submitter Signature\*: Bret Eckert, P.E.  
Digitally signed by Bret Eckert, P.E.  
 email=bret.eckert@trin.net, c=US  
 Date: 2020.11.12 07:40:55 -08'00

Submit Form

## ATTACHMENTS

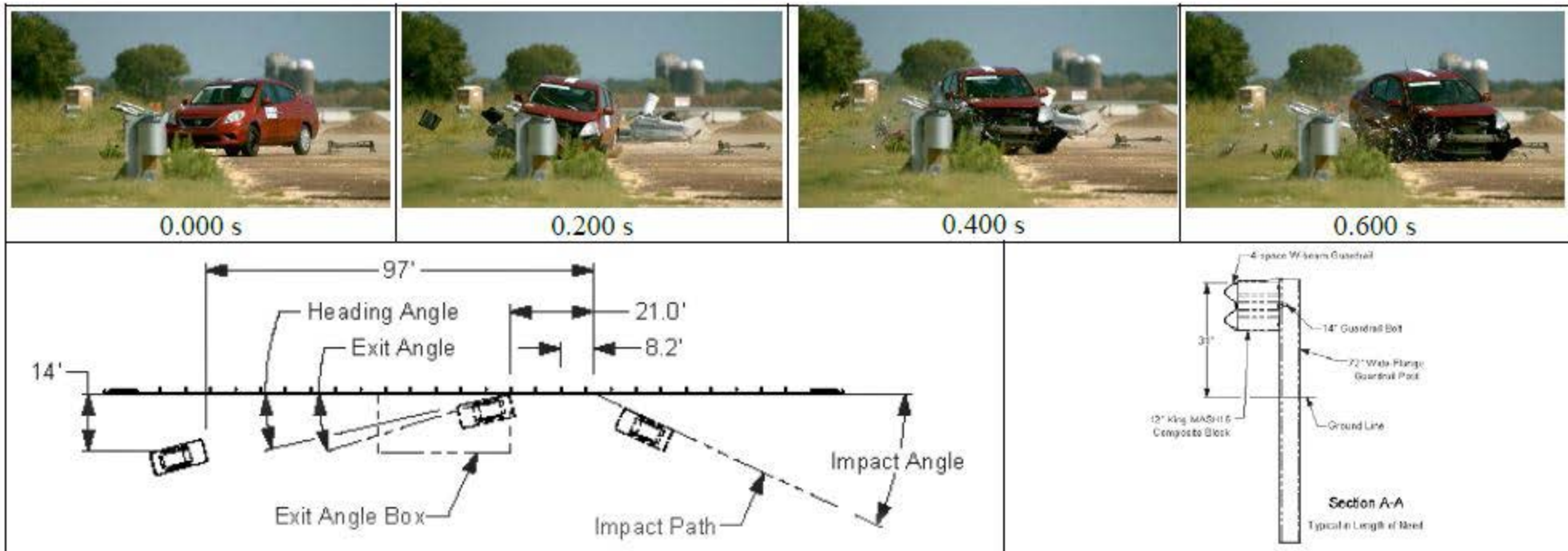
Attach to this form:

- 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:

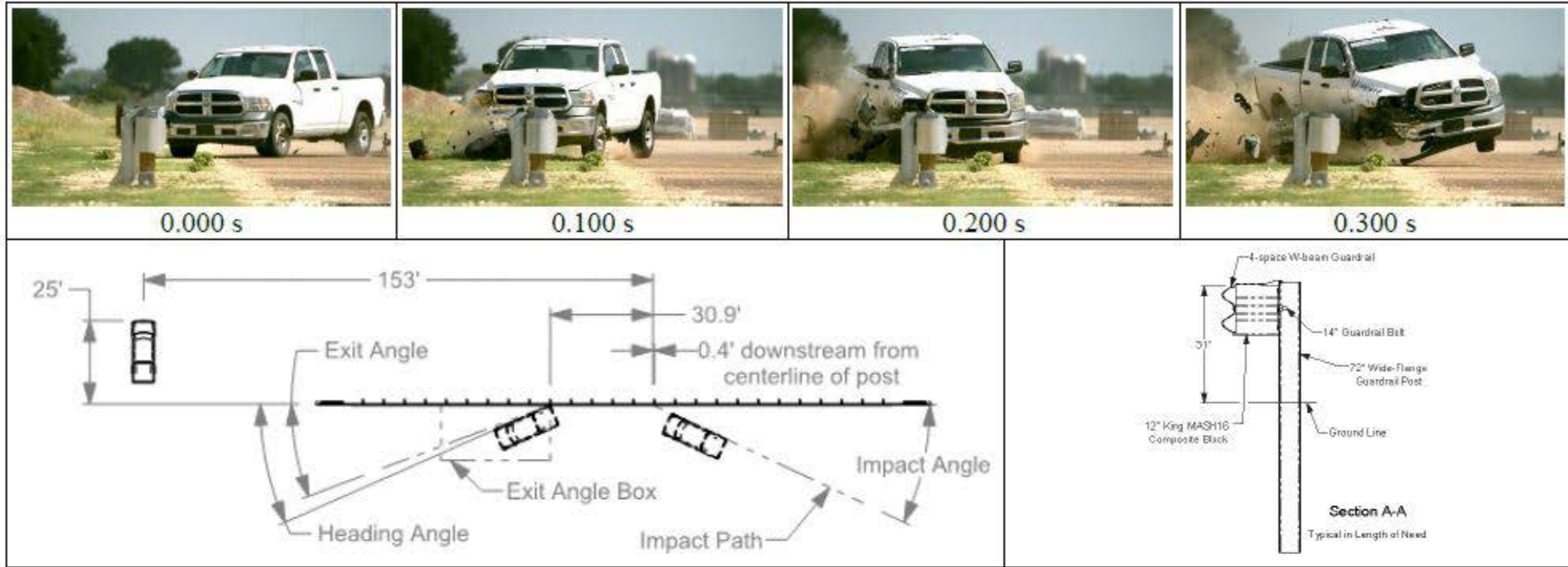
Eligibility Letter		Key Words
Number	Date	





General Information		Impact Conditions		Post-Impact Trajectory	
Test Agency	Texas A&M Transportation Institute (TTI)	Speed	63.4 mi/h	Stopping Distance	97 ft downstream
Test Standard Test No.	MASH-2016 Test 3-10	Angle	24.6°		14 ft twd traffic lanes
TTI Test No.	690900-KES5	Location/Orientation	8.2 ft upstream of post 12	<b>Vehicle Stability</b>	
Test Date	2020-09-07	Impact Severity	56 kip-ft	Maximum Yaw Angle	53°
<b>Test Article</b>		Exit Conditions		Maximum Pitch Angle	7°
Type	Longitudinal Barrier—Blockout	Speed	30.7 mi/h	Maximum Roll Angle	13°
Name	12-inch King MASH16 Composite Block on Midwest Guardrail System	Trajectory/Heading Angle	17.5°/13.0°	Vehicle Snagging	Yes
Installation Length	181 ft 3 inches	<b>Occupant Risk Values</b>		Vehicle Pocketing	No
Material or Key Elements	MGS guardrail system, top of W-beam 31 inches above grade on Std 72-inch long wide-flange guardrail posts, with 12-inch King MASH16 composite blockouts	Longitudinal OIV	19.0 ft/s	<b>Test Article Deflections</b>	
Soil Type and Condition	AASHTO M147-65, grading B soil (crushed limestone), damp	Lateral OIV	18.0 ft/s	Dynamic	29.5 inches
<b>Test Vehicle</b>		Longitudinal Ridedown	10.9 g	Permanent	16.0 inches
Type/Designation	1100C	Lateral Ridedown	11.1 g	Working Width	43.0 inches
Make and Model	2014 Nissan Versa	THIV	9.0 m/s	Height of Working Width	6.7 inches
Curb	2411 lb	ASI	0.8	<b>Vehicle Damage</b>	
Test Inertial	2416 lb	Max. 0.050-s Average		VDS	01RFQ5
Dummy	165 lb	Longitudinal	-7.8 g	CDC	01FREW3
Gross Static	2581 lb	Lateral	-6.3 g	Max. Exterior Deformation	7.0 inches
		Vertical	2.2 g	OCDI	FR0010000
				Max. Occupant Compartment Deformation	0.5 inch

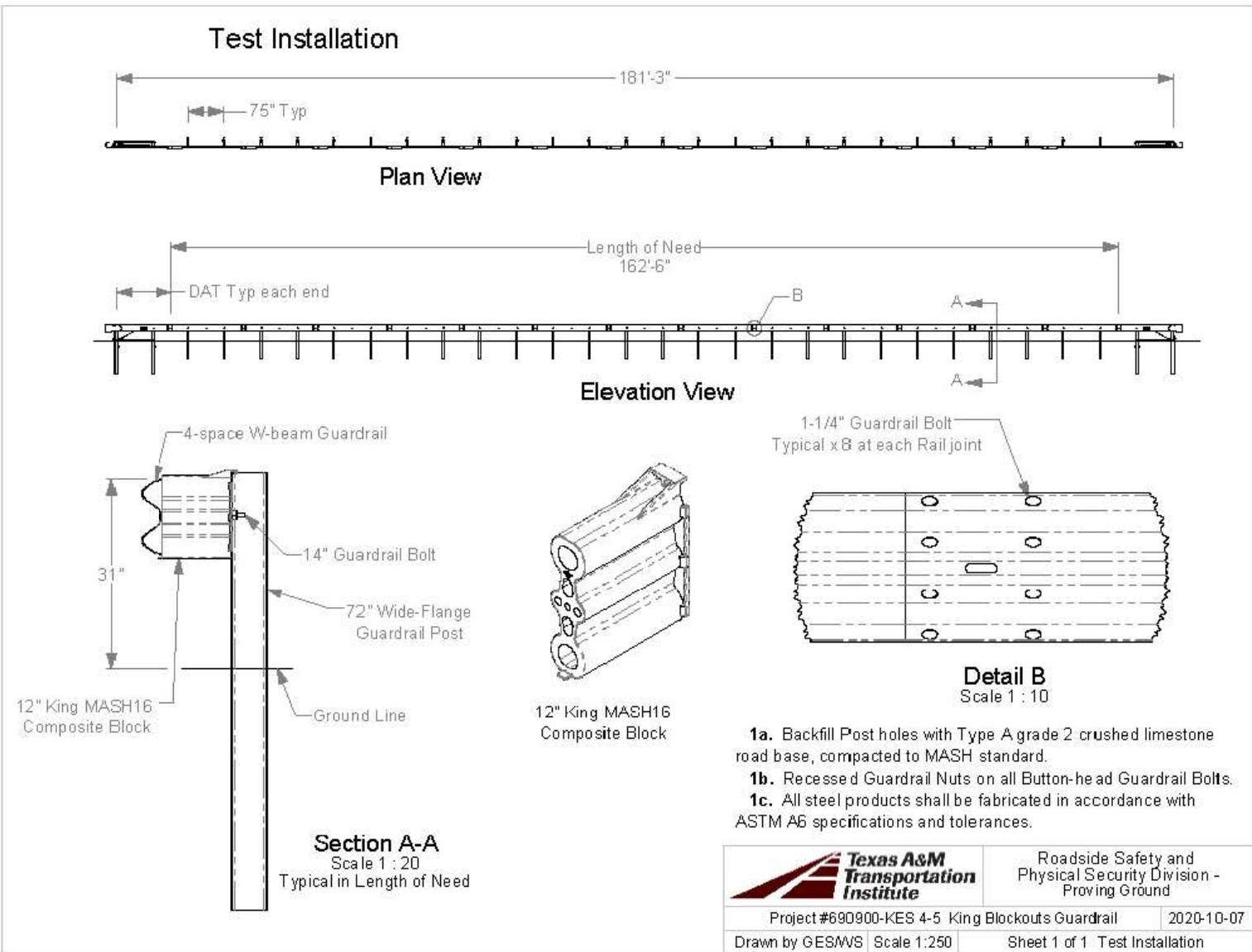
Figure 5.7. Summary of Results for MASH-2016 Test 3-10 on 12-inch King MASH16 Composite Block on MGS.



General Information		Impact Conditions		Post-Impact Trajectory	
Test Agency	Texas A&M Transportation Institute (TTI)	Speed	61.9 mi/h	Stopping Distance	153 ft downstream 25 ft twd field side
Test Standard Test No.	MASH-2016 Test 3-11	Angle	25.1°		
TTI Test No.	690900-KES4	Location/Orientation	4.5 inches dwnstrm of post 14		
Test Date	2020-07-09	Impact Severity	116 kip-ft		
<b>Test Article</b>		<b>Exit Conditions</b>		<b>Vehicle Stability</b>	
Type	Longitudinal Barrier—Blockout	Speed	34.5 mi/h	Maximum Yaw Angle	47°
Name	12-inch King MASH16 Composite Block on Midwest Guardrail System	Trajectory/Heading Angle	20.6°/23.8°	Maximum Pitch Angle	6°
Installation Length	181 ft 3 inches	<b>Occupant Risk Values</b>		Maximum Roll Angle	10°
Material or Key Elements	MGS guardrail system, top of W-beam 31 inches above grade on Std 72-inch long wide-flange guardrail posts, with 12-inch King MASH16 composite blockouts	Longitudinal OIV	17.4 ft/s	Vehicle Snagging	Yes
Soil Type and Condition	AASHTO M147-65, grading B soil (crushed limestone), dry	Lateral OIV	11.8 ft/s	Vehicle Pocketing	No
<b>Test Vehicle</b>		Longitudinal Ridedown	5.5 g	<b>Test Article Deflections</b>	
Type/Designation	2270P	Lateral Ridedown	6.7 g	Dynamic	46.0 inches
Make and Model	2014 RAM 1500 Pickup	THIV	7.1 m/s	Permanent	36.4 inches
Curb	4955 lb	ASI	0.7	Working Width	69.2 inches
Test Inertial	5015 lb	<b>Max. 0.050-s Average</b>		Height of Working Width	52.8 inches
Dummy	No dummy	Longitudinal	-6.5 g	<b>Vehicle Damage</b>	
Gross Static	5015 lb	Lateral	-4.6 g	VDS	01RFQ5
		Vertical	-4.2 g	CDC	01FREW4
				Max. Exterior Deformation	10.0 inches
				OCDI	FR0010000
				Max. Occupant Compartment Deformation	2.0 inches

Figure 6.8. Summary of Results for MASH-2016 Test 3-11 on 12-inch King MASH16 Composite Block on MGS.

**APPENDIX A. DETAILS OF 12-INCH KING MASH16 COMPOSITE  
BLOCK ON MIDWEST GUARDRAIL SYSTEM**



G:\Accreditation-17C25-2017\EIR-000 Project Files\690900\KES - KESS Corporation - Bullard\KES4&5\Drafting\_KES 4-5\690900-KES-4-5 Drawing

	Roadside Safety and Physical Security Division - Proving Ground	
	Project #690900-KES 4-5 King Blockouts Guardrail	2020-10-07
Drawn by GES/MWS	Scale 1:250	Sheet 1 of 1 Test Installation

