June 3, 2020

Mr. David King
KESS Corporation
23 Alamo Court
Elizabethtown, KY 42701
USA

Dear Mr. King:

This letter is in response to your March 25, 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-342 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:

- 8-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: 8-inch King MASH16 Composite Block on 31” MGS
Type of system: Longitudinal Barrier
Test Level: MASH Test Level 3 (TL3)
Testing conducted by: Texas A&M Transportation Institute
Date of request: March 25, 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-342 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,

Michael S. Griffith
Director, Office of Safety Technologies
Office of Safety

Enclosures
Request for Federal Aid Reimbursement Eligibility of Highway Safety Hardware

Date of Request: March 25, 2020

Name: David King
Company: KESS Corporation
Address: 23 Alamo Court, Elizabethtown, KY 42701
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

<table>
<thead>
<tr>
<th>System Type</th>
<th>Submission Type</th>
<th>Device Name / Variant</th>
<th>Testing Criterion</th>
<th>Test Level</th>
</tr>
</thead>
<tbody>
<tr>
<td>'B': Rigid/Semi-Rigid Barriers (Roadside, Median, Bridge Railings)</td>
<td>☐ Physical Crash Testing ☑ Engineering Analysis</td>
<td>8-inch King MASH16 Composite Block on 31'' MGS</td>
<td>AASHTO MASH</td>
<td>TL3</td>
</tr>
</tbody>
</table>

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: David King
Company Name: KESS Corporation
Address: 23 Alamo Court, Elizabethtown, KY 42701
Country: USA

Texas A&M Transportation Institute (TTI) was contracted by the KESS Corporation to perform full-scale crash testing of the 8-inch King MASH16 Composite Block on 31'' MGS. There are no shared financial interests in the 8-inch King MASH16 Composite Block on 31'' MGS by TTI, or between KESS Corporation and TTI, other than the costs involved in the actual crash tests and reports for this submission to FHWA.
PRODUCT DESCRIPTION

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 8-inch King MASH16 composite blockouts and secured with 10-inch guardrail bolts and nuts. The guardrail posts were embedded 40 inches. The supplied 8-inch King MASH16 composite blocks were formed using 99% recycled high-density polyethylene (HDPE) blowing agent. The 8-inch King MASH16 composite blocks are an alternate choice to be used in conjunction with the 31" Midwest Guardrail System (MGS).

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: D. Lance Bullard, Jr. P.E.

D. Lance Bullard, Jr.  Digitally signed by D. Lance Bullard, Jr.
Date: 2020.03.27 16:36:02 -05'00'

Address: 3100 SH 47, Bldg 7091, Byran, Texas 77807

Country: USA

Same as Submitter

A brief description of each crash test and its result:
<table>
<thead>
<tr>
<th>Required Test Number</th>
<th>Narrative Description</th>
<th>Evaluation Results</th>
</tr>
</thead>
<tbody>
<tr>
<td>3-10 (1100C)</td>
<td>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 left corner of the front bumper was 8.5 ft upstream of the centerline of Post #12.</td>
<td>PASS</td>
</tr>
<tr>
<td></td>
<td>The results of the test conducted on January 17, 2020 are found in TTI Test Report No. 690900-KES2-3. The test vehicle was traveling at a speed of 65.0 mi/h as it made contact with the 31-inch MGS Guardrail with 8-inch King MASH16 Composite Blocks 8.3 ft upstream of the centerline of Post #12 and at an impact angle of 25.1°. After loss of contact with the barrier, the vehicle came to rest 210 ft downstream of the impact point and 82 ft toward the traffic side.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>The 31-inch MGS Guardrail with 8-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 32.9 inches. Maximum permanent deformation was 18.0 inches. Working width was 38.9 inches, and height of working width was 1.0 inch.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>The 1100C vehicle remained upright during and after the collision event. Maximum roll and pitch angles were 10° and 6°, respectively.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Longitudinal OIV was 19.0 ft/s and lateral OIV was 16.1 ft/s. Maximum longitudinal occupant ridedown acceleration was 8.3 g, and maximum lateral occupant ridedown acceleration was 8.9 g. Occupant risk factors were within the maximum limits specified in MASH.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Maximum exterior crush to the vehicle was 11.5 inches in the side plane at the right front corner at bumper height. No occupant compartment deformation or intrusion was observed.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>The 31-inch MGS Guardrail with 8-inch King MASH16 Composite Blocks performed acceptably for MASH test 3-10.</td>
<td></td>
</tr>
<tr>
<td>Required Test Number</td>
<td>Narrative Description</td>
<td>Evaluation Results</td>
</tr>
<tr>
<td>----------------------</td>
<td>--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------</td>
<td>-------------------</td>
</tr>
<tr>
<td>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 left corner of the front bumper was the centerline of the face of post 14.</td>
<td>PASS</td>
<td></td>
</tr>
</tbody>
</table>
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):

<table>
<thead>
<tr>
<th>Laboratory Name:</th>
<th>Texas A&amp;M Transportation Institute</th>
</tr>
</thead>
<tbody>
<tr>
<td>Laboratory Signature:</td>
<td>Digitally signed by Darrell L. Kuhn Date: 2020.03.26 17:02:50 -05'00</td>
</tr>
<tr>
<td>Address:</td>
<td>3100 SH 47, Bldg 7091, Byran, Texas 77807 TTI, TAMU 3135, College Station, TX 77843-3135</td>
</tr>
<tr>
<td>Country:</td>
<td>USA</td>
</tr>
<tr>
<td>Accreditation Certificate Number and Dates of current Accreditation period:</td>
<td>ISO 17025-2017 Laboratory A2LA Certificate Number: 2821.01 Valid To: April 30, 2021</td>
</tr>
</tbody>
</table>

Submitter Signature:

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:

<table>
<thead>
<tr>
<th>Eligibility Letter</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number</td>
</tr>
</tbody>
</table>

Submit Form
Figure 5.8. Summary of Results for MASH Test 3-10 on 31-inch MGS Guardrail with 8-inch King MASH16 Composite Blocks.
Figure 6.8. Summary of Results for MASH Test 3-11 on 31-inch MGS Guardrail with 8-inch King MASH16 Composite Blocks.
1a. Backfill Post holes with Type A grade 2 crushed limestone road base, compacted to MASH standard.

1b. Recessed Guardrail Nuts on all Button-head Guardrail Bolts.

1c. All steel products shall be fabricated in accordance with ASTM A6 specifications and tolerances.
Notes:
1. Material: HDPE 99% Regrind/Blowing agent & 1% Black Color Concentrate
DAT System

Isometric View

Plan View

Elevation View

<table>
<thead>
<tr>
<th>#</th>
<th>Part Name</th>
<th>Qty.</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Foundation Tube</td>
<td>2</td>
</tr>
<tr>
<td>2</td>
<td>Terminal Timber Post</td>
<td>2</td>
</tr>
<tr>
<td>3</td>
<td>BCT Bearing Plate</td>
<td>1</td>
</tr>
<tr>
<td>4</td>
<td>DAT Strut</td>
<td>2</td>
</tr>
<tr>
<td>5</td>
<td>BCT Post Sleeve</td>
<td>1</td>
</tr>
<tr>
<td>6</td>
<td>Shelf Angle Bracket</td>
<td>1</td>
</tr>
<tr>
<td>7</td>
<td>DAT Terminal Rail</td>
<td>1</td>
</tr>
<tr>
<td>8</td>
<td>W-beam End Section</td>
<td>1</td>
</tr>
<tr>
<td>9</td>
<td>Anchor Cable Assembly</td>
<td>1</td>
</tr>
<tr>
<td>10</td>
<td>Guardrail Anchor Bracket</td>
<td>1</td>
</tr>
<tr>
<td>11</td>
<td>Bolt, 5/8 x 2&quot; hex</td>
<td>8</td>
</tr>
<tr>
<td>12</td>
<td>Bolt, 5/8 x 8&quot; hex</td>
<td>4</td>
</tr>
<tr>
<td>13</td>
<td>Bolt, 5/8 x 10&quot; hex</td>
<td>2</td>
</tr>
<tr>
<td>14</td>
<td>Washer, 5/8 F844</td>
<td>16</td>
</tr>
<tr>
<td>15</td>
<td>10&quot; Guardrail Bolt</td>
<td>2</td>
</tr>
<tr>
<td>16</td>
<td>1-1/4&quot; Guardrail Bolt</td>
<td>4</td>
</tr>
<tr>
<td>17</td>
<td>Recessed Guardrail Nut</td>
<td>20</td>
</tr>
</tbody>
</table>

1a. All bolts are ASTM A307.

1b. Hardware secures Shelf Angle Bracket to Post. Rail is supported by Shelf Angle Bracket and does not attach directly to Post.
DAT Terminal Rail
Scale 1:20 - See 4-space W-beam
Guardrail drawing for cross-section and other dimensions.

W-beam End Section
12 gauge steel - Scale 1:20
1a. Manufacture per AASHTO M180 specifications.
72" Wide-Flange Guardrail Post

Elevation View

Isometric View

W6x8.5
ASTM A992

\( \phi 13/16" \) Typ, both flanges

3.940
5.830
.194
.170

Section A-A
Scale 1 : 3
1a. Material is ASTM A307.

1b. All bolt sizes not used in all projects. See system drawing.

1c. Head and shoulder dimensions typical all sizes.
1a. Material is ASTM A 563 Grade A.