December 23, 2015

In Reply Refer To:
HSST/CC-124

Mr. Barry Stephens
Trinity Highway Products, LLC
3617 Cincinnati Ave.
Rocklin, CA 95677

Dear Mr. Stephens:

This letter is in response to your July 22, 2014 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 HSST/CC-124 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:
• Trinity Slotted Rail Terminal SRT End Terminal Family Ground Strut Modification

Scope of this Letter

To be found eligible for Federal-aid funding, modified roadside safety devices should meet the crash test and evaluation criteria contained in the National Cooperative Highway Research Program (NCHRP) Report 350. 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

FHWA previously issued an eligibility letter for the roadside safety system described in your pending request. Your pending request now identifies a modification to that roadside safety system.

The original roadside safety device information is provided here:

Name of system: Slotted Rail Terminal (SRT)  
Type of system: Terminal  
Date of original request: November 6, 1995  
Date of original FHWA eligibility letter: December 4, 1995  
FHWA Control number: CC31

Name of system: Modified Slotted Rail Terminal (SRT)  
Type of system: Terminal  
Date of original request: November 21, 2000  
Date of original FHWA eligibility letter: December 18, 2000  
FHWA Control number: HSA-1/CC72

The pending modification(s) consists of the following changes:

1. Allow the single 3"x3"x1/4" angle ground strut as a satisfactory replacement for the older SRT strut configurations (i.e., CC-31 & CC-72) and consider it acceptable for use in all versions of the Slotted Rail Terminal (SRT).

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.
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 the NCHRP Report 350.

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 HSST/CC-124 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 yours,

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: December 18, 2015

Name: Bret R. Eckert, P.E.
Company: Trinity Highway Products, LLC
Address: 3617 Cincinnati Ave., Rocklin, CA 95677
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.

<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>&quot;CC&quot;: Crash Cushions, Attenuators, &amp; Terminals</td>
<td>Physical Crash Testing</td>
<td>SRT-350*</td>
<td>NCHRP Report 350</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 NCHRP Report 350 (Report 350) and that the evaluation results meet the appropriate evaluation criteria in the Report 350.

Identification of the individual or organization responsible for the product:

| Contact Name: | Michael Bennett | Same as Submitter | ✓ |
| Company Name: | Trinity Highway Products, LLC | Same as Submitter | ✓ |
| Address: | 2525 Stemmons, Freeway, Dallas, TX 75207 | Same as Submitter | ✓ |
| Country: | USA | 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.

<table>
<thead>
<tr>
<th>Trinity Highway Products, LLC (&quot;THP&quot;) sponsored crash tests of the SRT system conducted by the Texas A&amp;M Transportation Institute (&quot;TTI&quot;) Proving Ground. TTI Proving Ground is an International Standards Organization (&quot;ISO&quot;) 17025 accredited laboratory with American Association for Laboratory Accreditation (A2LA) Mechanical Testing certificate 2821.01. The SRT-350 system was designed and developed by engineers who are currently or previously employed by Texas A&amp;M at TTI. The associated United States Patent Office patent numbers are assigned to TAMUS and Exodyne Technologies, Inc. The patent holders of record for the associated patents are listed below:</th>
</tr>
</thead>
<tbody>
<tr>
<td>CRP (Cable Release Post) - US Patent Number 6,729,607: Dean C. Alberson, D. Lance Bullard, Jr., Roger P. Bligh, C. Eugene Buth (TAMUS)</td>
</tr>
<tr>
<td>HBA (Breakaway Support Post) - US Patent Numbers 8,038,126 / 6,886,813 / 6,793,204 / 6,793,116 / 6,619,630 / 6,488,268 / 6,398,192: James R. Albritton (Exodyne Technologies, Inc.)</td>
</tr>
<tr>
<td>SYTP (Steel Yielding Terminal Post) - US Patent Number 6,902,150: Dean C. Alberson, D. Lance Bullard, Jr., Roger P. Bligh, C. Eugene Buth (TAMUS)</td>
</tr>
<tr>
<td>SRT (Slot Guard) - US Patent Number 6,435,761: Roger P. Bligh, King K. Mak, Hayes E. Ross, Jr. (TAMUS)</td>
</tr>
<tr>
<td>THP pays royalties to TAMUS and Exodyne for sales of the SRT system and parts, pursuant to an executed license agreement. THP is willing to discuss confidential treatment of the content of the license agreement with the FHWA, in a manner that does not cause a breach of the license agreement.</td>
</tr>
</tbody>
</table>
PRODUCT DESCRIPTION

<table>
<thead>
<tr>
<th>New Hardware or Modification to Existing Hardware</th>
<th>Non-Significant</th>
</tr>
</thead>
</table>
| The original Slotted Rail Terminal (SRT°) as described in Eligibility Letter CC-31 dated December 4, 1995 specified a yoke design ground strut used between posts 1 and 2. A straight flare SRT° with HBA posts was subsequently approved in Eligibility Letter CC-72 on December 18, 2000 and used two, (2), 2"x2"x3/8" angle ground struts. With the approval of the SRT-31° for 31" high guardrail, a single 3"x3"x1/4" angle design ground strut was used between posts 1 and 2 and detailed in Eligibility Letter CC-100 dated August 30, 2007. The single, 3"x3"x1/4" angle ground strut was also used for the SRT-27° in Eligibility Letter CC-101 dated June 3, 2008 and the SRT-101° in Eligibility Letter CC-1008 dated December 5, 2012. As detailed in the SRT° timeline, the single 3"x3"x1/4" angle ground strut has been successfully tested in various SRT° systems under both NCHRP Report 350 and the more severe MASH Impact conditions. This request is for the following:
1. Allow the single 3"x3"x1/4" angle ground strut as a satisfactory replacement for use in the SRT-350° systems. This modification has been reviewed and justified through engineering analysis and judgment to be non-significant and will have no bearing on the as-tested performance of the system. The Testing Laboratory's signature concurs that these modifications are considered Non-Significant.

CRASH TESTING

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>3-30 (820C)</td>
<td>TTI Test No. 220530-5, Test Date April 29, 1994, Test Report titled &quot;NCHRP Report 350 Compliance Testing of the W-Beam Slotted Rail Terminal&quot;, Report No. FHWA-RD-95-. As detailed in the Product Description above, the single 3&quot;x3&quot;x1/4&quot; angle ground strut has been successfully tested in various SRT° systems under both NCHRP Report 350 and the more severe MASH Impact conditions. This non-significant modification will have no bearing on the as-tested performance of the system.</td>
<td>PASS</td>
</tr>
<tr>
<td>S3-30 (700C)</td>
<td>Not Applicable. Test S3-30 is an optional test and not required for SRT-350° system eligibility.</td>
<td></td>
</tr>
<tr>
<td>3-31 (2000P)</td>
<td>TTI Test No. 220530-10, Test Date June 26, 1995, Test Report titled &quot;NCHRP Report 350 Compliance Testing of the W-Beam Slotted Rail Terminal&quot;, Report No. FHWA-RD-95-. As detailed in the Product Description above, the single 3&quot;x3&quot;x1/4&quot; angle ground strut has been successfully tested in various SRT° systems under both NCHRP Report 350 and the more severe MASH Impact conditions. This non-significant modification will have no bearing on the as-tested performance of the system.</td>
<td>PASS</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>3-32 (820C)</td>
<td>Test 3-32 was waived for the SRT-350° terminal as stated in FHWA Eligibility letter CC-31; In all tests the occupant impact velocities and subsequent ride down accelerations were below the maximum allowable values given in the NCHRP Report 350 evaluation criteria. The non-significant modifications described in the Product Description will have no bearing on the as-tested performance of the system.</td>
<td>Non-Critical, not conducted</td>
</tr>
<tr>
<td>S3-32 (700C)</td>
<td>Not Applicable. Test S3-32 is an optional test and not required for SRT-350° system eligibility.</td>
<td></td>
</tr>
<tr>
<td>3-33 (2000P)</td>
<td>Test 3-33 was waived for the SRT-350° terminal as stated in FHWA Eligibility letter CC-31; In all tests the occupant impact velocities and subsequent ride down accelerations were below the maximum allowable values given in the NCHRP Report 350 evaluation criteria. The non-significant modifications described in the Product Description will have no bearing on the as-tested performance of the system.</td>
<td>Non-Critical, not conducted</td>
</tr>
<tr>
<td>3-34 (820C)</td>
<td>TTI Test No. 2404SR-5, Test Date August 20, 1987, Test Report titled &quot;NCHRP Report 350 Compliance Testing of the W-Beam Slotted Rail Terminal&quot;, Report No. FHWA-RD-95-. As detailed in the Product Description above, the single 3&quot;x3&quot;x1/4&quot; angle ground strut has been successfully tested in various SRT* systems under both NCHRP Report 350 and the more severe MASH impact conditions. This non-significant modification will have no bearing on the as-tested performance of the system.</td>
<td>PASS</td>
</tr>
<tr>
<td>S3-34 (700C)</td>
<td>Not Applicable. Test S3-34 is an optional test and not required for SRT-350° system eligibility.</td>
<td></td>
</tr>
<tr>
<td>3-35 (2000P)</td>
<td>TTI Test No. 220536-13, Test Date September 8, 1995, Test Report titled &quot;NCHRP Report 350 Compliance Testing of the W-Beam Slotted Rail Terminal&quot;, Report No. FHWA-RD-95-. As detailed in the Product Description above, the single 3&quot;x3&quot;x1/4&quot; angle ground strut has been successfully tested in various SRT* systems under both NCHRP Report 350 and the more severe MASH impact conditions. This non-significant modification will have no bearing on the as-tested performance of the system.</td>
<td>PASS</td>
</tr>
<tr>
<td>3-36 (820C)</td>
<td>Not Applicable. Test 3-36 is required for nongating devices and not applicable for gating redirective terminals such as the SRT-350° system.</td>
<td></td>
</tr>
<tr>
<td>S3-36 (700C)</td>
<td>Not Applicable. Test S3-36 is an optional test and not required for SRT-350° system eligibility.</td>
<td></td>
</tr>
<tr>
<td>3-37 (2000P)</td>
<td>Not Applicable. Test 3-37 is required for nongating devices and not applicable for gating redirective terminals such as the SRT-350° system.</td>
<td></td>
</tr>
<tr>
<td>3-38 (2000P)</td>
<td>Not Applicable. Test 3-38 is required for nongating devices and not applicable for gating redirective terminals such as the SRT-350° system.</td>
<td></td>
</tr>
<tr>
<td>Test</td>
<td>Description</td>
<td>Result</td>
</tr>
<tr>
<td>-------</td>
<td>-------------</td>
<td>--------</td>
</tr>
<tr>
<td>3-39</td>
<td>PASS</td>
<td>PASS</td>
</tr>
<tr>
<td>3-40</td>
<td>Not Applicable</td>
<td>Not Applicable</td>
</tr>
<tr>
<td>S3-40</td>
<td>Not Applicable</td>
<td>Not Applicable</td>
</tr>
<tr>
<td>3-41</td>
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<td>Not Applicable</td>
</tr>
<tr>
<td>3-42</td>
<td>Not Applicable</td>
<td>Not Applicable</td>
</tr>
<tr>
<td>S3-42</td>
<td>Not Applicable</td>
<td>Not Applicable</td>
</tr>
<tr>
<td>3-43</td>
<td>Not Applicable</td>
<td>Not Applicable</td>
</tr>
<tr>
<td>3-44</td>
<td>Not Applicable</td>
<td>Not Applicable</td>
</tr>
</tbody>
</table>

Full Scale Crash Testing was done in compliance with NCHRP Report 350 by the following accredited crash test Laboratory. By signature below, the Laboratory agrees in support of this submission that all critical and relevant crash tests for the device listed above were conducted. (cite the laboratory's accreditation status as noted in the crash test reports.):

Testing Laboratory's signature concurs that these modifications are considered Non-Significant.

<table>
<thead>
<tr>
<th>Laboratory Name</th>
<th>Texas Transportation Institute</th>
</tr>
</thead>
<tbody>
<tr>
<td>Laboratory Signature</td>
<td>Bligh, Roger P</td>
</tr>
<tr>
<td>Address</td>
<td>Texas A&amp;M Transportation Institute Proving Ground, Roadside Safety &amp; Physical Security, 3135 TAMU 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>A2LA Certificate Number 2821.01 Expires: April 30, 2017</td>
</tr>
</tbody>
</table>

Submitter Signature: Bret Eckert
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>
<th>AASHTO TF13</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number</td>
<td>Date</td>
</tr>
<tr>
<td>Designator</td>
<td>Key Words</td>
</tr>
</tbody>
</table>

Archived
For Research and Historical Purposes Only
# Currently Accredited Organizations

Organizations meeting your criteria who have not yet been renewed, renewal process can be viewed here.

**“Comm Code” Definitions:**
- **C1** - Available for Commercial Services
- **C2** - Conditionally Available for Commercial Services
- **C3** - Not Normally Available for Commercial Services

**Type A** - 3rd party (commercially available)
**Type B** - 1st and 2nd party (not commercially available)
**Type C** - 1st and 2nd party, also offering commercially available inspections

Your query returned 1 records

<table>
<thead>
<tr>
<th>Certificate</th>
<th>Organization</th>
<th>Contact</th>
<th>City, State</th>
<th>Country</th>
<th>Phone 1</th>
<th>Phone 2</th>
<th>Comm Code</th>
<th>Field</th>
<th>Standard</th>
<th>Expiration</th>
</tr>
</thead>
<tbody>
<tr>
<td>989 01</td>
<td>E-TECH Testing Services</td>
<td>Paul Kruse</td>
<td>Rocklin, CA</td>
<td>United States</td>
<td>916 644</td>
<td>9102</td>
<td>C1</td>
<td>Mechanical</td>
<td>ISO/IEC 17025</td>
<td>2005</td>
</tr>
</tbody>
</table>
Mr. William P. Longstreet
Highway Engineer, Safety Design Team
Office of Safety Technologies, Rm E71-107
Federal Highway Administration
U.S. Department of Transportation
1200 New Jersey Avenue, SE
Washington, DC 20590

Re: SRT™ Disclosure of Financial Interest, FHWA Review for Eligibility Letter

Mr. Longstreet,

On behalf of Trinity Highway Products, LLC ("THP"), I am responding to your email requesting details of any financial interest that the crash test laboratory, that performed testing, has in the SRT™ End Terminal Family, manufactured by THP.

As noted in THP's request for eligibility for reimbursement under the Federal-aid highway program for this product, the SRT™ End Terminal system was previously deemed eligible by the FHWA pursuant to HNG-14/CC-31, HNG-14/CC-31A, HNG-14/CC-51, HMHS-CC51A, HSA-1/CC72, HSSD/CC-100, HSST/CC-100B, HSST/CC-100C, and HSSD/CC-101.

The SRT™ end terminal technology is the commercial embodiment of intellectual property that is protected by patents that are owned by the Texas A&M University System ("TAMUS"). TAMUS licenses the right to manufacture and sell that commercial embodiment that is commercially known as the SRT™ End Terminal system, to Trinity. THP sponsored certain crash tests of the SRT™ End Terminal system; such tests were conducted at the Texas Transportation Institute ("TTI") Proving Ground on a campus of Texas A&M University. TTI Proving Ground is an International Standards Organization ("ISO") 17025 accredited laboratory with American Association for Laboratory Accreditation (A2LA) Mechanical Testing certificate 2821.01.

TTI conducted full-scale crash testing of the SRT™ End Terminal system, in accordance with the National Cooperative Highway Research Program ("NCHRP") testing criteria, first set forth in the NCHRP Report 230 (198X); then Report 350 (1993); and, per the American Association of State Highway and Transportation Officials ("AASHTO") published testing criteria, as required in the Manual for Accessing Safety Hardware (2009) ("MASH").

The SRT™ End Terminal system was designed and developed by research engineers who are (or were employed) by Texas A&M University at its member, TTI.
The patent holders of record for the SRT™ End Terminal systems are Dean L. Sicking, Roger P. Bligh, King K. Mak, and Hayes E. Ross Jr. Sicking and Mak are no longer employed by Texas A&M and Ross has been retired from Texas A&M for many years. The associated United States Patent Office patent numbers (5,407,298; 5,503,495) are assigned to TAMUS. Additionally, as a modification of the SRT™ End Terminal system, the SRT™ End Terminal with Modified Ground Strut patents and financial interests are the same as the SRT™ End Terminal.

THP pays royalties to TAMUS for sales of the SRT™ End Terminal system pursuant to a patent license agreement. TAMUS also received a licensing fee from THP at the time of the license agreement execution.

In accordance with the patent license agreement applicable to this product, the specific details of the agreement are "confidential" and cannot be disclosed. If necessary, THP is willing to discuss confidential treatment of the content of this license agreement with the FHWA, in a manner that does not cause a breach of the license agreement.

Please advise if further information is required by the FHWA. We look forward to continuing to work with the FHWA in regard to the SRT™ End Terminal and other Roadside Safety Hardware.

Sincerely,

Bret Eckert, P.E.
Engineering Applications Manager
Trinity Highway

Office 916-644-9131
bret.eckert@trin.net
### General Information

<table>
<thead>
<tr>
<th>Test Agency</th>
<th>Texas Transportation Institute (TTI)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Test Standard Test No</td>
<td>MASH 3-31</td>
</tr>
<tr>
<td>TTI Test No</td>
<td>400001-SRT5</td>
</tr>
<tr>
<td>Date</td>
<td>October 21, 2010</td>
</tr>
</tbody>
</table>

#### Impact Conditions

<table>
<thead>
<tr>
<th>Speed (mph)</th>
<th>Angle (degrees)</th>
<th>Location/Orientation</th>
</tr>
</thead>
<tbody>
<tr>
<td>61.0</td>
<td>0.6</td>
<td>None</td>
</tr>
</tbody>
</table>

#### Impact Severity

<table>
<thead>
<tr>
<th>Impact Velocity</th>
<th>Longitudinal</th>
<th>Lateral</th>
</tr>
</thead>
<tbody>
<tr>
<td>18.0 ft/s</td>
<td>2.0 ft/s</td>
<td>2.0 ft/s</td>
</tr>
</tbody>
</table>

#### Occupant Risk Values

<table>
<thead>
<tr>
<th>Occupant Acceleration</th>
<th>Longitudinal</th>
<th>Lateral</th>
</tr>
</thead>
<tbody>
<tr>
<td>11.8 G</td>
<td>7.6 G</td>
<td>0.5 G</td>
</tr>
</tbody>
</table>

#### Speed

<table>
<thead>
<tr>
<th>Speed</th>
<th>Angle</th>
<th>Location/Orientation</th>
</tr>
</thead>
<tbody>
<tr>
<td>624 kip-ft (-3.5%)</td>
<td>72 degrees</td>
<td>None</td>
</tr>
</tbody>
</table>

#### Maximum Pitch Angle

<table>
<thead>
<tr>
<th>Maximum Pitch Angle</th>
<th>5 degrees</th>
</tr>
</thead>
</table>

#### Maximum Roll Angle

<table>
<thead>
<tr>
<th>Maximum Roll Angle</th>
<th>7 degrees</th>
</tr>
</thead>
</table>

#### Vehicle Snapping

<table>
<thead>
<tr>
<th>Vehicle Snapping</th>
<th>No</th>
</tr>
</thead>
</table>

#### Vehicle Pocketing

<table>
<thead>
<tr>
<th>Vehicle Pocketing</th>
<th>No</th>
</tr>
</thead>
</table>

#### Vehicle Damage

<table>
<thead>
<tr>
<th>Vehicle Damage Type/OEISign</th>
<th>2270P Late rat 76G VO5 12FC4</th>
</tr>
</thead>
<tbody>
<tr>
<td>Make and Model</td>
<td>2003 Dodge Ram 1500 Pickup Truck</td>
</tr>
<tr>
<td>Curb</td>
<td>4774 lb</td>
</tr>
<tr>
<td>Dummy</td>
<td>No dummy</td>
</tr>
<tr>
<td>Gross Static</td>
<td>5021 lb</td>
</tr>
</tbody>
</table>

#### Post-Impact Trajectory

<table>
<thead>
<tr>
<th>Stopping Distance</th>
<th>81.0 ft downstream</th>
</tr>
</thead>
</table>

#### Vehicle Stability

<table>
<thead>
<tr>
<th>Vehicle Stability</th>
<th>Maximum Yaw Angle</th>
<th>Maximum Pitch Angle</th>
<th>Maximum Roll Angle</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>72 degrees</td>
<td>5 degrees</td>
<td>7 degrees</td>
</tr>
</tbody>
</table>

#### Vehicle Deflections

<table>
<thead>
<tr>
<th>Vehicle Deflections</th>
<th>Dynamic</th>
<th>Permanent</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>13.3 ft</td>
<td>12.5 ft</td>
</tr>
</tbody>
</table>

#### Vehicle Width

<table>
<thead>
<tr>
<th>Vehicle Width</th>
<th>20.25 ft</th>
</tr>
</thead>
</table>

#### Dummy Information

<table>
<thead>
<tr>
<th>Dummy No</th>
<th>Longitudinal</th>
<th>Lateral</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 dummy</td>
<td>4.7 G</td>
<td>1.5 G</td>
</tr>
<tr>
<td></td>
<td>Vertical</td>
<td>-3.0 G</td>
</tr>
</tbody>
</table>

### Figure 5.7. Summary of results for MASH test 3-31 on the SRT-MASH.
Figure 5.7. Summary of results for MASH test 3-34 on SRT-MASH.
### General Information

**Test Agency**: Texas Transportation Institute (TTI)
**Test Standard Test No.**: MASH Test 3-30
**TTI Test No.**: 400001-SRT6
**Date**: October 29, 2010

### Impact Conditions

- **Speed**: 61.4 mph
- **Angle**: 12 degrees
- **Location/Direction**: Nose
- **Kinetic Energy**: 305 kip-ft (3.2%)
- **Maximum Yaw Angle**: 15 degrees
- **Maximum Pitch Angle**: 10 degrees
- **Maximum Roll Angle**: 45 degrees

### Test Article Exit Conditions

- **Maximum Pitch Angle**: 10 degrees
- **Maximum Roll Angle**: 45 degrees

### Vehicle Stability

- **Maximum Yaw Angle**: 151 degrees
- **Maximum Pitch Angle**: -10 degrees
- **Maximum Roll Angle**: 10 degrees
- **Vehicle Snagging**: No

### Test Vehicle

- **Make and Model**: 2005 Kia Rio
- **Curb Weight**: 2422 lb
- **Test Inertial Dummy**: 178 lb
- **Gross Static Weight**: 2601 lb

### Impact Velocity

- **Longitudinal**: 24.3 fps
- **Lateral**: 1.0 fps

### Rod/Beam Accelerations

- **Longitudinal**: 10.8 G
- **Lateral**: 8.5 G
- **Vertical**: 20.0 G

### Dummy

- **PHD**: 11.6 G
- **ASI**: 0.65
- **Max. 0.050-s Average**:
  - Longitudinal: -7.6 G
  - Lateral: -1.9 G
  - Vertical: -3.1 G

**Maximum Occupant Compartment Deformation**: 6.25 inches

**Test Article Deformations**

- **Dynamic**: 5.3 ft
- **Permanent**: 5.3 ft

**Vehicle Damage**

- **VDS**: 12RF06
- **CDC**: 12FRE4
- **Max. Exterior Deformation**: 12.0 inches
- **OCD**: RF1000100

**Post-Impact Trajectory**

- **Stopping Distance**: 43.75 ft downstream
- **26.3 ft two-lane side

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**Figure 5.7. Summary of results for MASH test 3-30 on the SRT-MASH.**
### General Information
- **Test Agency**: Texas Transportation Institute (TTI)
- **Test Standard Test No**: MASH Test 3-32
- **TTI Test No**: 400001-SRTB
- **Date**: January 21, 2011

### Test Article
- **Type**: Terminal SRT-MASH
- **Installation Length**: 131 ft-3 inches
- **Material or Key Elements**: Slotted rail, CRP post 1, SYTP, anchor bracket and cable
- **Soil Type and Condition**: Standard Soil, Dry

### Test Vehicle
- **Type/Designation**: 1100C
- **Make and Model**: 2005 Kia Rio
- **Curb**: 2365 lb
- **Test Inertial**: 2412 lb
- **Dummy**: 172 lb
- **Gross Static**: 2584 lb

### Impact Conditions
- **Speed**: 61.5 mph
- **Angle**: 5.8 degrees
- **Occupant Risk Values**:
  - Impact Velocity: 24.6 ft/s
  - Longitudinal: 5.2 G
  - Lateral: 3.3 G
- **Occupant Pocketing**: No

### Post-Impact Trajectory
- **Stop Distance**: 191 ft downstream
- **Vehicle Stability**:
  - Maximum Yaw Angle: -6 degrees
  - Maximum Pitch Angle: -14 degrees
  - Maximum Roll Angle: -32 degrees
- **Vehicle Snagging**: No
- **Vehicle Pocketing**: No
- **Test Article Deflections**:
  - Dynamic: 4.0 ft
  - Permanent: 4.0 ft
  - Working Width: 4.0 ft

### Vehicle Damage
- **SDF**: 12F06
- **CDC**: 12FDEW4
- **Max Exterior Deformation**: 7.0 inches
- **BCD**: 75000000
- **Max Occupant Compartment Deformation**: 0

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**Figure 5.7.** Summary of results for MASH test 3-32 on SRT-MASH.
### General Information
- **Test Agency**: Texas Transportation Institute (TTI)
- **TTI Test No**: 403374-SRT3
- **Date**: 2010-10-04

### Test Article
- **Type**: Terminal
- **Name**: SRT-MASH
- **Installation Length**: 137 ft-6 inches
- **Material or Key Elements**: Studded rail, CRP post 1, SYTP, anchor bracket and cable
- **Soil Type and Condition**: Standard Soil, Dry

### Test Vehicles
- **Type/Designation**: 2270P
- **Make and Model**: 2003 Dodge Ram 1500 Pickup
- **Curb**: 4712 lb
- **Test Inertial**: 4948 lb
- **Dummy**: No dummy
- **Gross Static**: 4948 lb

### Impact Conditions
- **Speed**: 62.4 mph
- **Location/Orientation**: Post 4
- **Impact Severity**: 3507 kip-ft (4.6%)
- **Exit Conditions**: Maximum Yaw Angle 43 degrees
- **Occupant Risk Values**: Maximum Pitch Angle 5 degrees
- **DVR Data**: No obtainable
- **Vehicle Snagging**: No
- **Test Article Deformations**: No
- **Impact Velocity**: 21.5 ft/s
- **Lateral**: 16.7 ft/s
- **Reduction Accelerations**: Longitudinal 5.5 ft/s²
- **Lateral**: 5.2 ft/s²
- **THVV**: 29.5 mph
- **PYD**: 9.4 ft
- **ASB**: 0.77
- **Max 0.050-s Average**: Longitudinal -6.7 G, Lateral 5.1 G, Vertical 1.6 G

### Post-Impact Trajectory
- **Stopping Distance**: 81.3 ft
- **Vehicle Stability**: Maximum Yaw Angle 43 degrees
- **Maximum Pitch Angle**: 5 degrees
- **Maximum Roll Angle**: 9 degrees
- **Vehicle Snagging**: No
- **Test Article Deformations**: No
- **Dynamic**: 38 ft
- **Working Width**: 40 ft
- **Vehicle Damage**: VDS 11LF05
- **CDC**: 11LF05
- **Max Exterior Deformation**: 16.0 inches
- **OCDI**: LF0000000
- **Max Occupant Compartment Deformation**: 1.5 inches

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**Figure 5.7. Summary of results for MASH test 3-35 on SRT-MASH.**