



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

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

January 10, 2018

In Reply Refer To:
HSST-1/ B-294

Michael van der Vlist
Laura Metaal Road Safety
Rimburgerweg 40, 647 XX Kerkrade
Netherlands

Dear Mr. van der Vlist:

This letter is in response to your August 23, 2017 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-294 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:

- SafeZone MASH TL-4 Limited Deflection

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 American Association of State Highway and Transportation Officials' Manual for Assessing Safety Hardware (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: SafeZone MASH TL-4 Limited Deflection
Type of system: Rigid/Semi-Rigid Barriers
Test Level: MASH Test Level 4
Testing conducted by: Crashtest-service.com GmbH
Date of request: August 24, 2017

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

This eligibility letter is issued for the subject device as tested. Modifications made to the device are not covered by this letter and will need to be tested in accordance with all recommended tests in AASHTO's MASH as part of a new and separate submittal.

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-294 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,



Michael Griffith
Director, Office of Safety Technologies
Office of Safety

Enclosures

Request for Federal Aid Reimbursement Eligibility of Highway Safety Hardware

| | | | |
|------------------|------------------|--|---|
| Submitter | Date of Request: | August 24, 2017 | <input checked="" type="radio"/> New <input type="radio"/> Resubmission |
| | Name: | Michael van der Vlist | |
| | Company: | Laura Metaal Road Safety | |
| | Address: | Rimburgerweg 40, 6471 XX Kerkrade | |
| | Country: | The Netherlands | |
| | 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 | SafeZone MASH TL-4 Limited Deflection | AASHTO MASH | TL4 |

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: | Michael van der Vlist | Same as Submitter <input checked="" type="checkbox"/> |
| Company Name: | Laura Metaal Road Safety | Same as Submitter <input checked="" type="checkbox"/> |
| Address: | Rimburgerweg 40, 6471 XX Kerkrade | Same as Submitter <input checked="" type="checkbox"/> |
| Country: | The Netherlands | 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.

With respect to Laura Metaal Road Safety, Crashtest-service.com GmbH does not hold any financial interests. Laura Metaal Road Safety contracted Crashtest-service.com GmbH for the services of crash testing our product SafeZone according to specifications of AASHTO Manual for Assessing Safety Hardware (MASH) Tests 3-10 and 3-11. Crashtest-service.com GmbH was compensated for the cost of the crash tests. No consulting relationship, research funding or other forms of research support, patents, copyrights, other intellectual property interests, licenses, contractual relationships, business ownership or investments interests are retained for Crashtest-service.com GmbH

PRODUCT DESCRIPTION

- New Hardware or Significant Modification
 Modification to Existing Hardware

SafeZone system is a proprietary modular high containment and low deflection steel barrier developed by Laura Metaal Road Safety. It is designed for both permanent and temporary use in construction and roadwork applications. The system is typically deployed in 5.8 m (19') standard sections that can quickly be connected together to form the desired total length of barrier wall.

Joining of the sections is done by linking them together and applying one security bolt per section to keep the sections securely fastened. If desired, two or three sections can remain connected permanently to form 11.6 m (38') or 17.4 m (54') combined sections for quicker placement on the road.

SafeZone is 0.81 m (32") high and 0.45 m (18") wide without anchor units or 0.64 m (25") with anchor units. The weight is approximately 93 kg/m or 62lbs/ft. For the MASH TL-4 Limited Deflection setup, 7 standard sections were lined up on asphalt, forming a 40.6 m (133 ft) string. The anchor positions used were the two outer positions, the second position on element one and the second position on every second element thereafter. Threaded rods 0.30 m (11.8") long and 0.030 m (1.18") diameter were used. All anchors were epoxied in asphalt. The dynamic deflection of the MASH TL4-12 test was 0.42 m (16.5") and the permanent deflection was 0.30 m (11.8"). The dynamic working width was 0.87 m (34.3") and the permanent working width was 0.69 m (27.2"). However, because the MASH TL4-11 test showed a higher dynamic deflection of 0.64 m (25.2") and higher dynamic working width of 0.95 m (37.4"), these higher values should be used for road design purposes at MASH TL-4 level as well as at MASH TL-3 level.

The used MASH TL4-10 and MASH TL4-11 tests reports are identical to the MASH TL3-10 and MASH TL3-11 reports, but renumbered with MASH TL-4 numbering of the tests in order to avoid confusion for the MASH TL4 application.

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: | Peter Schimmelpfennig | |
| Engineer Signature: | Peter Schimmelpfennig | Digital unterschrieben von Peter Schimmelpfennig Datum: 2017.11.10 16:09:05 +01'00' |
| Address: | Amelunxenstraße 30, 48167 Münster | Same as Submitter <input type="checkbox"/> |
| Country: | Germany | Same as Submitter <input type="checkbox"/> |

A brief description of each crash test and its result:

| Required Test Number | Narrative Description | Evaluation Results |
|----------------------|---|----------------------------------|
| 4-10 (1100C) | <p>Test nr. 18648. Test report nr. 11775-2887/18648 performed 20 April 2017 by Crashtest-Service.com. Test number and test report number are identical with the 3-10 test and report. Only change is using test title 4-10 instead of 3-10. This is done to make applications for test levels consistent.</p> <p>The 32" high longitudinal barrier contained and redirected the 1100C vehicle. The vehicle did not penetrate, underride or override the installation. Maximum dynamic deflection during the test was 13.8". No significant parts separated from either vehicle or barrier. No occupant compartment deformation or intrusion occurred. The vehicle remained upright during and after the impact.</p> | PASS |
| 4-11 (2270P) | <p>Test nr. 18664. Test report nr. 11775-2887/18664 performed 19 April 2017 by Crashtest-service.com. Test number and test report number are identical with the 3-11 test and report. Only change is using test title 4-11 instead of 3-11. This is done to make applications for test levels consistent.</p> <p>The 32" high longitudinal barrier contained and redirected the 2270P vehicle. The vehicle did not penetrate, underride or override the installation. Maximum dynamic deflection during the test was 25.2". No significant parts separated from either vehicle or barrier. No occupant compartment deformation or intrusion occurred. The vehicle remained upright during and after the impact.</p> | PASS |
| 4-12 (10000S) | <p>Test nr. 18651. Test report nr. 11775-2877/18651 performed 08 May 2017 by Crashtest-service.com. The 32" high longitudinal barrier contained and redirected the 10000S vehicle. The vehicle did not penetrate, underride or override the installation. Maximum dynamic deflection during the test was 16.5". No significant parts separated from either vehicle or barrier during impact. The vehicle fell over to the left during impact. For reasons of availability, an SUT without box was used. Chances of the truck with box top remaining upright during and after impact would have been better because the box would have rested on the barrier and is likely to have held the SUT more upright.</p> | PASS |
| 4-20 (1100C) | Device is stand alone. 4-20 now not relevant | Non-Relevant Test, not conducted |
| 4-21 (2270P) | Device is stand alone. 4-21 now not relevant | Non-Relevant Test, not conducted |

| Required Test Number | Narrative Description | Evaluation Results |
|----------------------|--|----------------------------------|
| 4-22 (10000S) | Device is stand alone. 4-22 now not relevant | 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: | Crashtest-service.com GmbH | |
| Laboratory Signature: | Peter Schimmelpfennig | Digital unterschrieben von Peter Schimmelpfennig Datum: 2017.11.10 16:09:19 +01'00' |
| Address: | Amelunxenstraße 30, 48167 Münster | Same as Submitter <input type="checkbox"/> |
| Country: | Germany | Same as Submitter <input type="checkbox"/> |
| Accreditation Certificate Number and Dates of current Accreditation period : | D-PL-17359-01-00 07.05.2013 - 06.05.2018 | |

Submitter Signature*: Michael van der Vlist
Digitaal ondertekend door Michael van der Vlist
Datum: 2017.09.11 08:51:37 +02'00'

Submit Form

ATTACHMENTS

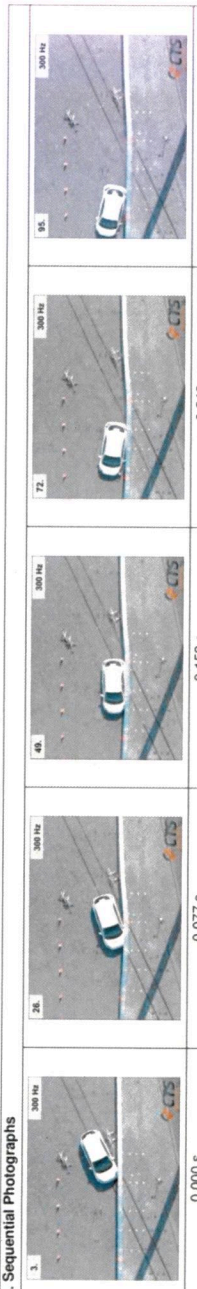
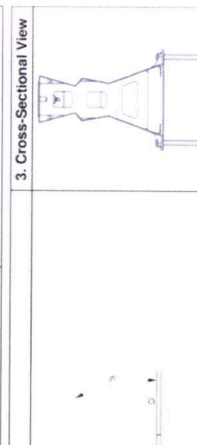
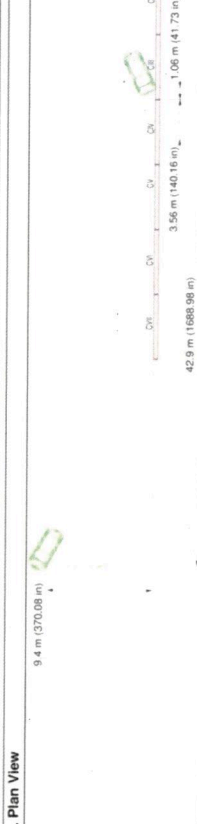
Attach to this form:

- 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.





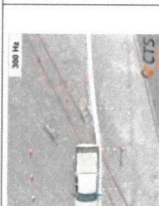

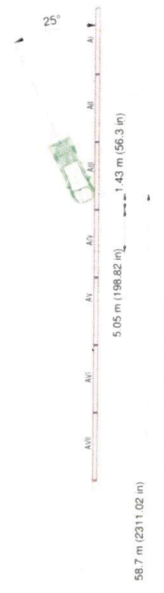
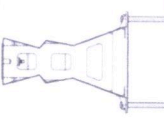
FHWA Official Business Only:

| Eligibility Letter | | |
|--------------------|------|-----------|
| Number | Date | Key Words |
| | | |

Summary of Crash Test Results

| | | | | | | | | | |
|--|--|--|--|--|--|--|--|--|--|
| 1. Sequential Photographs  | | | | | 3. Cross-Sectional View  | | | | |
| 2. Plan View  | | | | | | | | | |
| 4. General Information Test Agency: crashtest-service.com GmbH (CTS) Test Standard: MASH Test TL4-10 CTS-Test No.: 18648 Date: April 20, 2017 5. Test Article Type: Barrier Name: SafeZone Installation Length: 40.62 m (133.27 ft) Key Elements - Barrier: Length: 5.80 m (18.99 ft), Base Width: 0.45 m (1.48 ft), Height: 0.81 m (2.66 ft) | | | | | 8. Impact Conditions Speed: 102.1 km/h (63.4 mph) Angle: 25 degrees Location/Orientation: m (41.7 in) before transition of elements III & IV 9. Exit Conditions Speed: 84 km/h (52 mph) Angle: 12 degrees 10. Post-Impact Trajectory Vehicle Stability: Satisfactory Stopping Distance: 42.90 m (140.73 in) downstream, 9.40 m (30.84 in) laterally in front Vehicle Snagging: None Vehicle Pocketing: None 11. Occupant Risk Impact Velocity: Longitudinal 4.72 m/s (15.49 ft/s), Lateral 7.22 m/s (23.69 ft/s) Ridedown Accelerations (10 msec avg.): Longitudinal -5.37 g, Lateral -14.73 g | | | | |
| 6. Soil Type and Condition Type of Soil: Asphalt Soil strength: / Condition: sunny, dry, 15.2° C (59.36° F) 7. Test Vehicle Type/Designation: 1100C Make and Model: 2014 KIA Rio Curb Weight: 1140 kg (2513 lb) Test Inertial: 1123 kg (2476 lb) Dummy: 75 kg (165 lb) Gross Static: 1198 kg (2641 lb) | | | | | 12. Test Article Damage Classification: Moderate Particularities: None 13. Test Article Deflections Dynamic Deflection: 0.35 m (13.8 in) Permanent Deflection: 0.24 m (9.4 in) Dynamic Working Width: 0.89 m (35.0 in) Permanent Working Width: 0.68 m (26.8 in) 14. Vehicle Damage Classification: Moderate VDS: 11LFO3 CDC: 11FDEW3 Max. Exterior Deformation: 74 mm (2.91 in) Max. Interior Deformation: 68 mm (2.68 in) OCDI: LF0000011 | | | | |
| THIV PHD: 18.33 g ASI: 1.3 Classification: Moderate Particularities: None | | | | | m/s (30 ft/s): 9 g: 18.33 m (13.8 in): 0.35 m (9.4 in): 0.24 m (35.0 in): 0.89 m (26.8 in): 0.68 Moderate 11LFO3 11FDEW3 74 mm (2.91 in) 68 mm (2.68 in) LF0000011 | | | | |

Summary of Crash Test Results

| 1. Sequential Photographs | | 3. Cross-Sectional View | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|--|---|---|---------|-------------------|----------------------------|-----------------|-------------------|-------------------------------------|---|---------------------------|------------------|------------------------|------------------|-----------------------|------------------|-----------------------------------|------------------|---------------------------|---------------------|------------------------|---|-----------------------------------|----------------------------------|------------------|---------|---------------------------|------------------|---------------------------|------------------------------|------------------------|-----------|------------------|-----------------------|----------------|----------------------------|---------------------------------------|-------------------|---------------|-------------------|---------|------------|--------------|-------------------|
|  | 0.000 s |  | 0.330 s | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|  | 0.110 s |  | 0.220 s | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|  | 0.220 s |  | 0.440 s | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| <p>2. Plan View</p>  | |  | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| <p>4. General Information</p> <table border="1"> <tr><td>Test Agency (CTS)</td><td>crashtest-service.com GmbH</td></tr> <tr><td>Test Standard</td><td>MASH Test TL 4-11</td></tr> <tr><td>CTS-Test No.</td><td>18664</td></tr> <tr><td>Date</td><td>April 19, 2017</td></tr> <tr><td colspan="2">5. Test Article</td></tr> <tr><td>Type</td><td>Barrier</td></tr> <tr><td>Name</td><td>SafetyZone</td></tr> <tr><td>Installation Length</td><td>40.62 m (1599.2 in)</td></tr> <tr><td>Key Elements - Barrier</td><td>Length: 5.80 m (228.3 in) Base Width: 0.45 m (17.7 in) Height: 0.81 m (31.9 in)</td></tr> <tr><td colspan="2">6. Soil Type and Condition</td></tr> <tr><td>Type of Soil</td><td>Asphalt</td></tr> <tr><td>Soil strength</td><td>/</td></tr> <tr><td>Condition</td><td>Dry, cloudy, 12° C (53.3° F)</td></tr> <tr><td colspan="2">7. Test Vehicle</td></tr> <tr><td>Type/Designation</td><td>2270P</td></tr> <tr><td>Make and Model</td><td>2012 Dodge Ram 1500 Pickup</td></tr> <tr><td>Curb</td><td>2226 kg (4907 lb)</td></tr> <tr><td>Test Inertial</td><td>2264 kg (4991 lb)</td></tr> <tr><td>Dummy</td><td>/ kg (lb)</td></tr> <tr><td>Gross Static</td><td>2264 kg (4991 lb)</td></tr> </table> | | | | Test Agency (CTS) | crashtest-service.com GmbH | Test Standard | MASH Test TL 4-11 | CTS-Test No. | 18664 | Date | April 19, 2017 | 5. Test Article | | Type | Barrier | Name | SafetyZone | Installation Length | 40.62 m (1599.2 in) | Key Elements - Barrier | Length: 5.80 m (228.3 in) Base Width: 0.45 m (17.7 in) Height: 0.81 m (31.9 in) | 6. Soil Type and Condition | | Type of Soil | Asphalt | Soil strength | / | Condition | Dry, cloudy, 12° C (53.3° F) | 7. Test Vehicle | | Type/Designation | 2270P | Make and Model | 2012 Dodge Ram 1500 Pickup | Curb | 2226 kg (4907 lb) | Test Inertial | 2264 kg (4991 lb) | Dummy | / kg (lb) | Gross Static | 2264 kg (4991 lb) |
| Test Agency (CTS) | crashtest-service.com GmbH | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Test Standard | MASH Test TL 4-11 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| CTS-Test No. | 18664 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Date | April 19, 2017 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 5. Test Article | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Type | Barrier | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Name | SafetyZone | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Installation Length | 40.62 m (1599.2 in) | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Key Elements - Barrier | Length: 5.80 m (228.3 in) Base Width: 0.45 m (17.7 in) Height: 0.81 m (31.9 in) | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 6. Soil Type and Condition | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Type of Soil | Asphalt | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Soil strength | / | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Condition | Dry, cloudy, 12° C (53.3° F) | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 7. Test Vehicle | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Type/Designation | 2270P | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Make and Model | 2012 Dodge Ram 1500 Pickup | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Curb | 2226 kg (4907 lb) | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Test Inertial | 2264 kg (4991 lb) | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Dummy | / kg (lb) | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Gross Static | 2264 kg (4991 lb) | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| <p>8. Impact Conditions</p> <table border="1"> <tr><td>Speed</td><td>104.3 km/h (64.8 mph)</td></tr> <tr><td>Angle</td><td>25 degrees</td></tr> <tr><td>Location/Orientation</td><td>1.43 m (56.3 in) before transition of elements III & IV</td></tr> <tr><td colspan="2">9. Exit Conditions</td></tr> <tr><td>Speed</td><td>84 km/h (52 mph)</td></tr> <tr><td>Angle</td><td>6 degrees</td></tr> <tr><td colspan="2">10. Post-Impact Trajectory</td></tr> <tr><td>Vehicle Stability</td><td>Satisfactory</td></tr> <tr><td>Stopping Distance</td><td>58.7 m (2311 in) downstream</td></tr> <tr><td></td><td>1.8 m (71 in) laterally in front</td></tr> <tr><td>Vehicle Snagging</td><td>None</td></tr> <tr><td>Vehicle Picketing</td><td>None</td></tr> <tr><td colspan="2">11. Occupant Risk</td></tr> <tr><td>Impact Velocity</td><td></td></tr> <tr><td>Longitudinal</td><td>4.64 m/s (15.22 ft/s)</td></tr> <tr><td>Lateral</td><td>6.32 m/s (20.74 ft/s)</td></tr> <tr><td>Ridedown Accelerations (10 msec avg.)</td><td></td></tr> <tr><td>Longitudinal</td><td>-4.94 g</td></tr> <tr><td>Lateral</td><td>-9.01 g</td></tr> </table> | | | | Speed | 104.3 km/h (64.8 mph) | Angle | 25 degrees | Location/Orientation | 1.43 m (56.3 in) before transition of elements III & IV | 9. Exit Conditions | | Speed | 84 km/h (52 mph) | Angle | 6 degrees | 10. Post-Impact Trajectory | | Vehicle Stability | Satisfactory | Stopping Distance | 58.7 m (2311 in) downstream | | 1.8 m (71 in) laterally in front | Vehicle Snagging | None | Vehicle Picketing | None | 11. Occupant Risk | | Impact Velocity | | Longitudinal | 4.64 m/s (15.22 ft/s) | Lateral | 6.32 m/s (20.74 ft/s) | Ridedown Accelerations (10 msec avg.) | | Longitudinal | -4.94 g | Lateral | -9.01 g | | |
| Speed | 104.3 km/h (64.8 mph) | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Angle | 25 degrees | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Location/Orientation | 1.43 m (56.3 in) before transition of elements III & IV | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 9. Exit Conditions | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Speed | 84 km/h (52 mph) | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Angle | 6 degrees | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 10. Post-Impact Trajectory | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Vehicle Stability | Satisfactory | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Stopping Distance | 58.7 m (2311 in) downstream | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | 1.8 m (71 in) laterally in front | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Vehicle Snagging | None | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Vehicle Picketing | None | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 11. Occupant Risk | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Impact Velocity | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Longitudinal | 4.64 m/s (15.22 ft/s) | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Lateral | 6.32 m/s (20.74 ft/s) | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Ridedown Accelerations (10 msec avg.) | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Longitudinal | -4.94 g | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Lateral | -9.01 g | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| <p>12. Test Article Damage</p> <table border="1"> <tr><td>Classification</td><td>Moderate</td></tr> <tr><td>particularities</td><td>None</td></tr> <tr><td colspan="2">13. Test Article Deflections</td></tr> <tr><td>Dynamic Deflection</td><td>0.64 m (25.2 in)</td></tr> <tr><td>Permanent Deflection</td><td>0.23 m (9.1 in)</td></tr> <tr><td>Dynamic Working Width</td><td>0.95 m (37.4 in)</td></tr> <tr><td>Permanent Working Width</td><td>0.66 m (26.0 in)</td></tr> <tr><td colspan="2">14. Vehicle Damage</td></tr> <tr><td>Classification</td><td>Moderate</td></tr> <tr><td>VDS</td><td>11-LFO-4</td></tr> <tr><td>CDC</td><td>11FDEW3</td></tr> <tr><td>Max. Exterior Deformation</td><td>182 mm (7.17 in)</td></tr> <tr><td>Max. Interior Deformation</td><td>37 mm (1.47 in)</td></tr> <tr><td>OCDI</td><td>LF0000000</td></tr> </table> | | | | Classification | Moderate | particularities | None | 13. Test Article Deflections | | Dynamic Deflection | 0.64 m (25.2 in) | Permanent Deflection | 0.23 m (9.1 in) | Dynamic Working Width | 0.95 m (37.4 in) | Permanent Working Width | 0.66 m (26.0 in) | 14. Vehicle Damage | | Classification | Moderate | VDS | 11-LFO-4 | CDC | 11FDEW3 | Max. Exterior Deformation | 182 mm (7.17 in) | Max. Interior Deformation | 37 mm (1.47 in) | OCDI | LF0000000 | | | | | | | | | | | | |
| Classification | Moderate | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| particularities | None | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 13. Test Article Deflections | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Dynamic Deflection | 0.64 m (25.2 in) | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Permanent Deflection | 0.23 m (9.1 in) | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Dynamic Working Width | 0.95 m (37.4 in) | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Permanent Working Width | 0.66 m (26.0 in) | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 14. Vehicle Damage | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Classification | Moderate | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| VDS | 11-LFO-4 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| CDC | 11FDEW3 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Max. Exterior Deformation | 182 mm (7.17 in) | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Max. Interior Deformation | 37 mm (1.47 in) | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| OCDI | LF0000000 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| <p>THIV</p> <table border="1"> <tr><td>THIV</td><td>8 m/s (27 ft/s)</td></tr> <tr><td>PHD</td><td>11.4 g</td></tr> <tr><td>ASI</td><td>0.95</td></tr> </table> | | | | THIV | 8 m/s (27 ft/s) | PHD | 11.4 g | ASI | 0.95 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| THIV | 8 m/s (27 ft/s) | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| PHD | 11.4 g | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| ASI | 0.95 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

Summary of Crash Test Results

| 1. Sequential Photographs | | 2. Plan View | | 3. Cross-Sectional View | |
|---|---------|---|---------|---|---------|
|  | 0.000 s |  | 0.257 s |  | 0.513 s |
|  | 0.770 s |  | 1.033 s |  | |
|  <p>22.8 m (75.14 ft)</p> <p>35.2 m (115.78 ft)</p> <p>1.32 m (4.33 ft)</p> | | | | | |

| 4. General Information | | 8. Impact Conditions | |
|----------------------------|---|---------------------------------------|---|
| Test Agency | crashtest-service.com GmbH (CTS) | Speed | 88.8 km/h (55.2 mph) |
| Test Standard | MASH Test TL4-12 | Angle | 15 degrees |
| CTS-Test No | 18650 | Location/Orientation | 1.32 m (52.0 in) before transition of elements V & VI |
| Date | May 3, 2017 | 9. Exit Conditions | |
| 5. Test Article | | Speed | 76.9 km/h (48 mph) |
| Type | Barrier | Angle | not obtainable |
| Name | SafeZone | 10. Post-Impact Trajectory | |
| Installation Length | 69.63 m (228.3 in) | Vehicle Stability | Satisfactory |
| Key Elements - Barrier | Length: 5.80 m (228.3 in) Base Width: 0.45 m (17.7 in) Height: 0.81 m (31.9 in) | Stopping Distance | 72.8 m (2866 in) downstream laterally behind |
| 6. Soil Type and Condition | | Vehicle Snagging | None |
| Type of Soil | Asphalt | Vehicle Pooketing | None |
| Soil strength | / | 11. Occupant Risk | |
| Condition | cloudy, dry, 21.8° C (71.24° F) | Impact Velocity | |
| 7. Test Vehicle | | Longitudinal | N/A |
| Type/Designation | 1000S | Lateral | N/A |
| Make and Model | 2005 Freightliner M2 | Ride-down Accelerations (10 msec avg) | |
| Curb | 6005 kg (13239 lb) | Longitudinal | N/A |
| Test Inertial | 10096 kg (22258 lb) | Lateral | N/A |
| Dummy | / | | |
| Gross Static | 10096 kg (22258 lb) | | |

| 12. Test Article Damage | | 13. Test Article Deflections | | 14. Vehicle Damage | |
|------------------------------|------------------|------------------------------|------------------|---------------------------|----------|
| Classification | Moderate | Dynamic Deflection | 2.07 m (81.5 in) | Classification | Moderate |
| Particularities | None | Permanent Deflection | 1.81 m (71.3 in) | VDS | 11-LFQ-1 |
| 12. Test Article Damage | | Dynamic Working Width | 2.48 m (89.6 in) | CDC | 11FYEN1 |
| Classification | | Permanent Working Width | 2.25 m (88.6 in) | Max. Exterior Deformation | N/A |
| Particularities | | 14. Vehicle Damage | | Max. Interior Deformation | N/A |
| None | | Classification | | OCDI | N/A |
| 13. Test Article Deflections | | VDS | | | |
| Dynamic Deflection | 2.07 m (81.5 in) | CDC | | | |
| Permanent Deflection | 1.81 m (71.3 in) | Max. Exterior Deformation | | | |
| Dynamic Working Width | 2.48 m (89.6 in) | Max. Interior Deformation | | | |
| Permanent Working Width | 2.25 m (88.6 in) | OCDI | | | |

