



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

May 12, 2021

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

In Reply Refer To:
HSST-1/ CC-166

Mr. Roberto Impero
Industry AMS srl
Via Dante Giacosa
Marcianise (CE), 81025
Italy

Dear Mr. Impero:

This letter is in response to your February 24, 2021 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 CC-166 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:

- Ermes End Terminal

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: Ermes End Terminal
Type of system: Crash Cushion
Test Level: MASH Test Level 3 (TL3)
Testing conducted by: CSI SpA
Date of request: February 24, 2021

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 CC-166 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

| | | | |
|------------------|-------------------------|--|---|
| Submitter | Date of Request: | February 24, 2021 | <input checked="" type="radio"/> New <input type="radio"/> Resubmission |
| | Name: | Roberto Impero | |
| | Company: | Industry AMS srl | |
| | Address: | Via Dante Giacosa, Marcianise (CE), 81025 | |
| | Country: | Italy | |
| | 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.

| System Type | Submission Type | Device Name / Variant | Testing Criterion | Test Level |
|--|---|-----------------------|-------------------|------------|
| 'CC': Crash Cushions, Attenuators, & Terminals | <input checked="" type="radio"/> Physical Crash Testing <input type="radio"/> Engineering Analysis | Ermes End Terminal | 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.

Identification of the individual or organization responsible for the product:

| | | |
|---|---|---|
| Contact Name: | Roberto Impero | Same as Submitter <input checked="" type="checkbox"/> |
| Company Name: | Industry AMS srl | Same as Submitter <input checked="" type="checkbox"/> |
| Address: | Via Dante Giacosa, Marcianise (CE), 81025 | Same as Submitter <input checked="" type="checkbox"/> |
| Country: | Italy | 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. | | |
| Subject: Disclosure of financial interest CSI Spa, is an independent research and testing laboratory having no affiliation with any other entity. The principals and staff of CSI Spa have no past or present financial, contractual or organizational interest in any company or entity directly or indirectly related to the products that CSI Spa tests. | | |


 Industry AMS srl
 Via Dante Giacosa, Marcianise (CE), 81025
 Tel. 0823.821500 - Fax 0823.821510
 Partita IVA 08237060812

PRODUCT DESCRIPTION

| | |
|---|---|
| <input checked="" type="radio"/> New Hardware or Significant Modification | <input type="radio"/> Modification to Existing Hardware |
| Product Description Ermes End Terminal is a fully-redirective, non-gating End Terminal tested according to MASH-16 criteria. It has a frontal trolley unit that allows a controlled deformation, a collapsible beam made up of a 10 modules that crush in a frontal impact to absorb energy and stop the vehicle in a controlled manner, and side steel tubular for side impact. The unit is a 19.4 feet (5.92m) long, 11.41 inches (0.29) wide and 350 inches (0.817m) high. | |

CRASH TESTING

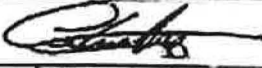
A brief description of each crash test and its result:

| Required Test Number | Narrative Description | Evaluation Results |
|----------------------|---|--------------------|
| 3-30 (1100C) | Complete test report 0004\ME\HRB\21 - CSI Spa. Test 3-30 involves a 1100C passenger car impacting the end terminal at a nominal impact speed of 100 km/h (62.2 mph) and an impact at 0 degrees with the quarter point of the vehicle aligned with the center line of the Ermes End Terminal. This test is preliminary intended to evaluate occupant risk and vehicle trajectory criteria. For this test a Kia Rio impacted the Ermes End Terminal at an angle of 0 degrees. Upon impact the vehicle forced the trolley rearward and began to collapse the beam modules. The End Terminal brought the vehicle to a controlled stop. The test vehicle sustained damage to its front end. The occupant compartment was not penetrated and the deformation was within allowable limits. The maximum roll and pitch angles did not exceed 75 deg. and the occupant risk values were within limits of the MASH specification for OIV and ORA. Ermes End Terminal passed all evaluation criteria for test 3-30. | PASS |
| 3-31 (2270P) | Complete test report 0081_ME_HRB_18 - CSI Spa. Test 3-31 involves a 2270P pick up truck impacting the End Terminal at a nominal impact speed of 100m/h (62.2 mph) and a impact at 0 degrees with the center line of the End Terminal. This test is preliminary intended to evaluate the capacity of the End Terminal to stop the vehicle in a safe and controlled manner. For this test, a Dodge Ram 1500 impacted the Ermes End Terminal at an angle of 0 degrees. Upon the impact the vehicle forced the Ermes trolley rearward and began to collapse the beam module. The End Terminal brought the vehicle to a controlled stop. The test vehicle sustained damage to its front end. The occupant compartment was not penetrated and the deformation was within allowable limits. The maximum roll and pitch angles did not exceed 75deg. and the occupant risk values were within limits for MASH specifications for OIV and ORA. Ermes End Terminal passed all evaluation criteria for test TL 3.31 | PASS |

| Required Test Number | Narrative Description | Evaluation Results |
|----------------------|--|--------------------|
| 3-32 (1100C) | <p>Complete test report 0001\ME\HRB\21 - CSI Spa. Test 3-32 involves a 1100C passenger car impacting the end terminal at a nominal impact speed of 100 km/h(62.2 mph) and an impact at 15 degrees with the center line of the Hermes End Terminal. This test is preliminary intended to evaluate occupant risk and vehicle trajectory criteria. For this test a Kia Rio impacted the Hermes End Terminal at an angle of 15 degrees. Upon impact the vehicle forced the trolley rearward and began to collapse the beam modules. The End Terminal brought the vehicle to a controlled stop. The test vehicle sustained damage to its front end. The occupant compartment was not penetrated and the deformation was within allowable limits. The maximum roll and pitch angles did not exceed 75 deg. and the occupant risk values were within limits of the MASH specification for OIV and ORA. Hermes End Terminal passed all evaluation criteria for test 3-32.</p> | PASS |
| 3-33 (2270P) | <p>Complete test report 0097\ME\HRB\18 - CSI Spa. Test TL 3-33 involves a 2270 pick up truck impacting the End Terminal at a nominal impact speed of 100 km/h (62.2 mph) and an impact at 15 degrees with the centerline of the vehicle aligned with the center line of the End Terminal. This test is preliminary intended to evaluate occupant risk and vehicle trajectory and the capacity of the end terminal to stop the vehicle in a controlled manner for an oblique impact. For this test a Dodge Ram 1500 impacted Hermes End Terminal. Upon impact the vehicle forced the Hermes trolley rearward and began to collapse the beam modules. The end terminal brought the vehicle to a controlled stop. The test vehicle sustained damage to its front end. The occupant compartment was not penetrated and the deformation was within allowable limits. The maximum pitch and roll angles did not exceed 75deg. and the occupant risk values were within limits for MASH specification for OIV and ORA. Hermes end Terminal passed all evaluation criteria for test 3-33.</p> | PASS |
| 3-34 (1100C) | <p>Complete test report 0003\ME\HRB\21 - CSI Spa. Test 3-34 involves a 1100C passenger car impacting the end terminal at a nominal impact speed of 100km/h (62.2 mph) and an impact at 15 degrees with the CIP at the point where the end terminal behavior changes from capturing to redirective. For this test a Kia Rio impacted the Hermes End Terminal at an angle of 15 deg. The impact point was downstream the trolley. Upon the impact the vehicle was smoothly redirected. The test vehicle sustained damage to its right front corner, doors and rear quarter panel. The occupant compartment was within allowable limits. The maximum roll and pitch angles did not exceed 75deg. and the occupant risk values were within allowable limits for MASH specification for OIV and ORA. Hermes End Terminal passed all evaluation criteria for test 3-34.</p> | PASS |

| | | |
|--------------|---|-----------------------------|
| 3-35 (2270P) | <p>Complete test report 0126\ME\HRB\18 - CSI Spa. Test 3-35 involves a 2270P pick up impacting the Ermes End Terminal at a nominal impact speed at 100km/h (62.2mph) and a 25degrees with the CIP at the point where the End Terminal behavior changes from capturing to redirective. This test is preliminary intended to evaluate the capacity for the end terminal for redirection/containment of heavy vehicles. For this test a Chevrolet Silverado impacted Ermes End Terminal at an angle of 25 degrees. The impact point was located downstream the trolley and very close to the nose. Upon the impact the vehicle was smoothly redirected. The test vehicle sustained damage to its left front corner, doors and rear quarter panel. The occupant compartment was within allowable limits. The maximum roll and pitch angles did not exceed 75deg. and the occupant risk values were within limits for MASH specification for OIV and ORA. Ermes end terminal passed all evaluation criteria for test 3-35. In order to evaluate the behavior of the transition between end terminal end rear barrier, was also performed a test described in 0098\ME\HRB\18. In this test a Chevrolet Silverado impact the End Terminal at the point where the center line of the pick up intersect the center line of the backup structure of the terminal. In this point is located the transition piece between end terminal end barrier. During the test was intalled a MASH tested barrier.</p> | PASS |
| 3-36 (2270P) | Ermes End Terminal is not attached to a rigid barrier. | Non-Critical, not conducted |
| 3-37 (2270P) | Ermes End Terminal is not installed in reverse impact condition. | Non-Critical, not conducted |
| 3-38 (1500A) | Numerical Simulation was performed on Ermes End Terminal | Non-Critical, not conducted |
| 3-40 (1100C) | Test for non-redirective end terminal, NOT APPLICABLE | Non-Critical, not conducted |
| 3-41 (2270P) | Test for non-redirective end terminal, NOT APPLICABLE | Non-Critical, not conducted |
| 3-42 (1100C) | Test for non-redirective end terminal, NOT APPLICABLE | Non-Critical, not conducted |
| 3-43 (2270P) | Test for non-redirective end terminal, NOT APPLICABLE | Non-Critical, not conducted |
| 3-44 (2270P) | Test for non-redirective end terminal, NOT APPLICABLE | Non-Critical, not conducted |
| 3-45 (1500A) | Test for non-redirective end terminal, NOT APPLICABLE | Non-Critical, 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: | CSI SPA | |
| Laboratory Signature: |  | |
| Address: | Viale Lombardia 20 - Bollate - MI | Same as Submitter <input type="checkbox"/> |
| Country: | Italy | Same as Submitter <input type="checkbox"/> |
| Accreditation Certificate Number and Dates of current Accreditation period : | Accredia 0006 rev.05 Expiring Date: 08-03-24 | |



Submitter Signature*:

Submit Form

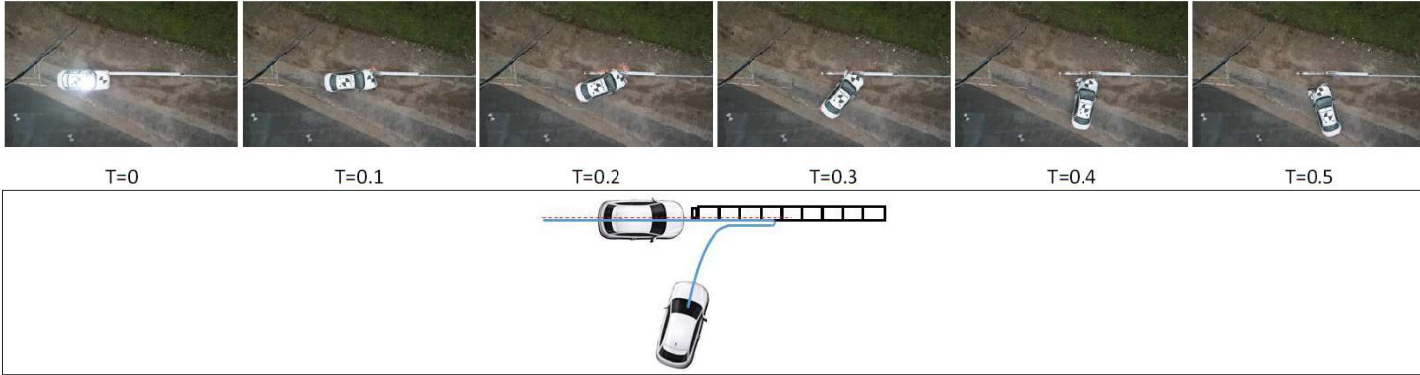
ATTACHMENTS

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 | | AASHTO TF13 | |
|--------------------|------|-------------|-----------|
| Number | Date | Designator | Key Words |
| | | | |



General Information

| | |
|---|-----------------------|
| Test agency..... | CSI S.p.A. |
| Test No. | 0004/ME/HRB/21 |
| Date..... | 20/01/2021 |
| Test Article | |
| Type..... | ERMES |
| Installation length [m]..... | 5.688 |
| Size and/or dimension and material of key Elements..... | See attached drawings |
| Foundation type and condition..... | Compacted SOIL |

Test Vehicle

| | |
|------------------------|---------|
| Type/ Designation..... | 1100C |
| Model..... | Kia Rio |
| Mass [kg] | |
| Curb..... | 1007.8 |
| Test Inertial..... | 1081.8 |
| Gross static..... | 1157.4 |

Impact Conditions

| | |
|---------------------------|-------------------------|
| Speed [km/h]..... | 98.2 |
| Angle [deg]..... | 0.0 |
| Impact Severity [kJ]..... | 430.6 |
| Impact Location..... | Frontal, offset W/4, 0° |
| Exit Speed [km/h]..... | < 10 |
| Exit Angle [deg]..... | N/A |

Post-impact Trajectory

| | |
|------------------------|--------------|
| Vehicle Stability..... | Satisfactory |
| Stopping Distance..... | 3 m upstream |
| | 5 m lateral |
| Vehicle snagging..... | None |
| Vehicle pocketing..... | None |

Occupant Risk Values

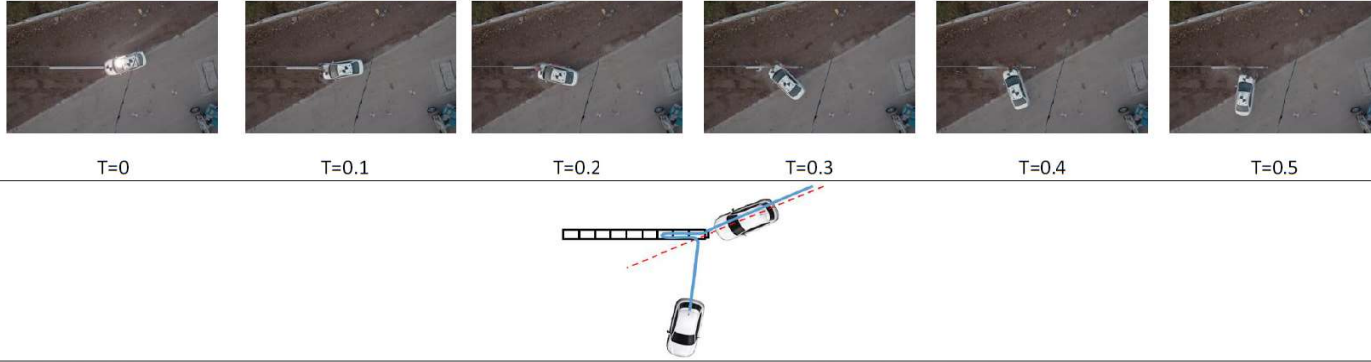
| | |
|-----------------------------|-------|
| Impact Velocity [m/s] | |
| X-direction..... | 11.9 |
| Y-direction..... | -1.1 |
| Ridedown Acceleration [g's] | |
| X-direction..... | -18.3 |
| Y-direction..... | 3.7 |
| THIV | 42.8 |
| PHD | 18.3 |
| ASI 2010..... | 1.43 |
| Test Article Damage | |

Test Article Deflections [m]

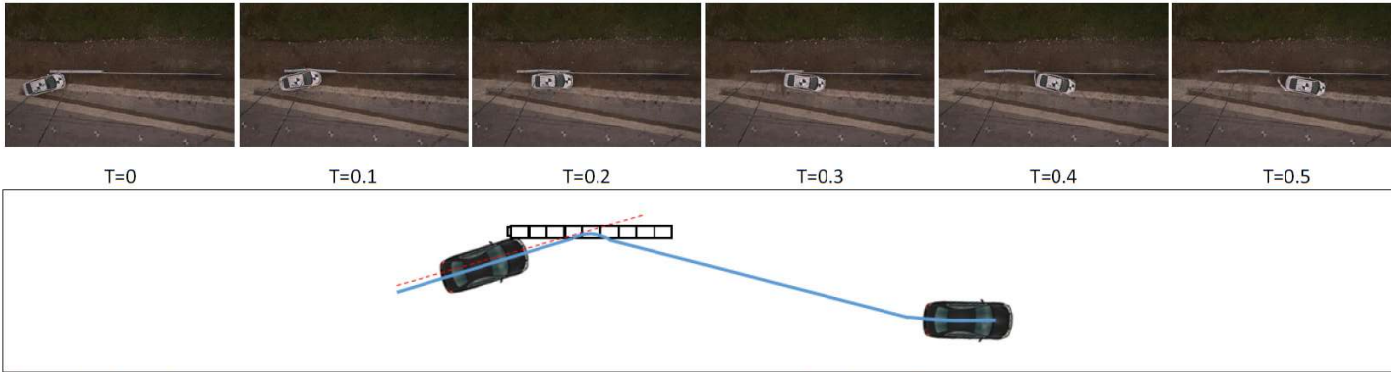
| | |
|--------------------|------|
| Permanent | 2.21 |
| Dynamic | 2.21 |
| Working Width..... | N/A |

Vehicle Damage

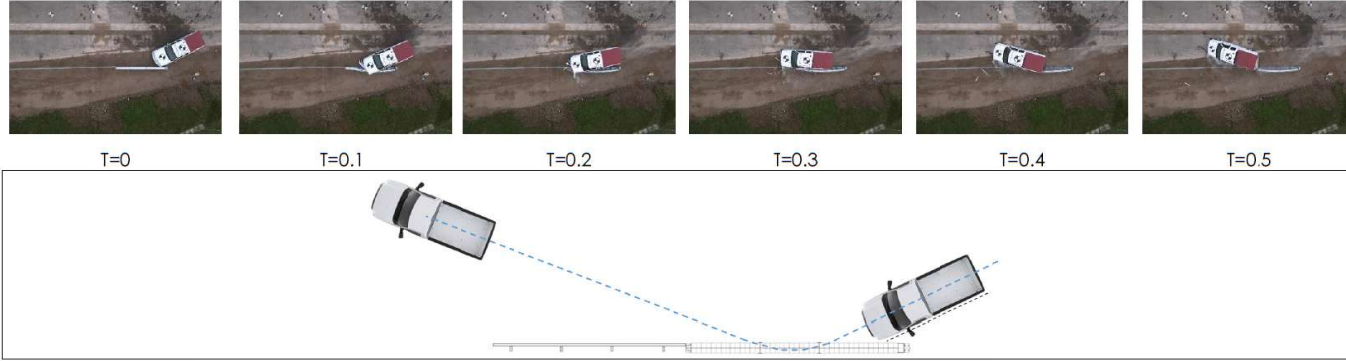
| | |
|-----------------------------------|--------|
| See appendix A | |
| Maximum internal deformation..... | 19 mm |
| Maximum external deformation..... | 290 mm |



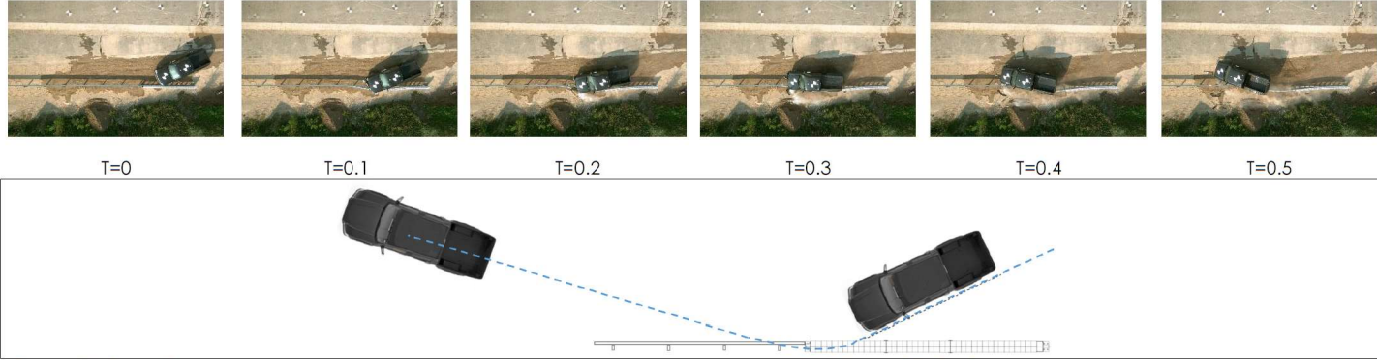
| | | | |
|--|-----------------------------|-------------------------------------|----------------------------------|
| General Information | | Post-impact Trajectory | |
| Test agency..... | CSI S.p.A. | Vehicle Stability..... | Satisfactory |
| Test No. | 0001/ME/HRB/21 | Stopping Distance..... | 3 m downstream 12 m Laterally |
| Date..... | 15/01/2021 | Vehicle snagging..... | None |
| Test Article | | Vehicle pocketing..... | None |
| Type..... | ERMES | Occupant Risk Values | |
| Installation length [m]..... | 5.688 | Impact Velocity [m/s] | |
| Size and/or dimension and material of key Elements..... | See attached drawings | X-direction..... | 11.5 |
| Foundation type and condition..... | Compacted SOIL | Y-direction..... | -1.2 |
| Test Vehicle | | Ridedown Acceleration [g's] | |
| Type/ Designation..... | 1100C | X-direction..... | -15.9 |
| Model..... | Kia Rio | Y-direction..... | 4.8 |
| Mass [kg] | | THIV | 41.7 |
| Curb..... | 1046.6 | PHD | 16.2 |
| Test Inertial..... | 1102.0 | ASI 2010..... | 1.18 |
| Gross static..... | 1178.0 | Test Article Damage | Moderate |
| Impact Conditions | | Test Article Deflections [m] | |
| Speed [km/h]..... | 97.1 | Permanent | 2.53 |
| Angle [deg]..... | 15.0 | Dynamic | 2.53 |
| Impact Severity [kJ]..... | 438.5 | Working Width..... | N/A |
| Impact Location..... | Frontal, head centered, 15° | Vehicle Damage | |
| Exit Speed [km/h]..... | < 10 | See appendix A | |
| Exit Angle [deg]..... | N/A | Maximum internal deformation..... | 12 mm |
| | | Maximum external deformation..... | 265 mm |



| | | | |
|---|-----------------------|-------------------------------------|-----------------|
| General Information | | Post-impact Trajectory | |
| Test agency..... | CSI S.p.A. | Vehicle Stability..... | Satisfactory |
| Test No. | 0003/ME/HRB/21 | Stopping Distance..... | 48 m downstream |
| Date..... | 19/01/2021 | Vehicle snagging..... | None |
| Test Article | | Vehicle pocketing..... | None |
| Type..... | ERMES | Occupant Risk Values | |
| Installation length [m]..... | 5.688 | Impact Velocity [m/s] | |
| Size and/or dimension and material of key | | X-direction..... | 6.9 |
| Elements..... | See attached drawings | Y-direction..... | -5.2 |
| Foundation type and condition..... | Compacted SOIL | Ridedown Acceleration [g's] | |
| Test Vehicle | | X-direction..... | -6.3 |
| Type/ Designation..... | 1100C | Y-direction..... | 7.3 |
| Model..... | Kia Rio | THIV | 32.6 |
| Mass [kg] | | PHD | 9.6 |
| Curb..... | 1065.0 | ASI 2010..... | 1.04 |
| Test Inertial..... | 1106.8 | Test Article Damage | Moderate |
| Gross static..... | 1181.6 | Test Article Deflections [m] | |
| Impact Conditions | | Permanent | 0.11 |
| Speed [km/h]..... | 98.6 | Dynamic | 0.24 |
| Angle [deg]..... | 15.0 | Working Width..... | 0.5 |
| Impact Severity [kJ]..... | 29.7 | Vehicle Damage | |
| Impact Location..... | Laterally | See appendix A | |
| Exit Speed [km/h]..... | 66.0 | Maximum internal deformation..... | 15 mm |
| Exit Angle [deg]..... | 8.0 | Maximum external deformation..... | 220 mm |



| | | | |
|--|-----------------------|-------------------------------------|-----------------------------------|
| General Information | | Post-impact Trajectory | |
| Test agency..... | CSI S.p.A. | Vehicle Stability..... | Satisfactory |
| Test No..... | 0126/ME/HRB/18 | Stopping Distance..... | 32 m downstream 13 m Laterally |
| Date..... | 30/11/2018 | Vehicle snagging..... | None |
| Test Article | | Vehicle pocketing..... | None |
| Type..... | 'ERMES' | Occupant Risk Values | |
| Installation length [m]..... | 5.688 | Impact Velocity [m/s] | |
| Size and/or dimension and material of key | | X-direction..... | 6.3 |
| Elements..... | See attached drawings | Y-direction..... | -5.3 |
| Foundation type and condition | Soil | Ridedown Acceleration [g's] | |
| Test Vehicle | | X-direction..... | -7.4 |
| Type/ Designation..... | 2270P | Y-direction..... | 10.7 |
| Model..... | CHEVROLET SILVERADO | THIV | 27.8 |
| Mass [kg] | | PHD | 12.9 |
| Curb..... | 2117.0 | ASI 2010..... | 1.09 |
| Test Inertial..... | 2307.0 | Test Article Damage | Moderate |
| Gross static..... | 2307.0 | Test Article Deflections [m] | |
| Impact Conditions | | Permanent | 0.40 |
| Speed [km/h]..... | 96.7 | Dynamic | 0.44 |
| Angle [deg]..... | 25.0 | Working Width..... | 0.73 |
| Impact Severity [kJ]..... | 148.6 | Vehicle Damage | |
| Impact Location..... | Lateral | See appendix A | |
| Exit Speed [km/h]..... | 58.5 | Maximum internal deformation..... | 166 mm |
| Exit Angle [deg]..... | 18.0 | Maximum external deformation..... | 1205 mm |



| | | | |
|--|---------------------------|-------------------------------------|-----------------------------------|
| General Information | | Post-impact Trajectory | |
| Test agency..... | CSI S.p.A. | Vehicle Stability..... | Satisfactory |
| Test No. | 0098/ME/HRB/18 | Stopping Distance..... | 34 m Downstream 12 m Laterally |
| Date..... | 12/09/2018 | Vehicle snagging..... | None |
| Test Article | | Vehicle pocketing..... | None |
| Type..... | 'ERMES' | Occupant Risk Values | |
| Installation length [m]..... | 5.688 | Impact Velocity [m/s] | |
| Size and/or dimension and material of key Elements..... | See attached drawings | X-direction..... | 5.3 |
| Foundation type and condition..... | Soil | Y-direction..... | -5.3 |
| Test Vehicle | | Ridedown Acceration [g's] | |
| Type/ Designation..... | 2270P | X-direction..... | -11.7 |
| Model..... | Chevrolet Silverado | Y-direction..... | 9.6 |
| Mass [kg] | | THIV | 26.7 |
| Curb..... | 2134.6 | PHD | 14.7 |
| Test Inertial..... | 2243.0 | ASI 2010..... | 1.21 |
| Gross static..... | 2243.0 | Test Article Damage | Modercte |
| Impact Conditions | | Test Article Deflections [m] | |
| Speed [km/h]..... | 97.4 | Permanent | 0.33 |
| Angle [deg]..... | 25.0 | Dynamic | 0.47 |
| Impact Severity [kJ]..... | 146.6 | Working Width..... | 0.75 |
| Impact Location..... | Final part of the device. | Vehicle Damage | |
| Exit Speed [km/h]..... | 66.9 | See appendix A | |
| Exit Angle [deg]..... | 17.0 | Maximum internal deformation..... | 141 |
| | | Maximum external deformation..... | 895 |

