



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

December 13, 2021

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

In Reply Refer To:
HSST-1/CC-170

Roberto Impero
Industry AMS srl
Via Dante Giacosa
81025 Marcianise (CE) snc
Italy

Dear Mr. Impero:

This letter is in response to your June 30, 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-170 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:

- Hercules TL2 P

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: Hercules TL2 P
Type of system: Crash Cushion
Test Level: Test Level 2
Testing conducted by: CSI S.P.A.
Date of request: June 30, 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-170 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:	June 30, 2021	<input type="radio"/> New <input type="radio"/> Resubmission
	Name:	Roberto Impero	
	Company:	Industry AMS srl	
	Address:	Via Dante Giacosa, 81025 Marcianise (CE) snc	
	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	Hercules TL2 P	AASHTO MASH	TL2

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, 81025 Marcianise (CE) snc	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.

CSI Spa, is an independent research and testing laboratory having no affiliation with any another 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.



PRODUCT DESCRIPTION

<input checked="" type="radio"/> New Hardware or Significant Modification	<input type="radio"/> Modification to Existing Hardware
<p>The Hercules TL2 P Crash Cushion is a fully-redirective, non-gating crash cushion tested to MASH criteria. It has a frontal trolley unit that allows a controlled deformation, a collapsible beam made up of 7 modules that crush in a frontal impact to absorb energy and stop the vehicle in a controlled manner, and 4-beam side panels for side impact redirection. The unit is 14.4 feet (4.39m) long, 23.2 inches (0.59m) wide at the rear, and 35.0 inches (0.89) high.</p> <p>Note : TL2 Hercules Crash cushion is designed to be attached to a barrier that has a lateral stiffness lower than TL2 crash cushion.</p> <p>It is not possible to connect Hercules TL2 to a rigid backup structure and in case of reverse impact condition.</p>	

CRASH TESTING

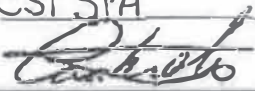
A brief description of each crash test and its result:

Required Test Number	Narrative Description	Evaluation Results
2-30 (1100C)	Test 2-30 involves a 1100C passenger car impacting the crash cushion at a nominal impact speed of 70 km/h and an impact at 0 degrees with the quarter point of the vehicle aligned with the center line of the crash cushion. This test is preliminary intended to evaluate occupant risk and vehicle trajectory criteria. For this test a Honda Civic (1180 kg) impacted the Hercules TL2P Crash Cushion at a speed 70.4 km/h and an angle of 0 degrees. Upon impact the vehicle forced the Hercules Crash Cushion's trolley rearward and began to collapse the beam modules. The crash cushion 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 per the MASH specifications for OIV and ORA. Hercules Crash Cushion passed all evaluation criteria for test 2-30.	PASS
2-31 (2270P)	Test 2-31 involves a 2270P pick up truck impacting the crash cushion at a nominal impact speed of 70 km/h and an impact at 0 degrees with the center line of the vehicle aligned with the center line of the Crash Cushion. This test is preliminary intended to evaluate the capacity of the attenuator to stop the vehicle in a safe and controlled manner. For this test, a Chevrolet Silverado (2222 kg) impacted the Hercules Crash Cushion at a speed 69.5 km/h and an angle of 0 degrees. Upon impact the vehicle forced the Hercules Crash Cushion's trolley rearward and began to collapse the beam modules. The crash cushion 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 per the MASH specifications for OIV and ORA. Hercules Crash Cushion passed all evaluation criteria for test 2-31.	PASS

Required Test Number	Narrative Description	Evaluation Results
2-32 (1100C)	<p>Test 2-32 involves a 1100C passenger car impacting the crash cushion at a nominal impact speed of 70 km/h and an impact at 15 degrees with the centerline of the crash cushion. This test is preliminary intended to evaluate occupant risk, vehicle trajectory and the capacity of the crash cushion to stop the vehicle in a controlled manner for an oblique impact. For this test a Honda Civic (1158.6 kg) impacted the Hercules Crash Cushion at a speed 70 km/h and an angle of 15 degrees. Upon impact the vehicle forced the Hercules Crash Cushion's trolley rearward and began to collapse the beam modules. The crash cushion 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 per the MASH specifications for OIV and ORA. Hercules Crash Cushion passed all evaluation criteria for test 2-32.</p>	PASS
2-33 (2270P)	<p>Test 2-33 involves a 2270P pick up truck impacting the crash cushion at a nominal impact speed of 70 km/h and an impact at 15 degrees with the centerline of the vehicle aligned with the center line of the crash cushion. This test is preliminary intended to evaluate occupant risk, vehicle trajectory and the capacity of the crash cushion to stop the vehicle in a controlled manner for an oblique impact. For this test a Chevrolet Silverado (2239.4 kg) impacted the Hercules Crash Cushion at a speed 70.2 km/h and an angle of 15 degrees. Upon impact the vehicle forced the Hercules Crash Cushion's trolley rearward and began to collapse the beam modules. The crash cushion 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 per the MASH specifications for OIV and ORA. Hercules Crash Cushion passed all evaluation criteria for test 2-33.</p>	PASS
2-34 (1100C)	<p>Test 2-34 involves a 1100C passenger car impacting the crash cushion at a nominal impact speed of 70 km/h and an impact at 15 degrees with the CIP at the point where the crash cushion behavior changes from capturing to redirective. This test is preliminary intended to evaluate occupant risk and vehicle trajectory criteria. For this test a Honda Civic 1171.6 kg impacted the Hercules Crash Cushion at a speed 69.7 km/h and an angle of 15 degrees. 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 75 deg. and the occupant risk values were within limits per the MASH specifications for OIV and ORA. Hercules Crash Cushion passed all evaluation criteria for test 2-34.</p>	PASS

2-35 (2270P)	Test 2-35 involves a 2270P pick up truck impacting the crash cushion at a nominal impact speed of 70 km/h and an impact at 25 degrees with the CIP at the point where the crash cushion behavior changes from capturing to redirective (BLON). This test is preliminary intended to evaluate the capacity of the attenuator for redirection/containment of heavy vehicles. For this test a Chevrolet Silverado 2257 kg impacted the Hercules Crash Cushion at a speed 70.6 km/h and an angle of 25 degrees. The impact point was downstream the trolley and very near 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 75 deg. and the occupant risk values were within limits per the MASH specifications for OIV and ORA. Hercules Crash Cushion passed all evaluation criteria for test 2-35.	PASS
2-36 (2270P)	Hercules TL2 P is not attached to a rigid backup structure	Non-Critical, not conducted
2-37 (2270P)	Hercules TL2 P is not installed in reverse impact condition	Non-Critical, not conducted
2-38 (1500A)	Numerical Simulation was performed on Hercules TL2 P	Non-Critical, not conducted
2-40 (1100C)	Test for non-redirective Crash Cushion, Not Applicable	Non-Critical, not conducted
2-41 (2270P)	Test for non-redirective Crash Cushion, Not Applicable	Non-Critical, not conducted
2-42 (1100C)	Test for non-redirective Crash Cushion, Not Applicable	Non-Critical, not conducted
2-43 (2270P)	Test for non-redirective Crash Cushion, Not Applicable	Non-Critical, not conducted
2-44 (2270P)	Test for non-redirective Crash Cushion, Not Applicable	Non-Critical, not conducted
2-45 (1500A)	Test for non-redirective Crash Cushion, Not Applicable	Non-Critical, not conducted

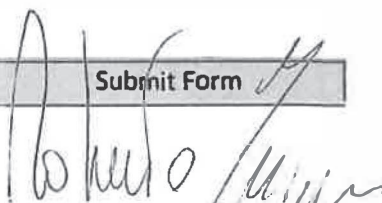
Full Scale Crash Testing was done in compliance with MASH by the following accredited crash test laboratory (cite the laboratory's accreditation status as noted in the crash test reports.):

Laboratory Name:	CSI SPA	
Laboratory Signature:		
Address:	Viale Lombardia 20 - Bollate - MILANO	Same as Submitter <input type="checkbox"/>
Country:	Italy	Same as Submitter <input type="checkbox"/>
Accreditation Certificate Number and Dates of current Accreditation period :	Accredia 006 rev.05 Expiring Date : 08-03-24	

Submitter Signature*:



ATTACHMENTS

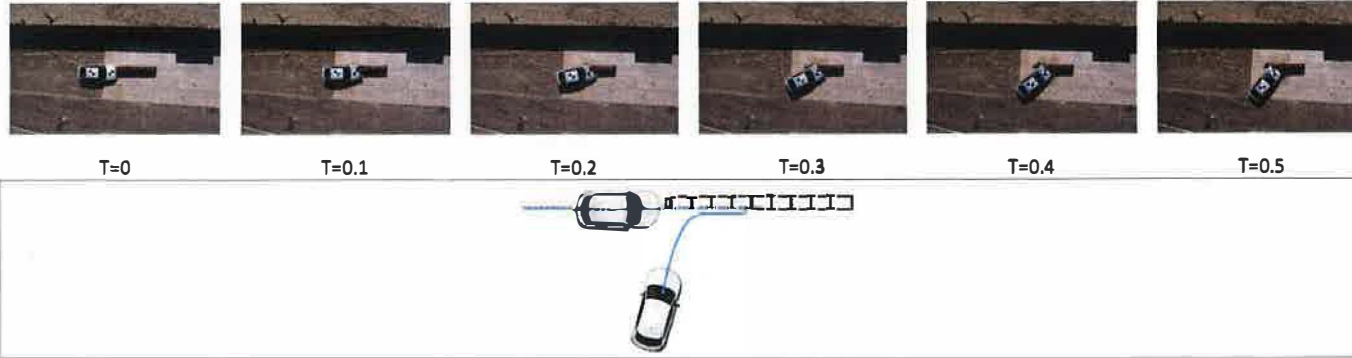
Submit Form 
INDUSTRY A.M.S. S.r.l.
Amministratore Unico
Dott. Roberto Impero

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:

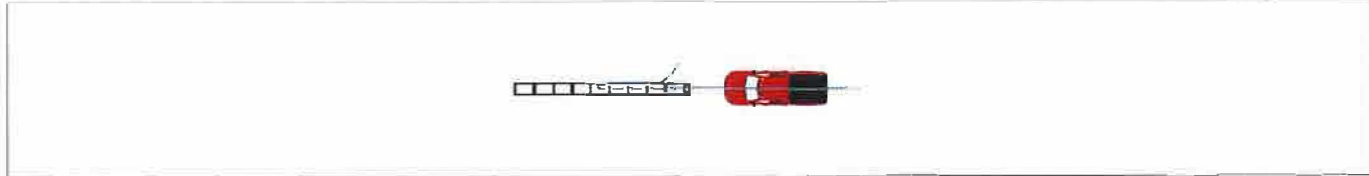
Eligibility Letter		AASHTO TF13	
Number	Date	Designator	Key Words



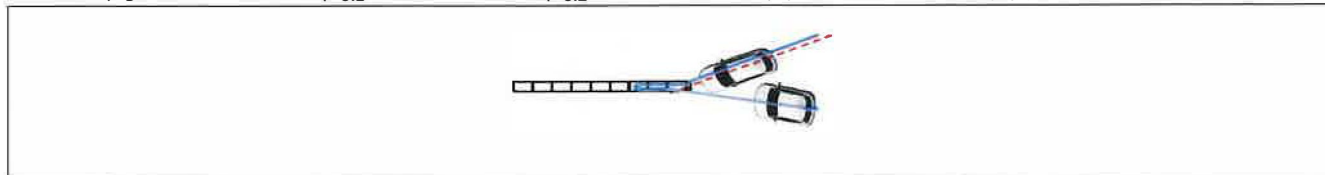
General Information		Post-Impact Trajectory	
Test agency.....	CSI S.p.A.	Vehicle Stability.....	Satisfactory
Test No.	Test 2-30	Stopping Distance.....	3 m upstream 6 m lateral
Date.....	29/03/2021	Vehicle snagging.....	None
Test Article		Vehicle pocketing.....	None
Type.....	HERCULES TL2 P	Occupant Risk Values	
Installation length [m].....	4.396	Impact Velocity [m/s]	
Size and/or dimension and material of key Elements.....	See attached drawings	X-direction.....	10.5
Foundation type and condition.....	Concrete	Y-direction.....	-0.7
Test Vehicle		Ridedown Acceleration [g's]	
Type/ Designation.....	1100C	X-direction.....	-14.4
Model.....	HONDA CIVIC	Y-direction.....	-3.6
Mass [kg]		THIV	37.8
Curb.....	1049.2	PHD	14.4
Test Inertial.....	1104.6	ASI 2010.....	0.88
Gross static.....	1180.2	Test Article Damage	
Impact Conditions		Test Article Deflections [m]	
Speed [km/h].....	70.4	Permanent	1.55
Angle [deg].....	0.0	Dynamic	1.55
Impact Severity [kJ].....	225.7	Working Width.....	0.65
Impact Location.....	Frontal, offset W/4, 0°	Vehicle Damage	
Exit Speed [km/h].....	< 10	See appendix A	
Exit Angle [deg].....	N/A	Maximum internal deformation.....	15 mm
		Maximum external deformation.....	140 mm



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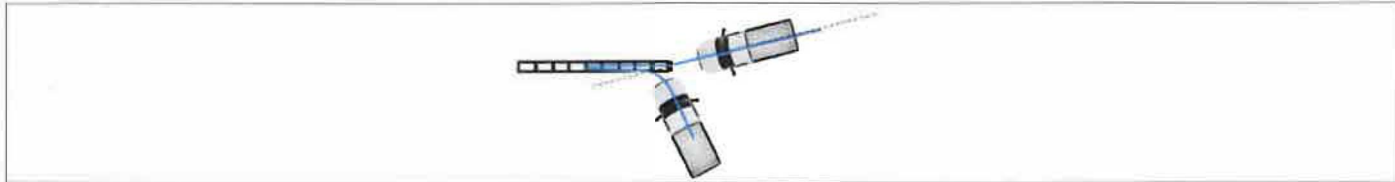
General Information		Post-impact Trajectory	
Test agency.....	CSI S.p.A.	Vehicle Stability.....	Satisfactory
Test No.	Test 2-31	Stopping Distance.....	1 m upstream
Date.....	16/04/2021	Vehicle snagging.....	None
Test Article		Vehicle pocketing.....	None
Type.....	HERCULES TL2 P	Occupant Risk Values	
Installation length [m].....	4.396	Impact Velocity [m/s]	
Size and/or dimension and material of key		X-direction.....	8.7
Elements.....	See attached drawings	Y-direction.....	-0.4
Foundation type and condition	Concrete (anchored)	Ridedown Acceleration [g's]	
Test Vehicle		X-direction.....	-13.7
Type/ Designation.....	2270P	Y-direction.....	1.1
Model.....	CHEVROLET SILVERADO 1500	THIV	31.4
Mass [kg]		PHD	13.7
Curb.....	2041.8	ASI 2010.....	0.66
Test Inertial.....	2222.0	Test Article Damage	Moderate
Gross static.....	2222.0	Test Article Deflections [m]	
Impact Conditions		Permanent	2.42
Speed [km/h].....	69.5	Dynamic	2.42
Angle [deg].....	0	Working Wldth.....	0.67
Impact Severity [kJ].....	414.1	Vehicle Damage	
Impact Location	Front, head centered	See appendix A	
Exit Speed [km/h].....	< 10	Maximum internal deformation.....	37 mm
Exit Angle [deg].....	N/A	Maximum external deformation.....	350 mm



General Information		Post-Impact Trajectory	
Test agency.....	CSI S.p.A.	Vehicle Stability.....	Satisfactory
Test No.	Test 2-32	Stopping Distance.....	3 m upstream
Date.....	24/03/2021	Vehicle snagging.....	None
Test Article		Vehicle pocketing.....	None
Type.....	HERCULES TL2 P	Occupant Risk Values	
Installation length [m].....	4.396	Impact Velocity [m/s]	
Size and/or dimension and material of key		X-direction.....	10.9
Elements.....	See attached drawings	Y-direction.....	0.1
Foundation type and condition.....	Concrete	Ridedown Acceleration [g's]	
Test Vehicle		X-direction.....	-15.5
Type/ Designation.....	1100C	Y-direction.....	-3.0
Model.....	HONDA CIVIC	THIV	38.9
Mass [kg]		PHD	15.6
Curb.....	1002.4	ASI 2010.....	1.10
Test Inertial.....	1082.8	Test Article Damage	Moderate
Gross static.....	1158.6	Test Article Deflections [m]	
Impact Conditions		Permanent	1.52
Speed [km/h].....	70.3	Dynamlc	1.52
Angle [deg].....	15.0	Working Width.....	0.7
Impact Severity [kJ].....	220.9	Vehicle Damage	
Impact Location	Frontal, head centered, 15°	See appendix A	
Exit Speed [km/h].....	< 10	Maximum internal deformation.....	20 mm
Exit Angle [deg].....	N/A	Maximum external deformation.....	160 mm



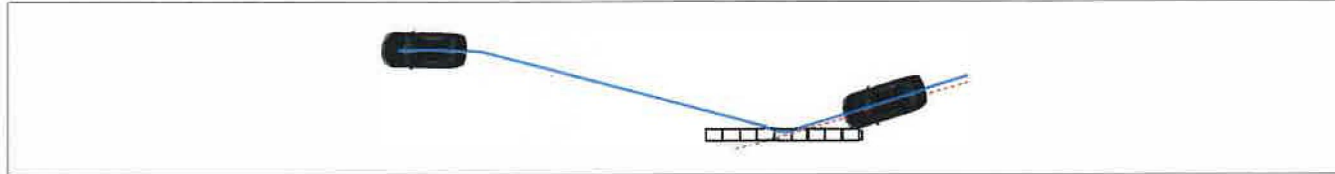
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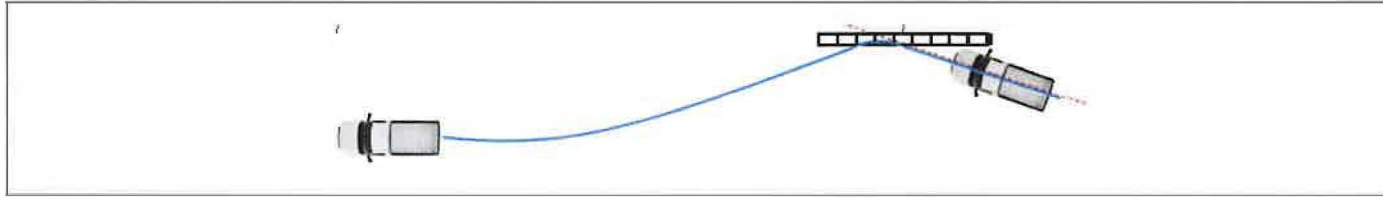
General Information		Post-Impact Trajectory	
Test agency.....	CSI S.p.A.	Vehicle Stability.....	Satisfactory
Test No.	Test 2-33	Stopping Distance.....	1 m upstream 2 m laterally
Date.....	07/04/2021	Vehicle snagging.....	None
Test Article		Vehicle pocketing.....	None
Type.....	HERCULES TL2 P	Occupant Risk Values	
Installation length [m].....	4.396	Impact Velocity [m/s]	
Size and/or dimension and material of key	See attached drawings	X-direction.....	9.7
Elements.....	Concrete (anchored)	Y-direction.....	-1.1
Foundation type and condition.....		Ridedown Acceleration [g's]	
Test Vehicle		X-direction.....	-11.0
Type/ Designation.....	2270P	Y-direction.....	-3.2
Model.....	CHEVROLET SILVERADO 1500	THIV	35.4
Mass [kg]		PHD	11.4
Curb.....	2212.0	ASI 2010.....	0.85
Test Inertial.....	2239.4	Test Article Damage	Moderate
Gross static.....	2239.4	Test Article Deflections [m]	
Impact Conditions		Permanent	2.25
Speed [km/h].....	70.2	Dynamic	2.25
Angle [deg].....	15.0	Working Width.....	0.71
Impact Severity [kJ].....	425.8	Vehicle Damage	
Impact Location.....	Front, head centered, 15°	See appendix A	
Exit Speed [km/h].....	< 10	Maximum internal deformation.....	29 mm
Exit Angle [deg].....	N/A	Maximum external deformation.....	330 mm



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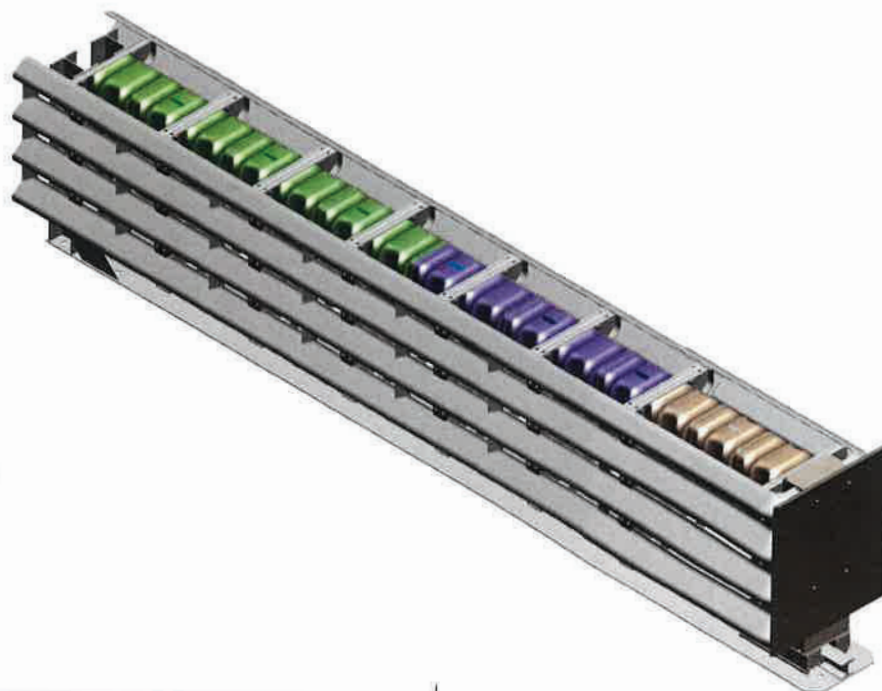
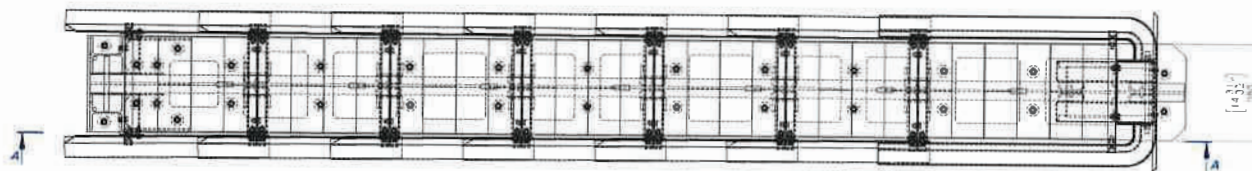
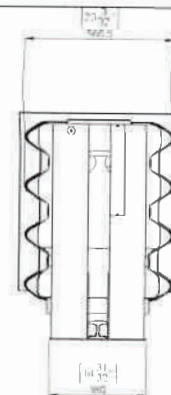
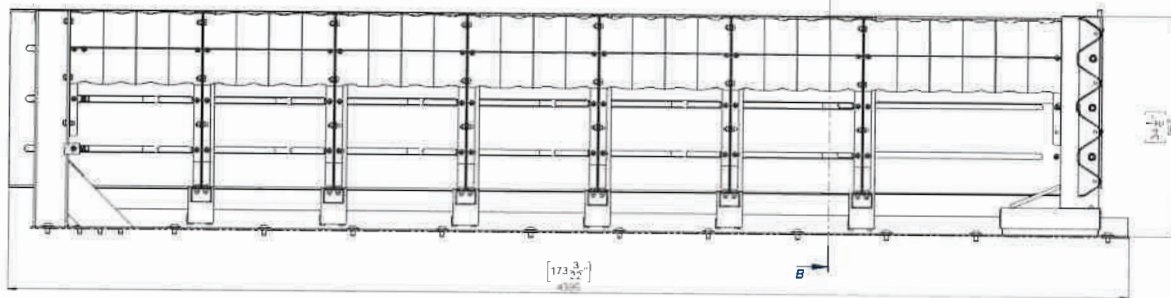
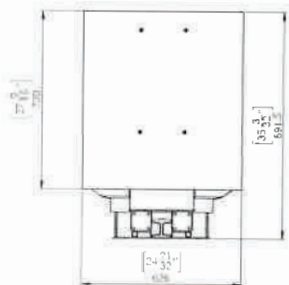


General Information		Post-Impact Trajectory	
Test agency.....	CSI S.p.A.	Vehicle Stability.....	Satisfactory
Test No.	Test 2-34	Stopping Distance.....	48 m downstream
Date.....	13/04/2021	Vehicle snagging.....	None
Test Article		Vehicle pocketing.....	None
Type.....	HERCULES TL2 P	Occupant Risk Values	
Installation length [m].....	4.396	Impact Velocity [m/s]	
Size and/or dimension and material of key		X-direction.....	2.9
Elements.....	See attached drawings	Y-direction.....	-4.9
Foundation type and condition.....	Concrete	Ridedown Acceleration [g's]	
Test Vehicle		X-direction.....	1.4
Type/ Designation.....	1100C	Y-direction.....	5.6
Model.....	HONDA CIVIC	THIV	20.7
Mass [kg]		PHD	5.6
Curb.....	1039.8	ASI 2010.....	0.99
Test Inertial.....	1096.0	Test Article Damage	Moderate
Gross static.....	1171.6	Test Article Deflections [m]	
Impact Conditions		Permanent	0.04
Speed [km/h].....	69.7	Dynamic	0.05
Angle [deg].....	15.0	Working Width.....	0.75
Impact Severity [kJ].....	14.7	Vehicle Damage	
Impact Location.....	Laterally	See appendix A	
Exit Speed [km/h].....	65	Maximum internal deformation.....	4 mm
Exit Angle [deg].....	9	Maximum external deformation.....	30 mm



General Information		Post-impact Trajectory	
Test agency.....	CSI S.p.A.	Vehicle Stability.....	Satisfactory
Test No.	Test 2-35	Stopping Distance.....	40 m downstream 13 m Laterally
Date.....	23/12/2020	Vehicle snagging.....	None
Test Article		Vehicle pocketing.....	None
Type.....	HERCULES TL2P	Occupant Risk Values	
Installation length [m].....	4.396	Impact Velocity [m/s]	
Size and/or dimension and material of key Elements.....	See attached drawings	X-direction.....	5.0
Foundation type and condition.....		Y-direction.....	6.3
Concrete (anchored)		Ridedown Acceleration [g's]	
Test Vehicle		X-direction.....	-3.2
Type/ Designation.....	2270P	Y-direction.....	-7.6
Model.....	CHEVROLET SILVERADO 1500	THIV	28.4 km/h
Mass [kg]		PHD	7.7
Curb.....	2168.4	ASI 2010.....	1.03
Test Inertial.....	2257.0	Test Article Damage	Moderate
Gross static.....	2257.0	Test Article Deflections [m]	
Impact Conditions		Permanent	0.08
Speed [km/h].....	70.6	Dynamic	0.21
Angle [deg].....	25.0	Working Width.....	0.75
Impact Severity [kJ].....	77.5	Vehicle Damage	
Impact Location.....	Beginning	See appendix A	
Exit Speed [km/h].....	43	Maximum internal deformation.....	40 mm
Exit Angle [deg].....	11	Maximum external deformation.....	530 mm

SEZIONE A-A



AMS					
B	Modello	2011/001	Controlli	Controlli	Controlli
C	Modello	2011/001	Controlli	Controlli	Controlli
A	Modello	2011/001	Controlli	Controlli	Controlli
Descrizione: SMA - Safety Modulo Attivo Codice: 110 Data: 1/2 Versione: C.0					
D74540000					C.0