

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

In Reply Refer To: HSST-1/B-352

Nathan Binette Durisol Ltd 70 Frid Street, Suite 1 Hamilton, ON L8P 4M4 Canada

Dear Mr. Binette:

This letter is in response to your October 13, 2020 request for the Federal Highway Administration (FHWA) to review a roadside safety device, hardware, or system for eligibility for reimbursement under the Federal-aid highway program. This FHWA letter of eligibility is assigned FHWA control number B-352 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:

• Durisol Acrylite Soundstop TL4 Noise Barrier System

## **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: Durisol Acrylite Soundstop TL4 Noise Barrier System

Type of system: Longitudinal Barrier

Test Level: TL4

Testing conducted by: Texas A&M Transportation Institute

Date of request: October 13, 2020

FHWA concurs with the recommendation of the accredited crash testing laboratory on the attached form.

## Full Description of the Eligible Device

The device and supporting documentation, including reports of the crash tests or other testing done, videos of any crash testing, and/or drawings of the device, are described in the attached form.

#### **Notice**

This eligibility letter is issued for the subject device as tested. Modifications made to the device are not covered by this letter. Any modifications to this device should be submitted to the user (i.e., state DOT) as per their requirements.

You are expected to supply potential users with sufficient information on design, installation and maintenance requirements to ensure proper performance.

You are expected to certify to potential users that the hardware furnished has the same chemistry, mechanical properties, and geometry as that submitted for review, and that it will meet the test and evaluation criteria of AASHTO's MASH.

Issuance of this letter does not convey property rights of any sort or any exclusive privilege. This letter is based on the premise that information and reports submitted by you are accurate and correct. We reserve the right to modify or revoke this letter if: (1) there are any inaccuracies in the information submitted in support of your request for this letter, (2) the qualification testing was flawed, (3) in-service performance or other information reveals safety problems, (4) the system is significantly different from the version that was crash tested, or (5) any other information indicates that the letter was issued in error or otherwise does not reflect full and complete information about the crashworthiness of the system.

## **Standard Provisions**

- To prevent misunderstanding by others, this letter of eligibility designated as FHWA control number B-352 shall not be reproduced except in full. This letter and the test documentation upon which it is based are public information. All such letters and documentation may be reviewed upon request.
- This letter shall not be construed as authorization or consent by the FHWA to use, manufacture, or sell any patented system for which the applicant is not the patent holder.
- This FHWA eligibility letter is not an expression of any Agency view, position, or determination of validity, scope, or ownership of any intellectual property rights to a specific device or design. Further, this letter does not impute any distribution or licensing rights to the requester. This FHWA eligibility letter determination is made based solely on the crash-testing information submitted by the requester. The FHWA reserves the right to review and revoke an earlier eligibility determination after receipt of subsequent information related to crash testing.

Sincerely,

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

Wichard & Tuffith

Enclosures

# Request for Federal Aid Reimbursement Eligibility of Highway Safety Hardware

	Date of Request:	October 13, 2020	•	New	○ Resubmission
	Name:	Nathan Binette			
ter	Company:	Durisol Ltd			
Submitter	Address:	70 Frid Street, Suite 1 Hamilton, ON	I L8P 4M4		
Sul	Country:	Canada			
	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 & resting Criterior	1 - Enter from fight to left s	starting with Test L   -   -		! -!
System Type	Submission Type	Device Name / Variant	Testing Criterior	י ו

System Type	Submission Type	Device Name / Variant	Testing Criterion	Test Level
'B':Rigid/Semi-Rigid Barriers (Roadside, Median, Bridge Railings)	Engineering Analysis		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:	Nathan Binette	Same asSubmitter⊠
Company Name:	Durisol Ltd	Same asSubmitter⊠
Address:	70 Frid Street, Suite 1 Hamilton, ON L8P 4M4	Same asSubmitter⊠
Country:	Canada	Same asSubmitter⊠

Enter below all disclosures of financial interests as required by the FHWA `Federal-Aid Reimbursement Eligibility Process for Safety Hardware Devices' document.

Durisol Ltd and Roehm America have collaborated to develop and test this noise barrier system. The University of Nebraska holds patent rights to USPatent 7,220,077 that they exclusively license to Roehm America. Roehm America exclusively sub-licenses patent rights to the same patent to Durisol Ltd. The design of the subject TL4 noise barrier system utilizes licensed patent rights.

Texas A&MTransportation Institute (TTI) was contracted by Durisol Ltd to perform full-scale crash testing of the Durisol®Acrylite®Soundstop TL4 Noise Barrier System. There are no shared financial interests in the Durisol® Acrylite®Soundstop TL4 Noise Barrier System by TTI, or between Durisol Ltd,Roehm America, University of Nebraska, and TTI, other than costs involved in the actual crash testsand reports for this submission to FHWA.

690902-DSL-1-2-3

## PRODUCT DESCRIPTION

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New Hardware or	Modification to
New Hardware or Significant Modification	Existing Hardware

The Durisol®Acrylite®Soundstop TL4 Noise Barrier installation consisted of 150 feet of 14-ft tall proprietary Durisol®Acrylite®noise barrier panelssupported with W6x20 postsspaced at 10 ft and anchored on the field side of a 154-ft-long, 36 inch tall Texas Department of Transportation Single Slope Traffic Rail (TxDOTSSTR). The TxDOTSSTR is a single slope concrete barrier that has been successfully tested to MASHTL-4 specifications (2). The top of the noise barrier measured 17 ft above grade. The installation was constructed atop, and fixed to, a concrete strip footing that measured 2-ft thick by 6 ft-8 inches wide by 154 ft long.

The vertically mounted W6x20 postssupport aluminum framed acrylic (tradename = Acrylite®Soundstop) noise barrier panels. Two (2) horizontal HSS8x4x1/4-inch continuous rails, placed 4 ft-8 inchesand 10-ft above grade, are connected to the W6x20 steel posts to help distribute the TL-4 Box crash loadsand prevent zone of intrusion of impacting vehicles between posts. The Acrylite®Soundstop within the framed panels includes cast-in-place filaments to deter panel fragmentation, and each acrylic panel issecondarily secured between the flanges of two adjacent posts to further limit any material from falling away from the structure during an impact event.

The Durisol®Acrylite®Soundstop TL4Noise Barrier, not inclusive of the concrete barrier to which it attaches, weighsapproximately 80-140 lbs per lineal foot (10-14 lbs per square foot), depending upon the height of the noise barrier wall and post span.

## **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 testsare necessary to determine the device meets the MASH criteria.

Engineer Name:	William Williams	
Engineer Signature:	William Williams Digitally sign Date: 2020.	ned by William Williams 10.13 16:16:59 -05'00'
Address:	1254 Avenue A, Bldg 7091, Bryan, Texas 77807	Same asSubmitter
Country:	USA	Same asSubmitter

Help

		Page 3 01 6
Required Test	Narrative	Evaluation
Number	Description	Results
	Test 4-10 involves an 1100C vehicle	
	impacting the test article at a target impact	
	speed of 62 mi/h ±2.5 mi/h and a target	
	impact angle of 25° ±1.5°. The target CIP	
	was determined using the information	
	provided in MASHSection 2.2.1,Section	
	2.3.2, and Table 2-7 and was for the right	
	corner of the front bumper to impact 3.6±1	
	ft upstream of the centerline of the first	
	joint in the concrete barrier.	
	The results of the test conducted on March	
	26, 2020 are found in TTI Test Report	
	number 690902-DSL 1-3. The test vehicle	
	was traveling at an impact speed of 63.0 mi/	
	h as it made contact with the barrier 3.7 ft	
	upstream of the barrier joint at an impact	
	angle of 25.0°. After loss of contact with the	
	barrier, the vehicle came to rest 213 ft	
	downstream of the impact point and 83 ft	
	towards the traffic side.	
	The barrier contained and redirected the	
	1100C vehicle. The vehicle did not	
	penetrate, underride, or override the	
	installation. The 1100C vehicle exited within	
	the exit box criteria.	
	Working width was 21.5 inches to the field	
	l = =	
4-10 (1100C)	side of barrier. There was no measurable	PASS
	dynamic deflection during the test, or	
	permanent deformation observed	
	afterwards, for either the barrier or the wall.	
	No detached elements, fragments, or other	
	debris were present to penetrate or show	
	potential for penetrating the occupant	
	compartment, or present hazard to others	
	in thearea.	
	Maximum exterior crush to the vehicle was	
	11.0 inches in the side plane at the right	
	front corner at bumper height. Maximum	
	occupant compartment deformation was	
	5.0 inches in the right front kick panel area.	
	The 1100C vehicle remained upright during	
	and after the collision event. Maximum roll	
	and pitch angles were 12° and 6°,	
	respectively. Longitudinal OIV was 24.0 ft/s,	
	and lateral OIV was 28.2 ft/s. Longitudinal	
	occupant ride down acceleration was 4.7g,	
	and lateral occupant ride down acceleration	
	5.1g. The occupant risk factors were within	
	the MASH preferred limits.	
	The Durisol®Acrylite®Soundstop TL4 Noise	
	Barrier System mounted on 36-inch Single	
	Slope Barrier performed acceptably for	
	MASH Test 4-10.	
	100 T 100 T 10.	

	1	Page 4 01 6
Required Test	Narrative	Evaluation
Number	Description	Results
	Test 4-11 involves an 2270P vehicle	
	impacting the test article at a target impact	
	speed of 62 mi/h ±2.5 mi/h and a target	
	impact angle of 25° ±1.5°. The target CIP	
	was determined using the information	
	provided in MASHSection 2.2.1,Section	
	2.3.2, and Table 2-7 and was for the right	
	corner of the front bumper to impact 9.5±1	
	ft upstream of the centerline of the first	
	joint in the concrete barrier.	
	The results of the test conducted on March	
	24, 2020 are found in TTI Test Report	
	number 690902-DSL 1-3. The test vehicle	
	was traveling at an impact speed of 63.2 mi/	
	h asit made contact with the barrier 10.2ft	
	upstream of the barrier joint at an impact	
	angle of 24.7°. After loss of contact with the	
	barrier, the vehicle came to rest 207 ft	
	downstream of the impact point and 12 ft	
	towards the field side.	
	The barrier contained and redirected the	
	2270P vehicle. The vehicle did not	
	penetrate, underride, or override the	
	installation. The 2270P vehicle exited within	
	the exit box criteria.	
	Working width was 23.1 inches to the field	
	side of barrier. Maximum dynamic	
4-11 (2270P)	deflection during the test was 1.6 inchesat	PASS
	the top of the acrylic wall. No permanent	
	deformation observed afterwards for either	
	the concrete barrier or the acrylic wall.	
	No detached elements, fragments, or other	
	debris were present to penetrate or show	
	potential for penetrating the occupant	
	compartment, or present hazard to others	
	in the area.	
	Maximum exterior crush to the vehicle was	
	9.0 inches in the side plane at the right front	
	corner at bumper height. Maximum	
	occupant compartment deformation was	
	6.0 inches in the right front fire wall area.	
	The 2270P vehicle remained upright during	
	and after the collision event. Maximum roll	
	and pitch angles were 31° and 7°,	
	respectively. Longitudinal OIV was 19.7 ft/s,	
	and lateral OIV was 27.2 ft/s. Longitudinal	
	occupant ride down acceleration was 4.7g,	
	and lateral occupant ride down acceleration	
	9.7g. The occupant risk factors were within	
	the MASH preferred limits.	
	The Durisol®Acrylite®Soundstop TL4 Noise	
	Barrier System mounted on 36-inch Single	
	•	
	Slope Barrier performed acceptably for MASH Test 4-11.	
	111/1/11 1 621 4-11.	

Test 4-12 involves an 10000S vehicle weighing 22,000 lb  $\pm$  660 lb impacting the test article at a target impact speed of 56 mi/h  $\pm$  2.5 mi/h and a target impact angle of 15°  $\pm$  1.5°. The target CIP was determined using the information provided in MASH Section 2.2.1,Section 2.3.2, and Table 2-7 and was for the left corner of the front bumper to impact 5 ft  $\pm$  1ft upstream of the concrete barrierjoint.

The results of the test conducted on April 9, 2020 are found in TTI Test Report number 690902-DSL 1-3. The test vehicle was traveling at an impact speed of 58.5 mi/h as it made contact with the barrier 4 ft upstream of the concrete barrier joint at an impact angle of 15°. After loss of contact with the barrier, the vehicle came to rest 227 ft downstream of the impact point and 21 ft towards the field side.

The barrier contained and redirected the 10000S vehicle. The vehicle did not penetrate, underride, or override the installation. The 10000S vehicle exited within the exit box criteria.

Maximum dynamic deflection during the test was 8.1 inches; maximum permanent deformation was 1.9 inches; and working width was 29.6 inches, each at the top of the acrylic wall to the field side of barrier.

4-12 (10000S)

The upper Acrylite panel was cracked at post 5 but no fragments disengaged from the panel. No detached elements, fragments, or other debris were present to penetrate or show potential for penetrating the occupant compartment, or present hazard to others in the area.

Maximum exterior crush to the vehicle was 16 inches in the side plane at the left front corner at bumper height. Maximum occupant compartment deformation was 8.75 inches in the left side floor pan where the seam between the floor pan and the lower door frame parted. The separation of the seam between the floor pan and the lower door frame was not caused by any portion of the test article protruding into the cab.

The 10000S vehicle remained upright during and after the collision event. Maximum roll and pitch angles were 12° and 8°, respectively.

The Durisol®Acrylite®Soundstop TL4 Noise Barrier System mounted on 36-inch Single Slope Barrier performed acceptably for MASH Test 4-12.

**PASS** 

4-20 (1100C)	This device is not a transition system	Non-Relevant Test, not conducted
4-21 (2270P)	This device is not a transition system	Non-Relevant Test, not conducted
4-22 (10000S)	This device is not a transition system	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:	Texas A&M Transportation Institute	
Laboratory Signature:	Digitally signed by Darrell L. Kuhn 'Date: 2020.10.13 16:34:41-05'00	LKulm
Address:	1254 Avenue A, Bldg 7091, Bryan, Texas 77807	Same asSubmitter
Country:	USA	Same asSubmitter
Accreditation Certificate Number and Dates of current Accreditation period :	ISO 17025-2017 Laboratory A2LA Certificate Number: 2821.01 Valid To: April 30, 2021	

Submitter Signature\*: Nathan Binette Digitally signed by Nathan Binette Signature\*: Nathan Binette

Submit Form
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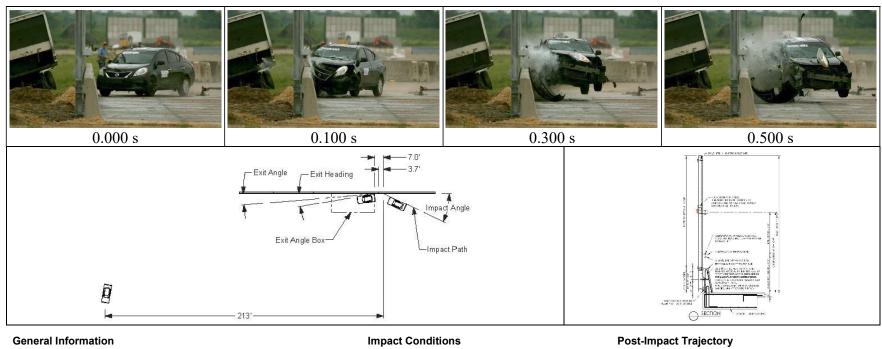
## **ATTACHMENTS**

#### 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.

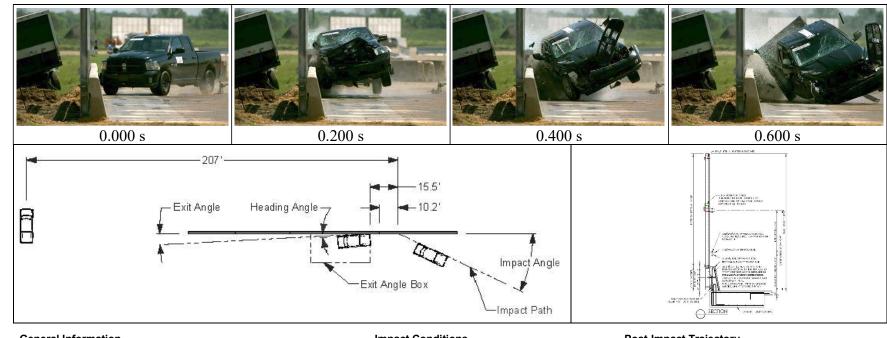
#### FHWA Official Business Only:

Eligibility Letter		
Number	Date	Key Words



General Information	Impact Conditions	Post-Impact Trajectory
Test Agency Texas A&M Transportation Inst	itute (TTI) Speed 63.0 mi/h	Stopping Distance 213 ft downstream
Test Standard Test No MASH Test 4-10	Angle 25.0°	83 ft twd traffic lanes
TTI Test No 690902-DSL3	Location/Orientation 3.7 ft upstream of	Vehicle Stability
Test Date 2020-03-26	first joint in concrete	e Maximum Yaw Angle 52°
Test Article	Impact Severity 57 kip-ft	Maximum Pitch Angle 6°
Type Longitudinal Barrier – Bridge R	ail Exit Conditions	Maximum Roll Angle 12°
Name Durisol®-Acrylite® Soundstop TI		Vehicle Snagging No
Barrier System	Trajectory/Heading Angle 3.1° / 8.3°	Vehicle Pocketing No
Installation Length 150-ft long noise barrier on 154		Test Article Deflections
Material or Key Elements 36-inch tall concrete barrier with	h 14-ft tall Longitudinal OIV24.0 ft/s	Dynamic None
acrylic wall panels supported by		Permanent None
steel posts and 2 @ HSS 8 × 4	3	Working Width 21.5 inches
rails. 17 ft to top of noise barrie	•	Height of Working Width 2.0 inches
Foundation Type Concrete Bridge Deck	THIV 11.1 m/s	Vehicle Damage
Test Vehicle	ASI2.4	VDS01RFQ5
Type/Designation1100C	Max. 0.050-s Average	CDC01FREW4
Make and Model 2014 Nissan Versa	Longitudinal13.2 g	Max. Exterior Deformation 11.0 inches
Curb 2413 lb	Lateral15.9 g	OCDI RF0010000
Test Inertial 2423 lb	Vertical6.6 g	Max. Occupant Compartment
Dummy 165 lb		Deformation 5.0 inches
Cross Statio 2500 lb		

Figure 7.6. Summary of Results for MASH Test 4-10 on Durisol®-Acrylite® Soundstop TL-4 Noise Barrier System.



General Information		Impact Conditions	Post-Impact Trajectory
Test Agency	Texas A&M Transportation Institute (TTI)	Speed 63.2 mi/h	Stopping Distance 207 ft downstream
Test Standard Test No	MASH Test 4-11	Angle 24.7°	12 ft twd field side
TTI Test No	690902-DSL2	Location/Orientation 10.2 ft upstream of	Vehicle Stability
Test Date	2020-03-24	first joint in concrete	Maximum Yaw Angle 45°
Test Article		Impact Severity 117 kip-ft	Maximum Pitch Angle 7°
Type	Longitudinal Barrier – Bridge Rail	Exit Conditions	Maximum Roll Angle 31°
Name	Durisol®-Acrylite® Soundstop TL-4 Noise	Speed 50.0 mi/h	Vehicle Snagging No
	Barrier System	Trajectory/Heading Angle 2.1° / 7.1°	Vehicle Pocketing No
Installation Length	150-ft long noise barrier on 154 ft barrier	Occupant Risk Values	Test Article Deflections
Material or Key Elements	36-inch tall concrete barrier with 14-ft tall	Longitudinal OIV 19.7 ft/s	Dynamic 1.6 inches
	acrylic wall panels supported by W6x20	Lateral OIV 27.2 ft/s	Permanent None
	steel posts and 2 @ HSS 8 × 4 x ¼ inch	Longitudinal Ridedown 4.7 g	Working Width 23.1 inches
	rails. 17 ft to top of noise barrier	Lateral Ridedown 9.7 g	Height of Working Width 204.0 inches
Foundation Type	Concrete Bridge Deck	THIV 10.3 m/s	Vehicle Damage
Test Vehicle		ASI 1.8 g	VDS01RFQ5
Type/Designation	2270P	Max. 0.050-s Average	CDC 01FREW4
Make and Model	2014 RAM 1500 pickup truck	Longitudinal9.9 g	Max. Exterior Deformation 9.0 inches
Curb	4985 lb	Lateral13.8 g	OCDI RF0020000
Test Inertial	5020 lb	Vertical 4.0 g	Max. Occupant Compartment
Dummy	165 lb		Deformation 6.0 inches
Gross Static	5185 lb		

Figure 6.6. Summary of Results for MASH Test 4-11 on Durisol®-Acrylite® Soundstop TL-4 Noise Barrier System.

			V ·
Test Standard Test No TTI Test No Test Date Test Article	690902-DSL1A	Impact Conditions Speed	rete Maximum Yaw Angle
Name Installation Length	Durisol®-Acrylite® Soundstop TL-4 Noise Barrier System 150-ft long noise barrier on 154 ft barrier 36-inch tall concrete barrier with 14-ft tall acrylic wall panels supported by W6x20 steel posts and 2 @ HSS 8 × 4 x ½ inch rails. 17 ft to top of noise barrier	Speed	Maximum Roll Angle
Foundation Type	10000S 2010 International 4300 SUT 13,200 lb 22,180 lb No dummy	THIV	Vehicle Damage VDS

Figure 5.8. Summary of Results for MASH Test 4-12 on Durisol®-Acrylite® Soundstop TL-4 Noise Barrier System.

2020-09-16

