U.S. Department
of Transportation
Federal Highway
Administration

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

AUG - 9 2019

In Reply Refer To:
HSST-1/B-322

Mr. Adrian Bullock
Highway Care Ltd.
The Highlands, Detling, Maidstone, Kent,
ME14 3HT
United Kingdom

Dear Mr. Bullock:

This letter is in response to your March 27, 2019 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-322 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:

- HighwayGuard LDS

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: HighwayGuard LDS
Type of system: Longitudinal Barrier
Test Level: MASH Test Level 3 (TL3)
Testing conducted by: HORIBA-MIRA Ltd
Date of request: March 27, 2019

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-322 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.

- 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 S. Griffith

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:	March 27, 2019	(•) New ( ) Resubmission
	Name:	Adrian Bullock	
	Company:	Highway Care Ltd	
	Address:	The Highlands, Detling, Maidstone, Kent, ME14 3HT	
	Country:	UK	
	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)	(•) Physical Crash Testing ( ) Engineering Analysis	HighwayGuard LDS	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.

Individual or Organization responsible for the product:

Contact Name:	Adrian Bullock	Same as Submitter ☒
Company Name:	Highway Care Ltd	Same as Submitter ☒
Address:	The Highlands, Detling, Maidstone, Kent, ME14 3HT	Same as Submitter ☒
Country:	UK	Same as Submitter ☒
Enter below all disclosures of financial interests as required by the FHWA `Federal-Aid Reimbursement Eligibility Process for Safety Hardware Devices' document.		
HORIBA-MIRA Ltd was the accredited independent test laboratory used for the physical crash testing of this product for this eligibility application. HORIBA-MIRA Ltd has no financial interests in HighwayGuard LDS and has no ownership of the product IP.		

PRODUCT DESCRIPTION

(•) New Hardware or Significant Modification ( ) Modification to Existing Hardware

HighwayGuard LDS is a steel barrier formed from two profiled, thin gauge sheets of steel being welded together along the join at the top, and to feet at the base, to form a long hollow section, the overall dimensions of the barrier section is 540mm wide at the base, 250mm wide at the top and 800mm high and 6000mm long. Each longitudinal section can be joined together using a unique T-connector which engages with vertical pins at the end of each section. These barrier sections are joined together and laid out along the road surface to create a longitudinal barrier system (wall).

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:	Dave Johnstone	
Engineer Signature:	D Johnston	Digitally signed by Dave Johnstone Date: 2019.03.27 12:00:21 Z
Address:	Watling Street, Nuneaton, Warwickshire, CV10 0TU	Same as Submitter ☐
Country:	UK	Same as Submitter ☐

A brief description of each crash test and its result:

Required Test Number	Narrative Description	Evaluation Results
3-10 (1100C)	This test was conducted by HORIBA MIRA Ltd on January 23, 2019 under H-M Ltd Test number W0207 The HighwayGuard LDS satisfied the MASH-16 structural adequacy criteria for its intended function as a longitudinal barrier. The test article redirected the 1100C vehicle in a controlled manner. The vehicle did not penetrate, underride, or override the installation. The test article exhibited controlled permanent and dynamic deflection in the test. All of the occupant risk criteria were satisfied in testing the HighwayGuard LDS. Theoretical occupant impact velocities in the longitudinal and lateral directions were well below the preferred limit of 30.0ft/s (9.1m/s). Ridedown accelerations in the longitudinal and lateral directions were well below the preferred limit of 15.0g. There was no test article debris detached during the test. There was no deformation to the occupant compartment of the 11OOC test vehicle. There were no intrusions into the occupant compartment. The test vehicle remained upright during and after the collision with minor roll, pitch and yaw. The HighwayGuard LDS was judged as satisfying the applicable MASH-16 vehicle trajectory criteria. The barrier was judged to have successfully met all of the evaluation criteria for MASH-16 Test 3- 10.	PASS

Required Test Number	Narrative Description	Evaluation Results
3-11 (2270P)	This test was conducted by HORIBA MIRA Ltd on January 24, 2019 under HM Ltd Test number W0208. The HighwayGuard LDS satisfied the MASH-16 structural adequacy criteria for its intended function as a longitudinal barrier. The test article redirected the 2270P vehicle in a controlled manner. The vehicle did not penetrate, underride, or override the installation. The test article exhibited controlled permanent and dynamic deflection in the test. All of the occupant risk criteria were satisfied in testing the HighwayGuard LDS. Theoretical occupant impact velocities in the longitudinal and lateral directions were well below the preferred limit of 30.0 ft/s (9.6 m/s). Ridedown accelerations in the longitudinal and lateral directions were well below the preferred limit of 15.0g. There was no test article debris detached during the test. There was no deformation to the occupant compartment of the 2270P test vehicle. There were no intrusions into the occupant compartment. The test vehicle remained upright during and after the collision with minor roll, pitch and yaw. The HighwayGuard LDS was judged as satisfying the applicable MASH-16 vehicle trajectory criteria. The barrier was judged to have successfully met all of the evaluation criteria for MASH-16 Test 3-11	PASS
3-20 (1100C)	Test not relevant to this submission	Non-Relevant Test, not conducted
3-21 (2270P)	Test not relevant to this submission	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:	HORIBA-MIRA Ltd	
Laboratory Signature:	D Johnstone	Digitally signed by Dave Johnstone Date: 2019.03.27 12:00:00 Z
Address:	Watling Street, Nuneaton, Warwickshire, CV10 0TU	Same as Submitter ☐
Country:	UK	Same as Submitter ☐
Accreditation Certificate Number and Dates of current Accreditation period :	UKAS accreditation to ISO17025 Ref: 1105 Latest Issue Date 26/10/2018	

Submitter Signature*:  Adrian Bullock
2019.03.27 12:42:33 Z

Submit Form

ATTACHMENTS

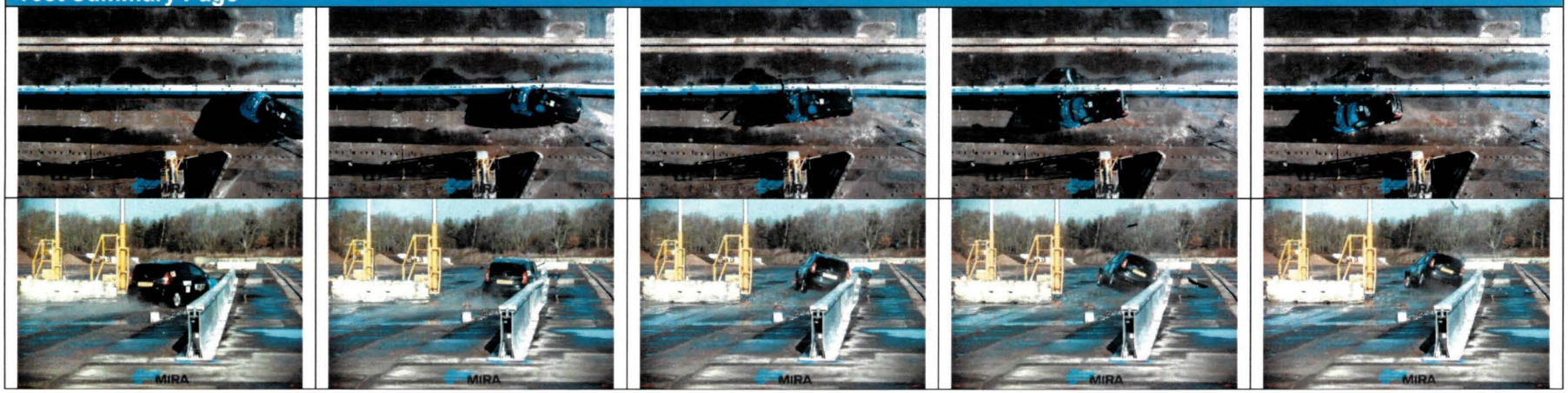
Attach to this form:

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

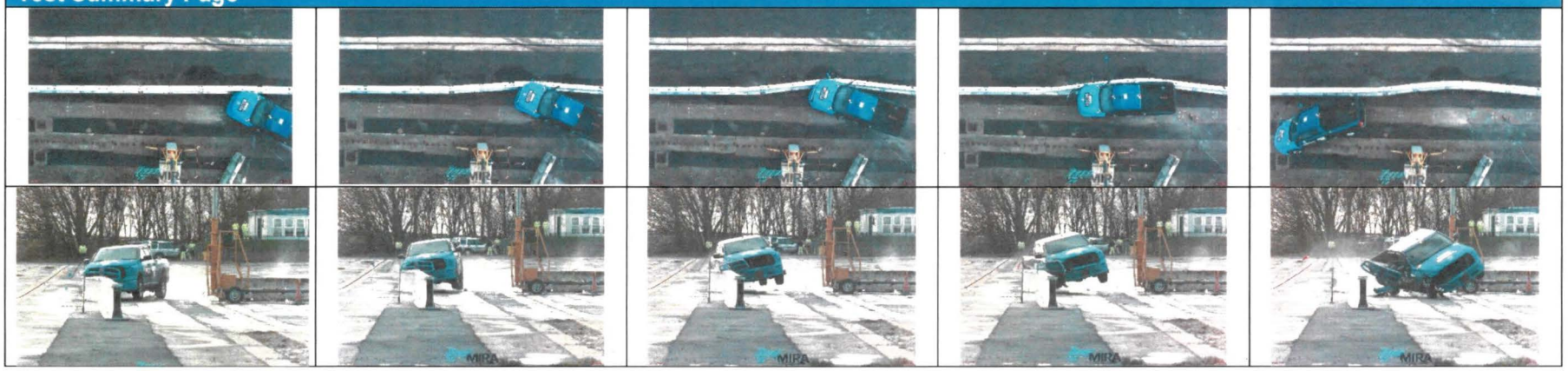
Test Summary Page



4. General Information		
Test Agency		HORIBA MIRA Ltd
Test no.		W0207
Test Date		23/01/2019
5. Test Article		
Type		HighwayGuard
Installation Length, ft. (m)		196.9 (60)
Size and/or dimension and material key elements, in. (mm)		Barrier Width: 21.3 (540), Barrier Height: 31.5 (800), Barrier Unit Length: 236.2 (6000). Ground fixings: 5 pairs of M24x330 threaded rod drilled into asphalt staggered along front and rear of system fixed with grout.
6. Ground Conditions		
Test surface/Ground		Tarmac (roadway construction)
7. Test Vehicle		
Designation		1100C (Small Passenger Car)
Make / Model		Nissan Note (VIN: SJNTAAE12U1001327)
Mass, lb (kg)	Kerb	2337.3 (1060)
	Test Inertial	2418.9 (1097)
8. Impact Conditions		
Speed, mile/h (km/h)		62.0 (99.8)
Angle (deg)		24.4
Location		Vehicle Centreline aligned to anchor bolt point close to halfway along barrier
9. Exit Conditions		
Speed, mile/h (km/h)		54.3 (87.4)
Angle (deg)		9.7
Exit Box		Compliant

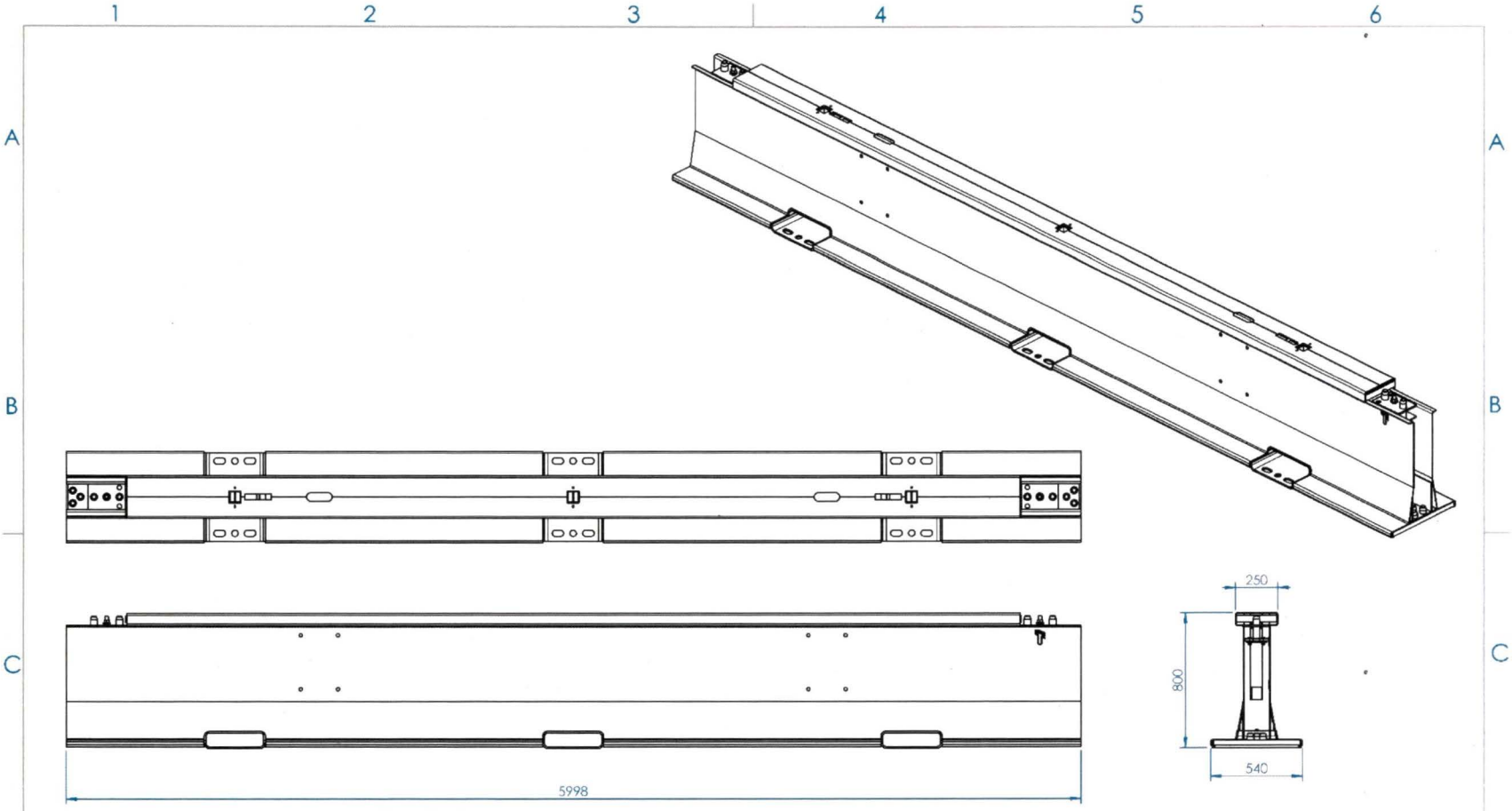
10. Post-Impact Trajectory		
Vehicle Stability		Satisfactory
Stopping distance ft. (m)		Braked to a halt 238 (72m) downstream and 118 (36m) in front of the traffic face.
11. Occupant Risk Values		
Impact Velocity ft./s (m/s)	X-direction	21.2 (6.45)
	Y-direction	-3.3 (-1.00)
THIV (optional), ft/s (km/h)		20 (22)
Occupant Ride down Acceleration (g)	X-direction	-2
	Y-direction	-5
PHD (g) (optional)		5
ASI (optional)		0.9
12. Test Article Damage		
Minor damage to barrier front face with some denting and bending. Bending to barrier anchor plate at IP and ground anchor rod at IP lifting 3.34in (85mm)		
13. Test Article Deflections		
Dynamic top of barrier, in. (m)		8.7 (0.22)
Dynamic base of barrier, in. (m)		3.5 (0.09)
Permanent Set, in. (m)		1.6 (0.04)
Working Width, in. (m)		24.8 (0.63)
14. Vehicle Damage		
Airbags deployed during impact. Damage to vehicles front longitudinal beams, Damage to RHF vehicle body, wing and inner wheel arch. Extensive damage to RHF wheel assembly, ball joint detached and wishbone folded back. Wheel and hub remained attached via the suspension strut.		

Test Summary Page



4. General Information		
Test Agency		HORIBA MIRA Ltd
Test no.		W0208
Test Date		22/01/2019
5. Test Article		
Type		HighwayGuard
Installation Length, ft. (m)		196.9 (60)
Size and/or dimension and material key elements, in. (mm)		Barrier width: 21.3 (540), Barrier Height: 31.5 (800), Barrier Unit Length: 236.2 (6000). Ground fixings: 5 pairs of M24x330 threaded rod drilled into asphalt and staggered along front and rear of system fixed with grout
6. Ground Conditions		
Test surface/Ground		Tarmac (roadway construction)
7. Test Vehicle		
Designation		2270P (4-door Pickup Truck)
Make / Model		Dodge Ram (VIN1C6RR6FT8ES278634)
Mass, lb (kg)	Kerb	5056.1 (2293)
	Test Inertial	5007.8 (2271.5)
8. Impact Conditions		
Speed, mile/h (km/h)		61.3 (98.6)
Angle (deg)		24.8°
Location		Vehicle centreline to the midpoint of installed barrier length
9. Exit Conditions		
Speed, mile/h (km/h)		51.2 (82.4)
Angle (deg)		13.4
Exit Box		Compliant

10. Post-Impact Trajectory		
Vehicle Stability		Satisfactory
Stopping distance ft. (m)		Halted 174 (53) downstream and 161 (49) in front of the traffic face.
11. Occupant Risk Values		
Impact Velocity ft./s (km/h)	X-direction	15.2 (4.64)
	Y-direction	17.1 (5.20)
THIV (optional), ft./s (km/h)		21.9 (24)
Occupant Ride down Acceleration (g)	X-direction	6
	Y-direction	9
PHD (g) (optional)		10
ASI (optional)		1.0
12. Test Article Damage		
There was deformation to the barrier at impact point and the system on the traffic face had moved back 450mm (static) as measured. There was some tearing of the steel structure on the rear of the barrier at the joint. The ground fixing studs had also been twisted and some slight tearing around the welds near the ground fixings.		
13. Test Article Deflections		
Dynamic top of barrier, in. (m)		26.8 (0.68)
Dynamic base of barrier, in. (m)		26.8 (0.68)
Permanent Set, in. (m)		25.5 (0.647)
Working Width, in. (m)		48.0 (1.22)
14. Vehicle Damage		
Damage to the whole RHS of the vehicle including bumper, front wing and some damage to the front chassis rail. The front RHS wheel control arm was sheared in the impact. The rear quarter panel and rear light were also damaged. Some cosmetic damage was caused by the vehicle suffering secondary impact with obstruction on site.		



Approx Mass 517 Kg

Ensure drawing is the correct issue and release before using.

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Tel. +44 (0) 1622 734215
www.highwaycare.co.uk

Rev.	Details.	Dwn.	Date	Ch'k'd	App'd
A	ECN 324	LH	[illegible]	ST	PD

Title: HighwayGuard - 6m Barrier Assembly

DWG No. HG-10-01-ID

SHEET 1 OF 1

ISO A4 Landscape | DO NOT SCALE | SCALE 1:30 | Revision A | Status Released