



U.S. Department
of Transportation

**Federal Highway
Administration**

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

June 15, 2017

In Reply Refer To:
HSST-1/ CC-137

Mr. Mathew Harriman
Hill and Smith, LTD.
Springvale Business and Industrial Park
Bilston, West Midlands
WV140QL

Dear Mr. Harriman:

This letter is in response to your February 13, 2017 request for the Federal Highway Administration (FHWA) to review a roadside safety device, hardware, or system for eligibility for reimbursement under the Federal-aid highway program. This FHWA letter of eligibility is assigned FHWA control number CC-137 and is valid until a subsequent letter is issued by FHWA that expressly references this device.

Decision

The following devices are eligible, with details provided in the form which is attached as an integral part of this letter:

- Brifen MASH 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 American Association of State Highway and Transportation Officials' Manual for Assessing Safety Hardware (MASH). Therefore, the device is eligible for reimbursement under the Federal-aid highway program if installed under the range of tested conditions.

Name of system: Brifen MASH Terminal
Type of system: Terminal
Test Level: MASH Test Level 3
Testing conducted by: HORIBA MIRA Ltd
Date of request: October 13, 2016
Date initially acknowledged: October 21, 2016
Date of completed package: February 13, 2017

FHWA concurs with the recommendation of the accredited crash testing laboratory as stated within the attached form.

Full Description of the Eligible Device

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

Notice

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

You are expected to 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-137 shall not be reproduced except in full. This letter and the test documentation upon which it is based are public information. All such letters and documentation may be reviewed upon request.
- This letter shall not be construed as authorization or consent by the FHWA to use, manufacture, or sell any patented system for which the applicant is not the patent holder.
- If the subject device is a patented product it may be considered to be proprietary. If proprietary systems are specified by a highway agency for use on Federal-aid projects: (a) they must be supplied through competitive bidding with equally suitable unpatented items; (b) the highway agency must certify that they are essential for synchronization with the existing highway facilities or that no equally suitable alternative exists; or (c) they must be used for research or for a distinctive type of construction on relatively short sections of road for experimental purposes. Our regulations concerning proprietary products are contained in Title 23, Code of Federal Regulations, Section 635.411.

Sincerely,



Robert Ritter
Acting Director, Office of Safety
Technologies
Office of Safety

Enclosures

Request for Federal Aid Reimbursement Eligibility of Highway Safety Hardware

Submitter	Date of Request:	October 13, 2016	<input type="radio"/> New <input checked="" type="radio"/> Resubmission
	Name:	Matthew Harriman	
	Company:	Hill and Smith Ltd (Brifen)	
	Address:	Springvale Business and Industrial Park, Bilston, West Midlands, WV14 0QL	
	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
'CC': Crash Cushions, Attenuators, & Terminals	<input checked="" type="radio"/> Physical Crash Testing <input type="radio"/> Engineering Analysis	Brifen Mash 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.

Individual or Organization responsible for the product:

Contact Name:	Matthew Harriman	Same as Submitter <input checked="" type="checkbox"/>
Company Name:	Hill and Smith Ltd (Brifen)	Same as Submitter <input checked="" type="checkbox"/>
Address:	Springvale Business and Industrial Park, Bilston, West Midlands, WV14 0QL	Same as Submitter <input checked="" type="checkbox"/>
Country:	UK	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.


The Brifen MASH terminal is wholly owned by Hill and Smith Ltd (Brifen)

PRODUCT DESCRIPTION

<input checked="" type="radio"/> New Hardware or Significant Modification	<input type="radio"/> Modification to Existing Hardware
<p>The tested system was a Hill & Smith Ltd wire rope terminal model Brifen MASH Terminal. This consisted of a 36.75ft (11.2m) long wire rope safety barrier terminal made up of 4 steel ropes mechanically fixed at ground level to a steel anchor plate. The cable was woven around 2.875" OD x 0.134" (76.1mm OD x 3mm) circular posts. The first two posts at the approach end were 16.14" (410mm) and 27.36" (695mm) above ground and spaced at 13.12ft (4m) from the ground anchor plate. The third post was a full height deflection post with 4 hooks to hold the ropes up to full height. From the second post onwards, the post spacing was 10.5ft (3.2m) continuously. The ropes were tensioned before test to a target of 2945lbf (13.1kN) each.</p> <p>The full height system attached to the terminal was the Brifen MASH system (approval number B-245)</p> <p>Installation Length, ft. (m) 36.75 (11.2) terminal + 178.5 (54.4) full height system + 21 (6.4) departing end anchor Height in impact area, in. (m) Ctr. of rope above ground: 14 (0.355), 21 (0.53), 28 (0.71), 35 (0.89) Post Material: ASTM A500-01A Grade B (Grade S275) Post Embedment, in. (mm) 12.01 (305) Post Dimensions, in. (mm) 2.875 OD x 0.134 (76.1 OD x 3) Soil/Foundation Type: Steel sockets cast in continuous concrete footing</p>	

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:	Matthew Harriman	
Engineer Signature:		
Address:	Springvale Business and Industrial Park, Bilston, West Midlands, WV14 0QL	Same as Submitter <input checked="" type="checkbox"/>
Country:	UK	Same as Submitter <input checked="" type="checkbox"/>

A brief description of each crash test and its result:

Required Test Number	Narrative Description	Evaluation Results
3-30 (1100C)	Test number - R0257, Test date - May 5th 2016, Report number - 1211515-006-001-03	PASS
3-31 (2270P)	Test number - R0261, Test date - May 13th 2016, Report number - 1209929-002-02	PASS
3-32 (1100C)	Test number - R0258, Test date - May 9th 2016, Report number - 1209929-003-01	PASS
3-33 (2270P)	Test number - R0240, Test date - May 13th 2016, Report number - 1209929-007-03	PASS
3-34 (1100C)	Test number - R0252, Test date - April 25th 2016, Report number - 1209929-004-03	PASS
3-35 (2270P)	Test number - R0255, Test date - May 9th 2016, Report number - 1209929-006-03	PASS
3-36 (2270P)	Test not run as terminal isn't connected to a stiff/rigid system.	Non-Relevant Test, not conducted

Required Test Number	Narrative Description	Evaluation Results
3-37 (2270P)	Test number - R0254, Test date - April 26th 2016, Report number - 1209929-005-01 This test was performed with the 1100C vehicle as the small car has the greatest chance of getting caught in the sloping ropes, this test has also been changed to the 1100C in the new version of MASH soon to be released.	PASS
3-38 (1500A)	Test not run as the terminal isn't energy absorbing.	Non-Relevant Test, not conducted
3-40 (1100C)	This impact is for crash cushions.	Non-Relevant Test, not conducted
3-41 (2270P)	This impact is for crash cushions.	Non-Relevant Test, not conducted
3-42 (1100C)	This impact is for crash cushions.	Non-Relevant Test, not conducted
3-43 (2270P)	This impact is for crash cushions.	Non-Relevant Test, not conducted
3-44 (2270P)	This impact is for crash cushions.	Non-Relevant Test, not conducted
3-45 (1500A)	This impact is for crash cushions.	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:	MIRA, Ltd.	
Laboratory Signature:	_____ RACHAEL KENNEDY - TEST DELIVERY HEAD.	
Address:	Watling Street, Nuneaton, Warwickshire, CV10 0TU	Same as Submitter <input type="checkbox"/>
Country:	UK	Same as Submitter <input type="checkbox"/>
Accreditation Certificate Number and Dates of current Accreditation period :	ISO/IEC 17025:2005; UKAS 1105	

Submitter Signature*: 

Submit Form

ATTACHMENTS

Attach to this form:

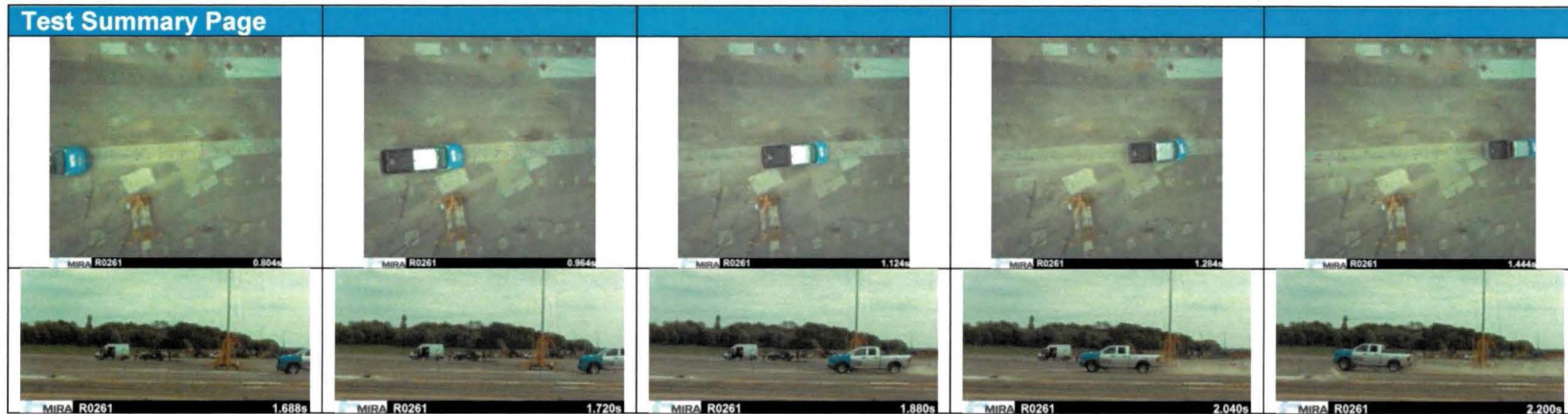
- 1) Additional disclosures of related financial interest as indicated above.
- 2) A copy of the full test report, video, and a Test Data Summary Sheet for each test conducted in support of this request.
- 3) A drawing or drawings of the device(s) that conform to the Task Force-13 Drawing Specifications [[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:

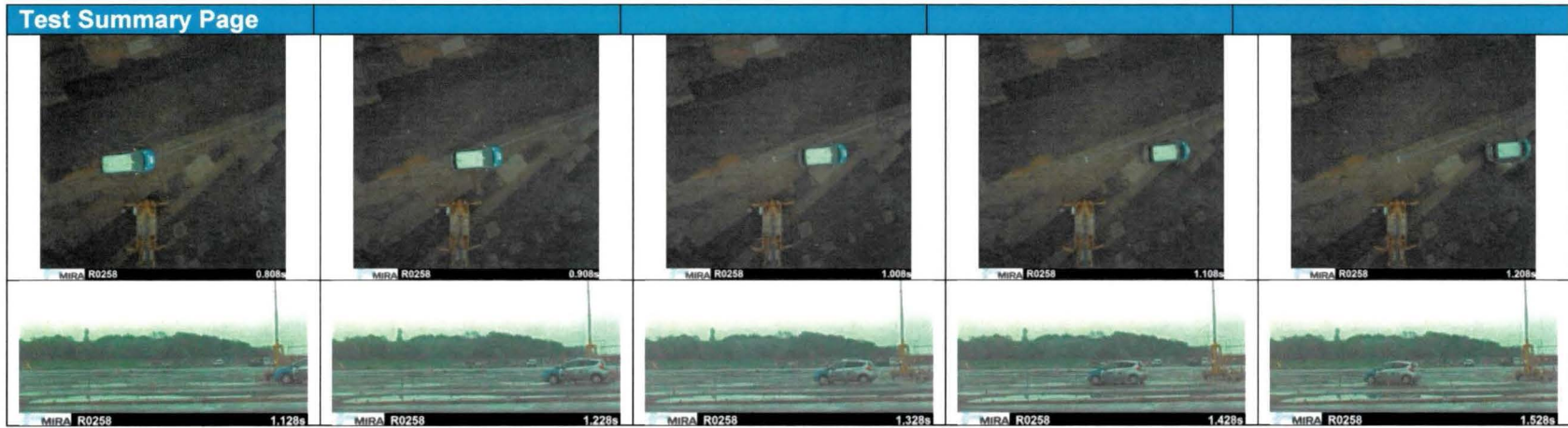
Eligibility Letter		
Number	Date	Key Words














4. General Information		10. Post-Impact Trajectory	
Test Agency	HORIBA MIRA Ltd	Vehicle Stability	Satisfactory
Test no.	R0257	Stopping distance ft. (m)	241 (73.5) downstream 56 (17) laterally
Test Date	10 th May 2016	11. Occupant Risk Values	
5. Test Article		Impact Velocity ft./s (m/s)	X-direction
Type	Wire Rope Terminal		Y-direction
Installation Length, ft. (m)	36.75 (11.2) Terminal + 178 (54.4) full height system + 21 (6.4) departing end anchor	THIV (optional), mph (km/h)	5.8 (9.4) @ 443.7ms
Size and/or dimension and material key elements, in. (mm)	Posts: 2.875 OD x 0.134 (76.1 x 3.0) x 28.15 (715), 39.39 (695), 50 (1270) Galvanised steel wire rope: 0.75 (19) dia, 3 x 7 (6 x 1) construction	Occupant Ride down Acceleration (g)	X-direction 8 @ 1258.0ms Y-direction 6 @ 1208.0ms
6. Soil Conditions, in. (mm)		PHD (g) (optional)	8.2 @ 1258.0ms
12 (305) deep steel sockets cast in continuous concrete bed		ASI (optional)	0.3 @ 1254.0ms
7. Test Vehicle		12. Test Article Damage	
Designation	1100C Small Car	Post 1 to 17 heavily bent. Post 18 to 21 slightly bent. Ropes and ground anchor not damaged.	
Make / Model	Nissan Note	13. Test Article Deflections	
Mass, lb (kg)	Kerb 2338 (1060.5)	Dynamic, in. (m)	n/a
	Test Inertial 2428 (1101.5)	Permanent Set, in. (m)	n/a
	Gross Static 2600 (1179.5)	Working Width, in. (m)	n/a
8. Impact Conditions		14. Vehicle Damage	
Speed, mile/h (km/h)	61 (98.3)	Front bumper destroyed, coolant pack holder detached, radiator damaged, headlight smashed, n/s doors and sill damaged, n/s/f wheel pushed back. Dented oil sump and deformed lower front left wishbone arm. Scuffs and scratches along under side of car. 1 severed brake line.	
Angle (deg)	0.2		
Location	Start of terminal, parallel with roadway, quarter offset to road side		
9. Exit Conditions			
Speed, mile/h (km/h)	25 (40.2)		
Angle (deg)	24.9		
Exit Box	n/a		

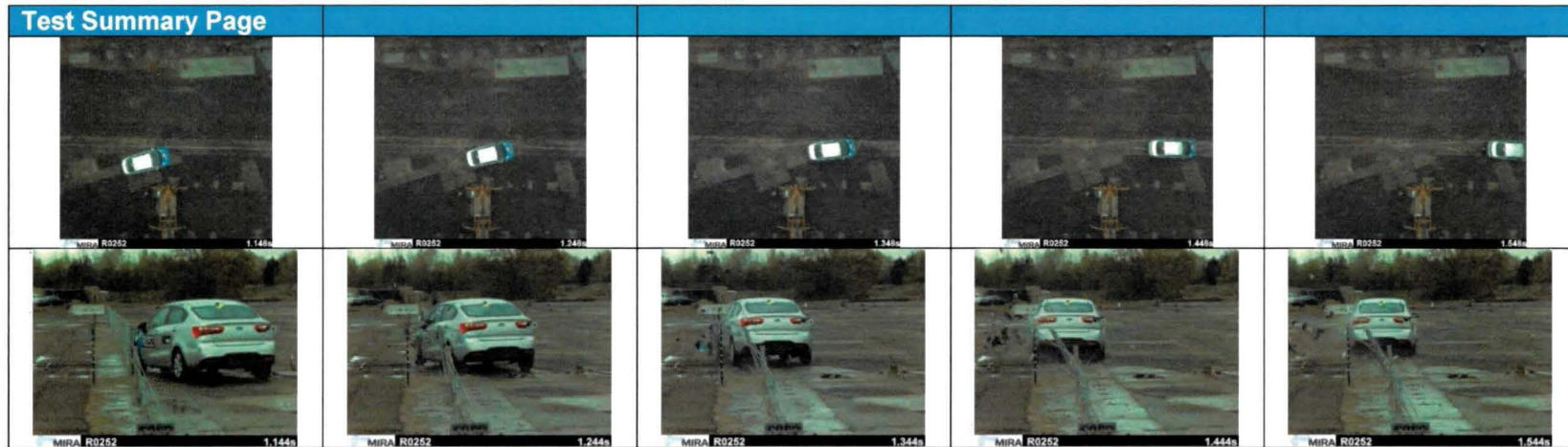


4. General Information		10. Post-Impact Trajectory			
Test Agency	HORIBA MIRA Ltd	Vehicle Stability	Satisfactory		
Test no.	R0261	Stopping distance, ft. (m)	310 (94.4) downstream 9 (2.8) laterally		
Test Date	13 th May 2016	11. Occupant Risk Values			
5. Test Article		Impact Velocity, ft./s (m/s)	X-direction	7.2 (2.2) @ 504.1ms	
Type	MASH Brifen Terminal Wire Rope Terminal		Y-direction	0.3 (0.1) @ 34.4ms	
Installation Length, ft. (m)	36.75 (11.2) Terminal + 178 (54.4) full height system + 21 (6.4) departing end anchor	THIV (optional), mile/h (km/h)		5.8 (9.4) @ 505.6ms	
Size and/or dimension and material key elements, in. (mm)	Posts: 2.875 OD x 0.134 (76.1 x 3.0) x 28.15 (715), 39.39 (695), 50 (1270) Galvanised steel wire rope: 0.75 (19) dia, 3 x 7 (6 x 1) construction	Occupant Ride down Acceleration (g)	X-direction	2 @ 1798.0ms	
6. Soil Conditions, in (mm)		PHD (g) (optional)	Y-direction	1 @ 3628.0ms	
12 (305) deep steel sockets cast in continuous concrete bed		ASI (optional)	2.3 @ 1800.0ms		
7. Test Vehicle		12. Test Article Damage			
Designation	2270P Pickup Truck	IP anchor undamaged, all posts bent. Wire support tabs on deflection post broken off. Tabs on end support post bent/snapped.			
Make / Model	Dodge Ram	13. Test Article Deflections			
Mass, lb (kg)	Kerb	Dynamic, in. (m)			n/a
	Test Inertial	Permanent Set, in. (m)			n/a
	Gross Static	Working Width, in. (m)			n/a
5054 (2292.5)		14. Vehicle Damage			
8. Impact Conditions		Front bumper/grill deformed heavily 100mm left from centreline. F/R tyre deflated. Radiator burst. Scrapes on underside.			
Speed, mile/h (km/h)	62.7 (100.9)				
Angle, (deg)	0.2				
Location	0 degrees to end terminal, parallel to roadway				
9. Exit Conditions					
Speed, mph (km/h)	n/a				
Angle, (deg)	n/a				
Exit Box	n/a				



4. General Information		10. Post-Impact Trajectory	
Test Agency	HORIBA MIRA Ltd	Vehicle Stability	Satisfactory
Test no.	R0258	Stopping distance ft. (m)	273.3 (83.3) downstream 62 (18.9) laterally
Test date	11 th May 2016	Vehicle stopped using remote braking system.	
5. Test Article		11. Occupant Risk Values	
Type	MASH Brifen Terminal	Impact Velocity, ft./s (m/s)	X-direction 1.15 (0.4) at 559.7ms
Type	Wire Rope Terminal		Y-direction 0.00 (0.00) at 5.40ms
Installation Length, ft (m)	36.75 (11.2) Terminal + 178 (54.4) full height system + 21 (6.4) departing end anchor	THIV (optional), mile/h (km/h)	2.1 (3.4) at 689.4ms
Size and/or dimension and material key elements, in (mm)	Posts: 2.875 OD x 0.134 (76.1 x 3.0) x 28.15 (715mm), 39.39 (695), 50 (1270) Galvanised steel wire rope: 0.75 (19) dia, 3 x 7 (6 x 1) construction	Occupant Ride down Acceleration (g)	X-direction 1 at 1387.0ms Y-direction 1 at 4480.0ms
6. Soil conditions, in (mm)		PHD (g) (optional)	1.4 at 1387.0ms
7. Test Vehicle		ASI (optional)	0.1 at -2819.0ms
Designation	1100C Small Car	12. Test Article Damage	
Make / Model	Nissan Note	Top wire passed over the 2 nd post downstream from IP, coming to rest on the opposite side.	
Mass, lb (kg)	Kerb 2321.5 (1053)	13. Test Article Deflections	
	Test Inertial 2425 (1100)	Dynamic, in. (m)	n/a
	Gross Static 2597 (1178)	Permanent Set, in. (m)	n/a
8. Impact Conditions		Working Width, in. (m)	n/a
Speed, mile/h (km/h)	62.1 (100)	14. Vehicle Damage	
Angle (deg)	15.4	No damage.	
Location	End/nose of terminal.		
9. Exit Conditions			
Speed, mile/h (km/h)	n/a		
Angle (deg)	n/a		
Exit Box	n/a		

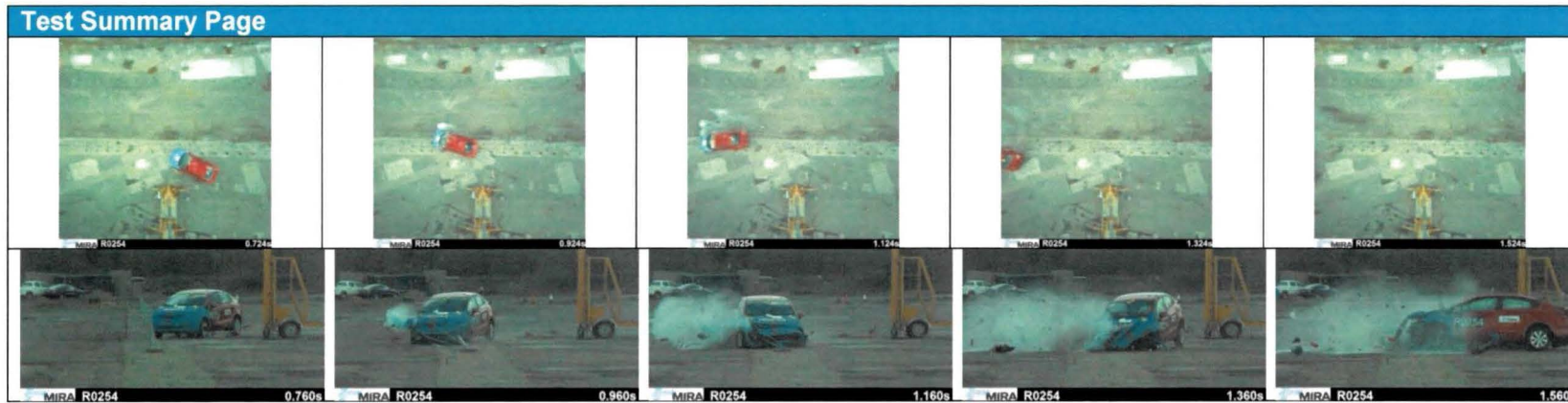
Test Summary Page					
					
					
					
					
4. General Information		10. Post-Impact Trajectory			
Test Agency		HORIBA MIRA Ltd		Vehicle Stability	
Test no.		R0240		Satisfactory	
Test Date		13 th May 2016		Stopping distance, ft. (m)	
				341 (104) downstream	
				97 (29.7) laterally	
5. Test Article		11. Occupant Risk Values			
Type		MASH Brifen Terminal		Impact Velocity, ft./s (m/s)	
Installation Length, ft. (m)		Wire Rope Terminal		X-direction	
		36.75 (11.2) Terminal + 178 (54.4) full height system + 21 (6.4) departing end anchor		Y-direction	
Size and/or dimension and material key elements, in. (mm)		Posts: 2.875 OD x 0.134 (76.1 x 3.0) x 28.15 (715), 39.39 (695), 50 (1270)		THIV (optional), mile/h (km/h)	
		Galvanised steel wire rope: 0.75 (19) dia, 3 x 7 (6 x 1) construction		3.8 (6.1) @ 452.4ms	
6. Soil Conditions, in. (mm)		305 deep steel sockets cast in continuous concrete bed		Occupant Ride down Acceleration (g)	
				X-direction	
				Y-direction	
7. Test Vehicle		PHD (g) (optional)		1.0 @ 495.1ms	
Designation		2270P Pickup Truck		ASI (optional)	
Make / Model		Dodge Ram		0.1 @ 271.2ms	
Mass, lb (kg)		Kerb 5108 (2317)		12. Test Article Damage	
		Test Inertial 5060 (2295)		Ropes were dislodged from their starting positions – top rope jumped over post 2 to rest on the opposite side. Rubber from tyre left on post 1.	
		Gross Static 5060 (2295)		13. Test Article Deflections	
8. Impact Conditions		Dynamic, in. (m)		n/a	
Speed, mph (km/h)		61.8 (99.5)		Permanent Set, in. (m)	
Angle, (deg)		15.1		4.0 (0.1)	
Location		Vehicle CL to impact end of terminal		Working Width, in. (m)	
				n/a	
9. Exit Conditions		14. Vehicle Damage			
Speed, mph (km/h)		n/a		Slight scuff and cut on front left tyre. (Still inflated).	
Angle, (deg)		n/a			
Exit Box		n/a			



4. General Information		10. Post-Impact Trajectory	
Test Agency	HORIBA MIRA Ltd	Vehicle Stability	Satisfactory
Test no.	R0252	Stopping distance ft. (m)	252.9 (77.1) downstream 7.2 (2.2) laterally
Test date	25/04/2016	Vehicle redirected but then turned back in to barrier and redirected again	
5. Test Article		11. Occupant Risk Values	
Type	MASH Brifen Terminal Wire Rope Terminal	Impact Velocity, ft/s (m/s)	X-direction 6.9 (2.1) at 153.8ms Y-direction 12.8 (-3.9) at 150.7ms
Installation Length, ft. (m)	36.75 (11.2) Terminal + 178 (54.4) full height system + 21 (6.4) departing end anchor	THIV (optional), mph (km/h)	9.8 (15.8) at 166ms
Size and/or dimension and material key elements, in. (mm)	Posts: 2.875 OD x 0.134 (76.1 x 3.0) x 28.15 (715), 39.39 (695), 50 (1270) Galvanised steel wire rope: 0.75 (19) dia, 3 x 7 (6 x 1) construction	Occupant Ride down Acceleration (g)	X-direction 6 at 391.2ms Y-direction -8 at 177ms
6. Soil conditions, in. (mm)		PHD (g) (optional)	7.7 at 176.2ms
7. Test Vehicle		ASI (optional)	0.4 at 176.4ms
Designation	1100C Small Car	12. Test Article Damage	
Make / Model	Kia Rio (USA Spec)	The deflection post and all posts up to and including DP+5 were bent to the ground. DP+12, +13 and +14 were also bent to the ground. The end anchors were undamaged and all of the wires were in-tact.	
Mass, lb (kg)	Kerb 2535 (1150)	13. Test Article Deflections	
	Test Inertial 2521 (1143.5)	Dynamic, in. (m)	35.5, (0.9)
	Gross Static 2655 (1200)	Permanent Set, in. (m)	15.75, (0.4)
8. Impact Conditions		Working Width, in. (m)	35.5, (0.9) at 27.6 (0.7) above ground
Speed, mile/h (km/h)	62.6 (100.7)	14. Vehicle Damage	
Angle (deg)	15.3	Front bumper smashed, n/s/f wheel/susp. Pushed back. Gearbox & sub frame damaged. Driver airbag deployed.	
Location	Critical impact point		
9. Exit Conditions			
Speed, mile/h (km/h)	49.7 (80) at post #9 (19.2m downstream of impact)		
Angle (deg)	2.9 degrees (after post #9)		
Exit Box	Vehicle remained within exit box		

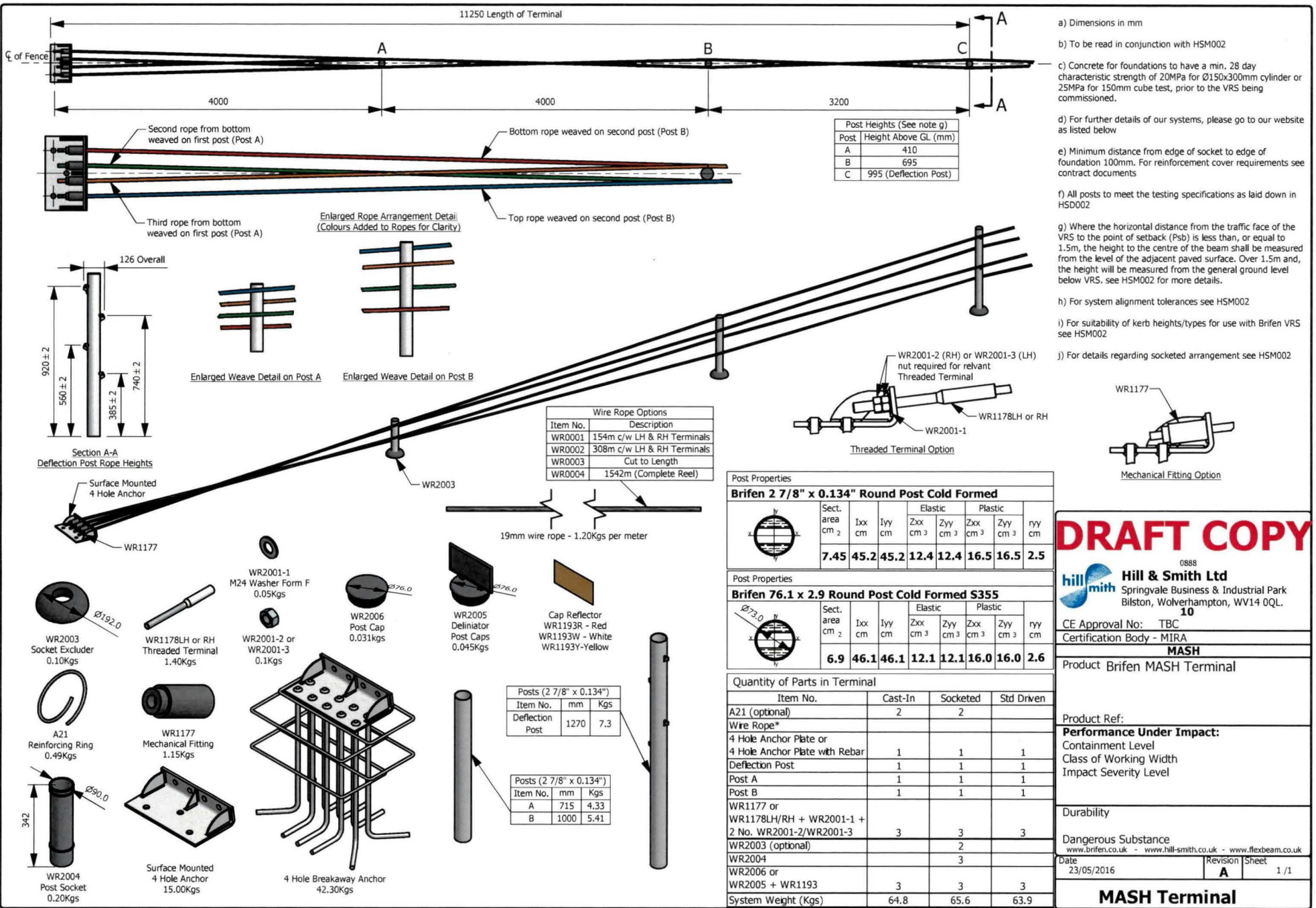


4. General Information		10. Post-Impact Trajectory	
Test Agency	HORIBA MIRA Ltd	Vehicle Stability	Satisfactory
Test no.	R0255	Stopping distance ft. (m)	185.0 (56.4) downstream 4.6 (1.4) laterally
Test date	9 th May 2016	Vehicle stopped on barrier trapped between top 2 ropes, one each side	
5. Test Article		11. Occupant Risk Values	
Type	MASH Brifen Terminal Wire Rope Terminal	Impact Velocity, ft./s (m/s)	X-direction 5.6 (1.7) at 251.2ms Y-direction -8.5 (-2.6) at 251.5ms
Installation Length, ft. (m)	36.75 (11.2) Terminal + 178 (54.4) full height system + 21 (6.4) departing end anchor	THIV (optional), mile/h (km/h)	6.8 (10.9) at 245.6ms
Size and/or dimension and material key elements, in. (mm)	Posts: 2.875 OD x 0.134 (76.1 x 3.0) x 28.15 (715), 39.39 (695), 50 (1270) Galvanised steel wire rope: 0.75 (19) dia, 3 x 7 (6 x 1) construction	Occupant Ride down Acceleration (g)	X-direction 5.0 at 2003.0ms Y-direction -4.0 at 647.7ms
6. Soil conditions, in (mm)		PHD (g) (optional)	4.9 at 2000ms
12 (305) deep steel sockets cast in continuous concrete bed		ASI (optional)	0.4 at 471.4ms
7. Test Vehicle		12. Test Article Damage	
Designation	2270P Pickup Truck	All posts upstream from impact either bent or completely bent down to ground. Rope cables still intact and connected to mechanical fixings at end anchor. Hooks on deflection post bent.	
Make / Model	Dodge Ram Crew Cab (RWD)	13. Test Article Deflections	
Mass, lb (kg)	Kerb 5254.7 (2383.5)	Dynamic, in. (m)	153.5 (3.9)
	Test Inertial 5114.7 (2320)	Permanent Set, in. (m)	47.2 (1.2)
	Gross Static 5114.7 (2320)	Working Width, in. (m)	153.5 (3.9) at 32.5 (0.8) above ground
8. Impact Conditions		14. Vehicle Damage	
Speed, mile/h (km/h)	62.8 (101.1)	Vehicle engine still running. Damage to front bumper and lights. Scrapes and dents along both sides.	
Angle (deg)	23.6		
Location	Start of full height re-directive VRS / beginning of length of need		
9. Exit Conditions			
Speed, mile/h (km/h)	Vehicle did not exit barrier		
Angle (deg)	Vehicle did not exit barrier		
Exit Box	Not required		



4. General Information		10. Post-Impact Trajectory	
Test Agency	HORIBA MIRA Ltd	Vehicle Stability	Satisfactory
Test no.	R0254	Stopping distance ft. (m)	62.3 (19) downstream 14.8 (4.5) laterally
Test date	26/04/2016	The vehicle became entangled in the barrier and impacted end anchor.	
5. Test Article		11. Occupant Risk Values	
Type	MASH Brifen Terminal Wire Rope Terminal	Impact Velocity, ft./s (m/s)	X-direction 14.8 (4.5) at 172.9ms Y-direction 15.4 (4.7) at 168.3ms
Installation Length, ft. (m)	36.75 (11.2) Terminal + 178 (54.4) full height system + 21 (6.4) departing end anchor	THIV (optional), mile/h (km/h)	13.9 (22.3) at 173.2ms
Size and/or dimension and material key elements, in (mm)	Posts: 2.875 OD x 0.134 (76.1 x 3.0) x 28.15 (715), 39.39 (695), 50 (1270) Galvanised steel wire rope 0.75 (19) dia, 3 x 7 (6 x 1) construction	Occupant Ride down Acceleration (g)	X-direction 17 at 575.5ms Y-direction -12 at 588.0ms
6. Soil conditions, in (mm)	12 (305) deep steel sockets cast in continuous concrete bed	PHD (g) (optional)	16.7 at 588.0ms
7. Test Vehicle		ASI (optional)	1.3 at 607.3ms
Designation	1100C Small Car (2270P required by standard)	12. Test Article Damage	
Make / Model	Kia Rio (USA Spec)	The end anchor (downstream) was undamaged/unmoved. All ropes were in-tact and undamaged. The deflection post (DFP), DFP +1 and DFP +2 were bent to the ground. DFP -1, -2, -3 and -4 were slightly bent.	
Mass, lb (kg)	Kerb 2538.5 (1151.5)	13. Test Article Deflections	
	Test Inertial 2584 (1172)	Dynamic, in. (m)	67 (1.7)
	61.7 (28) (water ballast dummy)	Permanent Set, in. (m)	19.7 (0.5)
	Gross Static 2645.5 (1200)	Working Width in. (m)	70.9 (1.8)
8. Impact Conditions		14. Vehicle Damage	
Speed, mile/h (km/h)	63.75 (100.9)	Front right wheel, hub and suspension detached. Front right corner deformed and stripped of outer wing. Front cross-member pushed back on right hand side. Front right door dented. SRS deployed. Oil leaks.	
Angle (deg)	23.5		
Location	Critical impact point for reverse direction impact.		
9. Exit Conditions			
Speed, mile/h (km/h)	n/a		
Angle (deg)	n/a		
Exit Box	n/a		

This drawing is Copyright © of Hill & Smith Ltd and protected under UK and International law. All rights reserved. This drawing may not be copied in whole or in part or used for any other purpose other than for that which it is supplied without express written consent from the company.



- a) Dimensions in mm
- b) To be read in conjunction with HSM002
- c) Concrete for foundations to have a min. 28 day characteristic strength of 20MPa for Ø150x300mm cylinder or 25MPa for 150mm cube test, prior to the VRS being commissioned.
- d) For further details of our systems, please go to our website as listed below
- e) Minimum distance from edge of socket to edge of foundation 100mm. For reinforcement cover requirements see contract documents
- f) All posts to meet the testing specifications as laid down in HSD002
- g) Where the horizontal distance from the traffic face of the VRS to the point of setback (Psb) is less than, or equal to 1.5m, the height to the centre of the beam shall be measured from the level of the adjacent paved surface. Over 1.5m and, the height will be measured from the general ground level below VRS. See HSM002 for more details.
- h) For system alignment tolerances see HSM002
- i) For suitability of kerb heights/types for use with Brifen VRS see HSM002
- j) For details regarding socketed arrangement see HSM002

DRAFT COPY

0888
Hill & Smith Ltd
Springvale Business & Industrial Park
Bilston, Wolverhampton, WV14 0QL.
10

CE Approval No: TBC
Certification Body - MIRA

MASH

Product Brifen MASH Terminal

Product Ref:

Performance Under Impact:
Containment Level
Class of Working Width
Impact Severity Level

Durability

Dangerous Substance
www.brifen.co.uk - www.hill-smith.co.uk - www.flexbeam.co.uk

Date	Revision	Sheet
23/05/2016	A	1 / 1

MASH Terminal

Uncontrolled When Printed or Downloaded

Print on A3

*Note: Rope not included. Please allow for the specific length of rope required when quoting.