



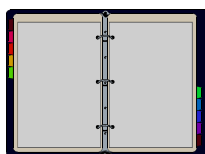
Electronic Reporting

Test TB31 of BS EN 1317 Parts 1 & 2

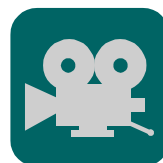
Test Number: TRL068

Trief Kerb and Pavement

(Opinions and interpretations do not form part of this report.)



[TEST
REPORT](#)



[VIDEO
FOOTAGE](#)

TEST TB31 OF BS EN 1317 PARTS 1&2

TRIEF KERB AND PAVEMENT

Customer:

Brett Landscaping & Building Materials

Test Date:

17 Jul 12

Test Number:

TRL068

Author:

A.Burton

Report Issue Date:

24 August 2012

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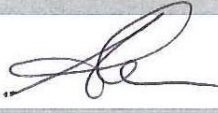

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Approval of Report

Test Manager	Anthony Burton  30/8/12
Technical Referee	Steve Savin  30/8/12

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Trief Kerb and Pavement

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1. SUMMARY

The correct installation of the test item is the responsibility of the client.

This report describes the dynamic impact test of a Trief Kerb and Pavement, measuring 30.33m in length, to TB31 of BSEN1317 Parts 1 & 2. The Trief Kerb was recessed 90mm into the running surface.

The impact conditions of this test are met with a target test mass of 1500(\pm 75) kg at a speed of 80 (-0, +7%) kph at an angle of 20(+1.5, -1) degrees to the line of the barrier traffic face.

The actual total test mass of the vehicle was 1,500kg, the impact speed was 80.3km/h and the impact angle was 19.9degrees and therefore satisfactory.

The dynamic deflection was 0.0m and the working width was 1.38m (the width of the system) (Class W5). The permanent deflection was 0.0m.

The barrier fully complied with the acceptance criteria for this TB31 test with an 'A' impact severity level (based on Table 3 of BS EN1317-2).

Note: the drawings provided by the client describe a 60m long system; this length was subsequently revised to the tested system length of 30.33m. During the vehicle acceleration and approach, the vehicle experienced a left front wheel lockup (non impact side); this did not affect the parameters of the test, and was later determined to be a seized brake calliper.

2. TEST LABORATORY

Name	TRL Limited
Address	Crowthorne House Nine Mile Ride Wokingham Berkshire RG40 3GA
Telephone Number	+44 (0)1344 773131
Facsimile	+44 (0)1344 770356
Internet Address	www.trl.co.uk
Test Site Location	Impact Test Facility
Contact	A Burton
Contact Telephone Number	+44 (0)1344 770853
Name & Address of Accreditation Body	UKAS 21-47 High Street Feltham Middlesex TW13 4UN
Notification/ Accreditation Number (with date of approval, valid at time of testing)	2721, Schedule 008, 7 Nov 2011
Additional Information	English (official test report language)

3. CUSTOMER

Name	Brett Landscaping
Address	Sileby Road, Barrow upon Soar Leicestershire
Telephone Number	01509 817187
Mobile number	07793 309643
Internet Address	www.brett.co.uk/landscaping
Contact	Andrew Gill
Additional Information	Andrew.gill@brett.co.uk

4. TEST ITEM

Name of Test Item	Trief Kerb and Pavement
Date Received	5 July 12
Date Installed	11 July 12
Date Tested	17 Jul 12
Job/quote reference Number	11109622, T10
Report Number (Laboratory Reference Number)	TRL068
Test Number	TRL068
Drawings	See Section 10
Additional Information	n/a

5. TEST PROCEDURE

5.1. TEST TYPE

Test Type (see BS EN 1317: 2, Table 1)	TB31
Target Impact Speed	80 (-0, +7%) kph
Target Impact Angle	20 (+1.5, -1.0) degrees
Target Vehicle Inertial Test Mass	1500 +/- 75 kg
Additional Information (e.g. details of other testing carried out within the barrier "Family")	n/a

5.2. TEST AREA

Description of Type and Condition of Test Area	Asphalt surface.
Sketch of vehicle approach to indicate impact point	System length 30.33m, impact target point 10.12m from 'entry'.
Type of underground	Asphalt running surface 50-80 mm thick.
Class/ condition of underground	Sub base: concrete 150-250 mm thick.
Additional Information	n/a

5.3. INSTALLATION OF TEST ITEM

4.3.1	Conformity between test item drawings and item tested (Yes/ No)	Yes
4.3.2	Conformity between installation manual and item installed (Yes/ No)	No manual provided
4.3.3	Description of the VRS tested which shall include, as a minimum:	Trief kerb stones and concrete pavement (no rebar).
4.3.3.1	<ul style="list-style-type: none"> • Ground fixing details 	System recessed 90mm into asphalt surface. No ground fixings.
4.3.3.2	<ul style="list-style-type: none"> • Total length of test item (m) 	30.33m
4.3.3.3	<ul style="list-style-type: none"> • Height of test item in the impact area (m) 	0.29m
4.3.3.4	<ul style="list-style-type: none"> • Unit length (m) 	Individual kerb stones measure 0.914m in length
4.3.3.5	<ul style="list-style-type: none"> • Product tension (where applicable) 	n/a
4.3.3.7	<ul style="list-style-type: none"> • Additional Information, to describe the VRS sufficiently (e.g. fastening torques) 	n/a

Note: numbers above refer to BS EN 1317 Part 2 clause numbers.

5.4. VEHICLE

Make		Rover	
Model		75	
Body Style		Saloon	
Year		2004	
VIN		SARRJHLPB4D326680	
Vehicle roadworthiness assessment (inc. date of assessment, e.g. MOT)		MOT Certificate present (ref: 377339902142), expires 17/04/2013.	
Condition		Good.	
Vehicle Mass		1500kg	Compliance Yes
Ballast Mass		166kg	Compliance Yes
Description of ballast		24kg remote brake system, 11kg DAU and battery in boot, 5kg of guidance hub, 1.5kg radio equipment on boot lid, 15.5kg rope release mechanism on tunnel and 1kg rope release battery. Ballast weights fitted in rear foot wells and roof (108kg total).	
Dummy Mass, Type & Position (if fitted)		None	
Total Test Mass		1,500kg	Compliance Yes
Track Width	Front	1511mm	Compliance Yes
	Rear	1489mm	Compliance Yes
Centre of Mass	Aft of front axle	1210mm	Compliance Yes
	Lateral from centre line	0mm to right	Compliance Yes
	Above ground	533mm	Compliance Yes
Drive (LHD/ RHD)		RHD	
Drive (FWD/ RWD)		FWD	
Number of axles		Two	
Transmission (Manual/Automatic)		Manual	
Tyre Size		195/65 R15	
Wheel radius mm		295mm	
Tyre Pressure	Front	30 psi	
	Rear	30 psi	
Ride Height	Front	LHS	693mm
		RHS	681mm
	Rear	LHS	680mm
		RHS	669mm
Wheelbase	LHS	2753mm	
	RHS	2751mm	
Maximum Width (excluding side mirrors)		1748mm	
Front Overhang		911mm	
Overall Vehicle Length		4727mm	
Any additional information			

The following parts were removed: Handbrake, jack and tools, boot liner, handbrake and centre console (to accommodate rope release mechanism and instrumentation).

5.5. VEHICLE INSTRUMENTATION

Transducer Position	Direction		
	X	Y	Z
Vehicle Acceleration	√	√	√
Roll Rate	√		
Pitch Rate		√	
Yaw Rate			√

5.6. DETAILS OF INSTRUMENTATION

Channel Description	Transducers				Position relative to C of G (+ forwards - rearwards)	
	ID	CAC	Units	Calibration date	X plane	Y Plane
Vehicle X	B63519	250	g	04/04/12	0mm	0mm
Vehicle Y	B63512	250	g	04/04/12	0mm	0mm
Vehicle Z	B58672	250	g	30/08/11	0mm	0mm
Vehicle X Back	B63523	500	g	04/04/12	0mm	-35mm
Vehicle Y Back	B63507	500	g	04/04/12	0mm	-35mm
Vehicle Z Back	B63522	500	g	16/05/12	0mm	-35mm
Vehicle Roll	ARS3540	1500	Deg/s	06/06/12	0mm	+35mm
Vehicle Pitch	ARS3546	1500	Deg/s	06/06/12	0mm	+35mm
Vehicle Yaw	ARS3723	1500	Deg/s	06/06/12	0mm	+35mm

6. RESULTS

Test Number	TRL068
Date	17 July 2012
Weather Conditions	Sunny/ overcast
Track Surface	Dry, swept.
Temperature (nominal)	20.3deg C
Additional information	n/a

6.1. IMPACT CONDITIONS AND INTERACTION WITH BARRIER

Impact speed	80.3km/h
Difference from target speed	+ 0.4%
Impact speed within tolerance	Yes
Impact angle	19.9degrees
Difference from target angle	-0.1 degrees
Within tolerance envelope (BS EN 1317-2 Figure 3)	Yes
Vehicle breaches barrier	No
During and after the impact, no more than one wheel of the vehicle passes over the rearmost part of the deformed system (yes/ no/ n-a)	n/a
Vehicle within 'exit box'	Yes
Vehicle rolls over within test area	No
Major part of vehicle detached	No
<i>For VRS to be mounted on bridges, retaining walls or on other structures: vehicle or tested item supported by any structure beyond the bridge deck edge (yes/ no/ n-a)</i>	n/a
Graphs of the vehicle instrumentation output may be found in Section 11	

6.2. TEST SEQUENCE

The vehicle was towed and guided to the impact area by means of wire ropes, one of which was attached to a continuous loop of steel cable, driven by a computer controlled hydraulic propulsion system. Immediately before impact, the towing cable and guidance cables were detached and the vehicle travelled freely, at the specified speed, into the barrier.

The speed of the vehicle immediately before impact was measured by a photoelectric device positioned a short distance (approximately 5m) from the impact point. Photographic coverage of the test was carried out using the required array of high speed cameras specified in BS EN 1317-2.

The front right hand side (RHS) corner of the vehicle contacted the barrier, at the intended impact point and immediately began to deform, leaving the first (bodywork) witness marks 9.830m from the entry end of the system. The RHS front wheel was damaged on impact. As the deformation of the front RHS continued, the vehicle yawed, concurrently pitching and rolling. During this movement, all four wheels lifted from the running surface. As the

vehicle came back into contact with the running surface, the RHS front wheel was displaced further (it should be noted that the damaged wheel remained attached throughout the impact).

The vehicle continued on its redirected path away from the kerbing, with minimal pitching and rolling. The vehicle's wheel track did not cross the exit box line, and it continued past the departure end of the system, remaining within the exit box boundary line (see below for additional details). The vehicle was remotely braked and came to rest, with no further impact damage sustained.

Note: During the vehicle acceleration and approach, the vehicle experienced a left front wheel lockup (non impact side); this did not affect the parameters of the test, and was later determined to be a seized brake calliper.

6.3. TEST ITEM PERFORMANCE

Maximum Dynamic Deflection (m)	0.0m
Normalised Dynamic Deflection (m)	0m
Working Width (m)	1.38m (the width of the system)
Normalised Working Width (m)	1.38m (the width of the system)
Class of Working Width	W5
Maximum Permanent Deflection of Barrier (m)	0m
Length of Contact (m)	5.14m
Impact Point (start of paint witness marks) (m)	9.83m from entry
Major parts fractured or detached	No
Describe movement of end anchors	n/a
Ground Fixing meets design levels	n/a

6.4. VISUAL MEDIA RECORDS

Digital stills were taken of the barrier and the vehicle pre and post-test. Particular stills are referred to in the text. Video evidence of the test was also taken.

6.4.1. PRE TEST PHOTOGRAPHS

Description	Photograph
Vehicle front	TRL068_S015
Vehicle rear	TRL068_S018
Vehicle left hand side	TRL068_S019
Vehicle right hand side	TRL068_S017
Vehicle at impact point (front view)	TRL068_S028
DAU and remote brake unit	TRL068_S027
Instrumentation	TRL068_S022

6.4.2. VIDEO EVIDENCE

The following camera views were recorded.

View	Nom Speed	File
View along barrier from approach end	500fps	TRL068 upstream along
Overhead view of impact point	500fps	TRL068 overhead direct
Overhead view from deflection zone to departure end	500fps	TRL068 overhead downstream
View along reciprocal of vehicle approach	500fps	TRL068 vehicle approach path
View along barrier from departure end	500fps	TRL068 downstream along
Panned real time video	25fps	TRL068 real time pan

6.4.3. POST TEST PHOTOGRAPHS

6.4.3.1. PHOTOGRAPHS OF VEHICLE

Description	Photograph
View of impact point from vehicle's approach	TRL068_S051
View of impact point from rear	TRL068_S082
General view of zone of deflection from front	TRL068_S086
Overhead view of zone of deflection	TRL068_S094
General view of barrier and vehicle	TRL068_S093
General view of front of system from departure end	TRL068_S080

6.4.3.2. PHOTOGRAPHS OF TEST ITEM

Description	Photographs
Vehicle front	TRL068_S077
Vehicle rear	TRL068_S062
Vehicle left hand side	TRL068_S057
Vehicle right hand side	TRL068_S061
Close up of damage to front right hand side	TRL068_S060
Vehicle interior	TRL068_S063

6.5. DAMAGE TO THE TEST ITEM

The maximum permanent deflection of the barrier was 0.0 m. There was no evidence of lateral movement or deviation of the pavement, and no evidence of cracking of the concrete pavement (see photograph [TRL068_S085](#)).

There was damage to kerb stones 11, 12 and 13. This damage consisted of surface chipping, and scratching (see photograph [TRL068_S053](#)).

There was no evidence of movement in either the entrance of departure ends of the system.

6.6. DAMAGE TO THE VEHICLE

The following damage to the vehicle was recorded:

- The RHS of the front bumper was displaced (cracked around fixing points);
- The RHS front wing was dented and creased;
- The RHS front wheel was damaged and displaced, with significant damage to the steering arm;
- The RHS sill between front and rear wheel, shows scratching and surface damage;
- The RHS front tyre was deflated;
- The LHS front tyre was deflated;
- Engine coolant reservoir was displaced on impact.

There was no significant damage or intrusion to the passenger compartment.

6.7. EXIT BOX

The exit box line was marked at 4.704m from the traffic face of the system (for calculations of exit box criteria reference BS EN1317-2: 2010 paragraph 4.3).

To aid post-test analysis a line of sand was applied to the exit box line, so that (should the vehicle cross the line) the displacement of the sand could be used to confirm whether or not exit box criteria 'B' was met (reference EN1317-2: 2010 Table 7).

The vehicle did not cross the exit box line at any point, therefore the criteria was met.

6.8. VEHICLE COMPARTMENT DEFORMATION INDEX (VCDI)

Position	Pre-Test (mm)	Post-Test (mm)	Difference Pre-test – Post-test	
			mm	%
Distance between the dashboard and top of the rear seat	1843	1843	0	0
Distance between the roof and the floor panel	1314	1313	-1	0
Distance between the rear seat and the motor panel	2217	2217	0	0
Distance between the lower dashboard and the floor panel	469	467	-2	-0.5
Interior width	1447	1447	0	0
Distance between the lower edge of the right window and the upper edge of the left window	1293	1292	-1	0
Distance between the lower edge of the left window and the upper edge of the right window	1294	1294	0	0
Vehicle cockpit deformation index VCDI	AS0000000			

6.9. PEAK CHANNEL VALUES

First record at Time 0.00ms.

Last record at time 1500.00ms

Name	Filter	Unit	Channel Description	Peak		Time (ms)	
				(+) ve	(-) ve	(+) ve	(-) ve
V0TM0GX0_F	CFC_60	g	Vehicle Acc X	10.54	-10.68	0.018	0.022
V0TM0GY0_F	CFC_60	g	Vehicle Acc Y	5.34	-17.65	0.089	0.173
V0TM0GZ0_F	CFC_60	g	Vehicle Acc Z	10.13	-29.29	0.110	0.120
V0TM0WX0_F	CFC_60	deg/s	Vehicle Roll Rate	136.34	-135.89	0.110	0.982
V0TM0WY0_F	CFC_60	deg/s	Vehicle Pitch Rate	208.95	-134.96	0.107	0.120
V0TM0WZ0_F	CFC_60	deg/s	Vehicle Yaw Rate	432.37	-165.41	0.119	0.052
V0TM0GR0_F	CFC_60	g	Vehicle Acc Resultant	29.5	0.03	0.120	1.377

7. ACCEPTANCE CRITERIA (BS EN 1317-2: 2010)

Safety Barrier Behaviour - Paragraph 4.2	
Details	Details
The safety barrier including parapet shall contain the vehicle without complete breakage of any of the principal longitudinal elements of the system.	The safety barrier contained and redirected the vehicle without breakage of principal longitudinal elements
Elements of the safety barrier including vehicle parapet shall not penetrate the passenger compartment of the Vehicle. Deformations of, or intrusions into the passenger compartment that can cause serious injuries shall not be permitted.	There were no deformations or intrusions into the passenger compartment that could cause serious injuries.
Foundations, ground anchorages and fixings shall perform according to the design of the safety barrier including vehicle parapets.	Not applicable – surface mounted safety barrier.
Vehicle Behaviour - Paragraph 4.3	
During and after impact, no more that one of the wheels of the vehicle shall completely pass over or under the safety barrier.	During the entire test sequence none of the wheels of the vehicle passed over or under the safety barrier.
The vehicle shall not roll over (including rollover of the vehicle onto its side) during or after impact.	The vehicle remained upright during the entire test sequence.
The vehicle shall leave the safety barrier including vehicle parapet after impact so that the wheel track does not cross a line parallel to the initial traffic face of the system, at a distance A (2.2m) plus the width of the vehicle plus 16 % of the length of the vehicle within a distance B (10m) from the last (namely closest to the downstream end of the barrier) point.	The vehicle left the safety barrier after impact so that the wheel track did not cross a line parallel to the initial traffic face of the system, at a distance A (2.2m) plus the width of the vehicle plus 16 % of the length of the vehicle within a distance B (10m) from the last (namely closest to the downstream end of the barrier) point.
Installation - Paragraph 5.3.2	
The length of the safety barrier should be sufficient to demonstrate the full performance characteristic of any longer system.	The length of the safety barrier was sufficient to demonstrate the full performance characteristic of any longer system. The ends of the barrier did not move.
Envelope of Combined Tolerances - Paragraph 5.4.3	
Test speed and angle within the envelope of combined tolerances	The test speed and angle were within the envelope of combined tolerances.

7.1. ASSESSMENT OF IMPACT SEVERITY

Using vehicle accelerometer corrected to CofG				
		Limit	CFC_180	13Hz filter
Acceleration Severity Index ASI (rounded to 1 d.p.)		1.9	1.0	0.9
Theoretical Head Impact Velocity THIV (km/h)		33	23	23
Post Impact Head Deceleration PHD (g)		20	9	5
Flail Space		0.6 x 0.3m	0.6 x 0.3m	0.6 x 0.3m
Time of Flight (ms)			241.2	247.5
Occupant Impact Velocity OIV (m/s)	Forward	Limits not specified in BS EN 1317	319	3.2
	Lateral		5.4	5.3
Occupant Ridedown Acceleration ORA (g)	Forward		-3.8	-2.1
	Lateral		-9.3	-4.6

Injury severity parameters are calculated using TRL autosequence *thiv_phdq.aut* (date 10/02/2010) running in DIADEM version 9.10.2036 TDM.

8. CONCLUSION

The overall length of the system, measured from the extreme ends was 30.33m.

The total test mass of the vehicle was 1,500kg, the impact speed was 80.3km/h and the impact angle was 19.9degrees, therefore the impact conditions were compliant with the Standard and satisfactory.

The dynamic deflection was 0.0m and the working width was 1.38m (the width of the system) (Class W5). The permanent deflection of the system was 0.0m.

The system fully complied with the acceptance criteria for this TB31 test with an 'A' rating for impact severity level.

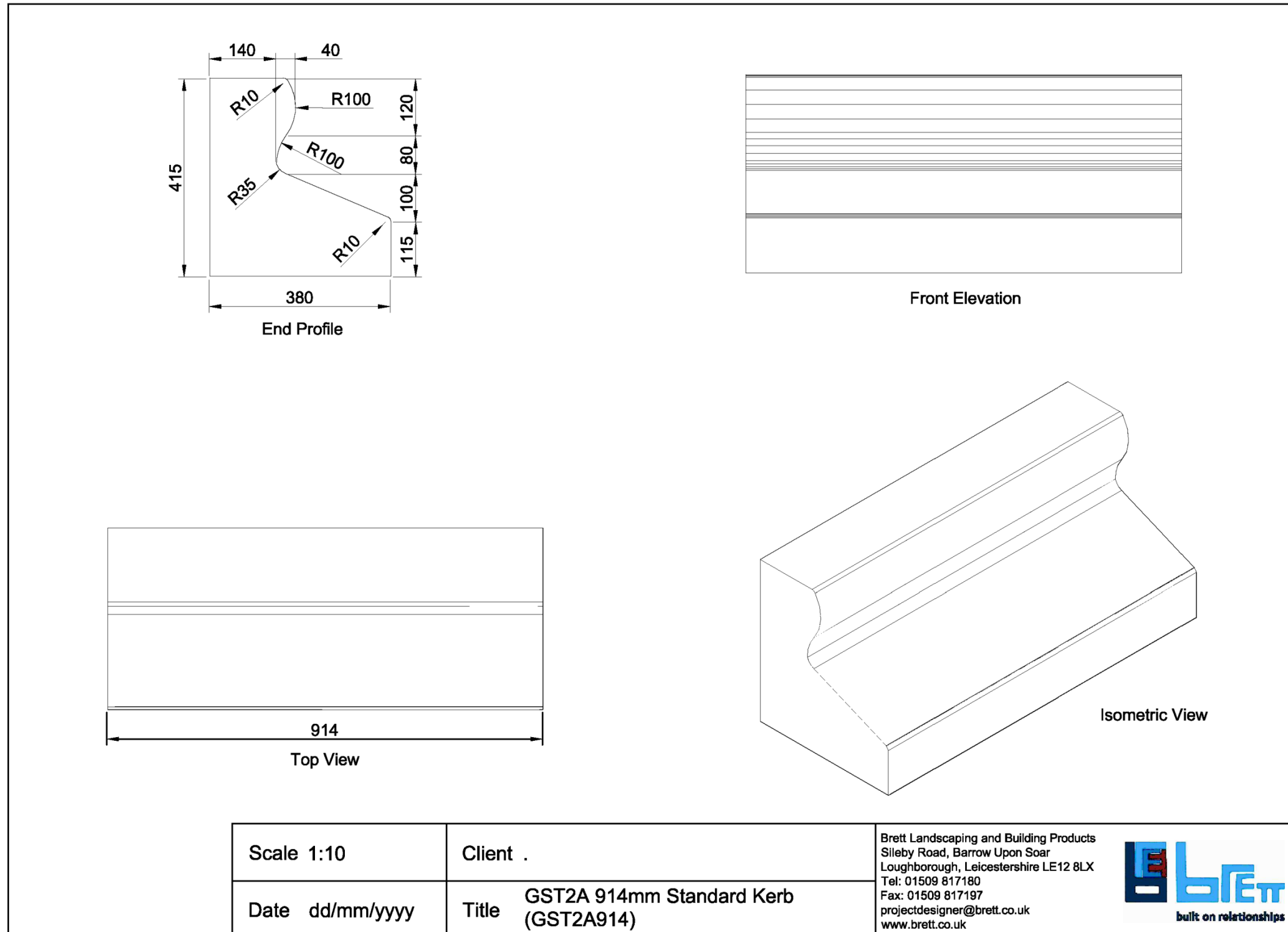
9. GENERAL STATEMENTS

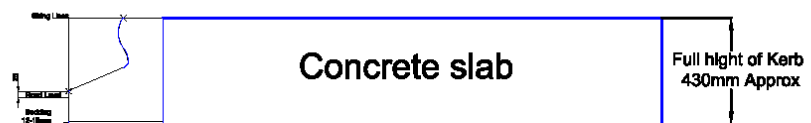
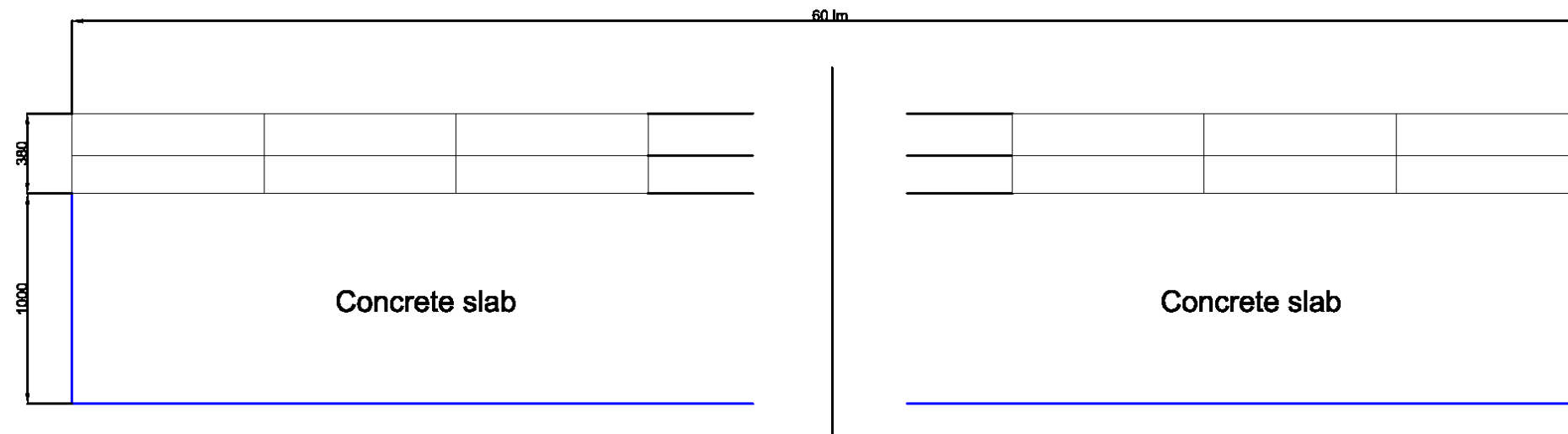
The test results in this report relate only to the items tested.

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The vehicle and test preparation were carried out by test engineers from TRL, under the supervision of the TRL test manager.

10. ANNEX A - DRAWINGS AND INSTALLATION OF THE TEST ITEM

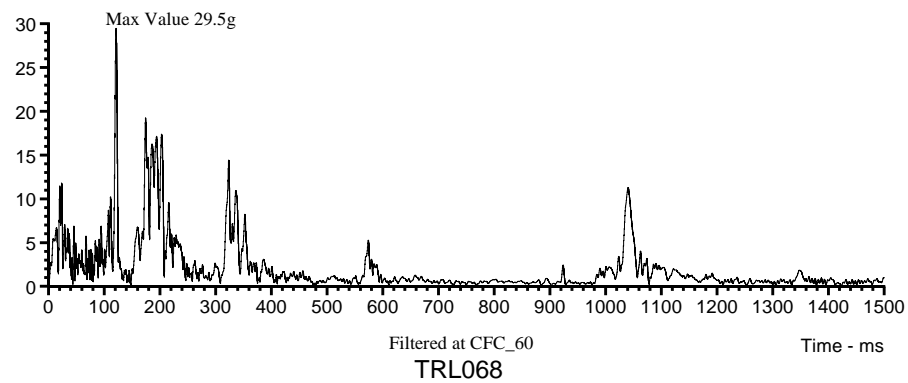
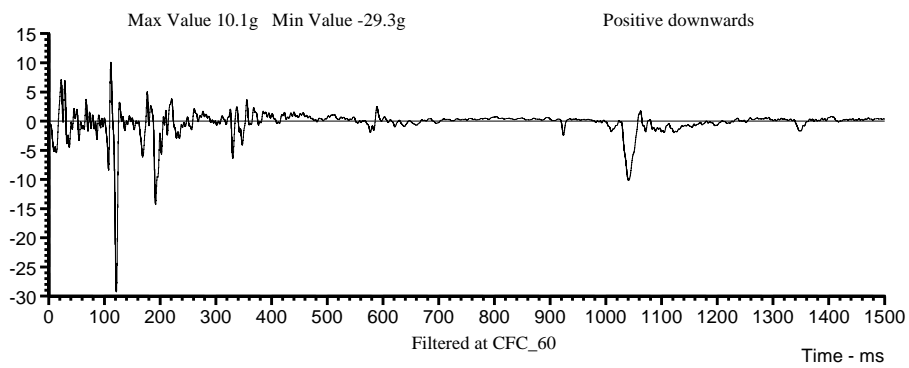
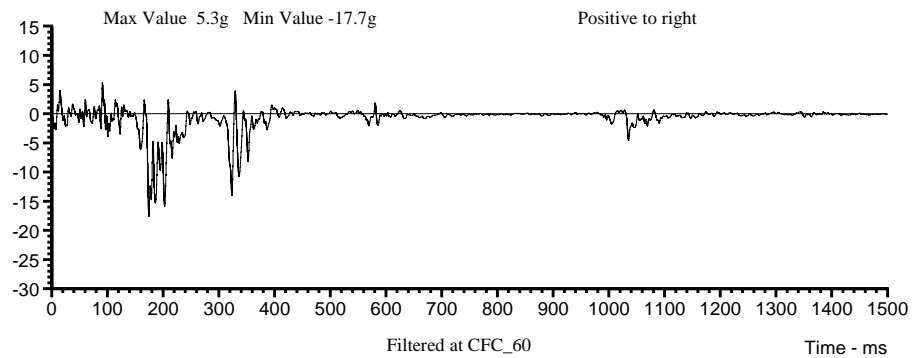
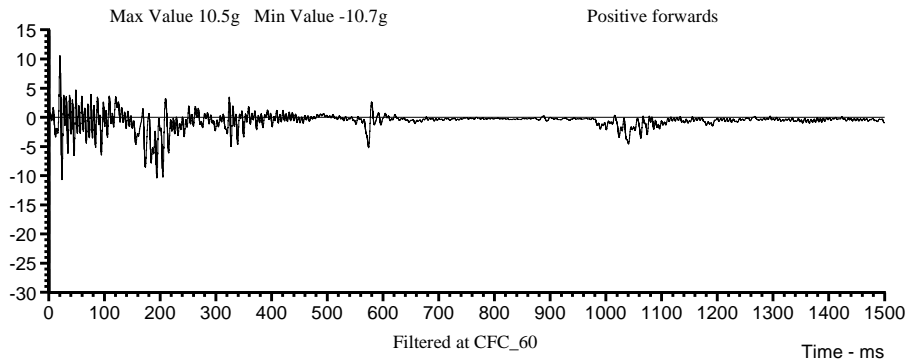




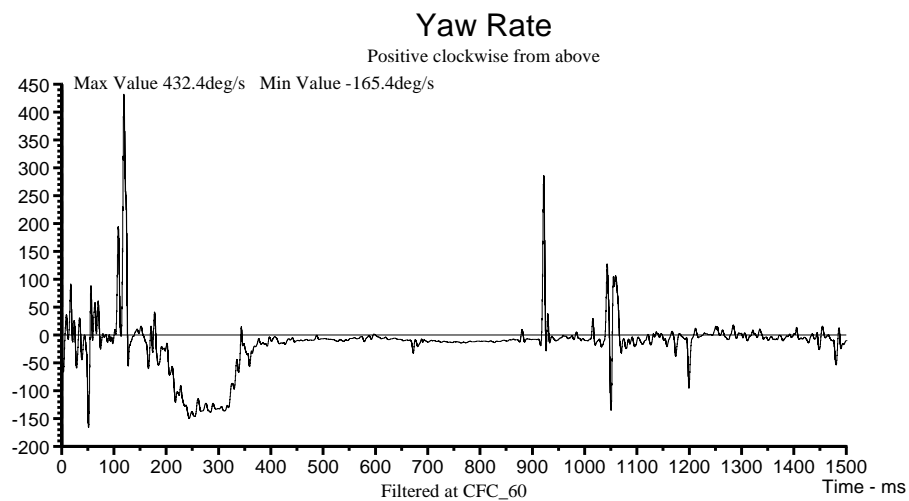
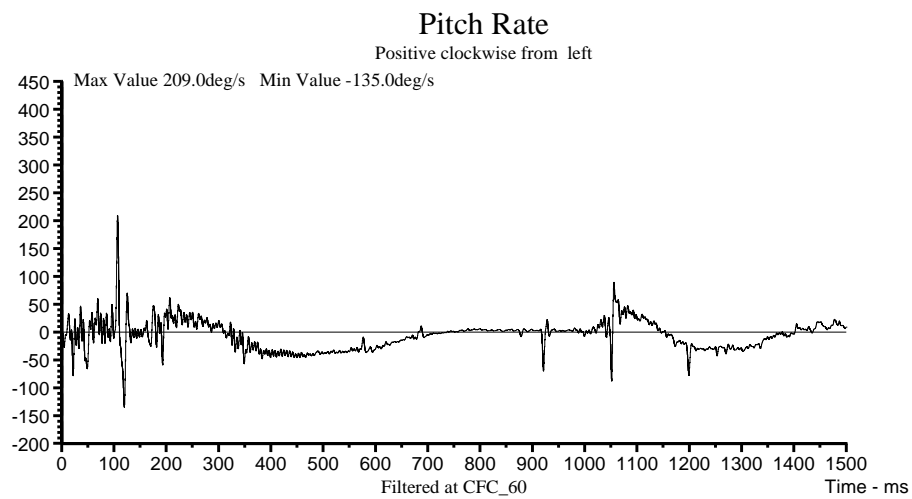
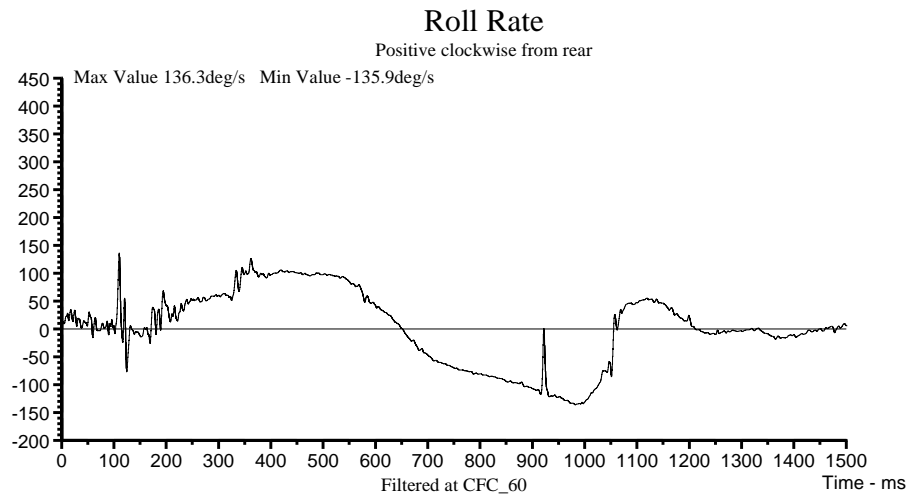
TRL Note: the drawings provided by the client describe a 60m long system; this length was subsequently revised to the tested system length of 30.33m.

11. ANNEX B - ACCELERATION & RATE GRAPHS

11.1. B1 - VEHICLE ACCELERATION



11.2. B2 - ANGULAR RATE OF THE VEHICLE



TRL068