Test Report - Commercial in Confidence
X0032 Bailey Street Furniture Inspira Protect Planter

Test Laboratory	**HORIBA MIRA Ltd**
Date of Report	**25/01/2022**
Client	**Centre for the Protection of National Infrastructure (CPNI)**
Test Item	**Inspira Protect Planter**
Date of Test	**10/09/2020**
Test Number	**X0032**
Report Number	**1223164-004-005-03**
Test Type	**Vehicle Impact**
Product Rating	**IWA 14-1:2013 Planter V/1500[M1]/48/90:0.0**
Number of Pages	**21**

Prepared By:

Dave Johnstone

Consultant - HSPI Test Centre

Approved By:

Rachael Kennedy

Head of HSPI Test Centre

Date:25/01/2022

1105

Tests marked "Not UKAS Accredited" in this report are not included in the UKAS Accreditation Schedule for this laboratory. Opinions and interpretations expressed herein are outside the scope of UKAS Accreditation

Contents

1 Introduction

1.1 Test laboratory

Name	HORIBA MIRA Limited
Address	Watling Street, Nuneaton, Warwickshire, CV10 0TU. United Kingdom
Telephone number	+44 (0)24 7635 5000
Facsimile number	+44 (0)24 7635 8000
Internet address	http://www.horiba-mira.com
Test site location	At above address.
Accrediting body	United Kingdom Accreditation Service 21-47 High Street, Feltham, Middlesex. TW13 4UN
Accreditation details	HORIBA MIRA is designated as UKAS testing laboratory 1105, with approval dated 31 July 1992, subsequently renewed periodically, for details of the latest approval, and schedule of accreditation see: http://www.ukas.org/testing/lab_detail.asp?lab_id=826

1.2 Product Manufacturer

Name	Bailey Streetscene Ltd
Address	Adlington Business Park, London Road, Adlington, Cheshire, SK104NL
Internet address / email	barrie.woodcock@bsfg.co.uk
Type	Planter
Model No	Inspira Protect

1.3 Client

Name	Centre for the Protection of National Infrastructure (CPNI)
Address	PPSD – HVM
Internet address / email	https://www.cpni.gov.uk/
Additional information	Purchase order: 7088264
	Client Engineer: n/a

1.4 Test Area

The test was carried out on the Highway Safety & Protection of Infrastructure (HSPI) Test Area adjacent to the HORIBA MIRA Ltd Vehicle Proving Ground.
The test area was generally flat with a gradient not exceeding 2.5 %. It had a level hardened paved surface and was kept as clear of dust, debris, standing water, ice and snow at the time of the test, as was practicably possible.
Vehicle propulsion was by use of a computer controlled electric drum winch with guidance to the impact point by means of a tensioned wire system attached to the front wheel of the test vehicle. Both towing and guidance systems were detached approximately 3m prior to contact with the test article.

1.5 Test Procedure

Item	Requirement
Test Specification	IWA 14-1:2013
Target Speed (km/h)	48.0 +3.0 /-1.0
Target Impact Angle (deg)	90.0 ±2.0
Target test vehicle mass (kg)	1500 ±75
Product Classification	B-Foundation/Passive/Planter
Target Impact Energy (kJ)	133.3

2 Test Set-up

2.1 Product Description

The tested item an Inspira Protect Planter, manufactured by Bailey Street Furniture and installed by Wilkinson Environmental Ltd.

The planter consisted of 4mm wall steel box measuring 1500x1000x450mm with steel gussets on each internal corner and on the centreline. The sections of the planter were bolted together with M10 bolts. The top face was folded into a "U" section forming a channel around the sides to create a seating area. There were box section supports inside on the corner joints. Once fixed, the planter was filled with dry topsoil to the required level.

2.2 Foundation/Installation Description

The foundation consisted of an excavation 1640x1140x150mm deep.

This was then was filled with C30/37 concrete with “TopRoc Rapid 1” additive to ensure that the concrete reached the minimum design strength in the required time. This pad had a A393 mesh placed at 75mm below ground level.

The test item was bolted down to the concrete pad using 28No. 130mm long M16 Concrete expanding bolts to 100mm depth.

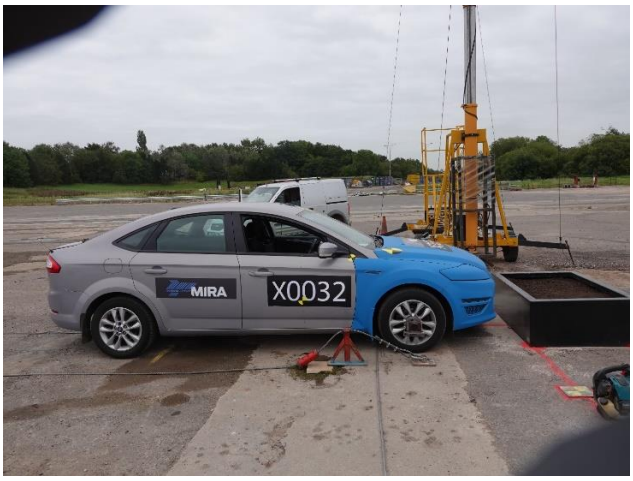
The planter was then filled with a 1m3 bag of topsoil to just below the top strengthening frame, ensuring good compaction by hand.

2.3 Concrete Crush Test Results

Item	Information / Measurement
Date Foundation Cast	01/09/2020 (9 days before test date)
Concrete compressive crush test results for 150mm sample (MPa). Compressive testing carried out at CTS at Newark UKAS Accredited Lab No. 4161 to EN12390-3: 2009 and EN12390-7: 2009.	
7 day	59.1
14 day	n/a
28 day	n/a
Test day	60.5

2.4 Test Vehicle Description

Item	Information / Measurement
Vehicle Make and Model	Ford Mondeo
Registration Mark and VIN	YS60UNU / WF0EXXGBBAB68749
Engine	Diesel
Gearbox	Manual
Body Type	Hatchback
Delivery Mass (kg)	1531.5
Test Mass (kg)	1532
Test Equipment (kg), GPS, DAS, Towing & guidance	37
Components removed (kg) Rear seats, spare wheel and internal trim.	36.5
Test Vehicle condition	Test vehicle acquired with valid current MOT certificate. The roadworthiness of the following items was checked prior to test: Tyres and wheels, Suspension, Wheel Alignment, Bodywork, Brakes and Chassis. The engine was running for the test.



3 Test Results

3.1 General

Item	Information / Measurement
Test Number	X0032
Test Date	10/09/2020
Impact Angle (deg)	90.3
Angle measurement method	V-Box
Impact alignment (mm)	273
Impacted height (mm)	450
Impact velocity (km/h)	50.3
Velocity measurement method	V-Box
Impact energy (kJ)	149.4
Vehicle penetration - dynamic (m)	0.0
Vehicle penetration - static (m)	0.0
Clear gap >1200mm at 600mm above ground?	No
Debris ejected?	None
Vehicle disabled?	Yes

3.2 Test Sequence Description

The target impact point was the centreline of the vehicle aligned with the centreline of the long edge of the planter.

On first contact with the planter, the front plastics of the vehicle crushed. The front bumper bar and chassis then engaged with the planter and the vehicle began to ride up the front face, which was bent forward during the impact. All four wheels on the vehicle lost contact with the ground before coming back down and finally coming to rest with slight rearwards movement.

3.3 Ambient Conditions*

Item	Measure
Rainfall (mm)+	0.0
Temperature (°C)	16.0

+ From midnight to time of test
*Weather records are not UKAS accredited

3.4 System Damage Description

The front face of the planter was bent forward to 54.5° in the impact, with the fixings on the LHS vertical seam pulling through the steel. A small amount of soil was thrown forwards. The top edge was rolled over and a corner support was left exposed. There was no forwards movement of the planter from the original position. The foundation to the front and rear of the unit was intact. Following removal of the unit, there was damage around the fixing points along the front edge.

3.5 Vehicle Damage Description

The front bumper and plastics were damaged and the front airbags were deployed. The intercooler and all cooling pack components were damaged, and the engine/gearbox was leaking oil. There was damage to bumper bar and chassis rail ends. The vehicle was disabled and unable to start post impact.

4 Conclusions

The Bailey Street Furniture Inspira Protect Planter was assessed according to IWA 14-1:2013 and achieved the following classification:

Product Classification	B-Foundation/Passive/Planter
Performance Rating	IWA 14-1:2013 Planter V/1500[M1]/48/90:0.0

5 General Comments and Disclaimers

The installation of the product was the responsibility of the product manufacturer or their representative.

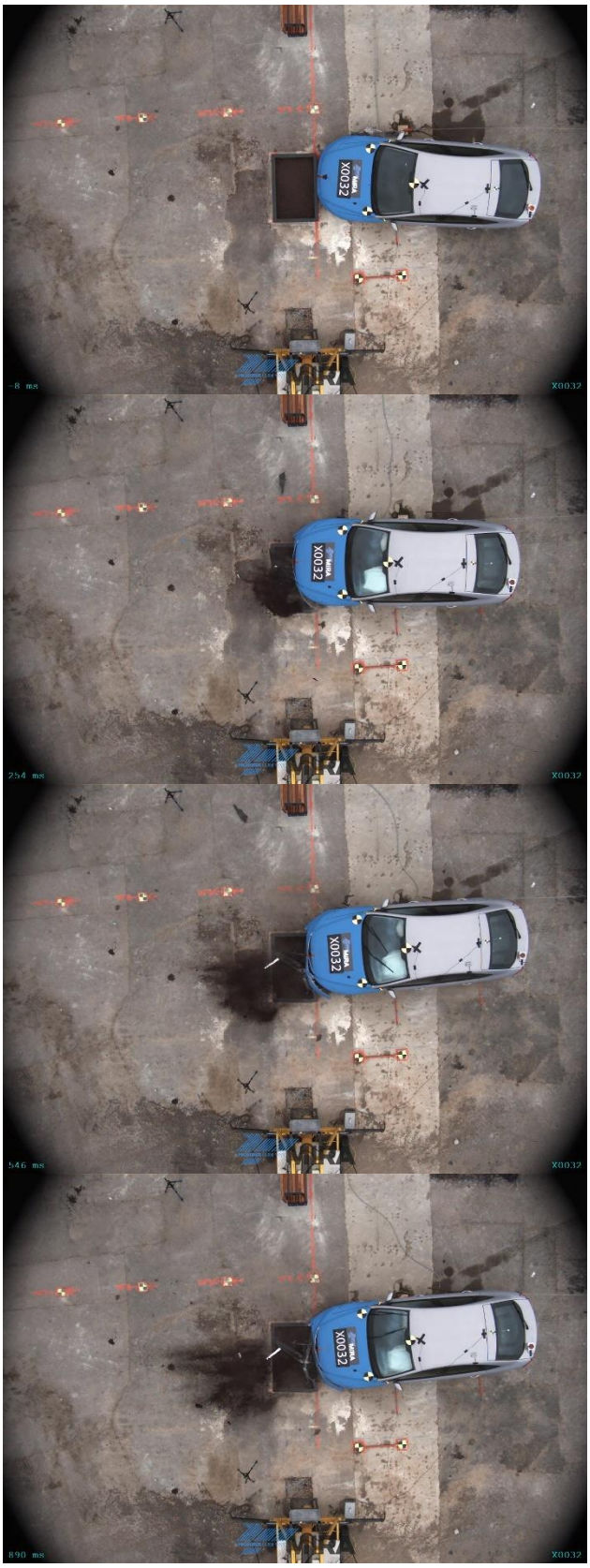
The test results in this report relate only to the product tested.

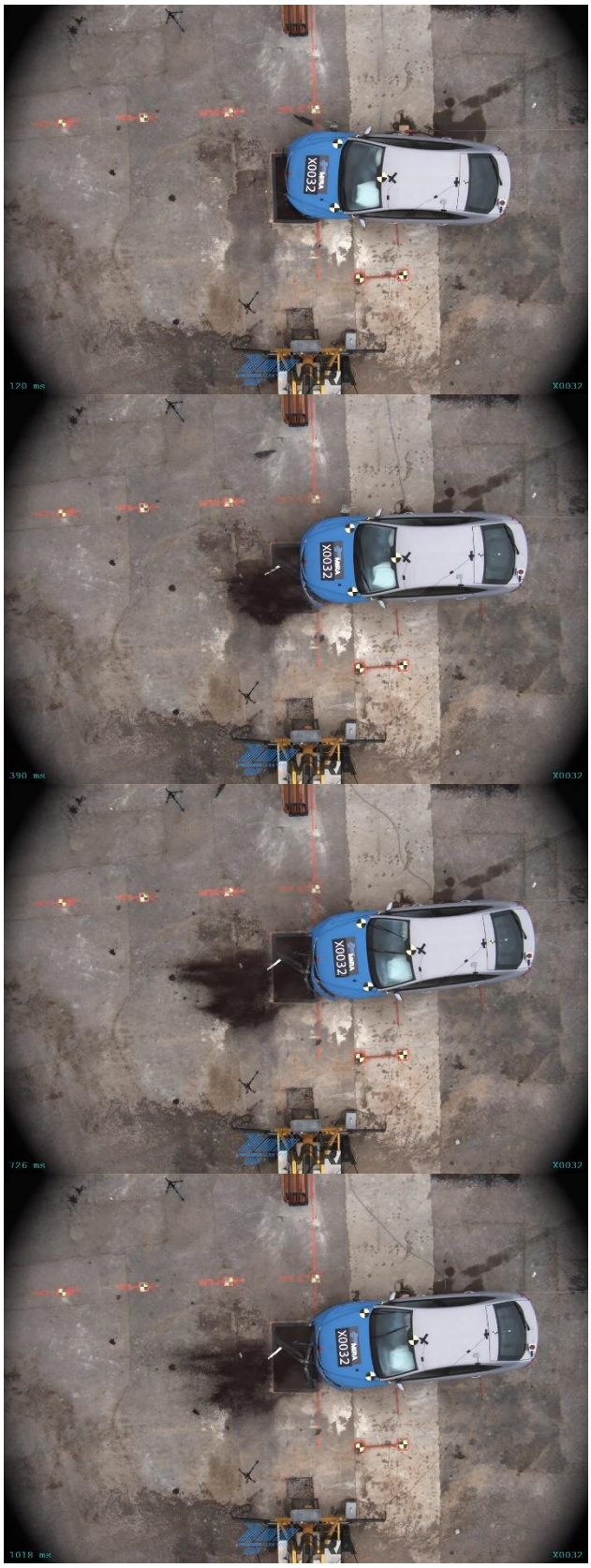
This report may not be reproduced other than in full, except with the prior written approval of the issuing laboratory.

Opinions, interpretations and meteorological information included in this report are not part of the UKAS accreditation and are marked thus *.

6 Side Views from High Speed Videos

7 Overhead Views from High Speed Videos





8 Post Impact Product and Vehicle Images

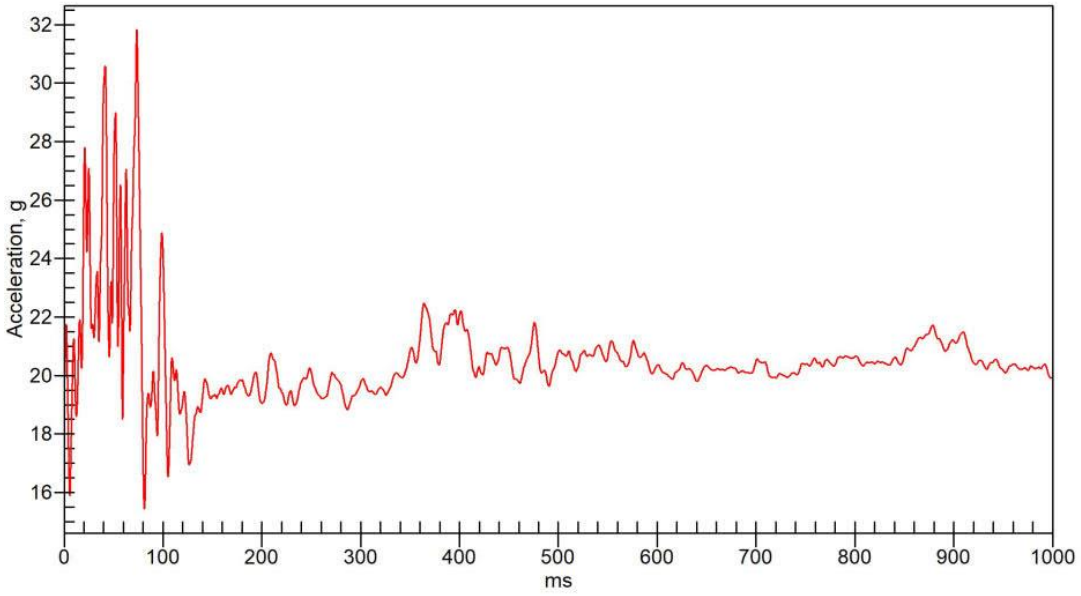
9 Data Plots from Vehicle Transducers

Test Number: X0032
Project: imported

Legislation: PAS68:2013
Test Type: Planter
Test Date: 2020-09-10

Vehicle 1: Vehicle CofG resultant

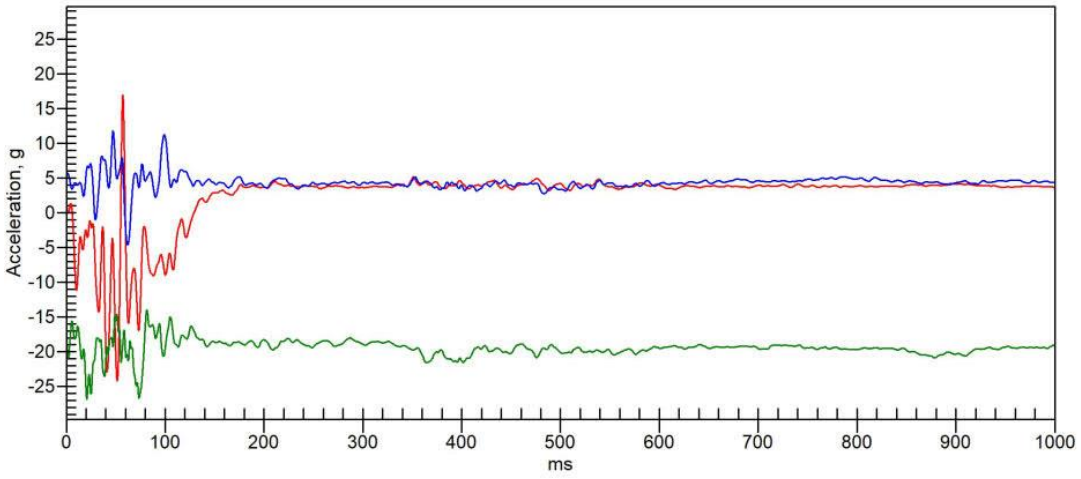
Resultant Acceleration



15VEHCCG0000ACRD
Max: 32g at 73.40ms

Component Accelerations

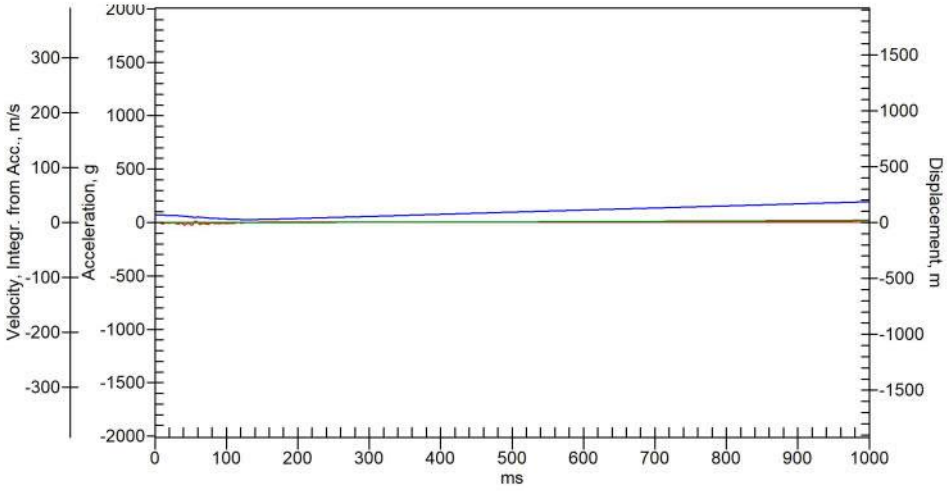
Max: 17g at 57.10ms, Min: -24g at 51.40ms 15VEHCCG0000ACXD
Max: 12g at 47.30ms, Min: -4.586g at 62.00ms 15VEHCCG0000ACYD
Max: -13.920g at 81.50ms, Min: -27g at 20.70ms 15VEHCCG0000ACZD



Test Number: X0032
Project: imported

Legislation: PAS68:2013
Test Type: Planter
Test Date: 2020-09-10

Vehicle 1: Vehicle CofG components



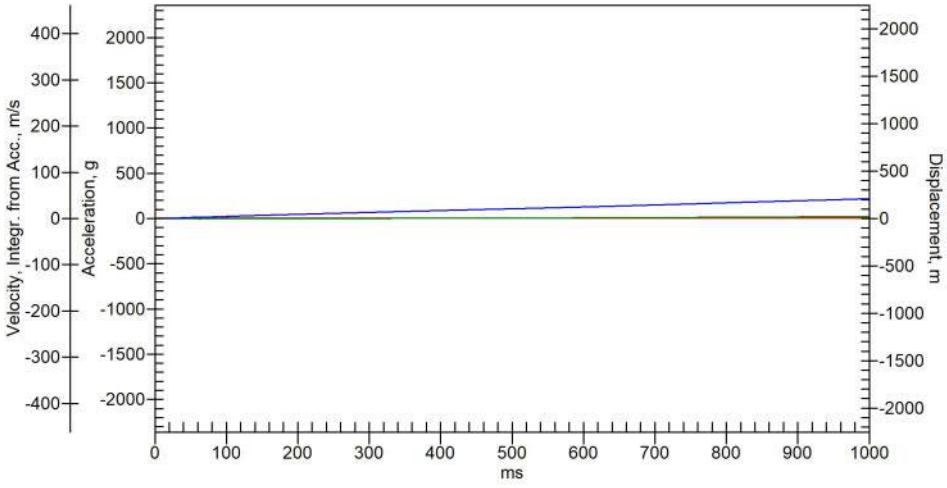
X-axis

QNo:
CAC: 2000

Acceleration
15VEHCCG0000ACXD
Max: 17g at 57.10ms
Min: -24g at 51.40ms

Velocity, Integr. from Acc.
15VEHCCG0000VAXD
Max: 363.70m/s at 1E04ms
Min: -180.10m/s at -5000.00ms

Displacement
15VEHCCG0000DSXD
Max: 1828.00m at 1E04ms
Min: -2.98m at -410.00ms



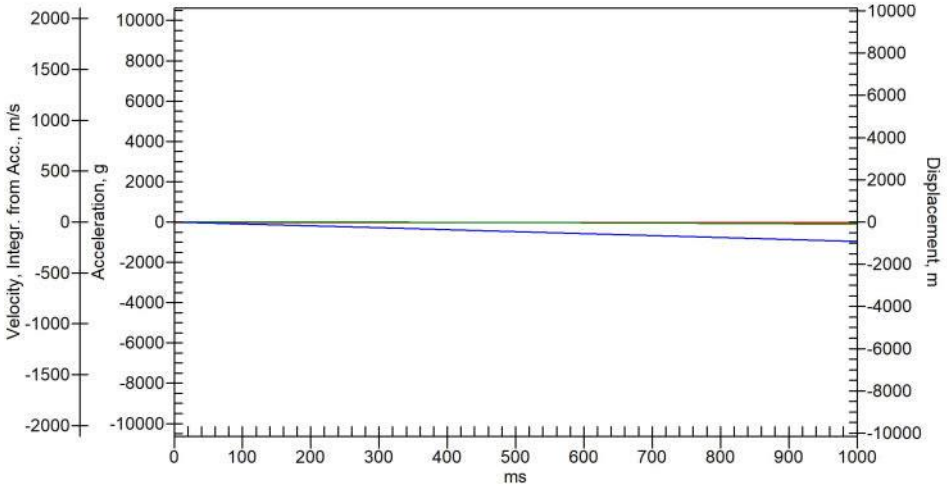
Y-axis

QNo:
CAC: 2000

Acceleration
15VEHCCG0000ACYD
Max: 12g at 47.30ms
Min: -4.586g at 62.00ms

Velocity, Integr. from Acc.
15VEHCCG0000VAYD
Max: 429.60m/s at 1E04ms
Min: -215.10m/s at -5000.00ms

Displacement
15VEHCCG0000DSYD
Max: 2145.00m at 1E04ms
Min: 0.00m at 0.00ms



Z-axis

QNo:
CAC: 2000

Acceleration
15VEHCCG0000ACZD
Max: -13.920g at 81.50ms
Min: -27g at 20.70ms

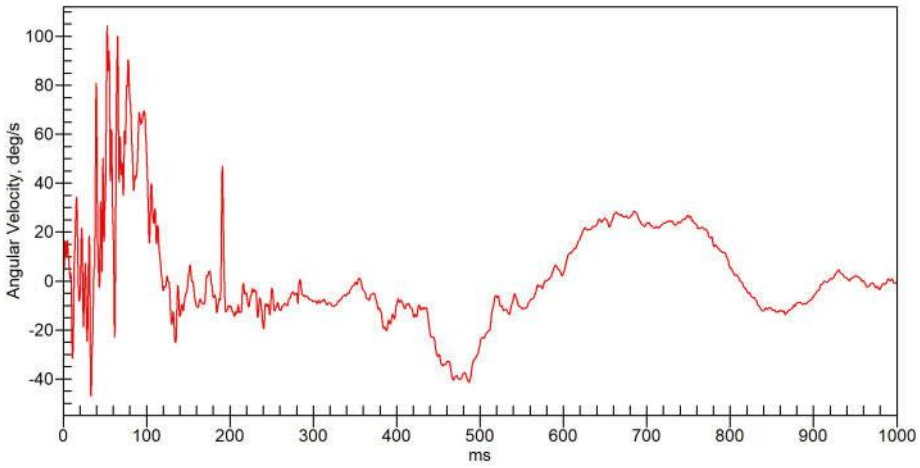
Velocity, Integr. from Acc.
15VEHCCG0000VAZD
Max: 987.30m/s at -5000.00ms
Min: -1957.00m/s at 1E04ms

Displacement
15VEHCCG0000DSZD
Max: 0.00m at 0.00ms
Min: -9661.00m at 1E04ms

Test Number: X0032
Project: imported

Legislation: PAS68:2013
Test Type: Planter
Test Date: 2020-09-10

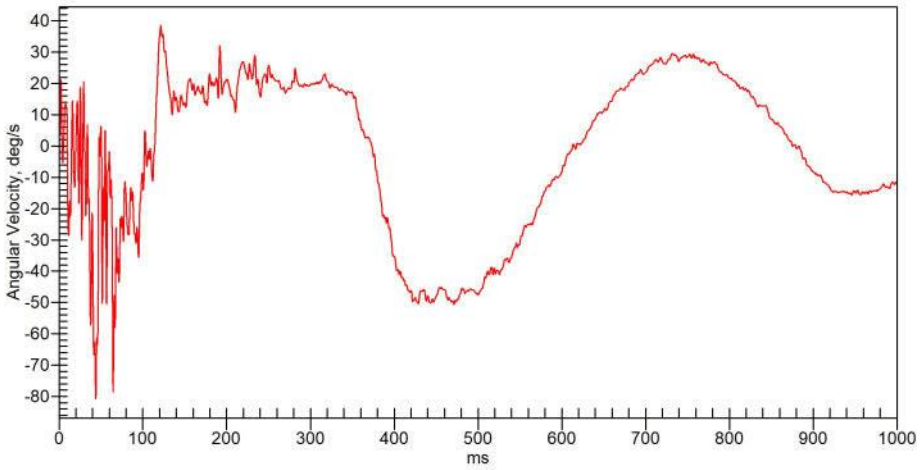
Vehicle 1: Vehicle CofG angular velocities



X0032 : Vehicle CG Roll (CFC180)

QNo:
CAC: 600

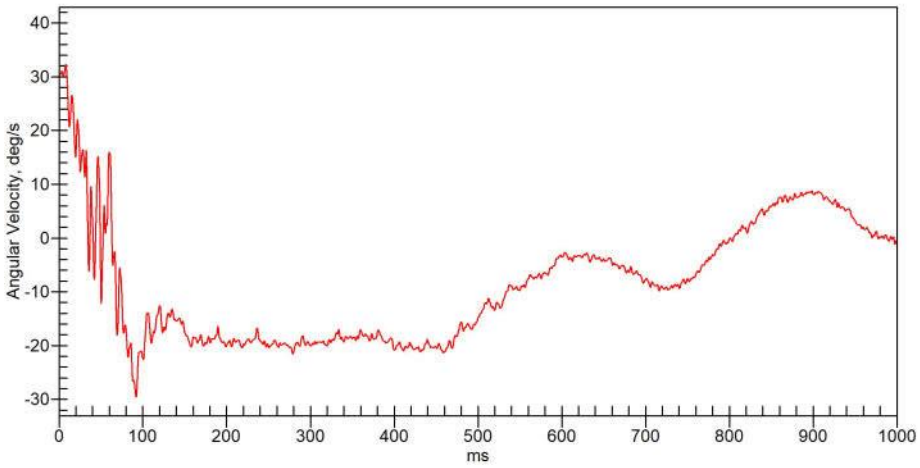
15VEHCCG0000AVXC
Max: 105deg/s at 50.00ms
Min: -47deg/s at 30.00ms



X0032 : Vehicle CG Pitch (CFC180)

QNo:
CAC: 600

15VEHCCG0000AVYC
Max: 39deg/s at 120.00ms
Min: -81deg/s at 40.00ms



X0032 : Vehicle CG Yaw (CFC180)

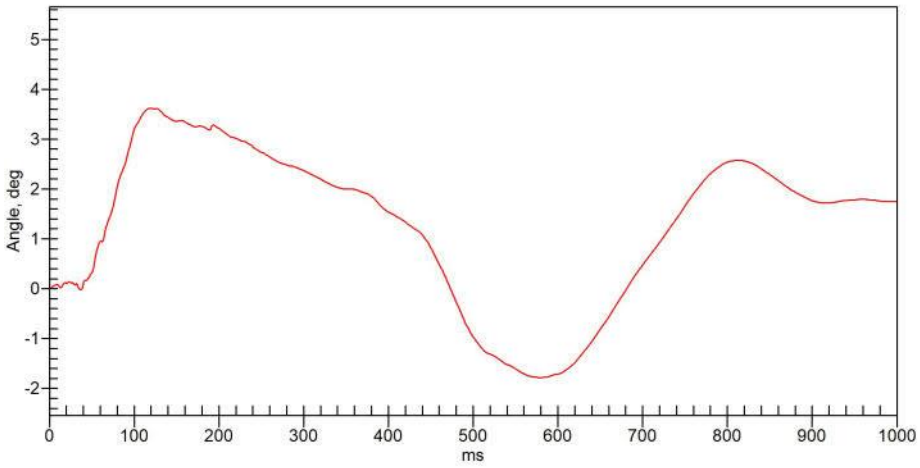
QNo:
CAC: 600

15VEHCCG0000AVZC
Max: 40deg/s at -50.00ms
Min: -30deg/s at 90.00ms

Test Number: X0032
Project: imported

Legislation: PAS68:2013
Test Type: Planter
Test Date: 2020-09-10

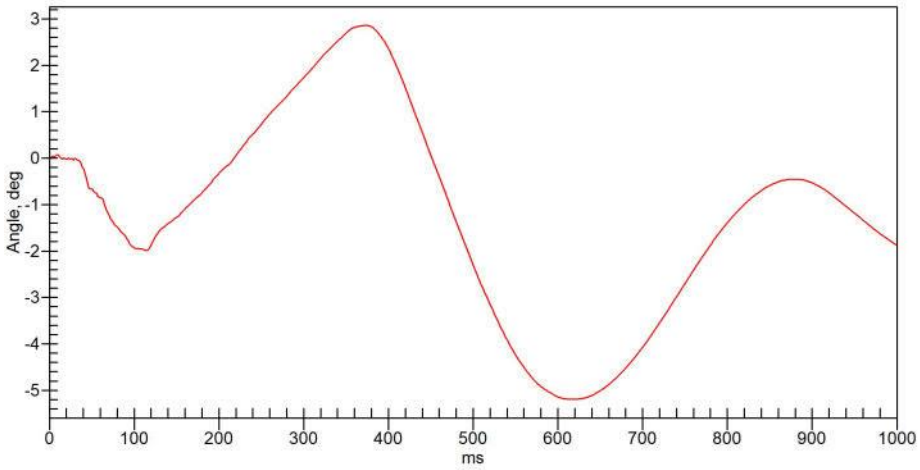
Vehicle 1: Vehicle CofG angles



Vehicle CG Roll Angle

QNo:
CAC: 600

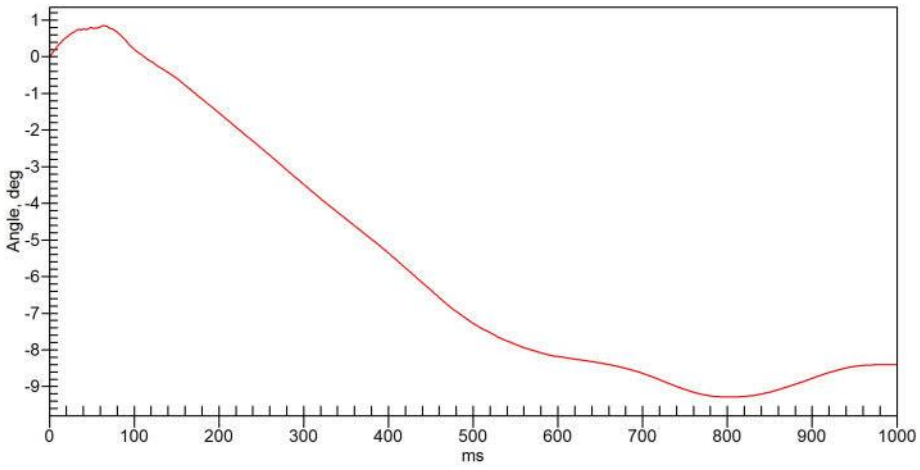
15VEHCCG0000ANXC
Max: 5.28deg at -4610.00ms
Min: -2.16deg at 1E04ms



Vehicle CG Pitch Angle

QNo:
CAC: 600

15VEHCCG0000ANYC
Max: 2.86deg at 370.00ms
Min: -5.19deg at 620.00ms



Vehicle CG Yaw Angle

QNo:
CAC: 600

15VEHCCG0000ANZC
Max: 0.85deg at 60.00ms
Min: -9.29deg at 810.00ms

Executive Summary

Manufacturer Details

Company Name	Bailey Streetscene Ltd
Company Address	Adlington Business Park, London Road. Adlington, Cheshire, SK104NL
Contact Name	Barrie Woodcock
Contact Email	barrie.woodcock@bsfg.co.uk

Test Item Details

Item Reference	Inspira Protect Planter
Item Description	Planter
Length 'X' (mm)	1000
Width 'Y' (mm)	1500
Height 'Z' (mm)	450
Material thickness (mm)	4
Foundation type	Depth <0.5m
Foundation depth (mm)	150
Installation Date	09/10/2020
Concrete strength	60.5

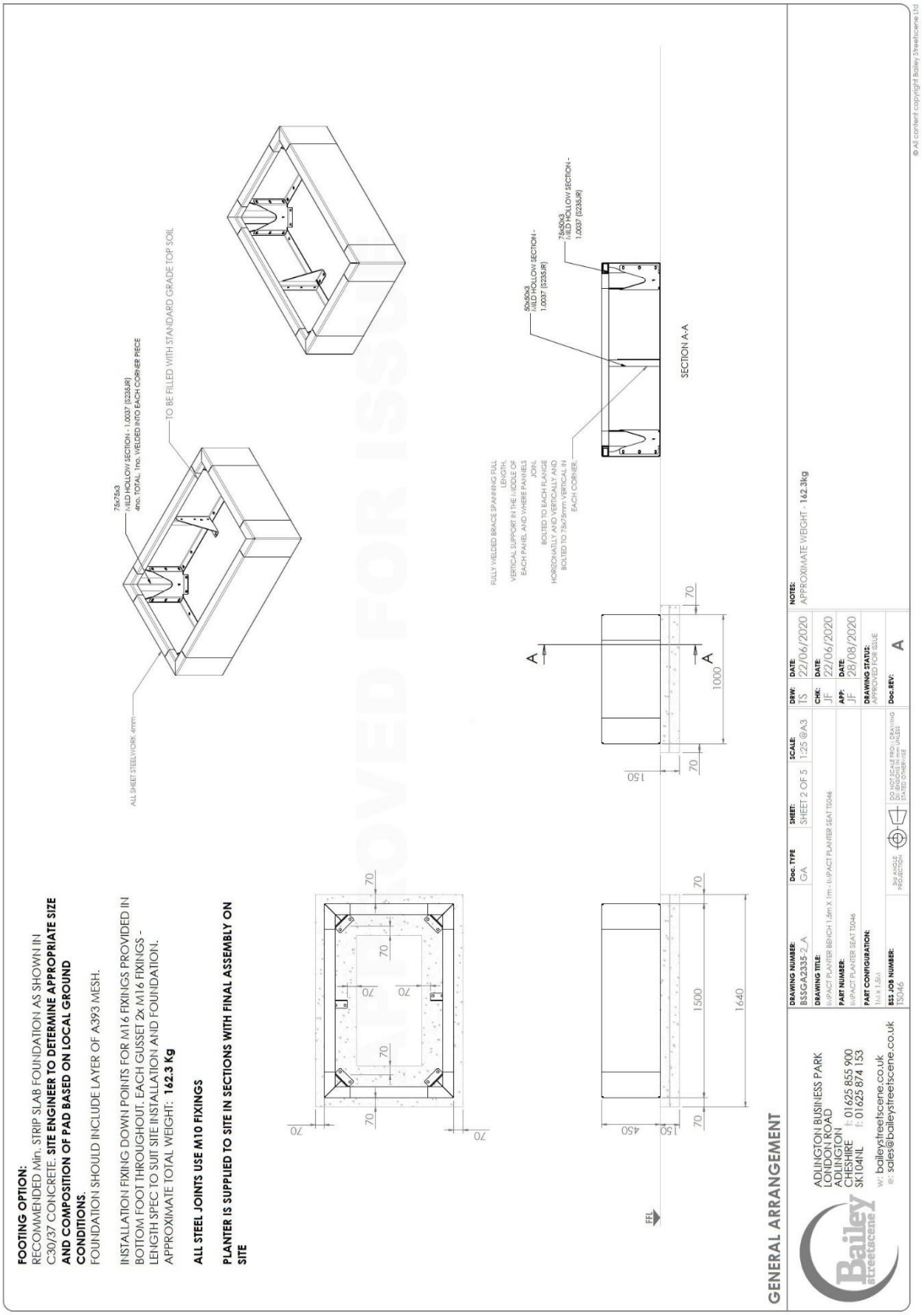
Test Parameters

	Requirement	Measured Value
Test Vehicle category	M1	M1
Test Mass (kg)	1500 ±75	1532
Impact Speed (km/h)	48 +3/-1	50.3
Impact Angle (deg)	90 ±2	90.3
Alignment (mm)	0 ±300	273 Right
Vehicle penetration – dynamic (m)	-	0.0
Vehicle penetration – static (m)	-	0.0
Major Debris ejection distance (m)	-	0.0
Vehicle disabled?	-	Yes
Follow-on vehicle encroachment possible?	-	No
Follow-on pedestrian encroachment possible?	-	Not assessed

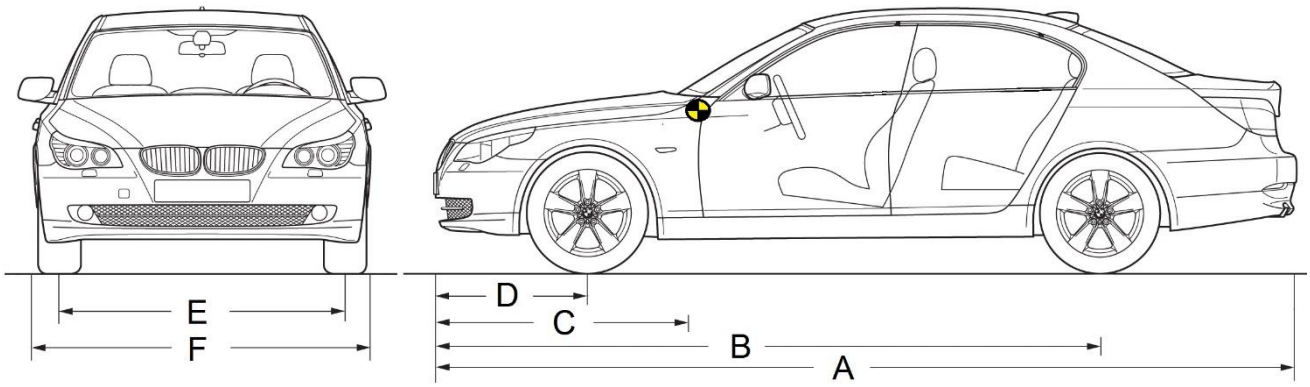
Performance Classification – Vehicle Impact

Performance classification	IWA 14-1:2013 Planter V/1500[M1]/48/90:0.0
Product Classification	B-Foundation/Passive/Planter

Appendix 1 Product Drawings and Details



Appendix 2 Test Vehicle Details



Test Vehicle Details	
Vehicle classification	M1
Vehicle Registration No.	YS60UNU
Vehicle Identity No (VIN)	WF0EXXGBBAB68749
Unladen Mass (kg)	1531.5
Test Inertial Mass (kg)	1532
Net Ballast Mass (kg)	0.5
Number of axles x driven axle	1+1s
Tyre Size	215/55/16

Test Vehicle Measurements (mm)					
A	Vehicle overall length	4755	H	N/A	
B	Vehicle front to rearmost axle	3695	I	N/A	
C	Vehicle front to datum point	1480	J	N/A	
D	Vehicle front to front axle	883	K	N/A	
E	Front track width (between tyre centres)	1575	L	N/A	
F	Vehicle width (excluding mirrors	1850	M	N/A	
G	N/A		N	N/A	

Appendix 3 Calibration Information

Instrumentation

Location	QA No	CAC	Cal Due Date
Centre of Gravity Acc X	048299	2000g	30/09/2020
Centre of Gravity Acc Y	048306	2000g	29/09/2020
Centre of Gravity Acc Z	041633	2000g	16/09/2020
Centre of Gravity Gyro Y	045667	600deg/s	16/01/2021
Centre of Gravity Gyro X	045668	600deg/s	16/01/2021
Centre of Gravity Gyro Z	045669	600deg/s	16/01/2021
Vehicle CG X Backup	039405	2000g	26/03/2021
Vehicle CG Y Backup	048300	2000g	26/03/2021
Vehicle CG Z Backup	041806	2000g	05/11/2020

Other Tools

Item	QA No	Used for	Cal Due Date
Scales (LHF)	43053	Vehicle mass measuring	10/07/2021
Scales (RHF)	43054	Vehicle mass measuring	10/07/2021
Scales (LHR)	43055	Vehicle mass measuring	10/07/2021
Scales (RHR)	43056	Vehicle mass measuring	10/07/2021
Tape Measure	41047	Vehicle dimensions	02/11/2022
Tyre Pressure Gauge	47963	Tyre pressure measurement	20/01/2021
Inclinometer	47024	General angular measurements	19/03/2021
C of G Loadcell	44810	C of G mass change measurement	14/01/2021
Measuring Wheel	47365	Penetration and debris position	17/07/2021
VBOX GPS	36509	Vehicle Impact Speed and angle	30/03/2021

High Speed Cameras

Position	Camera QA No	Cal Due Date	Lens Type	Image Rate (pps)	X (m) to impact	Y (m) to impact	Z (m) to impact
OH Standard	41527	15/07/2021	12	500	0	0	-12.4
OH Close	41525	15/07/2021	16	500	0	0	-12.4
Side on RH	41528	15/07/2021	35	500	0	26	-1.4
Downstream	41526	15/07/2021	300	500	90	0	-1.4
Oblique	41524	15/07/2021	50	500	15	-14	-1.4

Appendix 4 Test Sign-off Sheet

Test No:	X0032

Product Information & Documentation ☑

In line with legislative requirements please ensure the following information is provided by completing and returning this form and supplying the requested accompanying documentation.

Client Details	
Company name:	Centre for the Protection of National Infrastructure (CPNI)
Company address:	CPNI Business Support, London, P O Box 60628, London,
Contact name:	
Contact tel:	
Contact email:	
Product Details	
Manufacturer:	Bailey street furniture
Unique Product Name/Designation:-	Impact Planter Seat TS046
Prototype or Production sample:	Production
What orientation is required:	90
Test Details	
Legislation to be tested against:	IWA14-1:2013
Test Designation/speed class within	M1 - Car
Required Impact Speed(s):	48 +3 -1 km/h
Required Impact Angle(s):	90 +2 -2°
Required Test Vehicle:	M1 @ 1500 ±75kg

Please accompany this form with the following documentation. Please indicate below whether the documentation has been supplied, please also indicate if any information is not available or not applicable.

Product Documentation Supplied	
General Arrangement drawings (including tolerences and installation instructions):	X
Component drawings (including dimensions, tolerences and material specifications):	X
Factory Sub-assembly drawings:	X
Parts List:	X
Material specification certificates:	
Operating Manual	
Other relevant information (disposal/recycling, safety instructions)	

Funding		Product	Install	Removal	Vehicle	Test	Report
Manufacturer		X	X	X			
3rd Party:	CPNI				X	X	X
MIRA							

Test Sign-Off			
Please sign below Confirm that:-			
• The product and installation are to design intent and correct for test.			
• The target test parameters are correct.			
Comments/Agreed Deviations	Customer aware some bolts not fully inserted due to rebar mesh.		
	Sign	Print	Date
On Behalf of Client:	[signature]	B. Woodcock	10/9/20
On Behalf of Manufacturer: (If applicable)			10/9/20
On behalf of HORIBA MIRA Ltd	[signature]	D Johnstone	10/09/20

Appendix 5 Revision History

Report Number	Date	Comments	Sections Affected
1223164-004-005-01	15/10/2020	First Issue	n/a
1223164-004-005-02	21/10/2020	CPNI details redacted Photo of finished (filled) installation added & description updated	1.3, Appendix 4 2.1
1223164-004-005-03	25/01/2022	Corrected test item description	2.1