

Test Report



Customer	Autorack Products Limited
Test Description	'Duty of Care' Goods Retention Test Following the principles of UNECE Regulation 17.08
Test Item	HD-DU3-SL Extra-Heavy-Duty van racking GK96-SSWA Standard-Heavy-Duty van racking ST2 StoreTidy van racking
Millbrook Test No.	S15507
Millbrook Report No.	18/1070

Author:

A handwritten signature in black ink, appearing to read "C. Sells".

C. Sells
Engineer

Approved:

A handwritten signature in black ink, appearing to read "N. Targett".

N. Targett
Manager: Safety Test
Engineering

Date:

18th June 2018

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Distribution

Organisation	Recipient	Format	Qty
Autorack Products Ltd. 32 High Street Waddesdon Aylesbury Bucks HP18 0JA	G. Kamperis	PDF	1
Millbrook Proving Ground Ltd Millbrook Bedford MK45 2JQ	Contract file	PDF	1

Report Revision History

Rev.	Revision Description	Date	Author	Approver	Pages
0	Initial release	18 th June 2018	C. Sells	N. Targett	All

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High Speed Digital Films	See "Films" directory on data media
Still Photography	See "Stills" directory on data media

Test Facility and Date

The test, number S15507, was performed on 14th June 2018 at the Servo Sled facility at Millbrook Proving Ground Ltd.

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Millbrook
Bedford
MK45 2JQ
England

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Test Items

The Autorack Products Ltd. shelf and racking system was delivered to the Millbrook Servo Sled facility on 12th June 2018.

Item	Model
Autorack Vehicle Racking System, comprising of, 1. The Autorack Extra-Heavy-Duty van racking system (vertical system) 2. The Autorack Standard-Heavy-Duty van racking system (vertical system) 3. The Autorack StoreTidy van racking system (vertical system)	 HD-DU3-SL GK96-SSWA ST2

Test Objective

Autorack Products Ltd. commissioned the Servo Sled Laboratory at Millbrook Proving Ground to conduct a 'Duty of Care' dynamic sled test of a goods racking system mounted to a test rig. The rig was manufactured by Millbrook Proving Ground to simulate a van body.

The dynamic test was conducted to verify the integrity of racking drawers, compartments and loading shelves and their respective anchorages to the test rig when fully loaded with the maximum masses as specified by Autorack Products Ltd.

In the absence of regulatory requirements for the retention of goods and materials carried in light commercial vehicles of N1 Category, the 'Duty of Care' test followed the principles of UNECE Regulation 17.08 Annex 9, Test procedure for devices intended to protect vehicle occupants against displacement of luggage. The Regulation 17.08 Annex 9 test method ensures the integrity of partitions intended to retain articles of mass carried in a vehicle luggage compartment when subjected to the 20g/48kmh crash characteristics of an M1 Category passenger vehicle.

The 'Duty of Care' dynamic test, as commissioned by Autorack Products Ltd., ensures that first row driver and passengers seated within a light commercial vehicle are protected from displaced racking contents in case of a severe frontal impact.

Test Method

The test rig was attached to the surface of the Servo Sled carriage via purpose made brackets.

The Autorack Products Ltd. goods racking units were attached to the rig using production level attachment hardware by Millbrook personnel according to Autorack Products Ltd. fitting procedures.

The racking drawers, compartments and loading shelves were fitted with surrogate ballast masses in the form of wooden blocks, steel and gravel filled bags. The load masses installed in each section were in accordance with the loading specified by Autorack Products Ltd.

Note: High definition still photography of test outcomes is within the 'Stills' folder of the media file.

Three off-board high speed digital cameras were positioned to achieve left total, right total and overhead views to observe the performance of the components of the van racking system during the dynamic test.

The sled carriage with combined rig and loaded racking system was subjected to the 20g/48kmh dynamic acceleration pulse given in ECE Regulation 17.08 Annex 9, Test procedure for devices to protect occupants against displacement of luggage.

Pre and post-test still photography recorded the test set-up and post-test observations, and high speed film images provided a record of the performance of the racking unit during the test.

Test Outcome

The Autorack Van Racking System, demonstrated integrity and thus satisfied the principles of the test requirements of ECE Regulation 17.08, Clause 5.16 Special Requirements Regarding the Protection of Occupants from Displaced Luggage when subjected to the 20g/48kmh crash characteristics given in Annex 9 of the Regulation. There was some displacement of ballast masses due to the nature of their restraint within the racking but this was negligible given the overall performance of the system.

Note: High definition still photography of test outcomes is within the 'Stills' folder of the media file.

Photographic

Three off-board high speed digital cameras were positioned to provide side total and overhead views of the racking system during the test.

The high speed cameras (nominal 1000 frames per second) used for this test were as detailed below:

Camera Position	Camera	Lens
Off-board LH Total	MotionXtra NX-Air-5-S2	Kinoptic
Off-board RH Total	MotionXtra NX-Air-5-S2	Kinoptic
Off-board Overhead	MotionXtra NX-Air-5-S2	IDT 8mm

Disclaimers

Information contained within this report provides evidence of the performance of the Autorack Products Ltd. Racking systems as detailed in Test Items.

Millbrook Proving Ground Servo Sled Laboratory has no control over matters pertaining to conformity of production items with tested items.



At Millbrook, we provide a comprehensive range of engineering, test and validation services to customers in the automotive, transport, petrochemical, defence and security industries. We are independent and impartial in everything we do.

At our Proving Ground in the UK, we have 70km of varied test tracks, including hills routes, high speed areas and challenging off road courses. Our professional drivers and engineers perform repeatable tests, on all types of vehicles, in a secure and safe environment. We have a range of test facilities for components and full vehicles. These include engine dynamometers, environmental chambers, crash laboratory and advanced emissions testing. We engineer and manufacture specialist vehicle conversions. These range from new versions of existing platforms, such as

estate cars, to armoured solutions and complex electronics installations. We conduct impartial vehicle assessments and develop class-leading vehicle dynamics improvements. We help Vehicle Manufacturers manage complex bills of materials and launch new models.

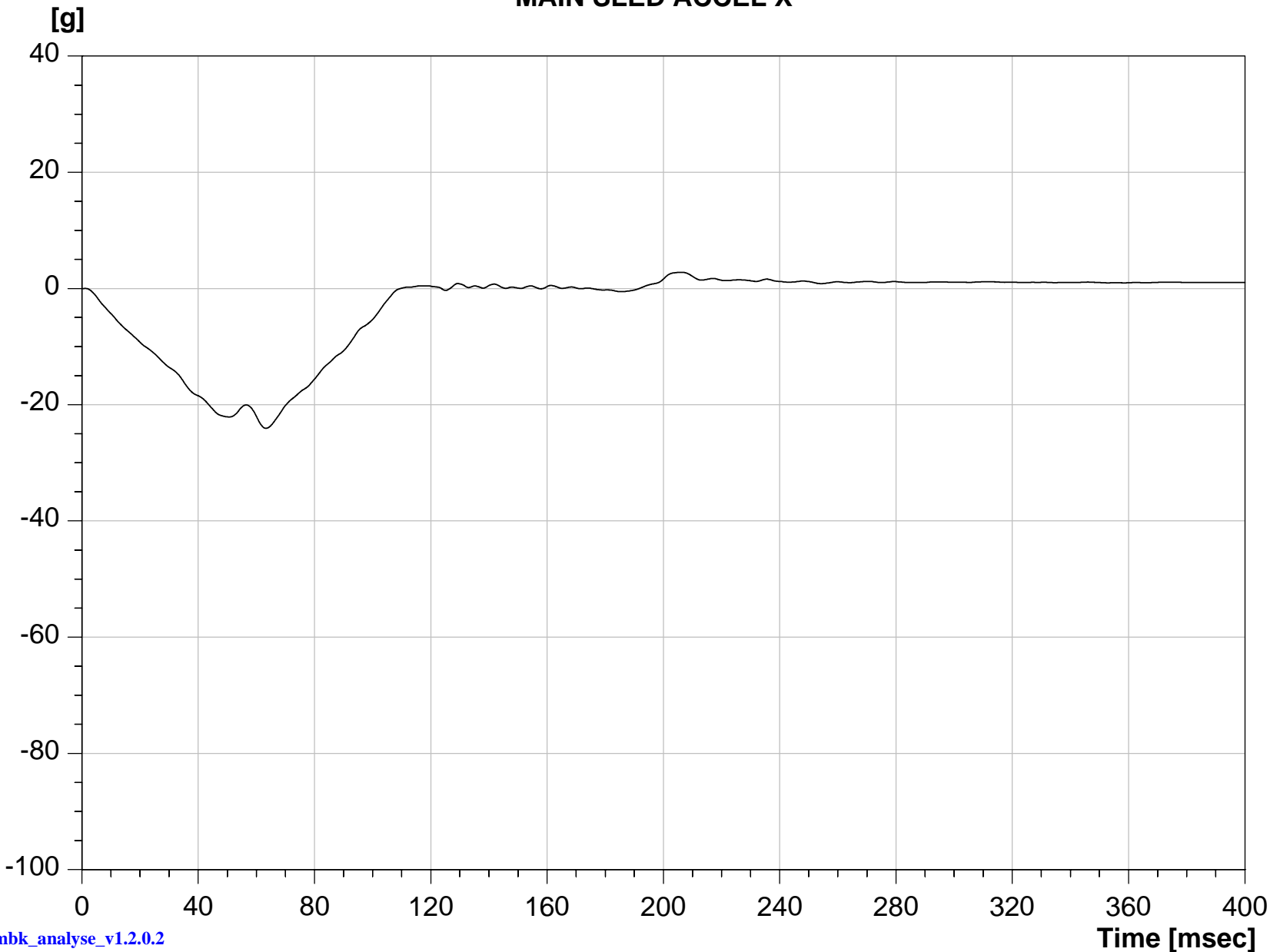
We are passionate about customer service and technical excellence; we take pride in delivering exactly what our customers want, whether that is a vehicle test, engineered solution or smooth-running conference. We develop our people so that they remain at the leading edge of their specialist fields and contribute to the development of future regulations. The quality of our work is reflected in our ISO 9001 and ISO 17025 certification. All of this combines to make Millbrook an integral part of the industries we serve and an ideal partner at any stage in the development and launch of the vehicles of tomorrow.

Millbrook, Bedford, MK45 2JQ, UK
www.millbrook.co.uk





MAIN SLED ACCEL X



Test No.
: S15507
: Test 1

Test Date
: 14 Jun 2018

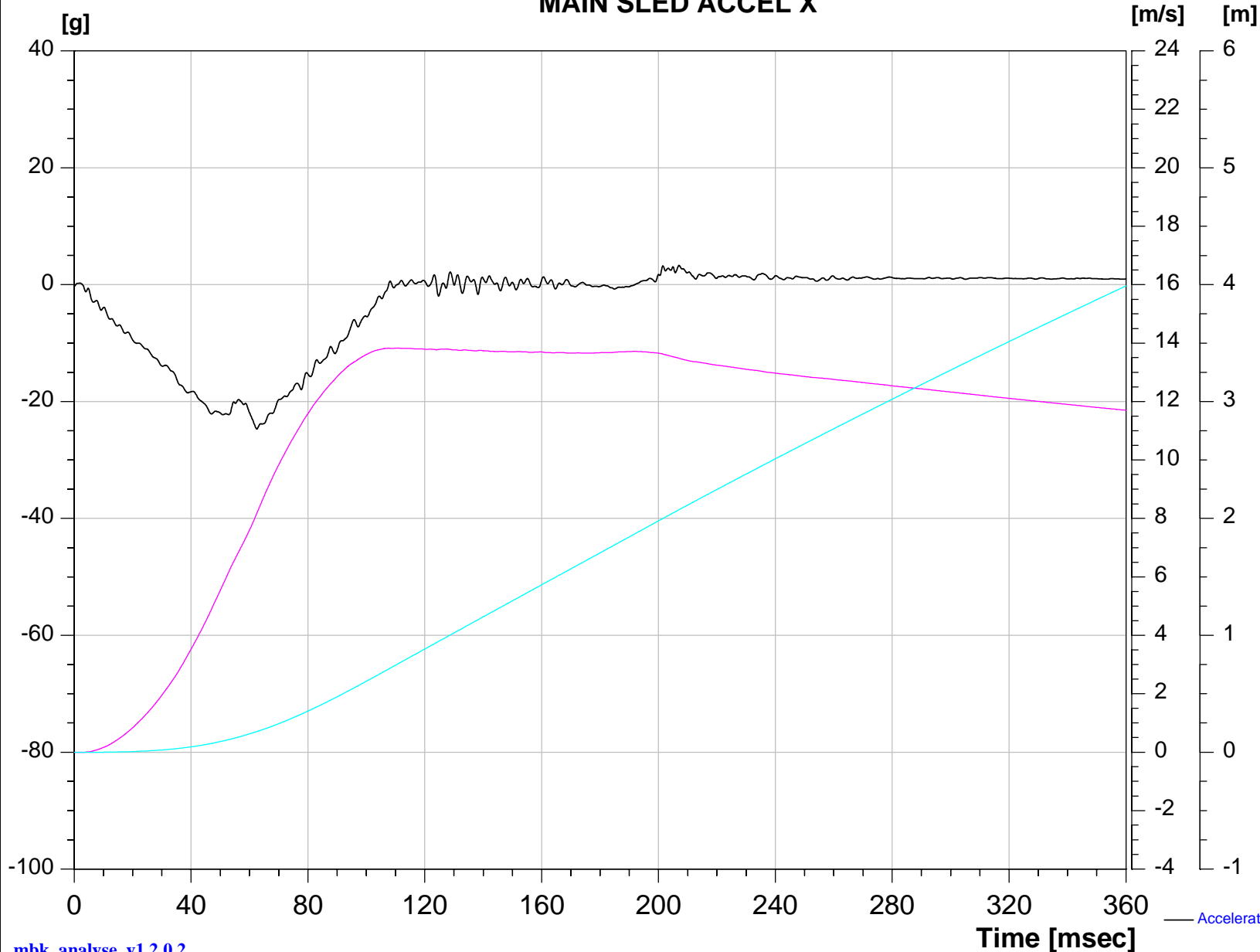
Test Type
: Reg 17 Type test
: Luggage retention
: Autorack Racking System

Test Engineers
: J.Filby

Filter : CFC 60 (SAE J211)
CAC : 50.00 [g]
Sensor ID : A226798
Max Value : 2.78 g [206.7 msec]
Min Value : -24.05 g [63.3 msec]
Plot Date : 14/06/2018 at 17:41:15



MAIN SLED ACCEL X



Test No.
: S15507
: Test 1

Test Date
: 14 Jun 2018

Test Type
: Reg 17 Type test
: Luggage retention
: Autorack Racking System

Test Engineers
: J.Filby

Filter : CFC 180 (SAE J211)
CAC : 50.00 [g]
Sensor ID : A226798

Acceleration
Max Value : 3.30 g [207.0 msec]
Min Value : -24.71 g [62.5 msec]

Velocity
Max Value : 13.83 m/s [110.5 msec]
Min Value : -0.00 m/s [2.8 msec]

Displacement
Max Value : 9.48 m [1000.0 msec]
Min Value : -0.00 m [3.7 msec]

Plot Date : 14/06/2018 at 17:41:45

TRANSDUCER CALIBRATION REPORT

Chan No.	Channel Description	Transducer Make	Transducer Model	Trans No.	CFC	CAC	Calibration Date	In Cal
1	MAIN SLED ACCEL X	MSI Sensors	58-2000	A226798	1000	200	16/04/2018	Y

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Front $\frac{3}{4}$ view, pre-test



LH view, pre-test



LH close up of Extra-Heavy-Duty van racking, pre-test



LH close up of Standard-Heavy-Duty van racking, pre-test

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LH close up of StoreTidy van racking, pre-test



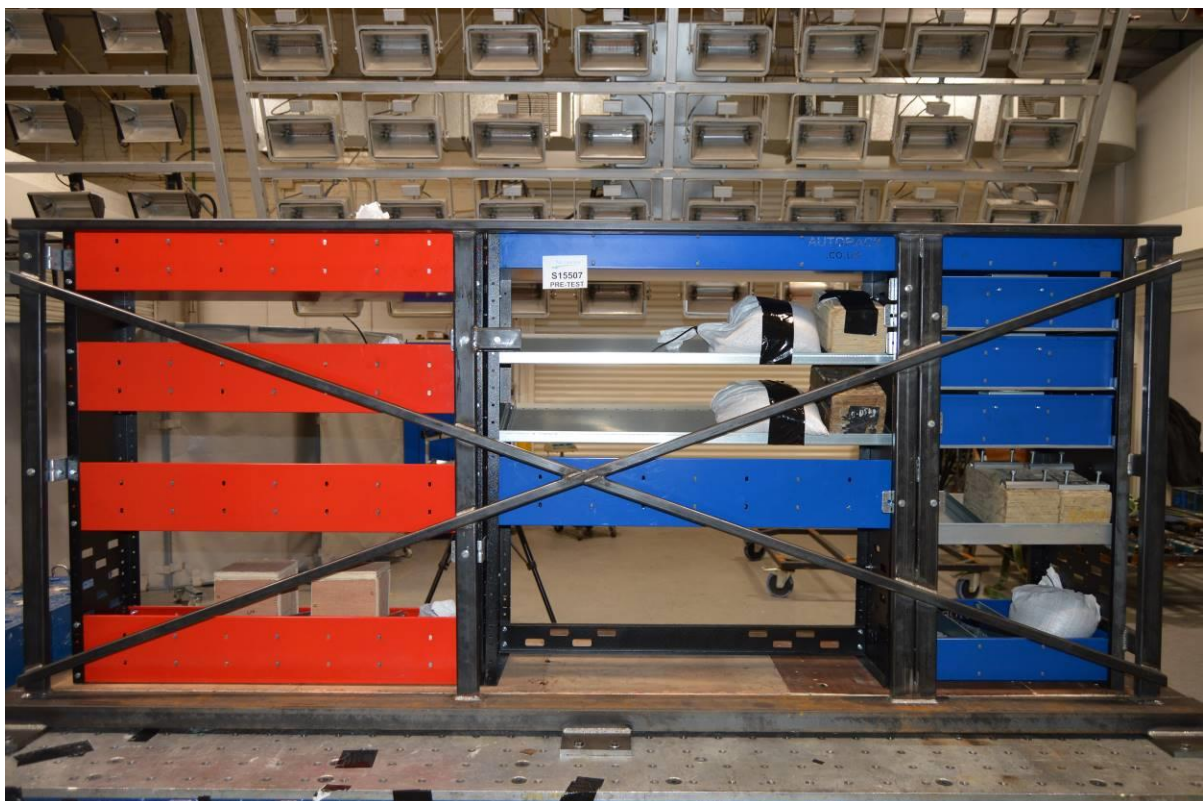
Rear view, pre-test

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Rear close-up of StoreTidy mounting brackets, pre-test



RH view, pre-test

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Close-up of StoreTidy/Standard-Heavy-Duty racking upper mount, pre-test



Close-up of StoreTidy/Standard-Heavy-Duty racking lower mount, pre-test

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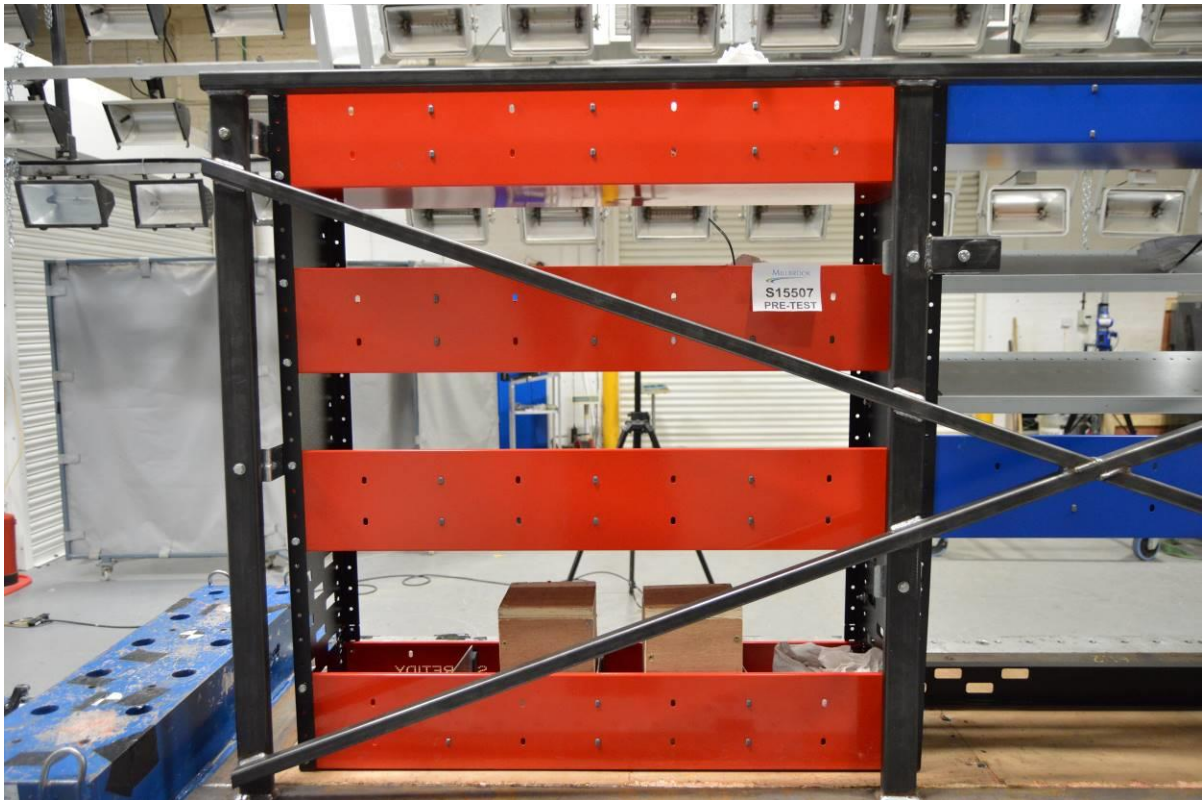
Close-up of Standard-Heavy-Duty/Extra-Heavy-Duty racking lower mount, pre-test



Close-up of Standard-Heavy-Duty/Extra-Heavy-Duty racking upper mounts, pre-test

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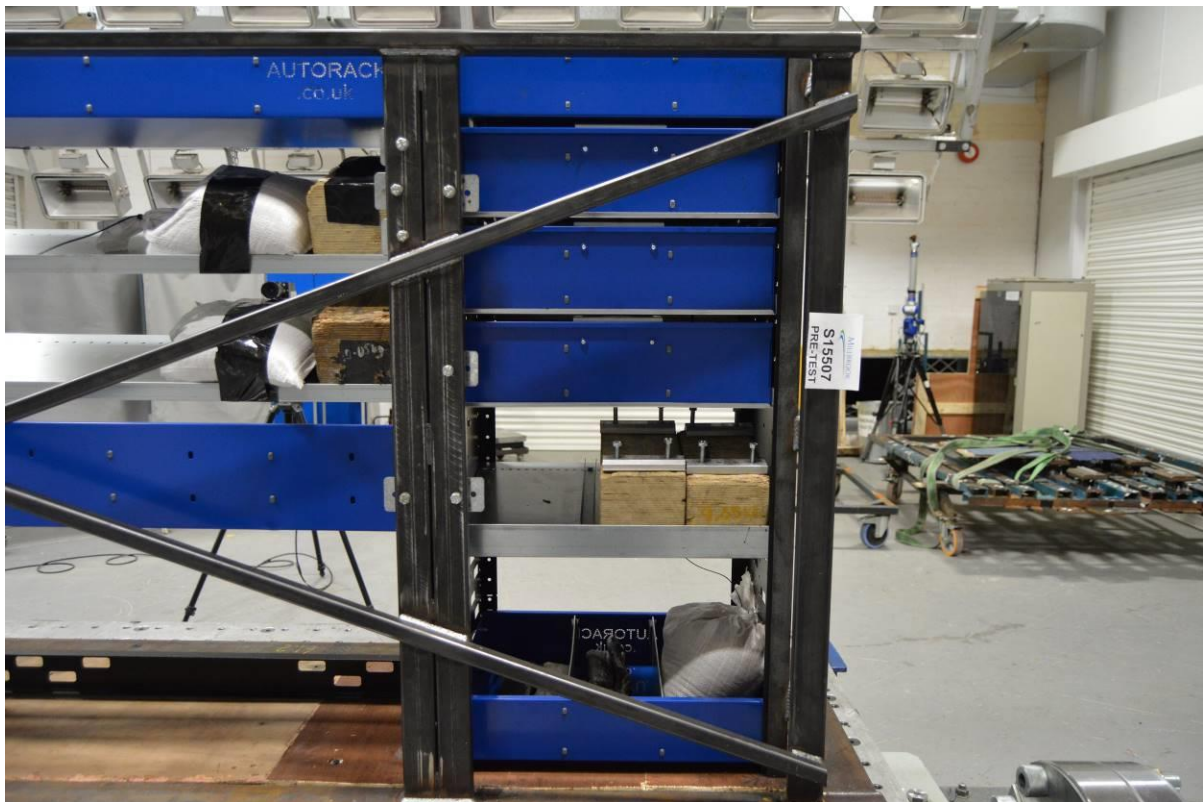
RH close up of StoreTidy van racking, pre-test



RH close up of Standard-Heavy-Duty van racking, pre-test

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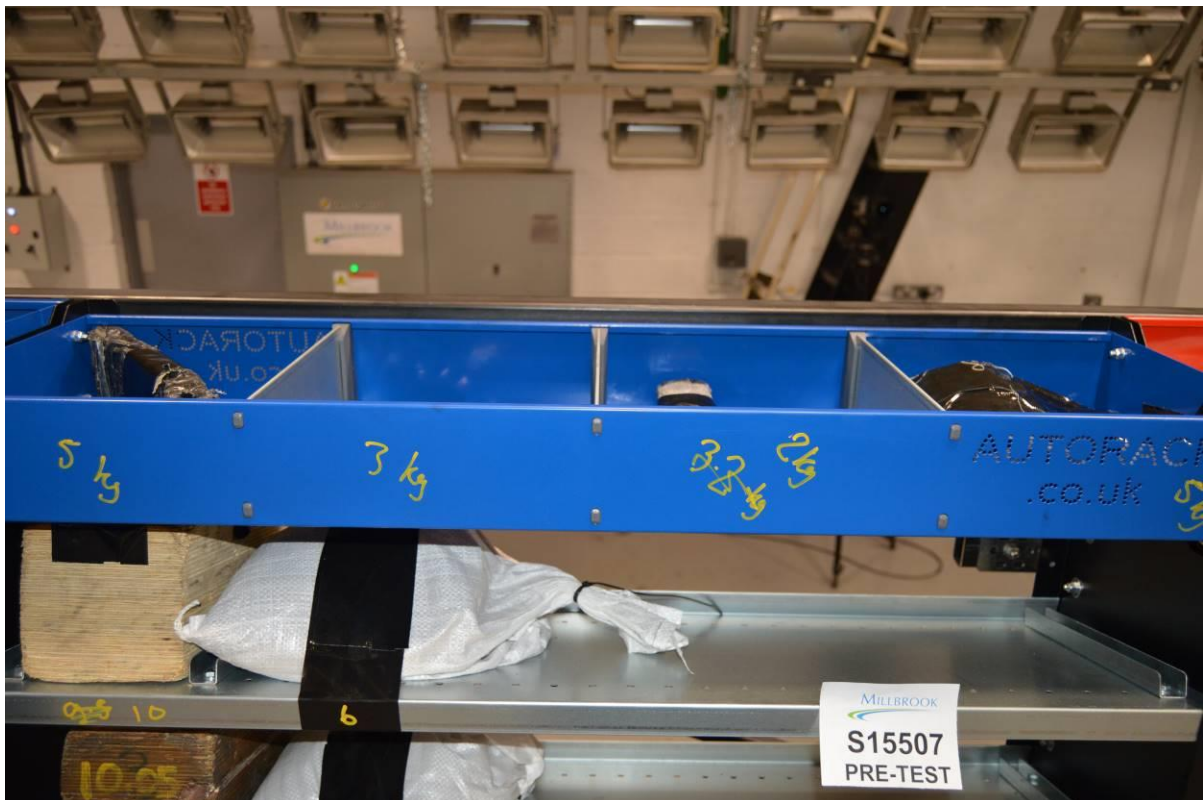
RH close up of Extra-Heavy-Duty van racking, pre-test



Content for lower compartment of Standard-Heavy-Duty racking, pre-test

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Content for upper compartment of Standard-Heavy-Duty racking, pre-test



Content for upper compartment of StoreTidy racking, pre-test

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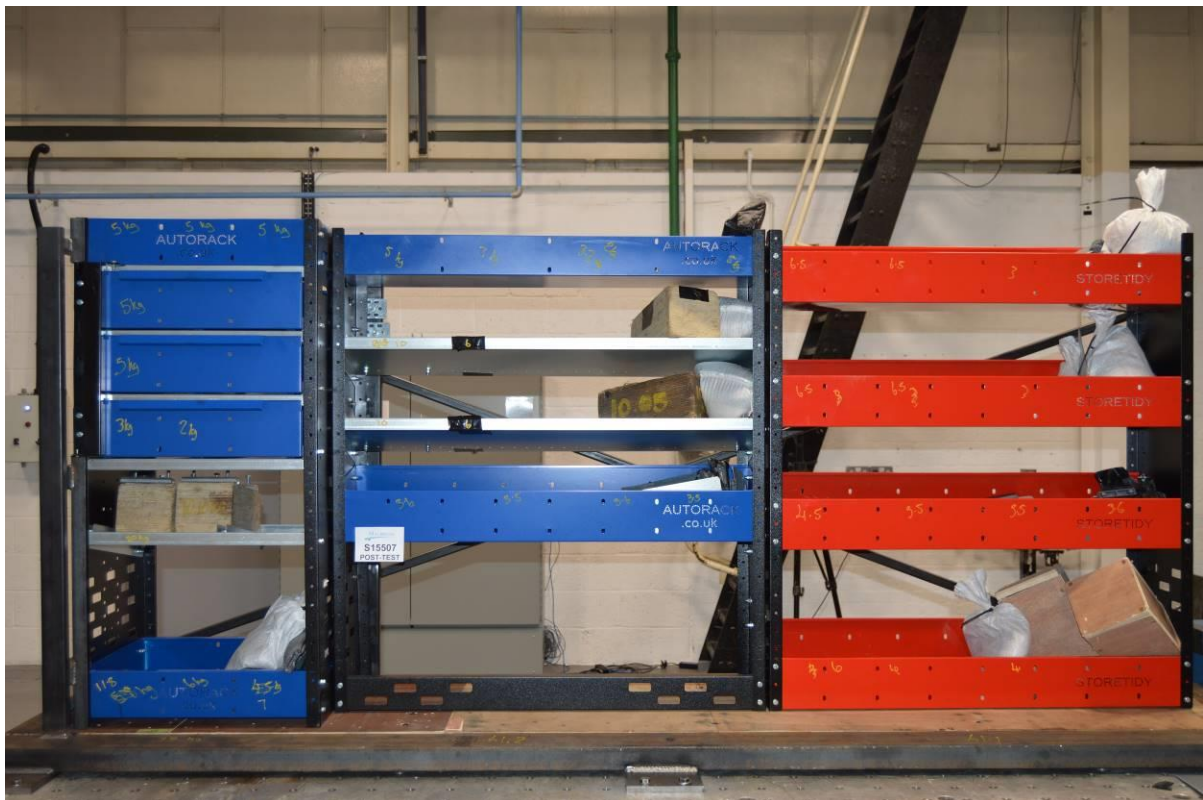
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Content for lower compartment of StoreTidy racking, pre-test

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LH view, post-test



LH close-up of Extra-Heavy-Duty racking, post-test

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LH close-up of Standard-Heavy-Duty racking, post-test



LH close-up of StoreTidy racking, post-test

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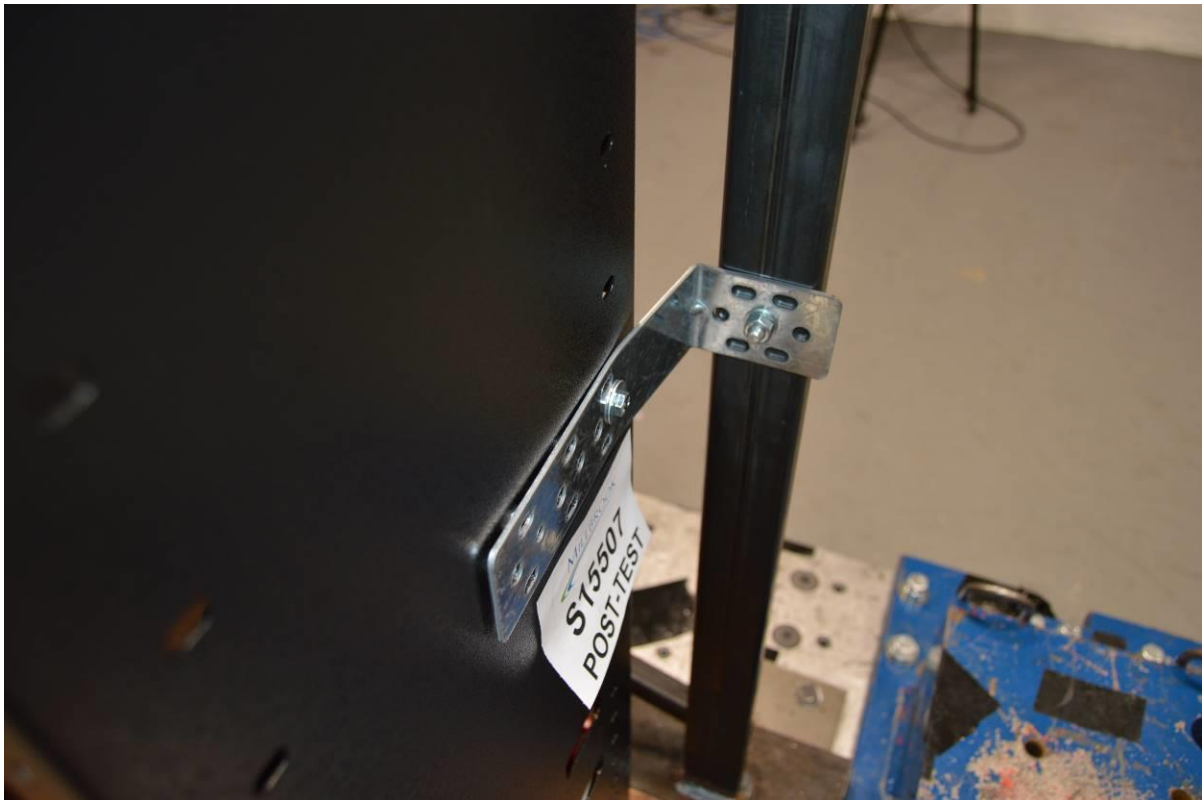
Rear view, post-test



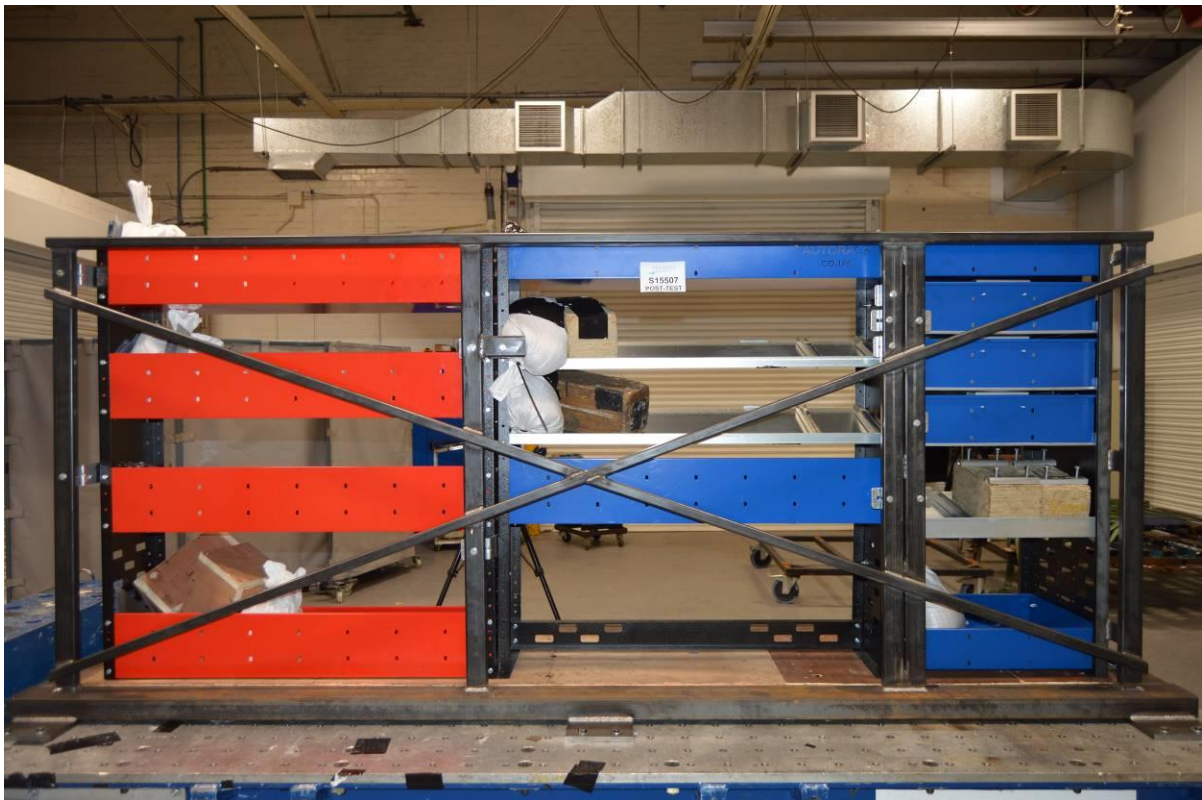
Close-up of StoreTidy racking upper mount, post-test

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Close-up of StoreTidy racking lower mount, post-test



RH view, post-test

Test Report

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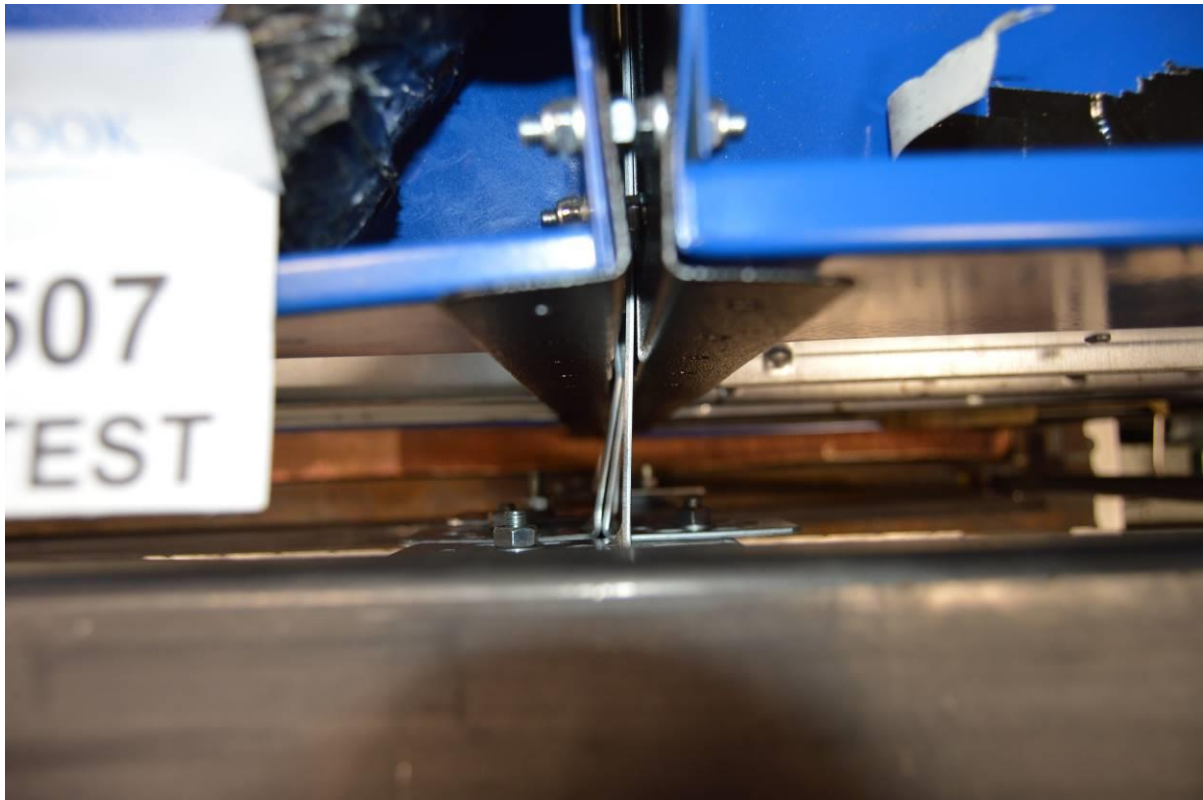
Close-up of lower shelving unit of Standard-Heavy-Duty racking, post-test



Close-up of StoreTidy/Standard-Heavy Duty Racking mounting bracket, post-test

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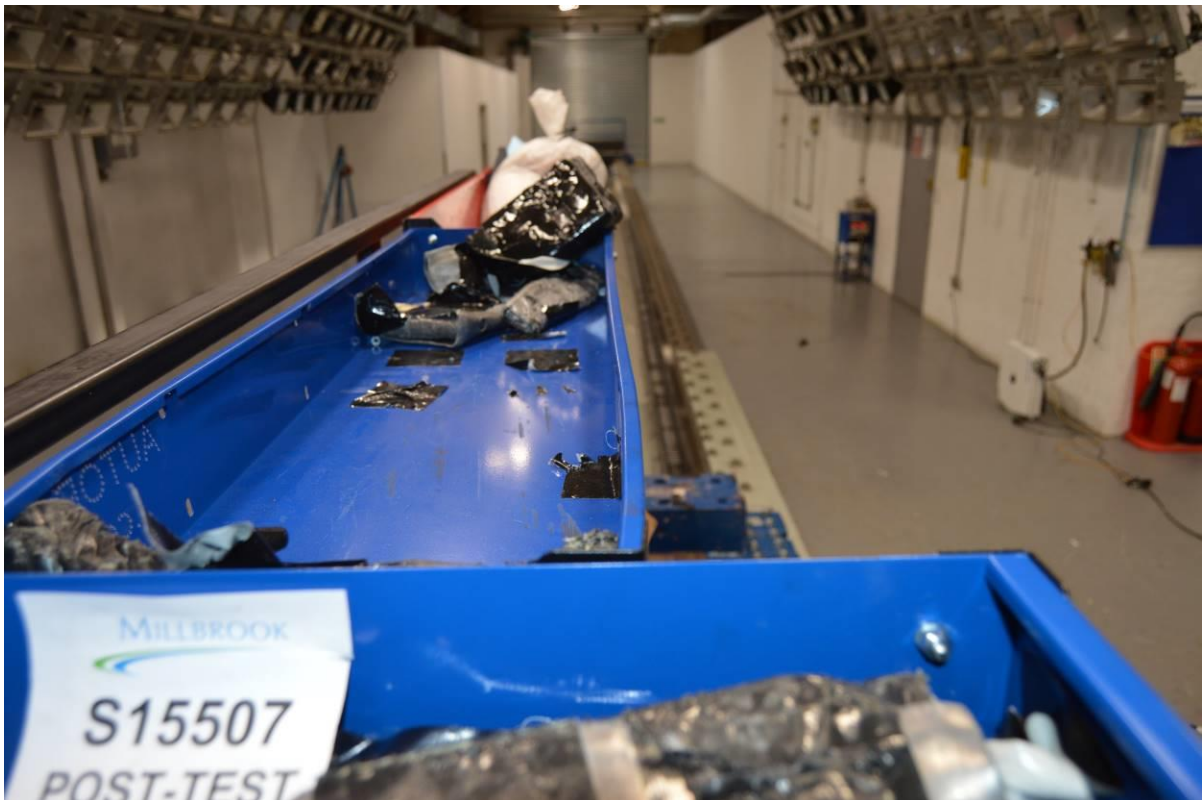
Overhead close-up of Standard-Heavy-Duty mounting brackets, post-test



Close-up of Standard-Heavy-Duty racking top shelving unit, post-test



Front view of Standard-Heavy-Duty racking top shelving unit, post-test



Close-up view of Standard-Heavy-Duty racking upper shelving unit, post-test

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Close-up of StoreTidy/Standard-Heavy-Duty racking, post-test



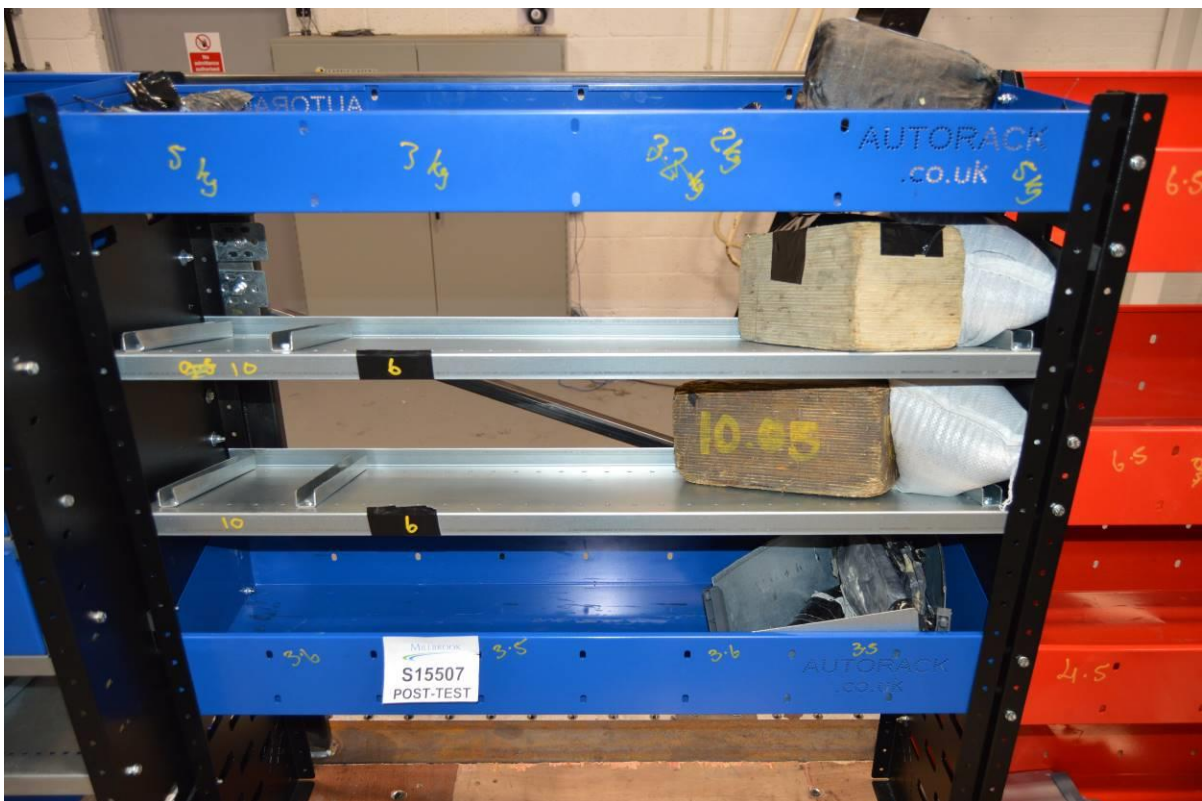
Close-up of Extra-Heavy-Duty racking lower mount, post-test

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Close-up of Standard-Heavy-Duty/Extra-Heavy-Duty racking, post-test



LH close-up of Standard-Heavy-Duty racking, post-test

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LH close-up of StoreTidy racking, post-test

Appendix D

Autorack Products Ltd.

Racking Ballast Details

HD-DU3-SL Extra-Heavy-Duty van racking

GK96-SSWA Standard-Heavy-Duty van racking

ST2 StoreTidy van racking

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Location #	Racking Type	Position in Vehicle	Mass kg.
1	HD-DU3-SL	Top shelf – left side	5
2	HD-DU3-SL	Top shelf – middle	5
3	HD-DU3-SL	Top shelf – right side	5
4	HD-DU3-SL	Top drawer	5
5	HD-DU3-SL	Middle drawer	5
6	HD-DU3-SL	Lower drawer – left side	3
7	HD-DU3-SL	Lower drawer - middle	2
8	HD-DU3-SL	Lower shelf	20
9	HD-DU3-SL	Bottom compartment – left side	11.8
10	HD-DU3-SL	Bottom compartment – middle	6
11	HD-DU3-SL	Bottom compartment – right side	7
12	GK96-SSWA	Top shelf – left side	5
13	GK96-SSWA	Top shelf – left middle	3
14	GK96-SSWA	Top shelf – right middle	2
15	GK96-SSWA	Top shelf – right side	5
16	GK96-SSWA	Middle shelf – left side	10
17	GK96-SSWA	Middle shelf – left middle	6
18	GK96-SSWA	Lower shelf – left side	10
19	GK96-SSWA	Lower shelf – left middle	6
20	GK96-SSWA	Lower compartment – left side	3.6
21	GK96-SSWA	Lower compartment – left middle	3.5
22	GK96-SSWA	Lower compartment – right middle	3.6
23	GK96-SSWA	Lower compartment – right side	3.5
24	ST2	Top shelf – left side	6.5
25	ST2	Top shelf – left middle	6.5
26	ST2	Top shelf – right middle	3
27	ST2	Top middle shelf – left side	6.5
28	ST2	Top middle shelf – left middle	6.5
29	ST2	Top middle shelf – right middle	3
30	ST2	Bottom middle shelf – left side	4.5
31	ST2	Bottom middle shelf – left middle	3.5
32	ST2	Bottom middle shelf – right middle	3.5
33	ST2	Bottom middle shelf – right side	3.6
34	ST2	Bottom shelf – left side	6
35	ST2	Bottom shelf – left middle	4
36	ST2	Bottom shelf – right middle	4
Total Mass			197.1