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Test Report

Loopwheels 'Urban 24" wheels with 'Stiff' spring rate'
'Duty of Care' component test according to the
dynamic test requirements of ISO 7176-19:2022.

Test Date: 18th August 2023

CIC Test No.: D23075

CIC Report No.: D23-075

Report Requesting Authority: Loopwheels

Author:

A handwritten signature in blue ink, appearing to read 'MR Herbert'.

Mr. M. Herbert
Test Engineer

Approved

A handwritten signature in blue ink, appearing to read 'J Watson'.

Dr. J. Watson
CIC Manager

Contents

1 Test Date and Location 3
 2 Test Items..... 3
 3 Test Method..... 3
 4 Test Environmental Conditions..... 3
 5 Test Outcome..... 4
 6 Disclaimer..... 4
 7 Graphic Results 5
 8 Pre-Test Photographs 6
 9 Post-Test Photographs..... 15
 10 Test Results Summary..... 28
 11 Calibration Report..... 29

Revision History

Rev. No.	Description	Author	Approved	Date	Pages
0	First Release	Mr. M. Herbert	Dr. J. Watson	16/10/2023	All

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Organisation	Recipient	Format	Qty.
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Loopwheels Jelly Products Ltd Unit 202 Boughton Industrial Estate Boughton, Newark Nottinghamshire NG22 9LD	G. Pearce	PDF	1

1 Test Date and Location

The 'Duty of Care' dynamic test, D23075, was conducted at the Cranfield Impact Centre sled test facility, at the above-mentioned location on the 18th of August 2023.

2 Test Items

The test items are described in Table 1, including information on the ATD used in the test. The test items arrived and were collected on the day of testing, 18th August 2023.

Table 1: Description of Test Items

Item	Manufacturer	Part Name	Test Mass (kg)
Wheels	Loopwheels	'Urban 24" with 'Stiff' Spring Rate'	17.60
Manual, Folding, User Propelled host Wheelchair (Used)	SunRise	'Breezy Rubix ² '	
Head Support	N/A	N/A	
Seat	SunRise	'Breezy Rubix ² '	
Front Wheelchair Tie Downs	Unwin	'OR03'	1.90
Rear Wheelchair Tie Downs	Unwin	'OR03'	1.90
Occupant Restraint	Cranfield Impact Centre	Surrogate ORS v4 (Vehicle Anchored)	3.50
ATD	Humanetics	Hybrid III 50 th Percentile Male	78.00

3 Test Method

The 'Duty of Care' test was conducted to assess the performance of the Loopwheels 'Urban 24" with 'Stiff' Spring Rate' wheels as 'retro-fit' wheelchair components according to the dynamic test requirements given in ISO 7176-19:2022 Wheelchair for use in vehicles, Annex A. The Loopwheels were fitted to a used Sunrise Medical 'Breezy Rubix²' manual, folding, user propelled wheelchair in accordance with instructions supplied by Loopwheels Ltd.

4 Test Environmental Conditions

This test was conducted according to the method described in ISO 7176-19:2022 and the environmental conditions are detailed in Table 2.



Table 2: Environmental Conditions

Environmental Condition	Value
Temperature (°C)	22.70
Humidity (%RH)	70.70

5 Test Outcome

The 'Duty of Care' dynamic sled test on the Loopwheels 'Urban 24" with 'Stiff' Spring Rate' wheels as components attached to a used Sunrise Medical 'Breezy Rubix²' manual, folding, user propelled wheelchair, as described in Test Items, demonstrated integrity during the dynamic test. The post-test vertical collapse of the wheelchair measured at the ATD H-Points left and right, in accordance with clause 5.2 i) was less than 2%. (See 10. Test Results Summary).

Post-test inspection of the Loopwheels products revealed no signs or evidence of structural failure, with minimal wheel buckling or distortion. Normal function of the wheel release mechanism was observed on both wheels.

The used Sunrise Medical Breezy Rubix² manual, folding, user propelled wheelchair failed to satisfy the dynamic test requirements of ISO 7176-19:2022 due to detachment of the foot supports, being of mass greater than 150g.

Note 1: Pre and post-test still photographs of the test setup are presented in section 8 and 9, respectively, of this report.

Note 2: Routing of the occupant restraint system was through the wheelchair.

6 Disclaimer

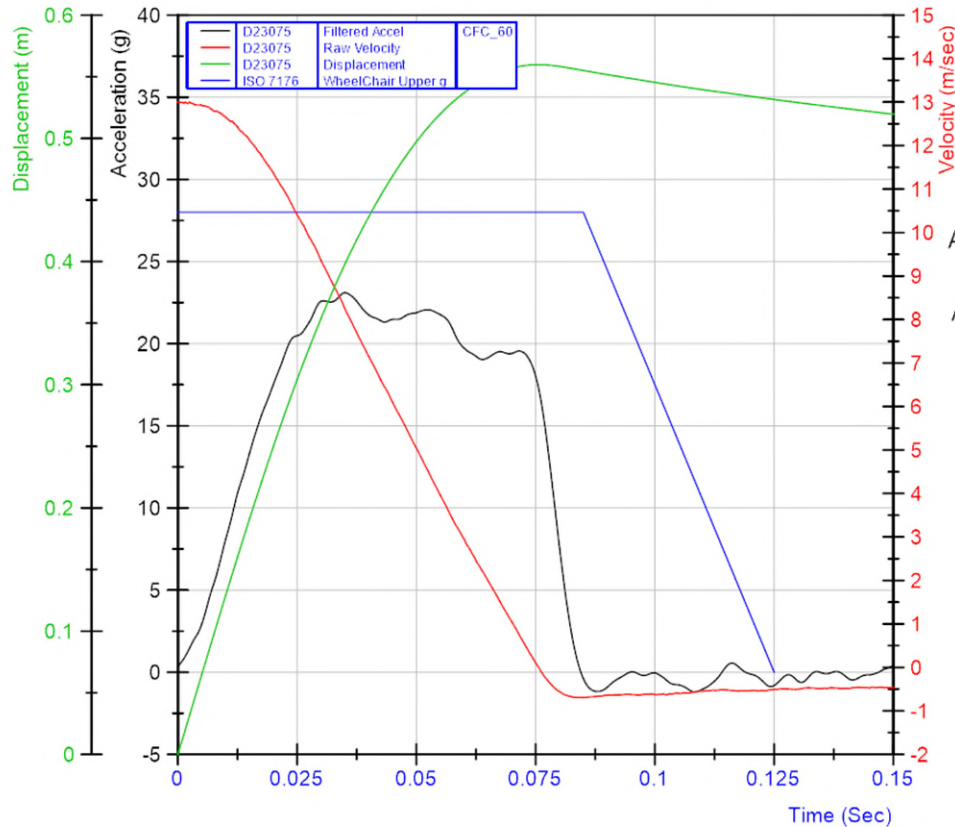
The results contained within this report relate only to the Loopwheels 'Urban 24" with 'Stiff' Spring Rate' wheels attached as 'retro-fit' components to a typical host manual user propelled wheelchair.

Cranfield Impact Centre has no control over matters pertaining to the Conformity of Production of tested items.

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7 Graphic Results

Test Name: Urban 24" with stiff spring rate



Time Over 20g: 35.88 ms
 Time Over 15g: 60.16 ms
 Pulse Duration: 84.51 ms
 Velocity Change: 49.30 km/h
 P-Point Disp: 80 mm
 ATD Knee Disp: 213 mm
 ATD Head Forward Disp: 514 mm
 ATD Head Rear Disp: -176 mm
 ATD Knee/P-Point Ratio: 2.66

Test Velocity: 13.00 m/s
 Test Mass 1300 kg
 Chosen Accel: L15294
 Test Date: 18/08/2023
 Test Time: 11:39
 Temperature: 22.70°C
 Humidity: 70.70%RH
 Test Engineer: MH



Decelerator Test Report

Standard: ISO 7176-19:2022
 ATD: Hybrid III 50th Percentile Male

CIC Test ID: D23075

Client: Loop Wheels

8 Pre-Test Photographs



Figure 1: Front view, pre-test



Figure 2: Front 3/4 view, pre-test



Figure 3: RH side view, pre-test



Figure 4: Rear 3/4 view, pre-test



Figure 5: Rear view, pre-test



Figure 6: Rear tie downs and ORS anchorage rear view, pre-test



Figure 7: Rear tie downs and ORS anchorage RH side view, pre-test



Figure 8: Front tie-downs and foot supports, pre-test



Figure 9: RH wheel RH side view, pre-test



Figure 10: RH wheel quick release fixing RH side view, pre-test



Figure 11: RH wheel quick release fixing bottom view, pre-test



Figure 12: RH inner wheel spoke attachment RH side view, pre-test



Figure 13: LH inner quick release fixing and LH upper tie-down attachment rear view, pre-test



Figure 14: RH inner quick release fixing and RH upper tie-down attachment rear view, pre-test



Figure 15: Wheelchair cross brace rear view, pre-test



Figure 16: RH ORS routing RH side view, pre-test



Figure 17: ORS front view, pre-test

9 Post-Test Photographs



Figure 18: Front view, post-test



Figure 19: Front 3/4 view, post-test



Figure 20: RH side view, post-test

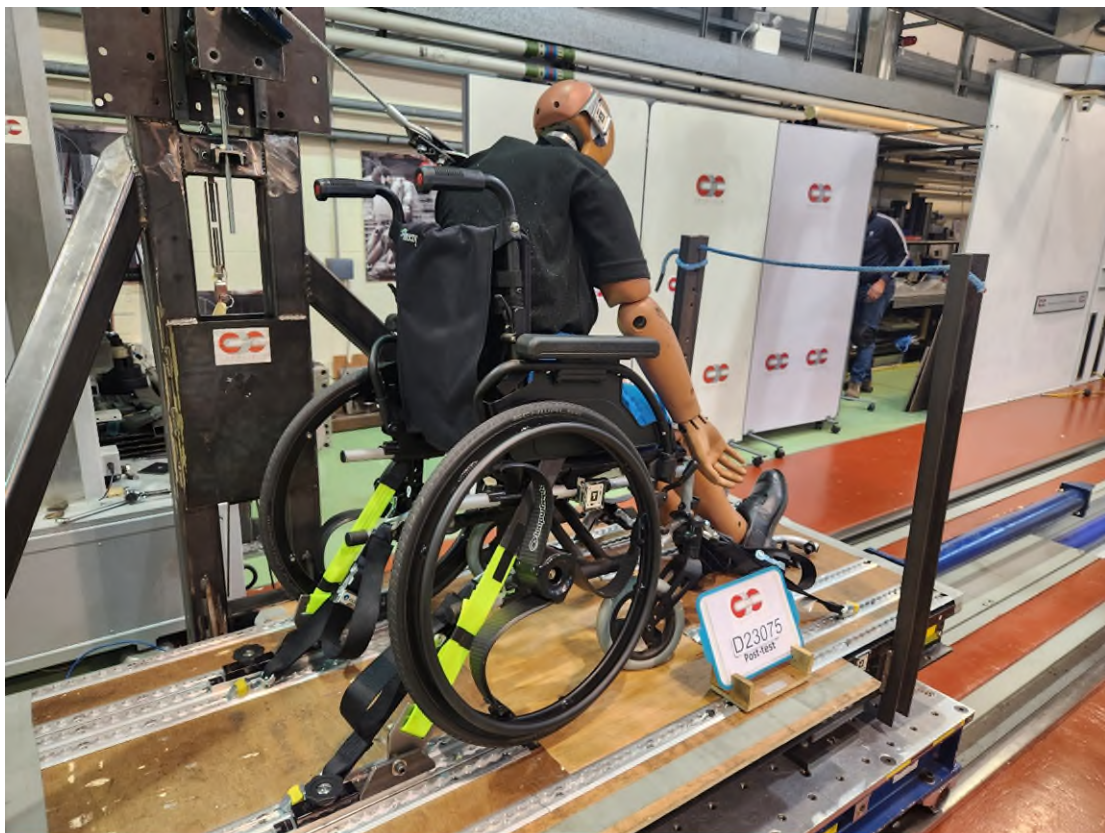


Figure 21: Rear 3/4 view, post-test



Figure 22: Rear view, post-test



Figure 23: Rear tie downs and ORS anchorage rear view, post-test



Figure 24: Wheelchair cross brace rear view, post-test



Figure 25: Dislodged component, post-test



Figure 26: Foot supports and front tie-downs front view, post-test



Figure 27: RH foot support attachment point front 3/4 view, post-test



Figure 28: LH foot support top view, post-test



Figure 29: LH foot support attachment point front $\frac{3}{4}$ view, post-test



Figure 30: RH foot support top view, post-test



Figure 31: LH wheel quick release mechanism LH side view, post-test



Figure 32: LH front inner wheel spoke attachment LH side view, post-test



Figure 33: LH upper inner wheel spoke attachment LH side view, post-test



Figure 34: LH rear inner wheel spoke attachment LH side view, post-test



Figure 35: LH wheel rear view, post-test



Figure 36: RH wheel rear view, post-test



Figure 37: RH wheel RH side view, post-test



Figure 38: RH front inner wheel spoke attachment RH side view, post-test



Figure 39: RH lower inner wheel spoke attachment RH side view, post-test



Figure 40: RH rear inner wheel spoke attachment RH side view, post-test



Figure 41: RH wheel quick release mechanism RH side view, post-test



Figure 42: Mass of detached components; 1.455kg, post-test

10 Test Results Summary

Test No.:	D23075	Test Date:	18 th August 2023
Test Type:	ISO 7176-19:2022 as a 'Duty of Care' rear wheel performance evaluation		
Manufacturer	Loopwheels	Part Name:	'Urban 24" with 'Stiff' Spring Rate'
Wheelchair Manufacturer:	SunRise Medical	Wheelchair Model:	'Breezy Rubix ² ' (Used).
Wheelchair Mass (kg):	17.60	Head Support:	N/A
Seat Rail Angle (°):	Fixed	Seat Back Angle (°):	Fixed
Occupant:	Hybrid III 50 th Percentile Male (78.00kg)		
Front Tie Downs:	Unwin OR03	Rear Tie Downs:	Unwin OR03
Occupant Restraint:	Cranfield Surrogate ORS v4 (Vehicle Anchored)		
5.1	During The Test		Results
a)	Horizontal ATD and wheelchair excursion limits as per limits shown in table 3:		
	Was the horizontal movement of the test wheelchair P-Point (X_{SS}) less than 200mm (± 5 mm)		Pass (80mm)
	Was the horizontal movement of the dummy knee (X_{knee}) less than 375mm (± 5 mm)		Pass (213mm)
	Was the forward horizontal movement of the dummy head (X_{headF}) less than 650mm (± 5 mm)		Pass (514mm)
	Was the rearwards horizontal movement of the dummy head (X_{headR}) greater than -450mm (± 5 mm)		Pass (-176mm)
b)	Was the ratio $X_{knee}/X_{SS} > 1.1:1$		Pass (2.66)
c)	Did the batteries of powered wheelchairs, or their surrogate parts:		
	Move outside of the wheelchair footprint		N/A
	Move into the wheelchair user's space		N/A
5.2	Post Test		
a)	Did the wheelchair remain upright on the test platform and did the ATD remain in the seated posture in the test wheelchair with a torso angle $> 45^\circ$		Pass
b)	Did the wheelchair securement points show visible signs of material failure		Pass
c)	Did any components of a mass greater than 100gm become detached from the wheelchair		Fail (1.455kg)
d)	Did any occupant contactable components fragment or separate with an edge less than 2mm		Pass
e)	Did any primary load carrying components of the wheelchair show any visible signs of failure		Pass
f)	Did any 'tilt in space' locking mechanisms show signs of failure		N/A
g)	Was the ATD released from the wheelchair without the use of tools		Pass
h)	Was the wheelchair released from the restraint system without the use of tools		Pass
i)	Was the average decrease of H-Point height relative to the wheelchair platform less than 20% of the pre-test height		Pass <2%
j)	Did the wheelchair and its components cause partial or complete failure of the webbing or any of the WTORS assemblies		Pass
<p>The 'Duty of Care' dynamic test on the Loopwheels 'Urban 24" with 'Stiff' Spring Rate' wheels attached to the Sunrise Medical 'Breezy Rubix²' manual, folding, user propelled wheelchair demonstrated integrity during dynamic test and satisfied the post-test requirements of ISO 7176-19:2022 clauses 5.1 and 5.2.</p>			



11 Calibration Report

<p>CERTIFICATE OF CALIBRATION ISSUED BY: CALIBRATION MAINTENANCE & REPAIR LTD</p> <p>DATE OF ISSUE: 6 September 2022 CERTIFICATE NUMBER: 1132078</p>	  0654								
 <p style="text-align: right; margin-right: 20px;"> 11 Frensham Road Norwich Norfolk NR3 2BT Tel: +44 1603 279557 </p>	<p style="text-align: center;">Page 1 of 4</p> <p style="text-align: center;">Approved Signatory Electronically Authorised Document</p> <table style="width: 100%; border: none;"> <tr> <td><input type="checkbox"/> P K CLARK</td> <td><input type="checkbox"/> J FRYER</td> </tr> <tr> <td><input type="checkbox"/> R J WADE</td> <td><input type="checkbox"/> M FOY</td> </tr> <tr> <td><input type="checkbox"/> M A FROST</td> <td></td> </tr> <tr> <td><input checked="" type="checkbox"/> M S PARDOE</td> <td></td> </tr> </table>	<input type="checkbox"/> P K CLARK	<input type="checkbox"/> J FRYER	<input type="checkbox"/> R J WADE	<input type="checkbox"/> M FOY	<input type="checkbox"/> M A FROST		<input checked="" type="checkbox"/> M S PARDOE	
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<input checked="" type="checkbox"/> M S PARDOE									

CUSTOMER CIM LTD BUILDING B56 CRANFIELD UNIVERSITY CRANFIELD BEDFORD BEDFORDSHIRE MK43 0AL UNITED KINGDOM	MANUFACTURER DESCRIPTION MODEL SERIAL No. IDENT No. DATE RECEIVED DATE OF CALIBRATION ORDER No	ENDEVCO ACCELEROMETER 2262A-1000 L15294 NOT KNOWN 5 SEPTEMBER 2022 5 SEPTEMBER 2022 111526
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ENVIRONMENT

The instrument was placed in the Vibration Laboratory environment and allowed to stabilise prior to calibration. The laboratory is maintained at ambient conditions of 22°C ±3°C, relative humidity 45% ±15%.

STABILITY

The results contained in this Certificate refer to the measurements made at the time of test and not to the accelerometers ability to maintain calibration.

PROCEDURE

Measurements were performed in accordance with the in house Laboratory procedure No.3308 which conforms to ISO16063-21 back to back comparison method for frequency sweep, and ISO16063-22 for Shock.

The uncertainty evaluation has been carried out in accordance with UKAS requirements.

ACCELEROMETER DATA

Nominal Sensitivity @ 160Hz	0.9175mV/g
Temperature	Ambient

This certificate is issued in accordance with the laboratory accreditation requirements of the United Kingdom Accreditation Service. It provides traceability of measurement to the SI system of units and/or to units of measurement realised at the National Physical Laboratory or other recognised national metrology institutes. This certificate may not be reproduced other than in full, except with the prior written approval of the issuing laboratory.

(End of Report)