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Crash testing of the Dahlia 30° wheelchair according to ISO 7176-19:2008

(2 appendices)

Summary

A crash test of the Dahlia 30° wheelchair has been performed according to ISO 7176-19:2008, chapter 5.2. The wheelchair was crash tested loaded with a Hybrid III-dummy, 79.2 kg, in 48.1 km/h.

Standard chapter		Comment	Fulfilment of requirement
5.2.1a	Horizontal excursion		OK
5.2.1b	Knee vs. WC excursion		OK
5.2.1c	Battery movement		-
5.2.2a	ATD torso angle <30°		OK
5.2.2b	Securement points		OK
5.2.2c	Separation of <100 grams		OK
5.2.2d	Sharp edges radius > 2 mm		OK
5.2.2e	Load carrying components		OK
5.2.2f	Tilt-in space locking		-
5.2.2g	Removal of ATD, no tools		OK
5.2.2h	WC removal, no tools		OK
5.2.2i	Post height diff < 20%	8%	OK
5.2.2j	No webbing failure		OK

The test object fulfilled the requirements according to ISO 7176-19:2008, chapter 5.2.

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1 Introduction

On assignment of Invacare Rea AB a crash test of the Dahlia 30° wheelchair was performed according to ISO 7176-19:2008, chapter 5.2. The purpose of the test was to evaluate if the wheelchair fulfilled the crash test requirements.

2 Test object

Wheelchair:	Dahlia 30° - 24"
Invacare test No.:	T14 040
Seat width:	440 mm
Seat depth:	450 mm
Seat height:	470 mm
Wheel base:	420 mm
WC weight:	42.3 kg
Seat angle:	4°
Back rest angle:	4°
Back rest type:	Flex 3 – Plate
Back rest height:	650 mm
Arm rest:	Straight narrow pad
User brake:	Yes
Legrest/Foot plate:	AA / AA-176
Calf pads:	Yes
Heel straps:	Yes
Rear wheel:	Basic 24"x1 3/8" air
Wheel attachment:	Upper position
Castor wheel:	200x45 solid – Pos.1
Castor wheel fork:	110 mm
Neckrest:	Yes
Pelvic belt:	1529 727
Antitip device:	Yes
Max user weight:	135 kg
Test object arrival at SP:	2014-02-27
Selection of test object:	The test object has been selected by the client without SP's assistance

3 Test method and performance

Test method:	ISO 7176-19:2008, section 5.2
Test date:	2014-02-27
Test facility:	SP Structural and Solid Mechanics crash laboratory in Borås.
Crash pulse:	15g for >40 ms, 20g for >15 ms, 48-50 km/h.
Pulse measurement:	Two accelerometers mounted on the sled, the graph can be found in appendix 1. SP inv. nos. 403201 and 403350
Velocity measurement:	Optical time sensors measuring the time for the sled to travel a distance of 1 meter just before impact. SP inv. no. 900081.
Excursion measurement:	The excursion values were measured from the high-speed film by the film analysis program, TEMA, with an accuracy of ± 5 mm.
Film camera:	HG 2000 High-speed camera, 1000 frames per second, with a Computar F1.2/12.5-75mm lens.
Crash test dummy:	Hybrid III, 50 th percentile, 79.2 kg. SP inv. no. 401460.
Occupant restraint system:	D/I Split Reel, ATF, PSR-01293-M + Stalk STK-06714-B + Shoulder Harness 3PTF. Supplier: Unwin Safety Systems, UK
4-point tie down system:	4pt wheelchair tie-down restraint with Karabiner: SYS 02. Supplier: Unwin Safety Systems, UK
Photographs:	Photos were taken before and after the test and can be found in appendix 2.

The test object was mounted in a forward direction on the impact sled and attached with the 4-point tie-down restraint. A Hybrid III-dummy, 79.2 kg, was positioned in the test object and fixated with the 3pt occupant restraint.

The sled was accelerated to a speed of 48.1 km/h before impact.



Figure 1 *Test setup*

4 Test results

The test results showed in this report refer only to the tested object.

Table 1 **Test results**

Standard chapter		Requirement	Result/ Comment	Requirement fulfilment
5.2.1a	Horizontal excursion: Head forward	< 650 mm	296 mm	Yes
5.2.1a	Horizontal excursion: Head rearward	< 450 mm	443 mm	Yes
5.2.1a	Horizontal excursion: Knee forward	< 375 mm	217 mm	Yes
5.2.1a	Horizontal excursion: Wheelchair point forward	< 200 mm	83 mm	Yes
5.2.1b	Knee vs. WC excursion: $X_{\text{knee}} / X_{\text{wc}}$	> 1.1	2.6	Yes
5.2.1c	Batteries of powered wheelchairs shall: - not move completely outside the wheelchair footprint - not move into the wheelchair user's legs space			N/A

5.2.2a	The wheelchair shall remain in an upright position on the test platform. The ATD shall be retained in the wheelchair in a seated posture, as determined by the ATD torso being oriented at no more than 30° to the vertical.		Yes
5.2.2b	The wheelchair securement points shall not show visible signs of material failure.		Yes
5.2.2c	Components, fragments or accessories of the wheelchair with a mass in excess of 100g shall not have completely separated from the wheelchair.		Yes
5.2.2d	Wheelchair components that may contact the occupant shall not fragment or separate in a manner that produces sharp edges, as defined by having a radius less than 2 mm.		Yes
5.2.2e	Primary load carrying components of the wheelchair shall not show visible signs of failure.		Yes
5.2.2f	Locking mechanisms of tilt-in-space seat adjusters shall not show signs of failure.		N/A
5.2.2g	Removal of ATD from the wheelchair shall not require the use of tools.		Yes
5.2.2h	Release of wheelchair from the tiedown system shall not require the use of tools.		Yes
5.2.2i	The post-test height of the average of left and right ATD H-points relative to the wheelchair ground plane shall not have decreased by more than 20% from the pre-test height.	8%	Yes
5.2.2j	The wheelchair and its components shall not cause partial or complete failure of the webbing of any of the WTORS assemblies during the test.		Yes

The test object fulfilled the requirements according to ISO 7176-19:2008, chapter 5.2.

5 Measurement uncertainty

The measurement uncertainty for the deceleration pulse is less than 1.5%.

Reported uncertainty corresponds to an approximate 95 % confidence interval around the measured value. The interval has been calculated in accordance with GUM (The ISO guide to the expression of uncertainty in measurements), which is normally accomplished by quadratic addition of the actual standard uncertainties and multiplication of the resulting combined standard uncertainty by the coverage factor $k=2$.

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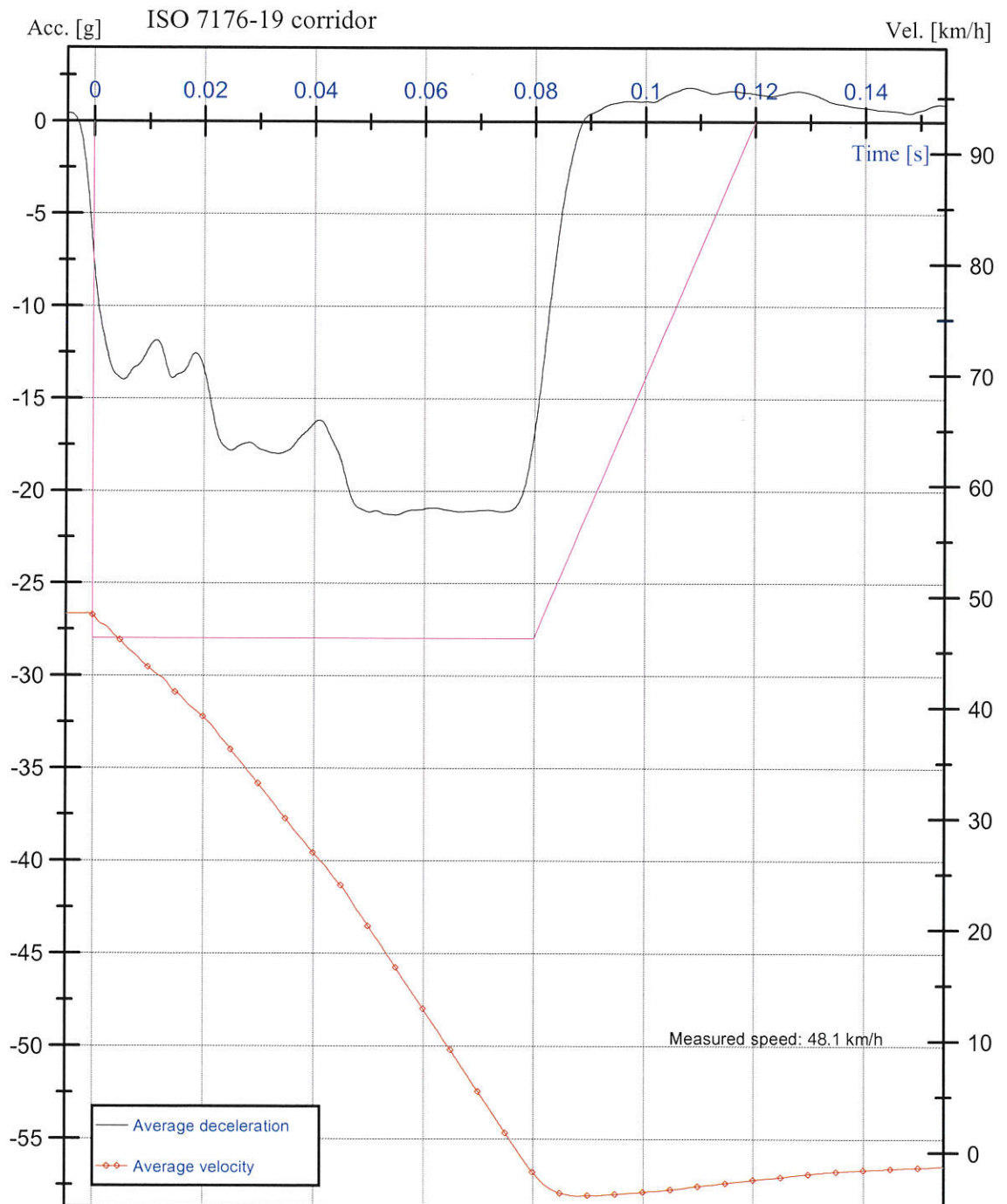
Appendices

Appendix 1 Deceleration graph (1 page)

Appendix 2 Photos (4 pages)

Appendix 1

Sled deceleration, Average pulse, CFC 60



Customer: Invacare Rea

Test object: Dahlia, 30°, 24"-hjul

Standard: ISO 7176-19

Test date: 2014-02-27 **Test:** 1

Appendix 2



Photo 1. Before test



Photo 2. Before test

Appendix 2



Photo 3. Before test

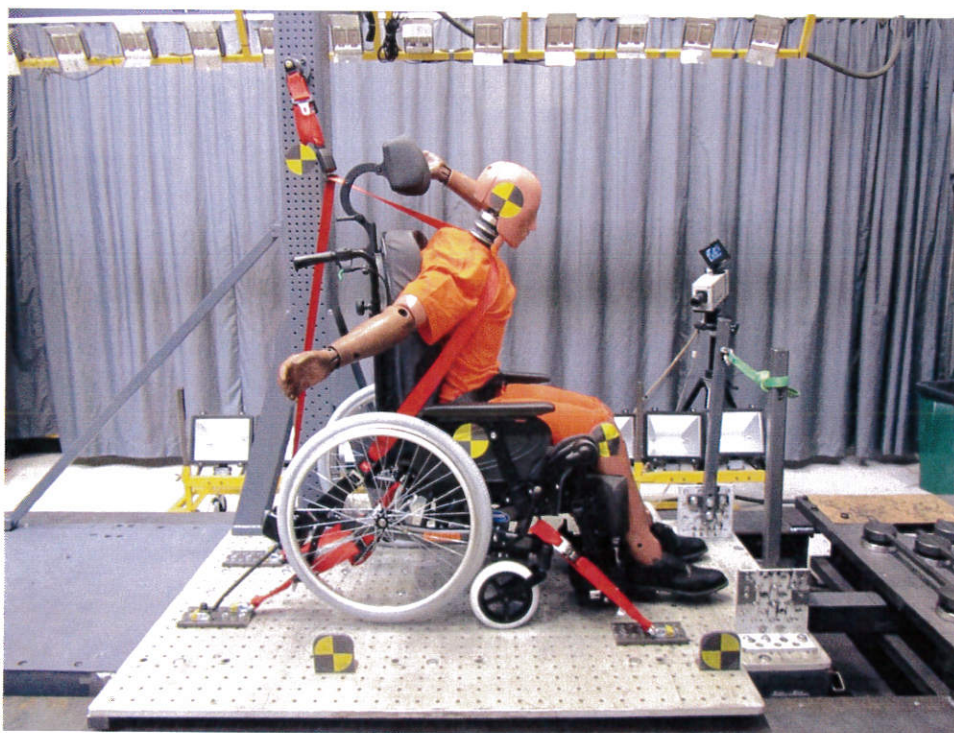


Photo 4. After test

Appendix 2



Photo 5. After test



Photo 6. After test

Appendix 2

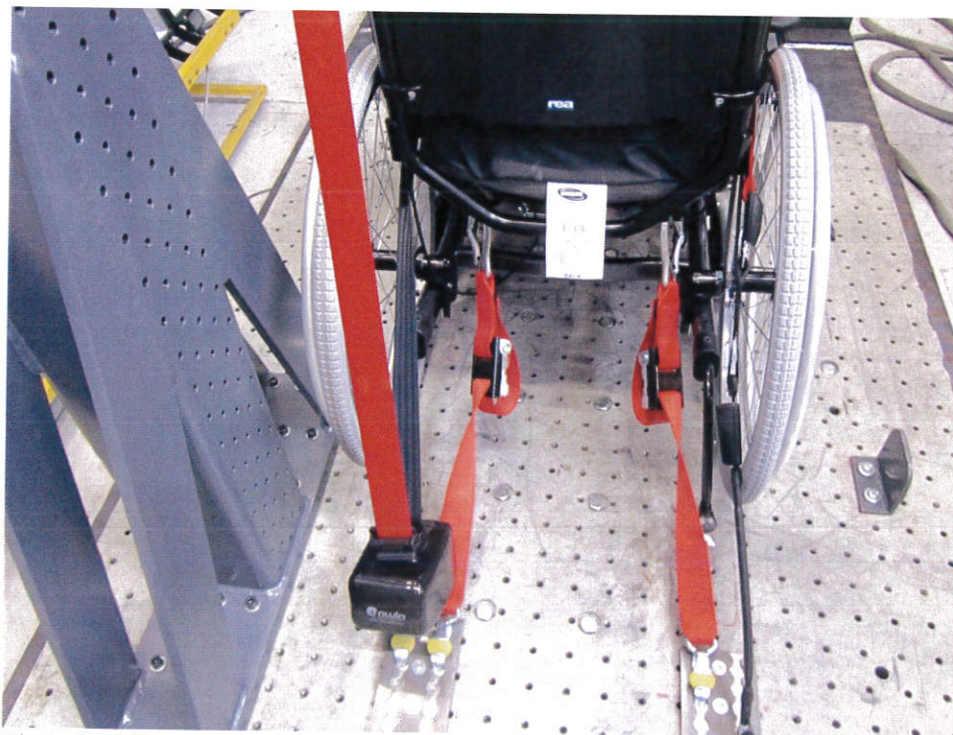


Photo 7. After test



Photo 8. After test