

## Crash testing of the Azalea base with Matrix backrest according to ISO 7176-19:2008

(2 appendices)

A crash test of the Azalea base with Matrix backrest 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 48.7 km/h.

Standard chapter		Comment	Fulfilment of requirement
5.2.1a	Horizontal excursion		Yes
5.2.1b	Knee vs. WC excursion		Yes
5.2.1c	Battery movement		N/A
5.2.2a	ATD torso angle <45°		Yes
5.2.2b	Securement points		Yes
5.2.2c	Separation of <100 grams		Yes
5.2.2d	Sharp edges radius > 2 mm		Yes
5.2.2e	Load carrying components		Yes
5.2.2f	Tilt-in space locking		Yes
5.2.2g	Removal of ATD, no tools		Yes
5.2.2h	WC removal, no tools		Yes
5.2.2i	Post height diff < 20%	<2%	Yes
5.2.2j	No webbing failure		Yes

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

## 1 Introduction

On assignment of Invacare Rea AB a crash test of the Azalea base with Matrix backrest 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.

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## 2 Test object

Wheelchair:	Azalea base with Matrix backrest
Rea Test No.	T11 035
Seat width	49 cm
Seat depth	45 cm
Seat height	45 cm
Wheel base	40.5 cm
WC weight	40 kg
Seat angle	0°
Back rest angle	0°
Back rest height	56 cm
Arm rest	HA Standard - Ducktail
Legrest	AA
Foot plate	AA + heel straps
Rear wheel	IVCR 24x1 3/8" solid
Wheel position	Lower fore
Castor wheel	200x45 solid
Neckrest	Yes
Pelvic belt	Yes FR
Tp attachment	Standard Azalea
Antitip device	Yes
Test object arrival at SP:	Week 10, 2011
Selection of test object:	The test object has been selected by the client without SP's assistance

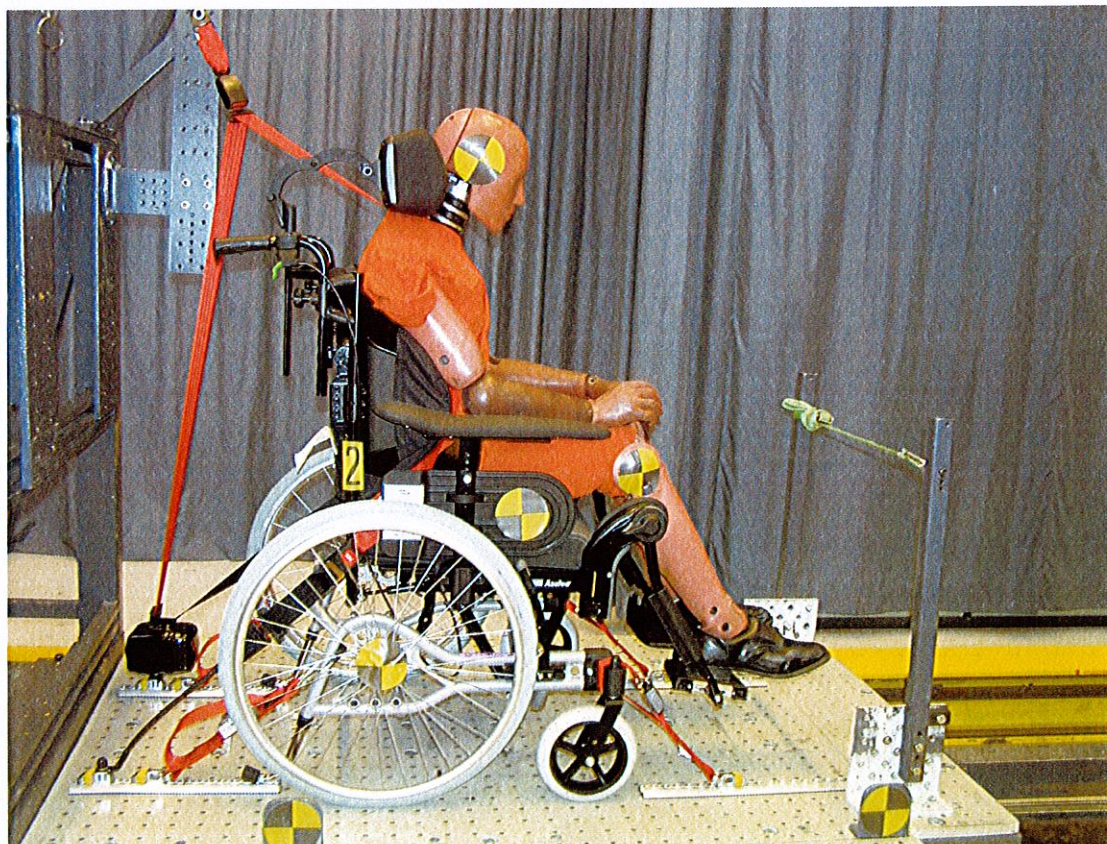
### 3 Test method and performance

Test method:	ISO 7176-19:2008, section 5.2
Test date:	2011-03-17
Test facility:	SP Building Technology and Mechanics crash laboratory in Borås.
Crash pulse:	15g during 40 ms, 20g during 15 ms, 48-50 km/h (pulse id: 2).
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 $\pm 5$ mm.
Film camera:	HG 2000 High-speed camera, 1000 frames per second, with a Schneider Variogon 1.8/10-100 lens. SP inv. nos. 403182 and 402522
Crash test dummy:	Hybrid III, 50 <sup>th</sup> percentile, 79.2 kg.
Restraint system:	3pt occupant restraint Split Reel D/I ATF + Stalk STK-60714-B + Shoulder Harness SBT-06339-C and 4pt wheelchair tie-down restraint W120. 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 tiedown 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 48.7 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	315 mm	Yes
5.2.1a	Horizontal excursion: Head rearward	< 450 mm	220 mm	Yes
5.2.1a	Horizontal excursion: Knee forward	< 375 mm	300 mm	Yes
5.2.1a	Horizontal excursion: Wheelchair point forward	< 200 mm	101 mm	Yes
5.2.1b	Knee vs. WC excursion: $X_{knee} / X_{wc}$	> 1.1	2.95	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 45° 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.	A sharp edge occurred see photo 7 in appendix 2. But SP judged that the edge may not contact the occupant.	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.		Yes
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.	<2%	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  $k=2$ .

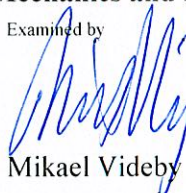
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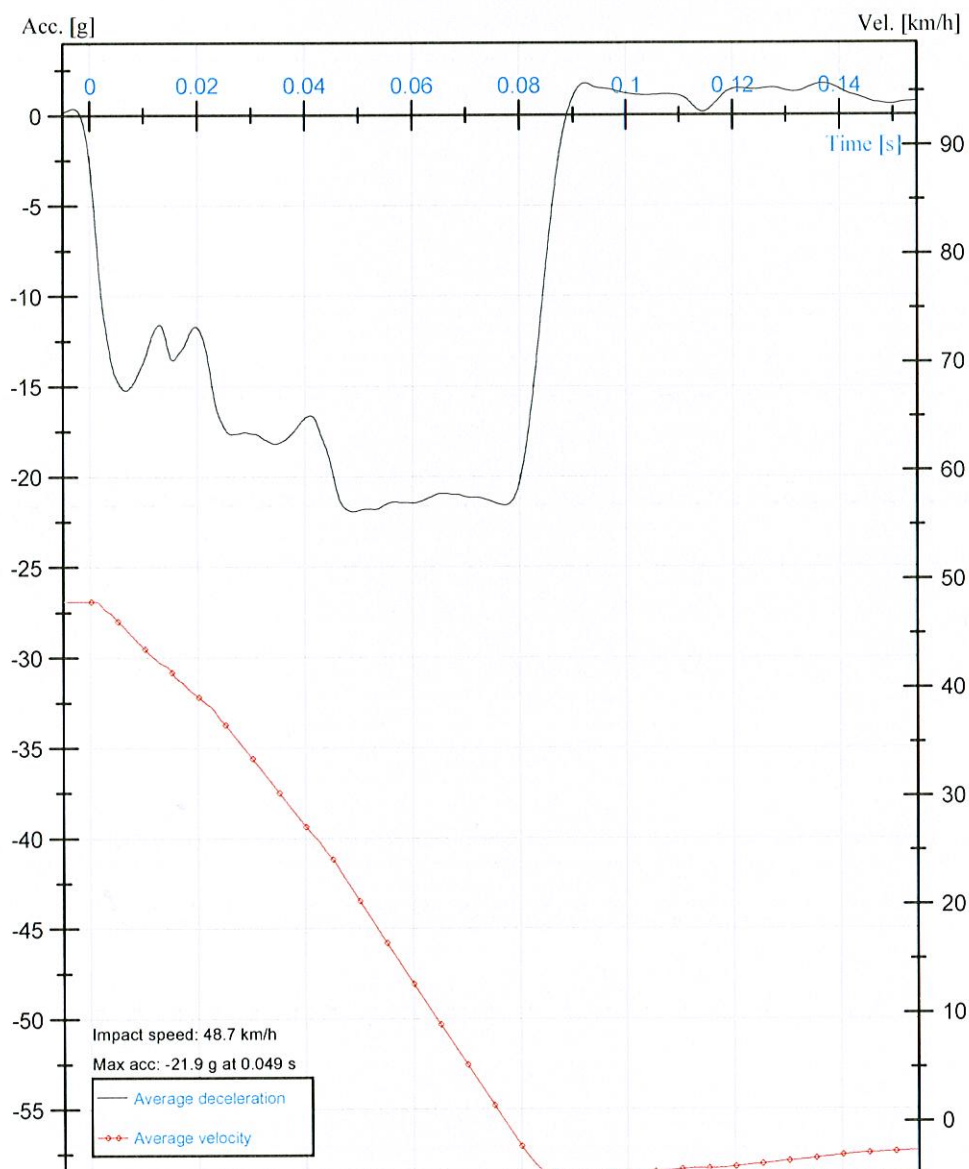
### Appendices

Appendix 1    Deceleration graph (1 page)

Appendix 2    Photos (5 pages)

# Appendix 1

## Sled deceleration, Average pulse, CFC 60



**Customer:** Invacare

**Test object:** Azalea Base, H3 50%

**Standard:** ISO 7176-19

**Test date:** 2011-03-17      **Test:** 2



## Appendix 2

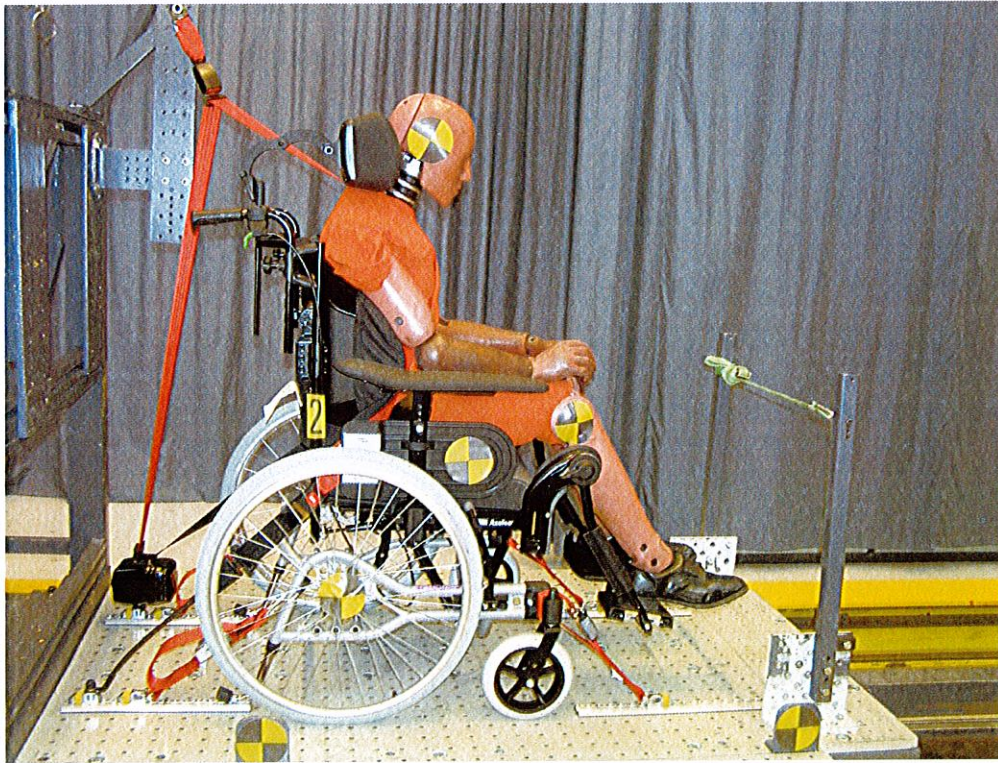


Photo 1. Before test



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

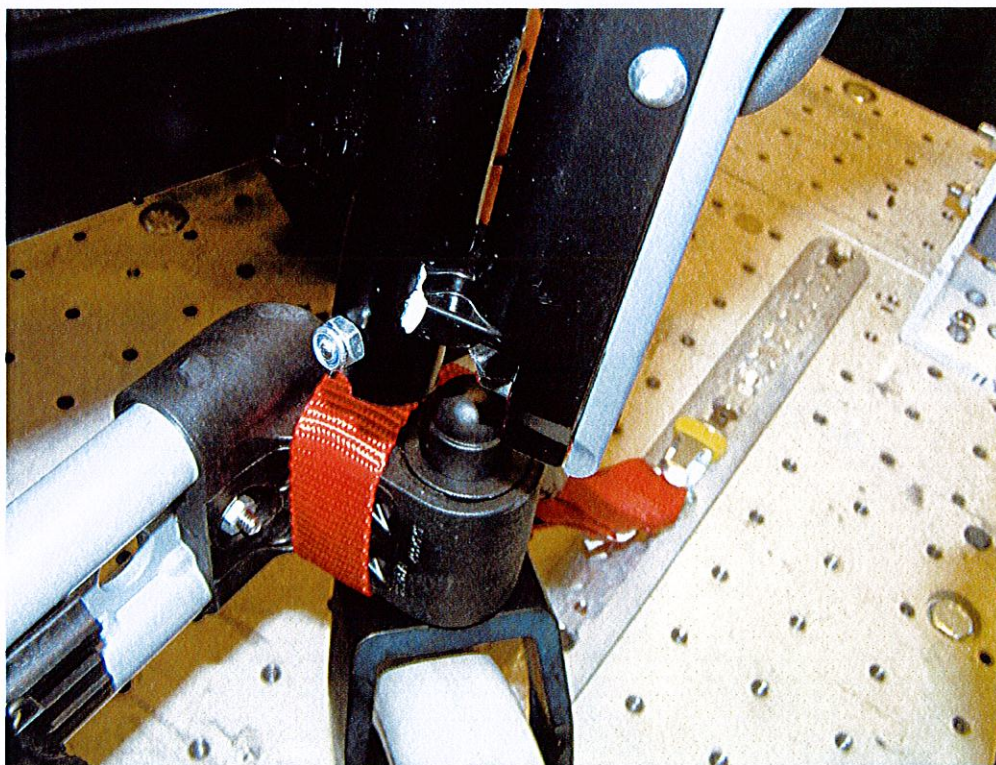


Photo 7. After test

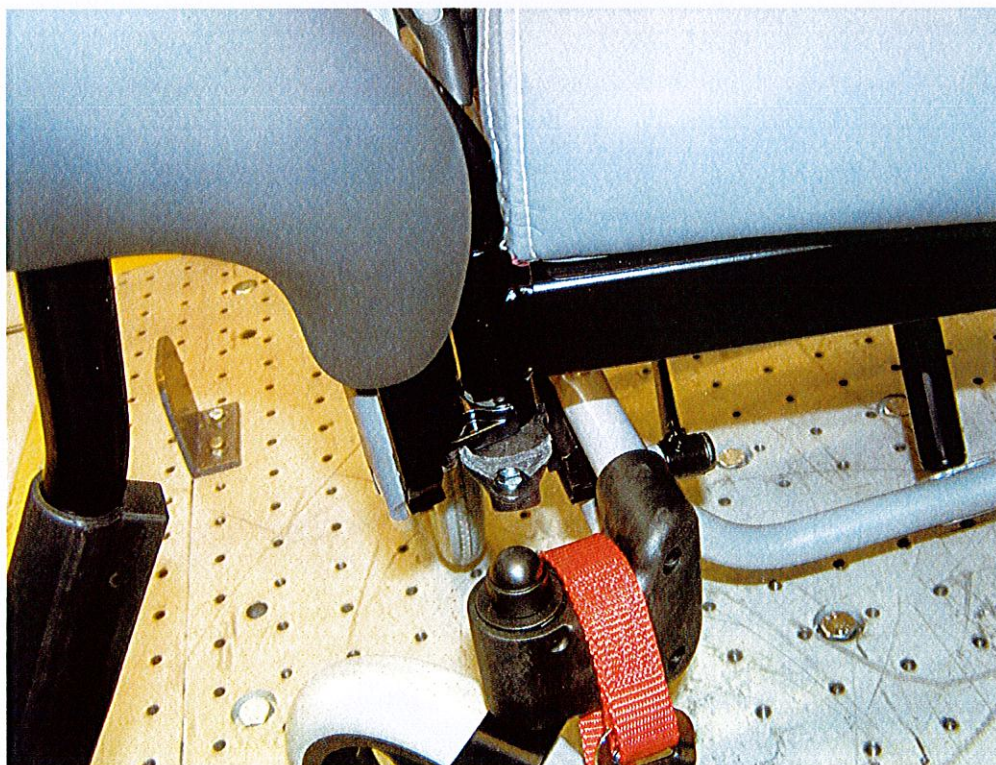


Photo 8. After test



## Appendix 2

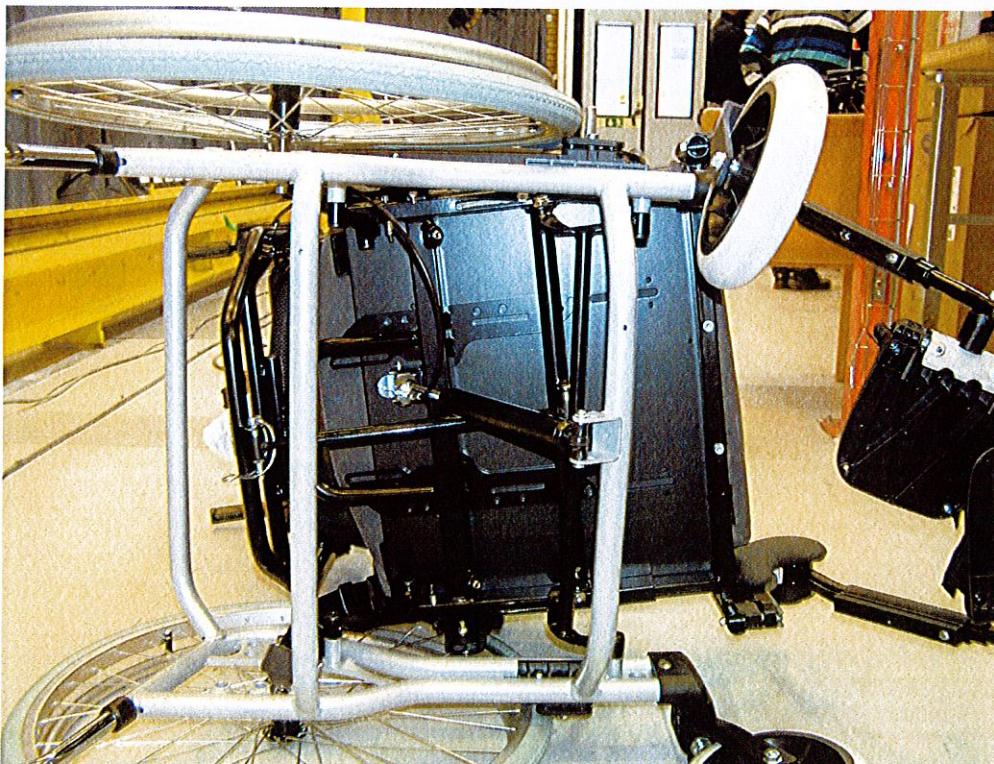


Photo 9. After test