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Crash testing of wheelchair XLT 75° according to ISO 7176-19:2001

(2 appendices)

Summary

A crash test of the XLT 75° wheelchair has been performed according to ISO 7176-19:2001, chapter 5.2. The wheelchair was crash tested with a Hybrid III-dummy, 76 kg, in 48-50 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		N/A
5.2.2g	Removal of ATD, no tools		Yes
5.2.2h	WC removal, no tools		Yes
5.2.2i	Post height > 20%		Yes

The test object fulfilled the requirements according to ISO 7176-19:2001, chapter 5.2.

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1 Introduction

On assignment of Invacare Rea AB a crash test of a XLT 75° wheelchair was performed according to ISO 7176-19:2001, chapter 5.2. The purpose of the test was to evaluate if the wheelchair fulfilled the crash test requirements.

2 Test object

Wheelchair:	XLT 75°		
Invacare test number:	T8063		
Height:	47 cm		
Seat width:	43 cm	Seat depth:	45 cm
Drive wheels:	24"	Castor wheels:	125x27
Backrest height:	40 cm		
Test specific:	Assistant drive handle, headrest		
Test object arrival at SP:	2008-06-10		
Selection of test object:	The test objects have been selected by the client without SP's assistance		

3 Test method and performance

Test method:	ISO 7176-19:2001, chapter 5.2
Test date:	2008-06-10
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, inv no 403201 and 403215. The graph can be found in appendix 1.
Velocity measurement:	Optical time sensors measuring the time for the sled to travel a distance of 1 meter just before impact.
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.
Crash test dummy:	Hybrid III, 50 th percentile, 76 kg. Inv. no: 401460.
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 and attached to the sled with a 4-point tiedown system from Unwin. A Hybrid III-dummy, 76 kg, was positioned in the test object. The sled was accelerated to a speed of 49.5 km/h before impact.

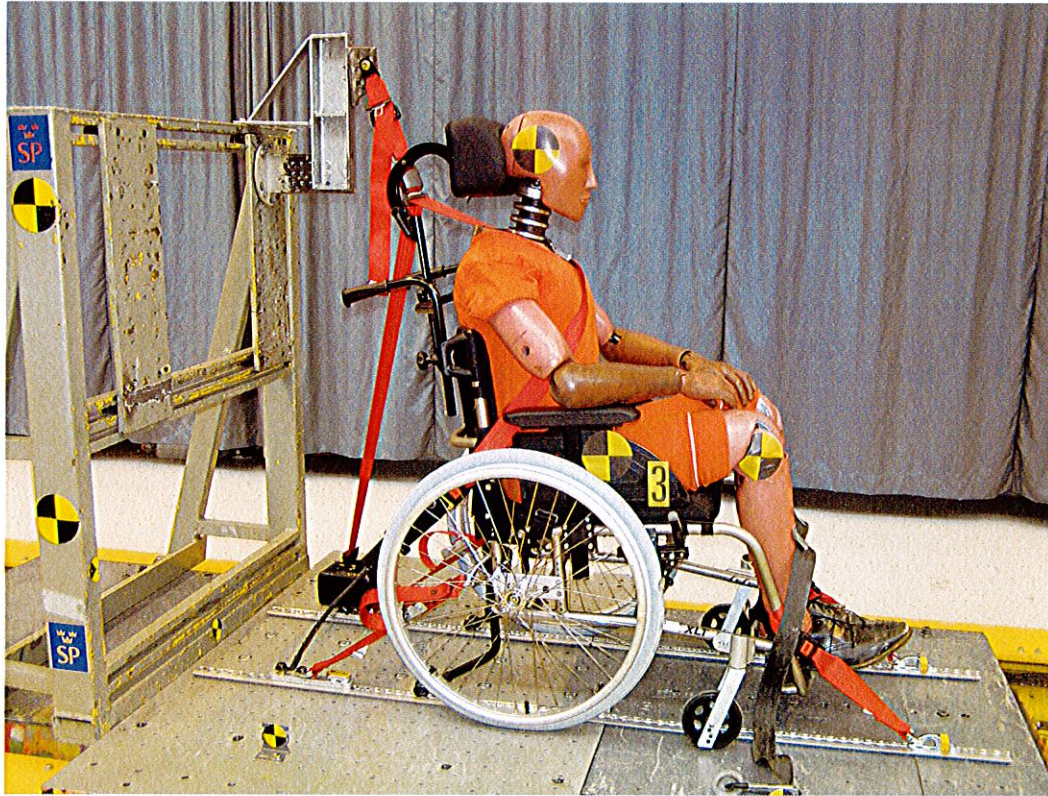


Figure 1 Test setup

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	371 mm	Yes
5.2.1a	Horizontal excursion: Head rearward	< 400 mm	312 mm	Yes
5.2.1a	Horizontal excursion: Knee forward	< 375 mm	240 mm	Yes
5.2.1a	Horizontal excursion: Wheelchair point forward	< 200 mm	47 mm	Yes
5.2.1b	Knee vs. WC excursion: X_{knee} / X_{wc}	> 1,1	5,0	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.		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.		Yes

The test object fulfilled the requirements according to ISO 7176-19:2001, 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 $k=2$.

SP Technical Research Institute of Sweden
Building Technology and Mechanics - Solid Mechanics and Structures



Erica Waller
Technical Manager



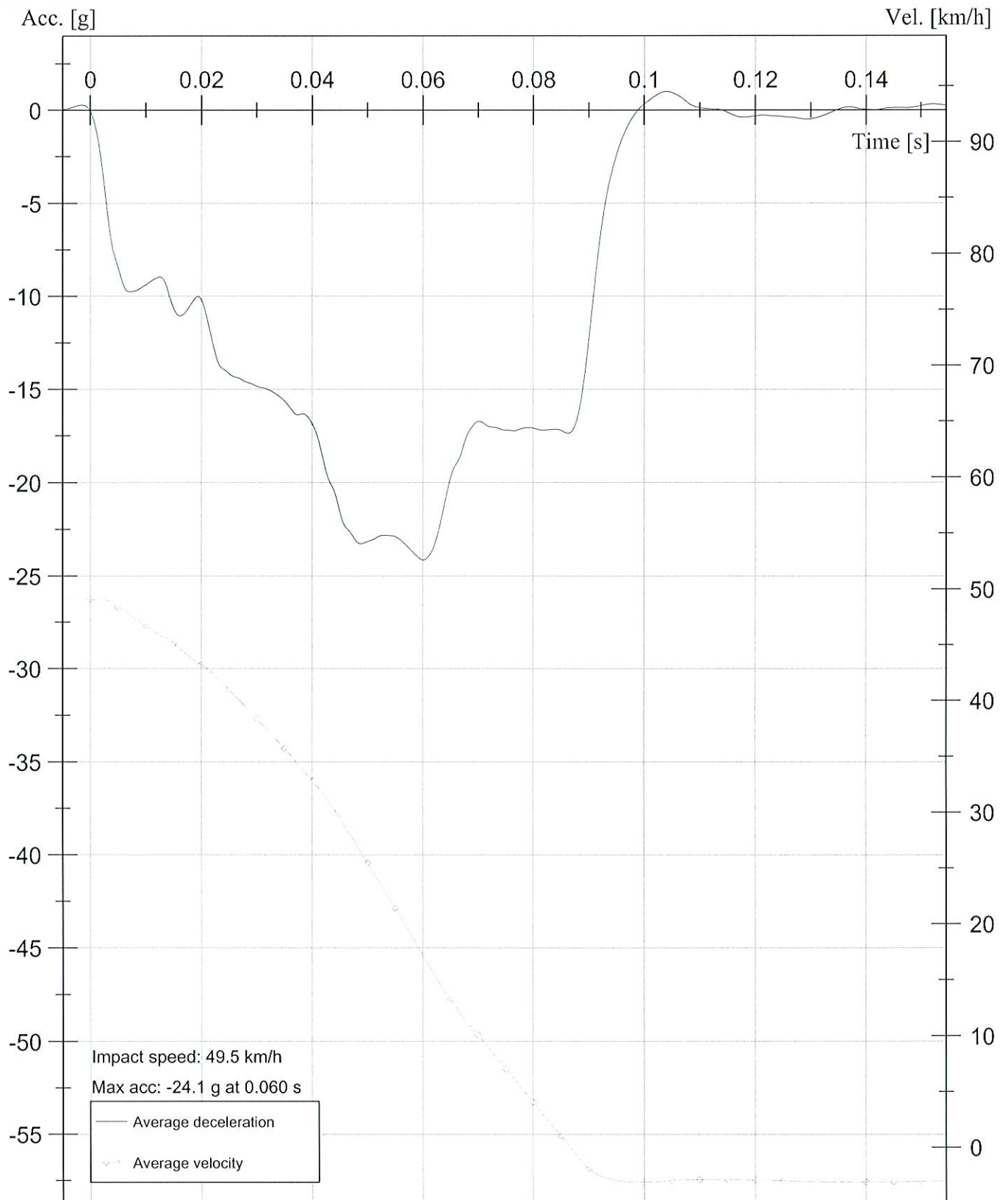
Mikael Videby
Technical Officer

Appendices

- Appendix 1 Deceleration graph (1 page)
- Appendix 2 Photos (6 pages)



Sled deceleration, Average pulse, CFC 60



Customer: Invacare Rea

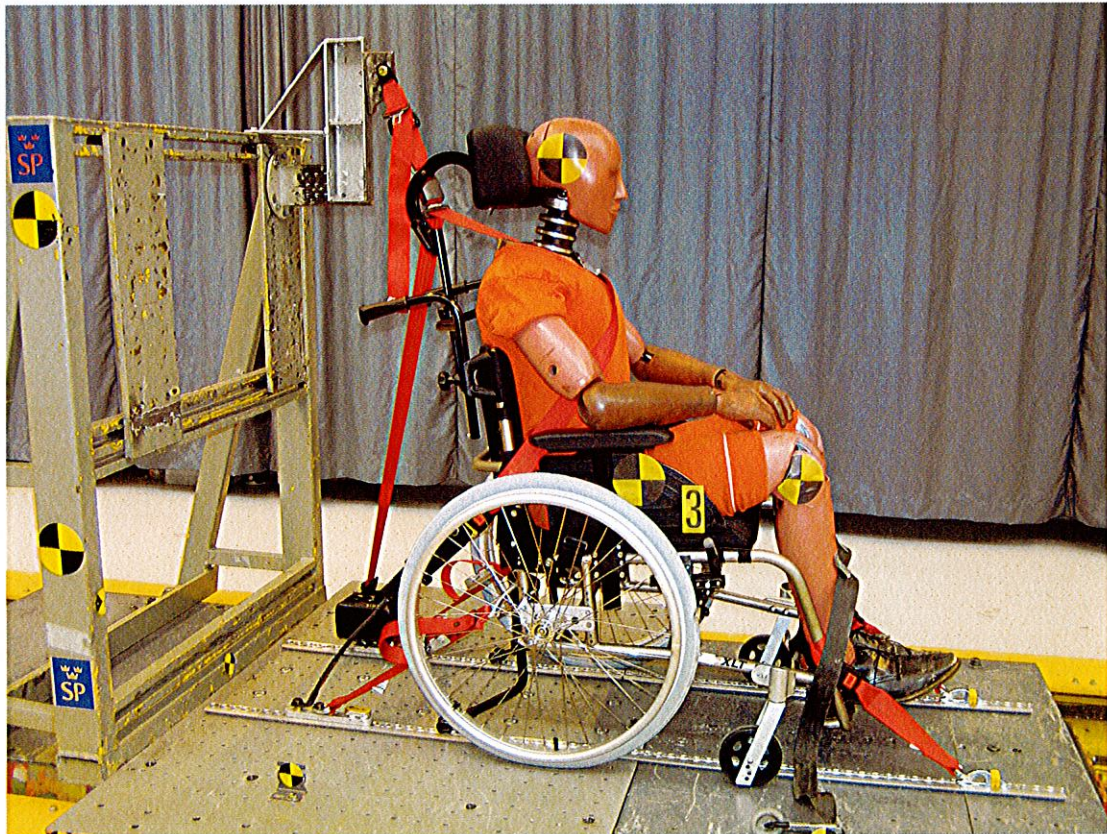
Test object: XLT 75°

Standard: ISO 7176-19

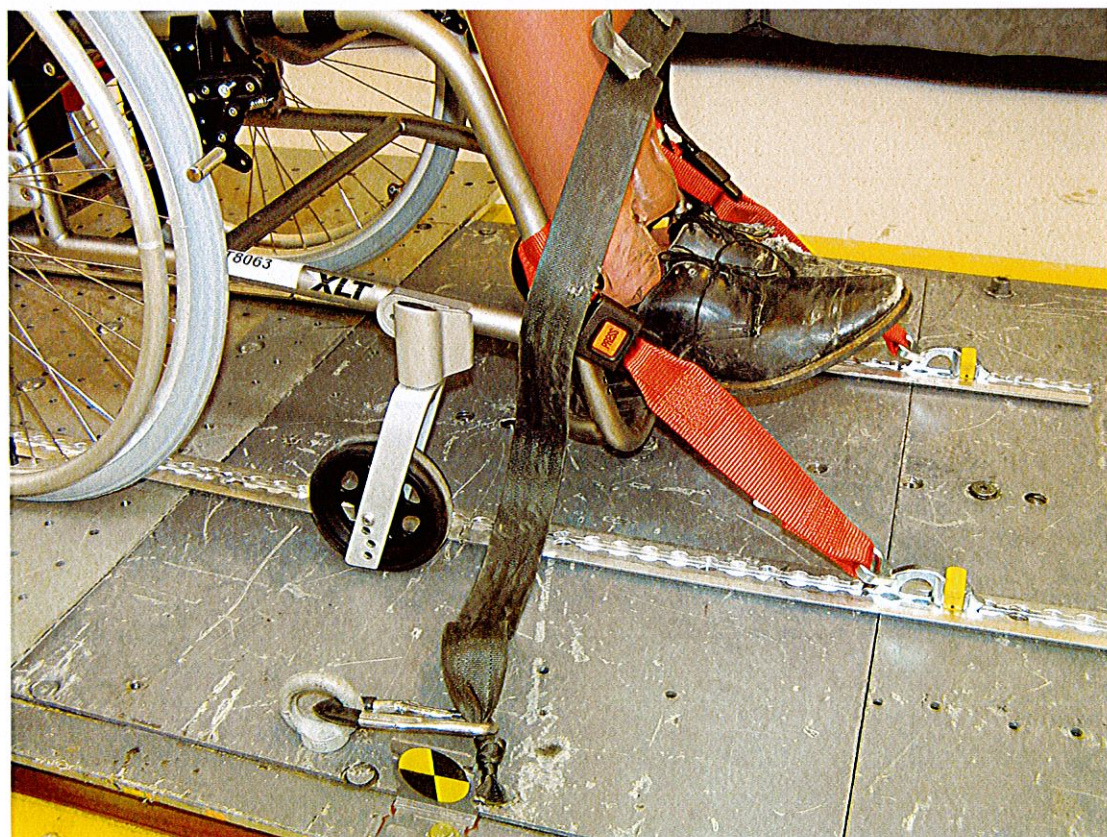
Test date: 2008-06-10

Test: 3

Appendix 2

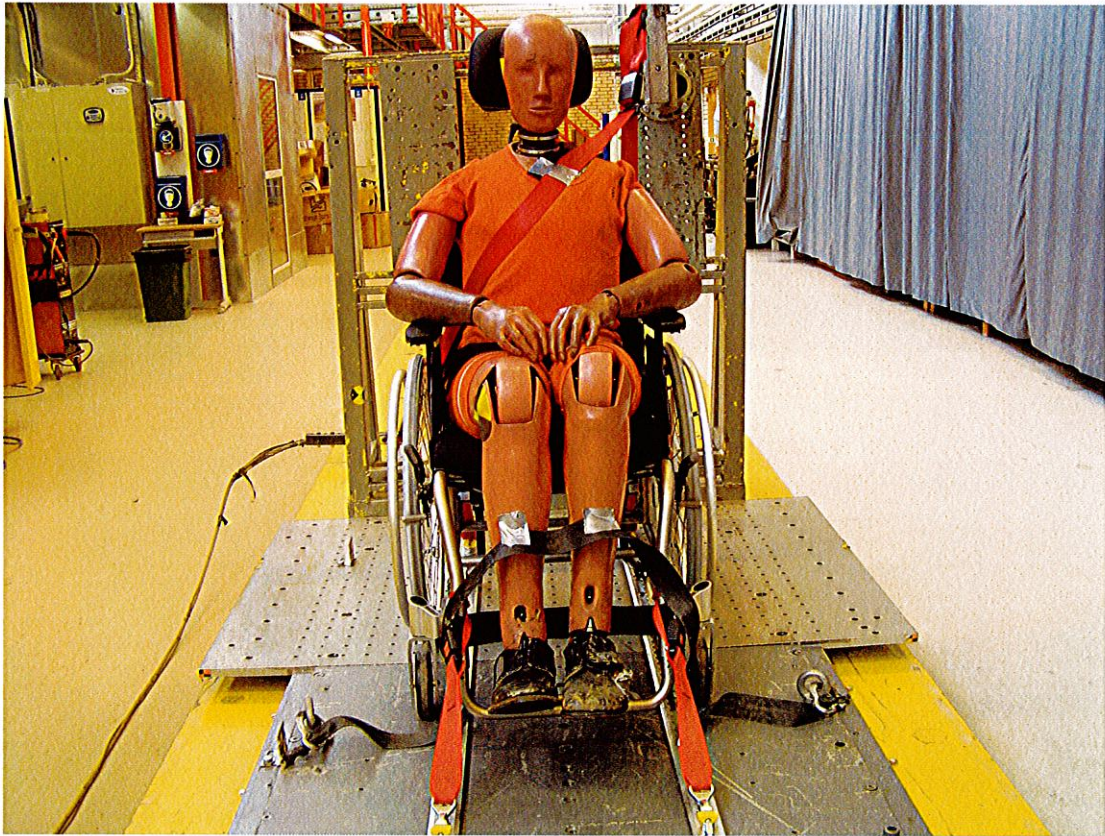


Before test 03



Before test 03

Appendix 2

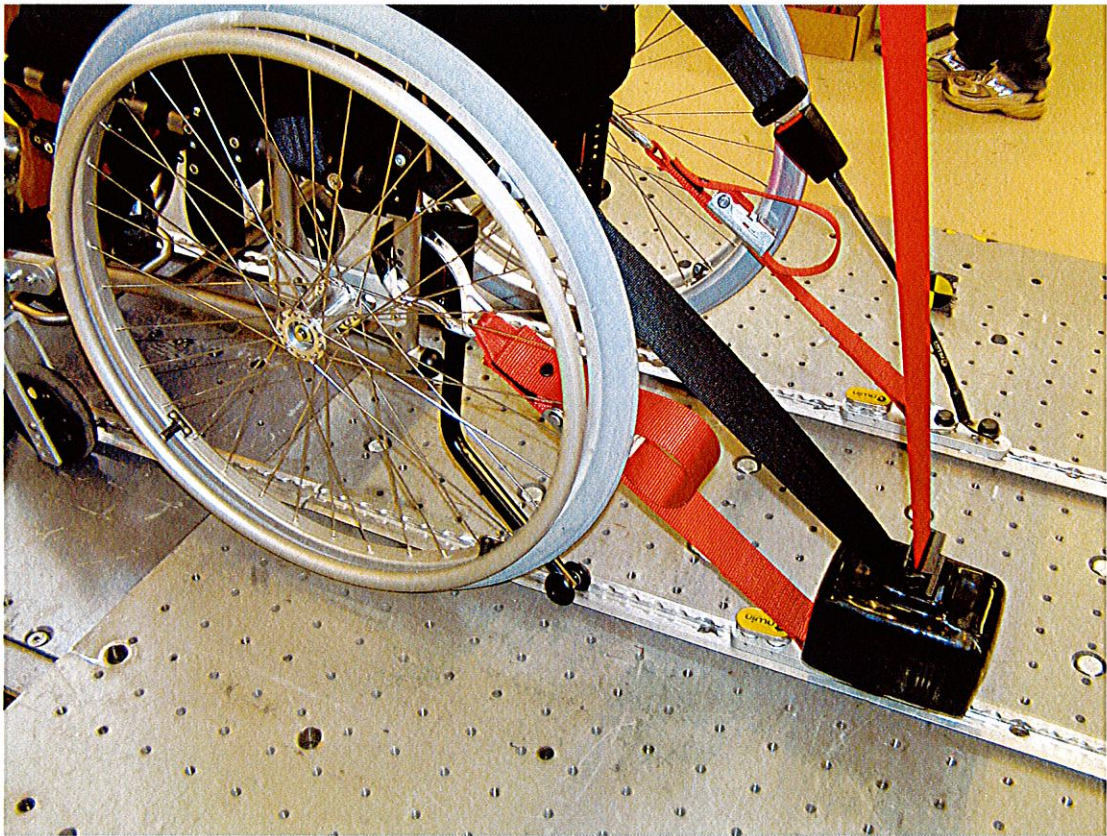


Before test 03



Before test 03

Appendix 2

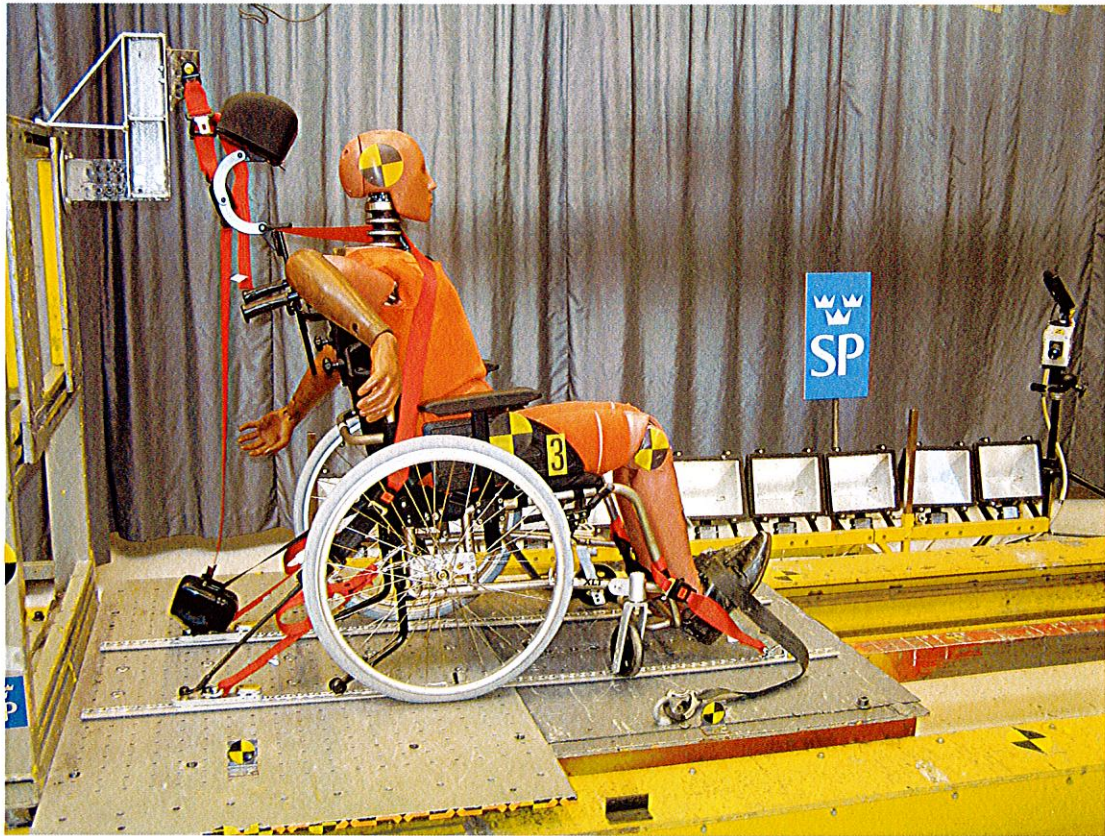


Before test 03

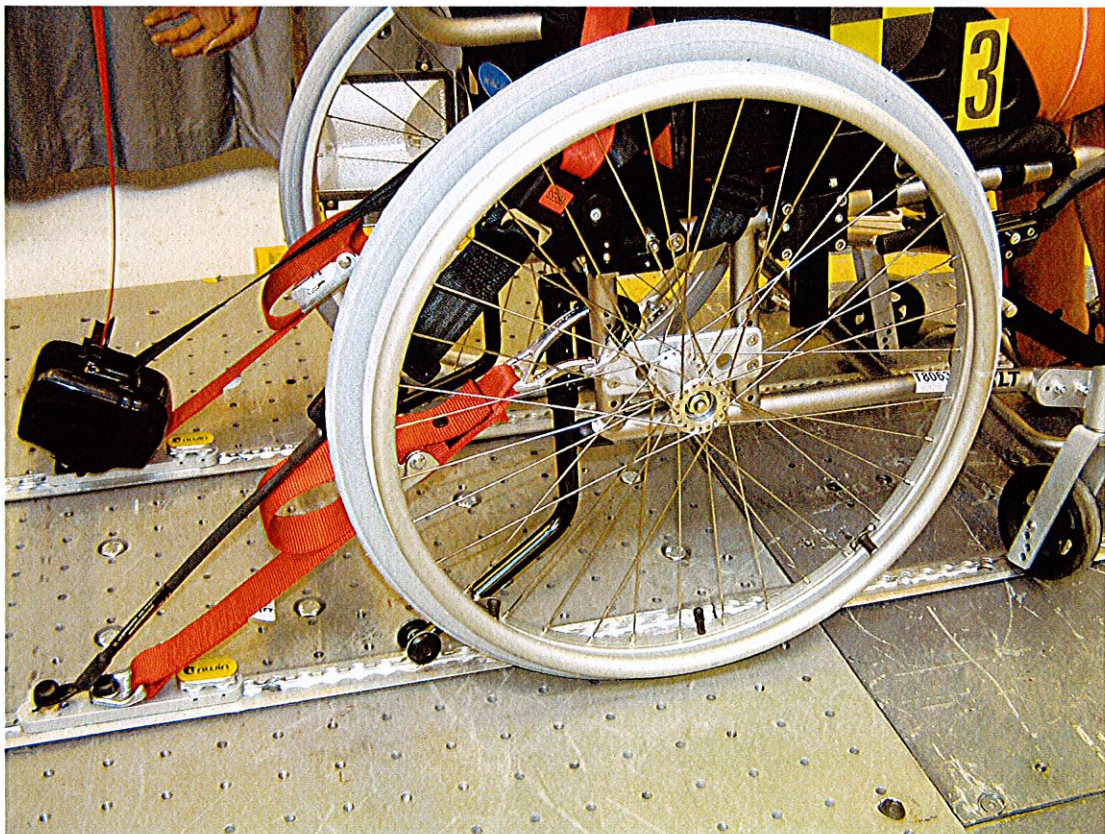


Before test 03

Appendix 2



After test 03



After test 03

Appendix 2

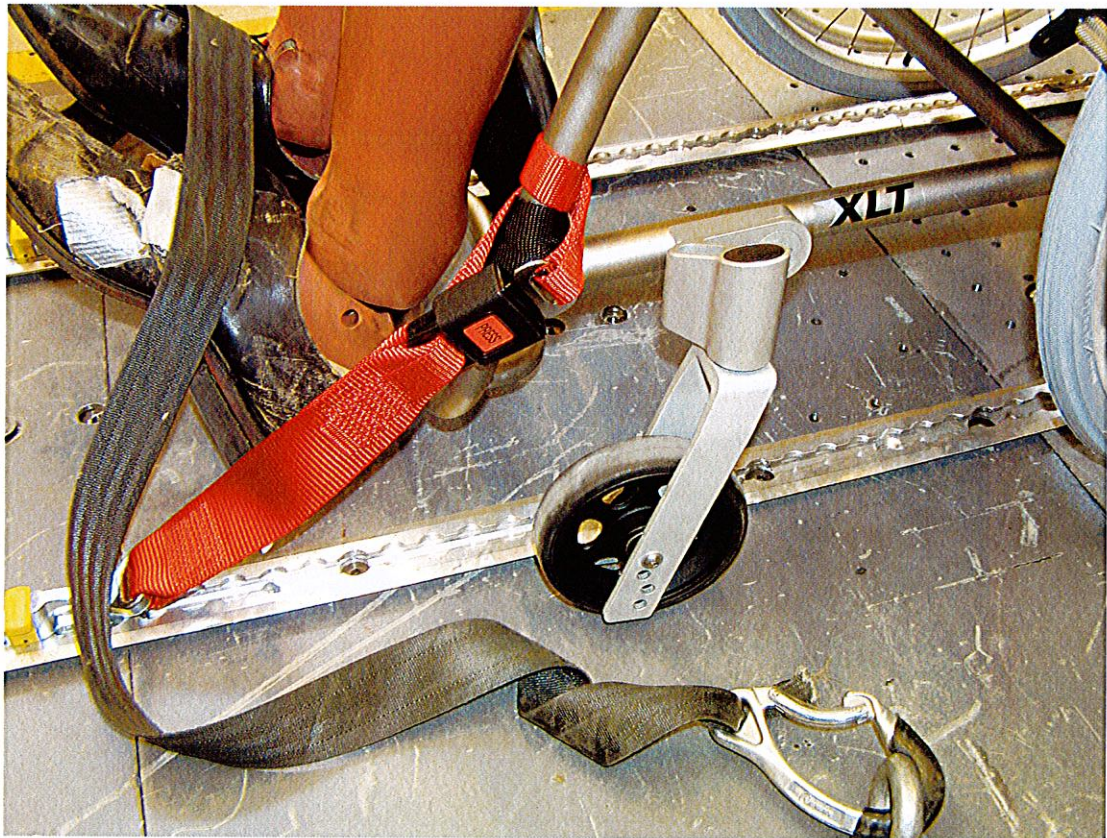


After test 03



After test 03

Appendix 2



After test 03



After test 03