

Handled by, department  
**Mikael Bynander**  
Building Technology and Mechanics  
033-16 52 33, mikael.bynander@sp.se

Invacare Rea AB  
Box 200  
343 75 Diö  
Sweden

## Crash test according to ISO-7176-19 and ISO-10542

### Assignment

Crash testing of wheelchair according to ISO-7176-19 and ISO-10542.

### Test object

|                |                                  |
|----------------|----------------------------------|
| Wheelchair     | Invacare Action 4 fixed backrest |
| Serial number  |                                  |
| Class          | B                                |
| Locking system | Unwin strap system               |
| Dummy          | Hybrid HIII dummy, mass 76.5 kg  |

### Date of arrival

The test objects arrived at SP on 05 April 2005. The test objects have been selected by the client without SP's assistance. The test results showed in this report refer only to the tested objects.

### Date of testing

The test was performed on 05 April, 2005.

### Measuring

The deceleration was measured by two accelerometers mounted on the trolley. The test was filmed with a high-velocity camera (1000 frames a second). The measurement uncertainty when determining the deceleration was better than  $\pm 5\%$  ( $g = 9.81 \text{ m/s}^2$ ).

### SP Swedish National Testing and Research Institute

Postal address  
SP  
Box 857  
SE-501 15 Borås  
SWEDEN

Office location  
Västeråsen  
Brinellgatan 4  
Borås

Phone / Fax / E-mail  
+46 33 16 50 00  
+46 33 13 55 02  
info@sp.se

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**Accuracy of measurement**

| Accuracy of measurement | EXACTNESS (+/-)        | INSTABILITY FACTOR |
|-------------------------|------------------------|--------------------|
| Sensor                  | 0,50%                  | 0,50%              |
| Transvers.              | 0,80%                  | 0,46%              |
| Temperature             | 0,15%                  | 0,09%              |
| Power Supply            | 0,40%                  | 0,23%              |
| Gain                    | 0,10%                  | 0,06%              |
| A/D- conversion         | 0,02%                  | 0,01%              |
| Zero leeway             | 0,10%                  | 0,06%              |
|                         | <b>SQUARESUM</b>       | <b>0,53%</b>       |
|                         | <b>ROOTSQUARESUM</b>   | <b>0,73%</b>       |
|                         | <b>KONF. 95% (k=2)</b> | <b>1,46%</b>       |

The reported expanded uncertainty of measurement is stated as the combined standard uncertainty of measurement multiplied by the coverage factor  $k = 2$ , which for a normal distribution corresponds to a coverage probability of approximately 95 %.

**Temperature**

|           |      |
|-----------|------|
| Dummy     | 19.9 |
| Test room | 20.1 |

**Results**

**Test:**

Velocity: 49.3 km/h

**Retardation distance: 635 mm**

Retardation pulse according to acceleration curves in appendix.

Locking device Unwin strapsystem with wheelchair model Invacare Action 4 with fixed backrest and Hybrid III crash test dummy.

The strapsystem withstands the test with small deformations. The seat back of the wheelchair was bent back 4° at the rebound of the dummy. The movement of the dummy is approved according to specification in ISO-7176-19 and ISO 10542. No other fractures or apparent deformations were noted on the wheelchair or anchorage points.

**The system fulfils the requirements according to ISO-10542 and ISO-7176-19.**

**Retardation distance:**

| Movements of dummy   | Result |
|----------------------|--------|
| Knee                 | 260 mm |
| Head frontal         | 324 mm |
| Head rear            | 348 mm |
| Wheelchairpoint      | 200 mm |
| Xknee/Xwc > 1.1      | 1.3    |
| Buckle opening force | 37.8 N |



Before test



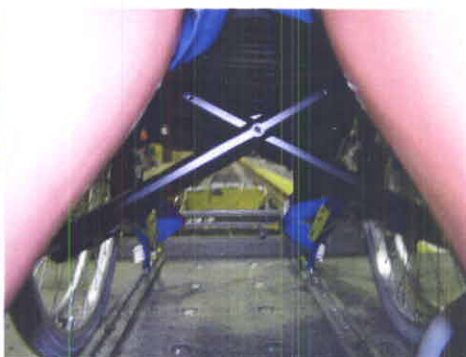
Before test



After test



After test







After test

**Description of the wheelchair****Action4 – Fixed backrest**

Wheelchair dimensions :

Seat high : 46 cm

Seat width : 43 cm

Seat depth : 40 cm

Self propulsion wheelchair

7° fixed backrest 43 cm height with standard nylon padded upholstery

Nylon Seat upholstery with velcro straps

80° straight swing in/swing out hanger with flip up footplate

Dismantable armrest

Standard 80° hanger and footplate with heelstrap

8" solid front wheel

24" pneumatic rear wheel with spoked rim

Standard rear wheel position

Push to lock brakes

Buckle belt fixed on frame tube

**SP Swedish National Testing and Research Institute**  
**Building Technology and Mechanics - Transport and Vehicle Technology**



Lars-Göran Nilsson  
Technical Manager



Mikael Bynander  
Technical Officer

**Appendices**

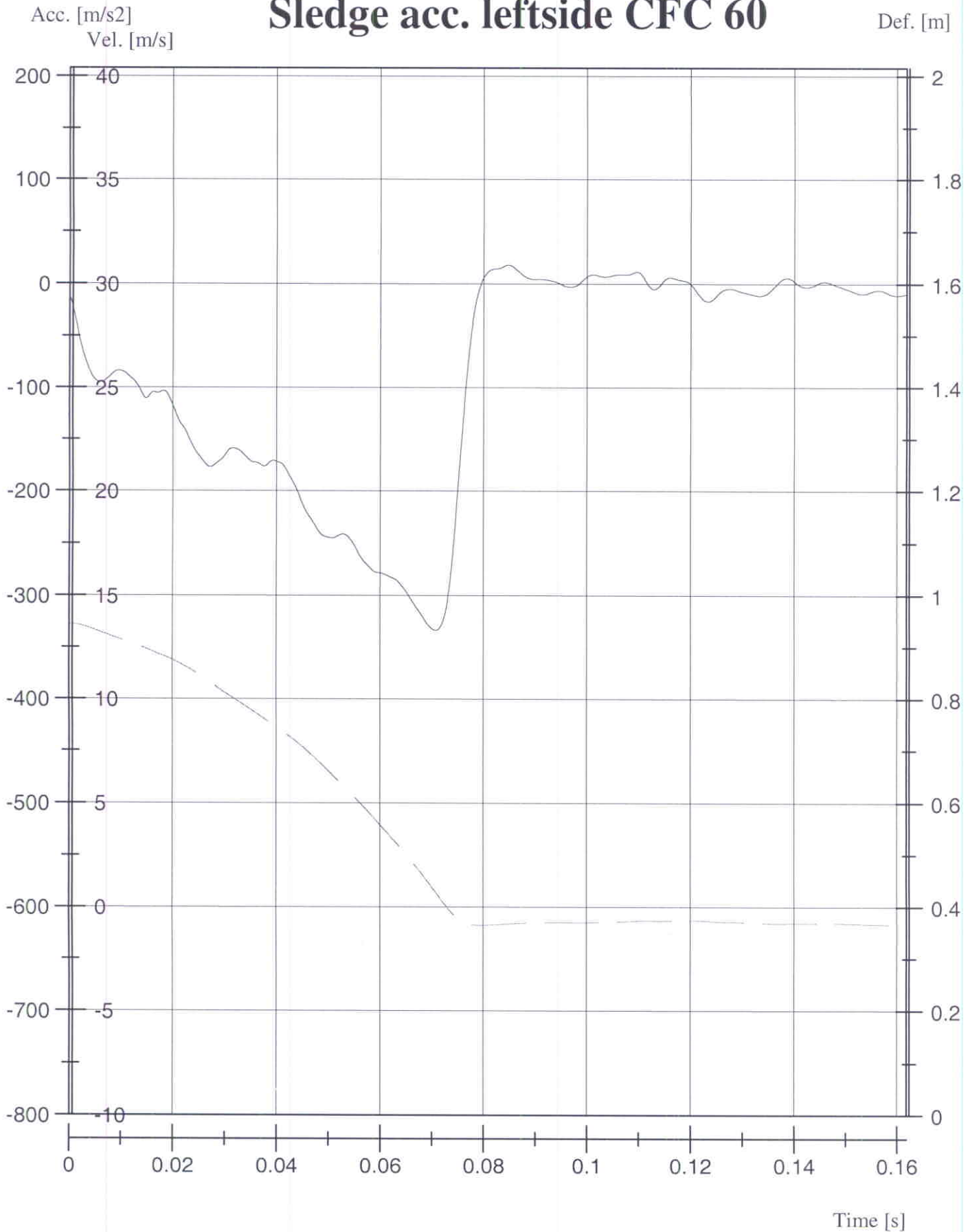
Appendix     Retardation pulses

Invacare  
Action4 fixed backrest  
Iso-10542  
2005-04-05-1

|          | max  | min    |                     |
|----------|------|--------|---------------------|
| Acc:     | 18   | -333   | [m/s <sup>2</sup> ] |
| Veloc.:  | 13.7 | -26.5  | [m/s]               |
| Deform.: | 6.22 | -17.29 | [m]                 |



# Sledge acc. leftside CFC 60



Invacare

Action4 fixed backrest

Iso-10542

2005-04-05-1

|          | max  | min  |                     |
|----------|------|------|---------------------|
| Acc:     | 22   | -303 | [m/s <sup>2</sup> ] |
| Veloc.:  | 13.7 | -3.5 | [m/s]               |
| Deform.: | 6.22 | 0.00 | [m]                 |



Acc. [m/s<sup>2</sup>]  
Vel. [m/s]

# Sledge acc. rightside CFC 60

Def. [m]

