DRAFT AMENDMENT

ISO 7176-19:2008/DAM 1

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Wheelchairs —

Part 19: Wheeled mobility devices for use as seats in motor vehicles

AMENDMENT 1: (Annex G)

Fauteuils roulants —

Partie 19: Dispositifs de mobilité montés sur roues et destinés à être utilisés comme sièges dans des véhicules à moteur

AMENDEMENT 1: (Annexe G)

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Contents

Page

Introduction

(add to the end of the 4th paragraph, just before the last sentence)

Recent research has shown that some commercial wheelchairs offer significantly less protection in rear-impact than conventional motor vehicle seats. Manufacturers who wish to test wheelchairs to determine their performance in rear-impact conditions should use the test methods and performance measures in Annex G.

Wheelchairs — 7176 19: Wheeled mobility devices for use as seats in motor vehicles — Amendment (Annex G)

(add to the end of clause 4, Design requirements)

4.2.3 Back and head support

Annex G provides suggested additional design guidelines for occupant back and head supports for equipment that is also intended to serve as back and head restraints that provide occupant protection in a vehicle rear-impact crash event. These supplemental design guidelines are based on strategies used in conventional vehicle seats and will reduce the risk of serious and fatal injuries to forward facing occupant seated in wheelchairs during rear-end impacts. In cases where these are incompatible with the person's medical and/or therapeutic needs, accommodation of the person's emergent healthcare needs should be given precedence.

(add to the end of clause 5, Performance requirements)

5.5 Rear impact

Annex G provides test methods and performance measures to determine the impact response of wheelchairs and particularly the performance of wheelchair back and head support/restraints in moderate-level rear impacts.

Annex G
(informative)

Wheelchair design, performance, and labeling recommendations for improved protection of occupants seated facing forward in wheelchairs during rear impacts

G.1 General

When a person seated in a forward facing wheelchair experiences a rear impact vehicle crash event, the wheelchair frame, back support, and head support of the wheelchair act as the primary occupant restraint and must resist the forces generated by the decelerating occupant in order to prevent occupant ejection and/or excessive rearward excursion of the entire body that significantly increases the likelihood of occupant contact with the vehicle structures that can cause severe injury. At the same time, the wheelchair structure cannot be so stiff as to create a new injury hazard. Wheelchair back supports are not tested to the same static and dynamic loading levels used in the design of vehicle seats and defined by FMVSS 207, ECE R17 and other safety motor vehicle standards. Consequently research to date shows many occupied wheelchairs do not perform well in simulations of a moderate-to-severe rear impacts and often experience catastrophic failures of the back support and frame. This Annex puts forth a test method, performance requirements, and head support/restraint design guidelines for those manufacturers who want to verify a level of product performance that enhances protection for occupants in this crash scenario and provides a greater level of safety parity with those vehicle occupants occupying conventional vehicle seats. The crash test severity for the dynamic test has been selected to replicate the nominal crash load levels used to test vehicle seatback integrity and add-on occupant restraint system integrity. Also, it has been shown to represent a moderate-to-severe rear-impact (80th-percentile) based on effective barrier speed distributions extracted from crash investigation databases.

G.2 Rear impact test

To simulate the rear-impact crash event, the wheelchair and ATD are placed on the test bed of a sled impact simulator, facing rearward to the primary direction of acceleration. The wheelchair is secured by a surrogate four-point, strap-type tiedown and the ATD is restrained by a surrogate three-point vehicle-anchored belt restraint system; both are described in Annex E. The sled is subjected to a defined deceleration-time pulse to achieve a specified horizontal velocity change (delta V). Observations and measurements are made during and after the test to determine if the wheelchair is effectively secured, and if the back support and head support/restraint provide effective occupant restraint.

G.2.1 Test sample

An unused, complete production or prototype wheelchair should be used for each test.

NOTE The wheelchair does not have to be equipped with a head support/restraint and can be equipped with an aftermarket head support/restraint. Wheelchairs that have back supports and head supports/restraints that meet the design guidelines of G.3 are likely to perform better in this test.

G.2.2 Test equipment

G.2.2.1 Impact simulator and surrogate tiedown/restraint equipment

An impact simulator should be used that includes:

a) an impact sled equipped with a flat, horizontal, structurally rigid platform on which the wheelchair can be mounted, and to which the surrogate WTORS can be fastened,

b) a horizontal track or guide path to provide unidirectional movement of the sled during the impact event,

c) a means to drive the impact sled through a change in velocity of 25 km/h, -0+2 km/h,

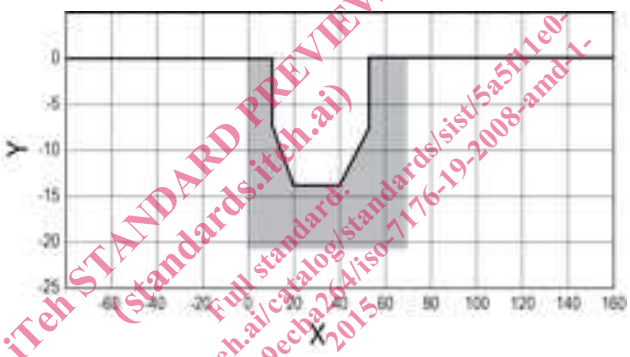
d) a rigid structure attached to the impact sled to which the upper-torso belt can be anchored in the manner, and to the geometry, specified by the WTORS manufacturer

e) a surrogate four-point strap-type tiedown and complete upper and lower belt restraint system, as defined in Annex E, that conforms to ISO 10542-1,

f) a means to accelerate and/or decelerate the impact sled such that the processed sled acceleration- and/or deceleration-time pulse falls within the shaded area of Figure G.1, and

g) a Hybrid III ATD selected from Annex A, Table A.1 based on wheelchair manufacturer's recommended occupant mass capacity.

NOTE A larger or heavier ATD may be used if desired by the manufacturer.



Key

X time (ms)

Y deceleration (*g*)

NOTE The acceleration/deceleration of the impact sled shall stay within the shaded area.

Figure G.1 — Acceleration/deceleration corridor for the 25 km/h Δ*V* rear impact test

G.2.2.1 Test instrumentation and data collection

A means should be provided to:

a) measure the ATD and wheelchair horizontal excursions specified in G.2.5.1 with a precision and accuracy of +/- 5 mm,

NOTE A side-view high-speed camera or video system with a minimum frame rate of 500 frames per second is required.

b) measure the horizontal acceleration and/or deceleration of the impact sled in the direction of travel, at a sampling rate in accordance with ISO 6487, and with a precision of + 0.5 *g*,

c) measure the horizontal velocity change (delta-V) of the impact sled during the impact with a precision of + 0.5 km/h, and

d) filter transducer signals using a low-pass filter in accordance with ISO 6487, including:

1) pre-filtering of all transducer signals to Channel Class 1000 (- 4 dB at 1650 Hz) prior to digitizing at 10,000 Hz, and

2) filtering of the digitized accelerometer and load-cell signals to Channel Class 60 (- 4 dB at 100 Hz).

G.2.3 Test preparation and procedure

G.2.3.1 Perform the following prior to initiating the test:

a) Adjust the ATD to achieve a static resistance of 1 *g* at each joint indicated by just noticeable movement from the weight of the distal body segment as specified by the ATD manufacturer,

b) Place snug-fitting cotton clothing on the pelvis, thighs, and torso of the ATD,

c) Prepare the wheelchair for use in a motor vehicle as specified by the manufacturer's user instructions,

NOTE If a range is specified for any adjustments then the midpoint of the range should be used, when possible.

d) Equip the wheelchair with any required add on components as specified by the manufacturer,

e) If a pelvic belt intended for use as an occupant restraint is provided as a component of the wheelchair, attach it to the wheelchair according to the manufacturer's instructions,

f) If the wheelchair is equipped with liquid electrolyte type batteries they should be replaced by the nearest equivalent gel, sealed or a surrogate battery. Supplemental weights, if used, must provide equivalent mass distribution to the original batteries,

g) Inflate any pneumatic tyres to the pressure recommended by the wheelchair manufacturer, and

h) Turn the wheelchair power off, if applicable.

G.2.3.2 Install the wheelchair tiedown anchorages on the sled platform in accordance with the surrogate WTORS instructions as found in Annex E.

G.2.3.3 Position the wheelchair on the sled in the orientation appropriate for representing vehicle accelerations during rear-impact event and with the wheelchair reference plane parallel to the direction of sled travel +/- 3°.

G.2.3.4 Secure the wheelchair with the surrogate wheelchair tiedown according to the instructions in Annex E. Follow the procedures in Annex A of ISO 10542-1.

G.2.3.5 If applicable, apply wheelchair brakes.

G.2.3.6 If applicable, adjust the seat, back support, and head support/restraint per the instructions in A.4.5 and also adjust the rear head support/restraint so that its center is vertically aligned with the most prominent point on the back of the ATD's head and so that the gap between head and head restraint is minimized.

G.2.3.7 Position the ATD in the wheelchair as described in A.4.6.

G.2.3.8 If the wheelchair is provided with postural belts, install and fasten the belts on the ATD as recommended by the manufacturer.

G.2.3.9 If the wheelchair is provided with a pelvic belt intended to provide protection in a crash, fasten the belt on the ATD as recommended by the manufacturer and then complete the three-point occupant restraint with a vehicle-mounted shoulder belt. If the wheelchair does not provide a wheelchair-anchored pelvic belt, then apply the vehicle-anchored three-point belt restraint of the surrogate WTORS to the ATD.

G.2.3.10 Apply contrast markers at:

a) the lateral aspect of the ATD's shoulder joint,

b) a point P of the wheelchair (see Figure 2), or a point on the side of the back support of a wheelchair that is as close to the wheelchair point P as possible,

c) points corresponding to rigid structural parts of the top and bottom of the back support to allow back support angle measurement during and after testing,

d) two points on the lateral surface of the ATD head, one at the head centre of gravity and one approximately 50 mm directly above the centre of gravity, and

e) on the side of the head support/restraint.

G.2.3.11 Ensure that there is sufficient clear space around the wheelchair so that the ATD and wheelchair will not contact the sled structure if successful in passing the test.

G.2.3.12 Record the locations of all WTORS anchor points relative to the wheelchair rear axle. Record the projected angles of tiedown straps and restraint belts relative to the horizontal longitudinal axis of the sled platform.

G.2.3.13 Measure and record the horizontal and vertical distance between of the top edge of the back support relative to the centre of the ATD shoulder joint.

G.2.3.14 Measure the vertical location of the center of the rear head restraint relative to the ATD head centre of gravity, the top edge of the back support, and the minimum gap between the back of the ATD head and the head support/restraint.

G.2.3.15 Measure the pre-test back support angle.

G.2.3.16 Conduct the impact test by activating the sequence of events to record data and deploy the impact sled.

G.2.4 Post test mesurements and calculations

G.2.4.1 Examine the wheelchair and ATD to determine and/or measure

a) whether the ATD remained in the wheelchair,

b) whether the wheelchair remained on the test platform,

c) whether any securement points on the wheelchair showed signs of failure,

d) whether any load-bearing parts of the wheelchair became separated, deformed, or fractured,

e) whether rigid wheelchair components greater than 100 g became detached,

f) the average of the left and right side post-test back support angle, and

g) the final distance between the center of the head support/restraint and the top edge of the back support.

G.2.4.2 Determine peak excursions Xwc and XheadR as defined in G.2.5.2, to an accuracy of +/- 5 mm.

G.2.4.3 Determine the change head-to-torso angle between the pre-impact posture and peak head-to-back rotation to an accuracy of +/- 0.5° through analysis of the high speed digital video and/or analysis of transducer information.