INTERNATIONAL STANDARD

ISO 16840-3

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2006-07-01

Wheelchair seating —

Part 3: Determination of static, impact and repetitive load strengths for postural support devices

Sièges de fauteuils roulants —
Partie 3: Détermination des efforts statiques, d'impact et cycliques pour les dispositifs de maintien de la posture

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Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

International Standards are drafted in accordance with the rules given in the ISO/IEC Directives, Part 2.

The main task of technical committees is to prepare International Standards. Draft International Standards adopted by the technical committees are circulated to the member bodies for voting. Publication as an International Standard requires approval by at least 75 % of the member bodies casting a vote.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights.

ISO 16840-3 was prepared by Technical Committee ISO/TC 173, *Assistive products for persons with disability*, Subcommittee SC 1, *Wheelchairs*.

ISO 16840 consists of the following parts, under the general title *Wheelchair seating*:

— *Part 1: Vocabulary, reference axis convention and measures for body segments, posture and postural support surfaces*

— *Part 2: Determination of physical and mechanical characteristics of devices intended to manage tissue integrity — Seat cushions*

— *Part 3: Determination of static, impact and repetitive load strengths for postural support devices*

The following parts are under preparation:

— *Part 4: Seating systems for use in motor vehicles*

— *Part 5: Determination of pressure relief characteristics of seat cushions intended to manage tissue integrity*

Introduction

Postural support devices (PSD), constructed as additional components to wheelchair seating or as wheelchair seating in its own right, are widely available and used extensively by people with disabilities. The selection or prescription of the most appropriate PSD should be, where appropriate, partially dependent on knowledge of its ability to withstand static, impact and repeated loads. This part of ISO 16840 is intended to specify test methods to provide this information.

The tests involve mounting the PSD on rigid test fixtures to simulate mounting on a wheelchair. Forces are then applied to simulate static loads encountered during normal use. Impact and repeated loads are also applied to simulate normal usage. The rigid test fixture is utilized to provide a worst-case situation, which is repeatable and avoids destroying multiple wheelchairs during testing. There is no minimum performance requirement currently specified in this part of ISO 16840. Usually tests are performed at increasing force until one or more failures occur. Repeated load tests are performed at a specific force until one or more failures occur. It is not required to test beyond a noted number of cycles.

Wheelchair seating —

Part 3: Determination of static, impact and repetitive load strengths for postural support devices

1 Scope

This part of ISO 16840 specifies test methods for the determination of static, impact and repetitive load strengths as well as disclosure requirements for postural support devices (PSD) with associated attachment hardware intended for use with wheelchairs.

This part of ISO 16840 does not test the transportability or the use of the PSD in a motor vehicle.

NOTE At the present time there are no minimum or maximum strength requirements specified in the test procedures for testing for PSDs. In the future, minimum or maximum loads for testing might be specified for testing on a pass/fail basis. The maximum displacement, the maximum force achieved before failure and the type of failure that occurs is disclosed for comparison purposes.

2 Normative references

The following referenced documents are indispensable for the application of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO 554:1976, *Standard atmospheres for conditioning and/or testing — Specifications*

ISO 898-7, *Mechanical properties of fasteners — Part 7: Torsional test and minimum torques for bolts and screws with nominal diameters 1 mm to 10 mm*

ISO 7176-8:1998, *Wheelchairs — Part 8: Requirements and test methods for static, impact and fatigue strengths*

ISO 7176-15, *Wheelchairs — Part 15: Requirements for information disclosure, documentation and labelling*

ISO 7176-26, *Wheelchairs — Part 26: Vocabulary*

ISO 16840-2, *Wheelchair seating — Part 2: Determination of physical and mechanical characteristics of devices intended to manage tissue integrity — Seat cushions*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 7176-26 and the following apply.

3.1
elastic attachment hardware
hardware that allows a PSD to move when a force is applied and returns to its original position when the force is removed

EXAMPLE A PSD designed with a spring that allows movement.

3.2
deformable support surface
support surface which conforms to the shape of the body part being supported

NOTE The surface might or might not return to its original shape but remains conformable over time.

EXAMPLE Foam or fluid seat supports are examples of deformable support surfaces.

3.3
passive support surface
PSD that moves with minimal resistance to follow the body part being supported

NOTE Passive support surfaces do not necessarily move back to a specific position.

EXAMPLE A mobile arm support is a passive support surface that allows movement with minimal resistance.

3.4
active support surface
PSD that is powered to change its position or support surface shape

EXAMPLE An alternating pressure seat support or an electronically operated back support surface that reclines.

3.5
continuous lateral support
support surface which has a depth that extends a minimum of 75 mm forward/upward of its uncompressed adjacent support surface and has an angle between the adjacent support surface and the lateral support which is less than or equal to 120°

See Figure 1.

NOTE 1 Figure 2 shows a support with a contoured surface that is not considered to be a lateral support.

NOTE 2 If there are difficulties in establishing the location of the adjacent support surface, use the reference planes as specified in ISO 7176-26.

Dimensions in millimetres

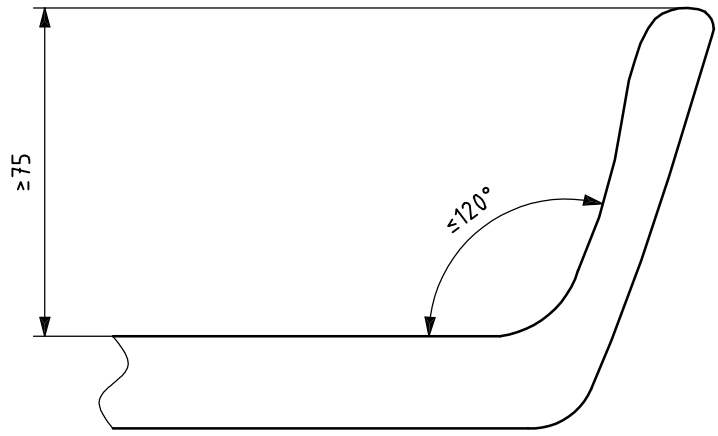


Figure 1 — Cross-section of a support surface with continuous lateral support

Dimensions in millimetres

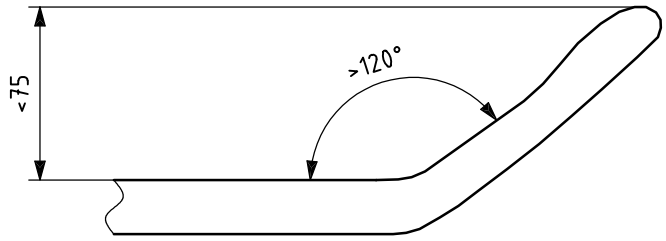


Figure 2 — Cross-section of a support surface with a contour not considered a lateral support

3.6
discontinuous lateral support
lateral support which is separate from the adjacent support surface

See Figure 3.

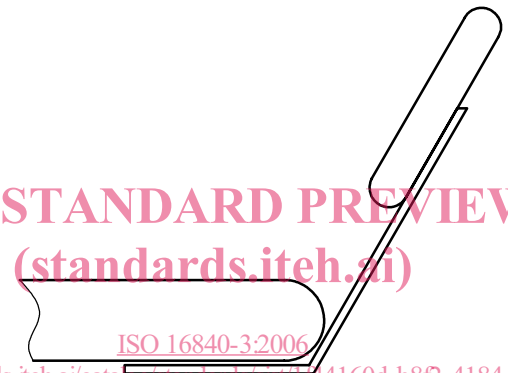


Figure 3 — Example of a lateral support discontinuous with the adjacent support surface

3.7
anchor point
intended attachment point or points of any PSD

4 Test apparatus

4.1 Rigid test fixtures, for securing or positioning PSDs during testing as specified below.

4.1.1 Adjustable rigid test frame, for simulating the tubes of a wheelchair frame, typically used to attach the sling seat or sling back, which allows the full range of angle adjustment of PSD attachment hardware.

The outside dimensions between the adjustable rigid components of the test frame should be adjustable from 280 mm ± 30 mm to 580 mm ± 30 mm. An informative example of an adjustable rigid test frame is shown in Figure 4.

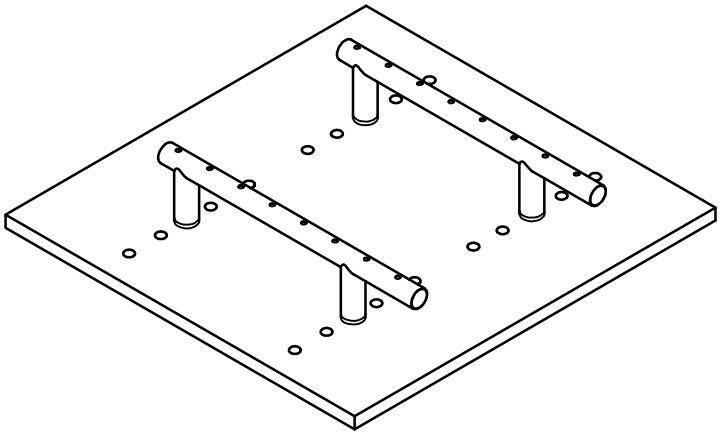
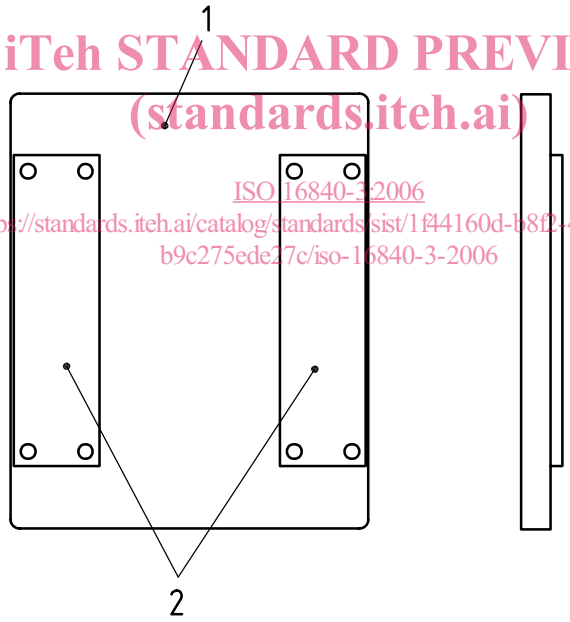


Figure 4 — Example of an adjustable rigid test frame

4.1.2 Rigid surrogate support surface, of securing attachment hardware for PSDs intended to be used with rigid flat support surfaces but which are provided without rigid flat support surfaces.

An example of a rigid surrogate support surface is shown in Figure 5. Holes may be drilled or other modifications made to accommodate the mounting of a variety of attachment hardware.



Key

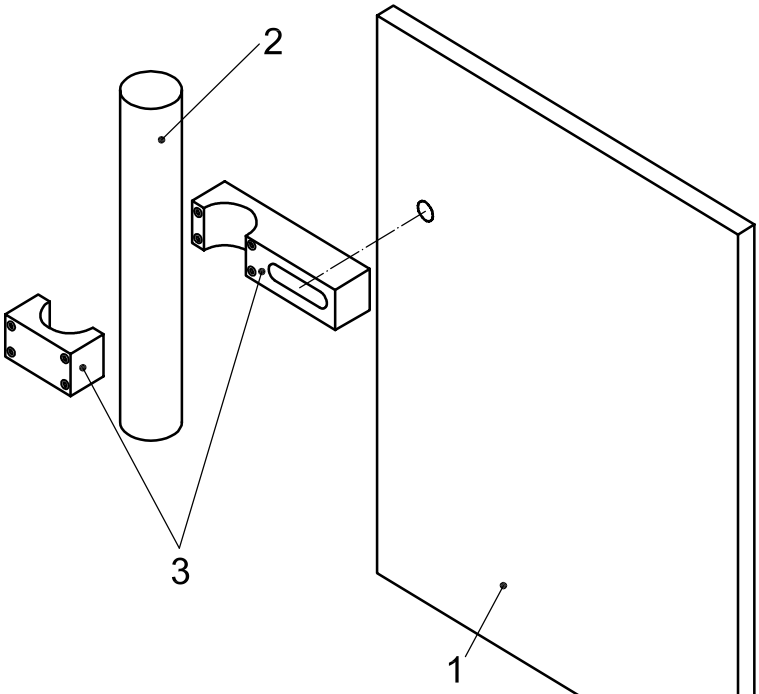
1 plywood

2 steel

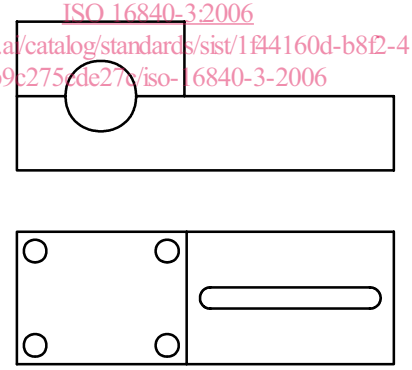
Figure 5 — Example of rigid surrogate support surface for testing attachment hardware

4.2 Surrogate attachment hardware, to secure PSDs, intended for use with attachment hardware, but provided without attachment hardware. Surrogate attachment hardware allows the attachment of PSDs to a rigid test fixture.

An informative example of surrogate attachment hardware is shown in Figure 6.



a) Set-up of surrogate attachment hardware



b) Detail of surrogate attachment hardware

Key

1 rigid surrogate support surface
2 member of PSD
3 surrogate attachment hardware

Figure 6 — Example set-up of surrogate attachment hardware to secure PSD

4.3 **Loading pads**, as specified below, for the application of loads to PSDs.

4.3.1 **Seat loading pad**, comprising a rigid contoured loading indenter (RCLI) as specified in ISO 16840-2.

4.3.2 Variable convex loading pad, made of a rigid material, with convex surface elements and variable width.

Based on anthropometric data for different body sizes, the following convex loading pads are specified:

— 25 kg;

— 50 kg;

— 75 kg;

— 100 kg.

Add a maximum of 10 mm foam padding to the outer surface of the loading pad with a vinyl or fabric cover to reduce the friction between the loading pad and the PSD being tested. Select the smallest loading pad to match the range application for the PSD. For example, if the PSD is designed for a user with a mass in the range 25 kg to 49 kg, use the 25 kg loading pad for testing. The smaller radius and width of the pad will more properly test for slippage.

Figure 7 illustrates the features of the variable convex loading pad when used with the specifications contained in Table 1.

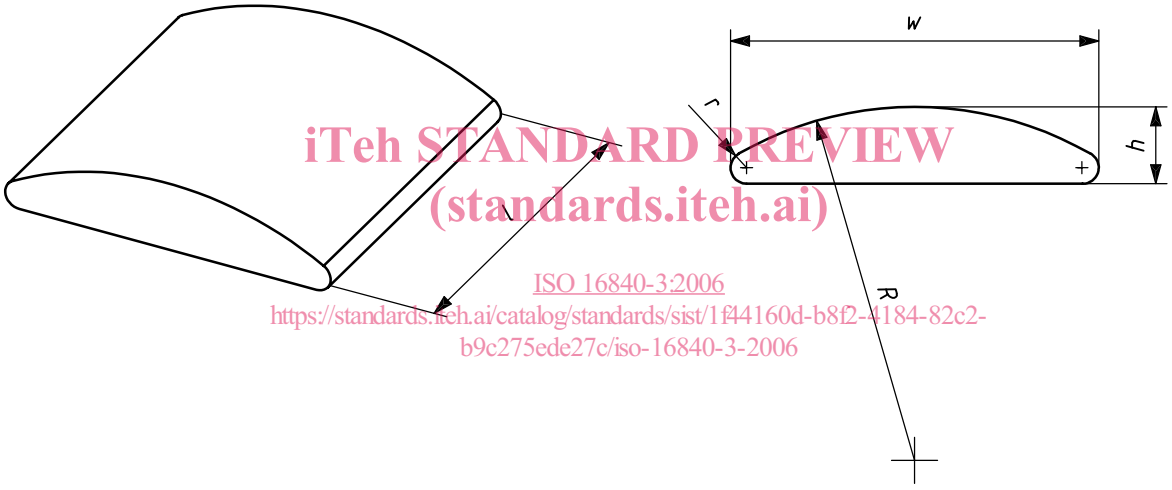


Figure 7 — Variable convex loading pad

Table 1 — Variable convex loading pad dimensions

Dimensions	User mass				
	25 kg	**50 kg**	**75 kg**	**⩾ 100 kg**	**Tolerance**
Width (mm), w	210	270	323	360	± 10
Height (mm), h	62	79	95	106	± 5
Length, l	Variable [a]	Variable [a]	Variable [a]	Variable [a]	
Convex radius (mm), R	210	270	323	360	± 10
Radius of side edge (mm), r	21	27	32	36	± 3

[a] To fit PSD being tested.