

---

# **Outdoor furniture — Seating and tables for camping, domestic and contract use —**

## **Part 2: Mechanical safety requirements and test methods for seating**

ICS 97.140; 97.200.30

**NO COPYING WITHOUT BSI PERMISSION EXCEPT AS PERMITTED BY COPYRIGHT LAW**



## National foreword

This Draft for Development is the English language version of ENV 581-2:2000.

**This publication is not to be regarded as a British Standard.**

It is being issued in the Draft for Development series of publications and is of a provisional nature because experience needs to be gained for tests carried out at high and low temperatures. It should be applied on this provisional basis, so that information and experience of its practical application may be obtained.

Comments arising from the use of this Draft for Development are requested so that UK experience can be reported to the European organization responsible for its conversion into a European Standard. A review of this publication will be initiated 2 years after its publication by the European organization so that a decision can be taken on its status at the end of its three-year life. The commencement of the review period will be notified by an announcement in *Update Standards*.

According to the replies received by the end of the review period, the responsible BSI Committee will decide whether to support the conversion into a European Standard, to extend the life of the prestandard or to withdraw it. Comments should be sent in writing to the Secretary of BSI Technical Committee FW/2, Domestic and contract furniture, at 389 Chiswick High Road, London W4 4AL, giving the document reference and clause number and proposing, where possible, an appropriate revision of the text.

A list of organizations represented on this committee can be obtained on request to its secretary.

### Cross-references

The British Standards which implement international or European publications referred to in this document may be found in the BSI Standards Catalogue under the section entitled "International Standards Correspondence Index", or by using the "Find" facility of the BSI Standards Electronic Catalogue.

### Summary of pages

This document comprises a front cover, an inside front cover, the ENV title page, pages 2 to 43 and a back cover.

The BSI copyright notice displayed in this document indicates when the document was last issued.

This Draft for Development, having been prepared under the direction of the Consumer Products and Services Sector Committee, was published under the authority of the Standards Committee and comes into effect on 15 July 2000

© BSI 07-2000

ISBN 0 580 34285 9

### Amendments issued since publication

Amd. No.	Date	Comments

EUROPEAN PRESTANDARD  
PRÉNORME EUROPÉENNE  
EUROPÄISCHE VORNORM

**ENV 581-2**

April 2000

ICS 97.140; 97.200.30

English version

**Outdoor furniture - Seating and tables for camping, domestic  
and contract use - Part 2: Mechanical safety requirements and  
test methods for sampling**

Mobilier d'extérieur - Sièges et tables à usages  
domestique, collectif et de camping - Partie 2: Exigences et  
essais de sécurité mécanique des sièges

Sitzmöbel und Tische für den Wohn-, Objekt- und  
Campingbereich - Teil 2: Mechanische  
sicherheitstechnische Anforderungen und Prüfverfahren für  
Sitzmöbel

This European Prestandard (ENV) was approved by CEN on 6 May 1999 as a prospective standard for provisional application.

The period of validity of this ENV is limited initially to three years. After two years the members of CEN will be requested to submit their comments, particularly on the question whether the ENV can be converted into a European Standard.

CEN members are required to announce the existence of this ENV in the same way as for an EN and to make the ENV available promptly at national level in an appropriate form. It is permissible to keep conflicting national standards in force (in parallel to the ENV) until the final decision about the possible conversion of the ENV into an EN is reached.

CEN members are the national standards bodies of Austria, Belgium, Czech Republic, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Luxembourg, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland and United Kingdom.



EUROPEAN COMMITTEE FOR STANDARDIZATION  
COMITÉ EUROPÉEN DE NORMALISATION  
EUROPÄISCHES KOMITEE FÜR NORMUNG

Central Secretariat: rue de Stassart, 36 B-1050 Brussels

© 2000 CEN All rights of exploitation in any form and by any means reserved  
worldwide for CEN national Members.

Ref. No. ENV 581-2:2000 E

## Contents

	Page
Foreword .....	2
0 Introduction .....	3
1 Scope.....	3
2 Normative references .....	3
3 Definitions .....	3
4 General test conditions.....	4
5 Test equipment and apparatus.....	7
6 Test methods and requirements.....	13
6.1 Stability .....	13
6.2 Seat strength and fatigue .....	14
6.3 Backrest strength and fatigue.....	17
6.4 Armrest strength and fatigue .....	21
6.5 Leg strength.....	24
7 Test report .....	26
ANNEX A (NORMATIVE) Behaviour of outdoor seating at high and low temperature .....	27
ANNEX B (NORMATIVE) SPECIFIC TEST METHODS AND REQUIREMENTS FOR LOUNGERS..	34
ANNEX C (INFORMATIVE) Examples of seat loading pad.....	41

### Foreword

This European Prestandard has been prepared by Technical Committee CEN/TC 207 "Furniture", the secretariat of which is held by IBN.

This text is one part of a general standard concerning safety and performance requirements for outdoor seating and tables.

The work programme of CEN/TC 207/WG 4 includes the following parts :

EN 581-1	Outdoor furniture - Seating and tables for camping, domestic and contract use Part 1 : General safety requirements.
EN 581-3	Outdoor furniture - Seating and tables for camping, domestic and contract use Part 3 : Mechanical safety requirements and test methods for tables.
prEN 581-4	Outdoor furniture - Seating and tables for camping, domestic and contract use Part 4 : Physical characteristics - Durability.
prEN 581-5	Outdoor furniture - Seating and tables for camping, domestic and contract use Part 5 : Requirements and test methods for surfaces.
prEN 581-6	Outdoor furniture - Seating and tables for camping, domestic and contract use Part 6 : General characteristics.

According to the CEN/CENELEC Internal Regulations, the national standards organizations of the following countries are bound to announce this European Prestandard: Austria, Belgium, Czech Republic, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Luxembourg, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland and the United Kingdom.

## 0 Introduction

This document is published as an European prestandard so that it can be completed with specific safety requirements and test methods in preparation on deckchairs and folding chairs and in the expectation of part 4 of EN 581 ; this part will fix safety requirements and test methods for the strength under weather conditions.

## 1 Scope

This part of EN 581 specifies the mechanical safety requirements and test methods of outdoor seating for camping, domestic and contract use for adults, without regard to materials, design/construction or manufacturing processes.

This prestandard does not apply to outdoor furniture for severe contract use where higher requirements may be necessary and to removable upholstery and coverings, permanently fixed furniture and street furniture.

Annex A includes tests methods for assessing the behaviour of outdoor seating at high and low temperatures.

The effect of ageing and degradation caused by light and moisture has not been included.

## 2 Normative references

This European prestandard incorporates by dated or undated reference, provisions from other publications. These normative references are cited at the appropriate places in the text and the publications are listed hereafter. For dated references, subsequent amendments to or revisions of any of these publications apply to this European prestandard only when incorporated in it by amendment or revision. For undated references the latest edition of the publication referred to applies.

EN 1022	Domestic furniture - Seating - Determination of stability
ISO 48	Rubber, vulcanized or thermoplastic - Determination of hardness (hardness between 10 IRHD and 100 IRHD)
ISO 2439	Polymeric materials, cellular flexible - Determination of hardness (indentation technique)

## 3 Definitions

For the purpose of this European prestandard, the following definitions apply :

- 3.1 Outdoor furniture for contract use :** Outdoor furniture intended for non-private use in places with public access, e.g. restaurants, hotels, open-air swimming pools, vocational and leisure sites. Due to this public use they are submitted to high loads.
- 3.2 Outdoor furniture for domestic use :** Outdoor furniture intended for private use in places without public access e.g. garden, wintergarten, terrace, balcony, etc.
- 3.3 Outdoor furniture for camping use :** In accordance with the need for easy transportation, outdoor furniture for camping use are foldable or detachable and of light-weight construction. It is intended for use in connection with camping and/or travelling.

- 3.4 Stool, folding stool, camping stool** : Seating without backrest.
- 3.5 Garden chair, garden folding chair, camping chair** : Seating with a backrest for upright sitting posture.
- 3.6 Fixed armchair ; folding, non-adjustable armchair ; camping armchair (folding but non-adjustable)** :  
Seating with backrest and armrests for upright or inclined sitting posture.
- 3.7 Multi-position armchair, camping multi-position armchair** : Armchair with a backrest adjustable in inclination and fixed or adjustable seating.
- 3.8 Directors' chair** : Camping folding seating with armrests and backrest. Seat and backrest are made of tightened textile material.
- 3.9 Bench** : Multi-place seating with or without backrest, with or without armrests.
- 3.10 Mobile lounger** : Seating intended for lying rest supplied with wheels and possibly handles, supplied with fixed or adjustable.
- 3.11 Lounger** : Seating intended for reclined posture without wheels. Loungers can be foldable.
- 3.12 Footrest** : Item intended to resting legs, with a fixed or adjustable height, independent or incorporated to an armchair,...
- 3.13 Deck chair** : Seat with a folds flat supplied with a support made of a flexible material (ex. linen) whose adjustable structure enables various resting postures. The deck chairs can be provided with armrests or not and possibly with a fixed footrest.

#### **4 General test conditions**

##### **4.1 Preliminary preparation**

Before any of the tests are commenced, the item shall be old enough to ensure that it has developed its full strength.

The furniture shall be tested as delivered. Knock-down furniture shall be assembled according to the instructions supplied with it. If the furniture can be assembled or combined in different ways, the most adverse combination shall be used for each test. Knock-down fittings shall be tightened before testing if applicable. Further tightening shall not take place unless this is specifically required by the manufacturer.

The sample for test shall be stored in indoor ambient conditions for at least 1 week immediately prior to testing. Any deviation from this procedure shall be recorded in the test report.

With the exception of tests described in the annex A, the tests shall be carried out in normal indoor ambient conditions (temperature between 15°C and 25°C). For seating including fabric parts in their construction, the humidity shall be between 55 % and 65 %.

For each test, adjustable components shall be in the most unfavourable position.

##### **4.2 Application of forces**

The test forces in durability and static load tests shall be applied sufficiently slowly to ensure that negligible dynamic load is applied. The forces in fatigue tests shall be applied sufficiently slowly to ensure that heating does not occur.

### 4.3 Determination of seat and back loading points

The seat and back loading points shall be determined using the loading point template as specified below. In some cases, it may not be possible to determine the loading points by means of the template. In such cases, points 175 mm forward of the seat/back junction and 300 mm upward from the seat/back junction, shall be used.

If the number of seats in the article is not obvious, divide the total seat length (in millimetres) by 600 mm and round to the nearest whole number to determine the number of seats. Divide the total seat length into seats of equal length. Mark the position of each of the seats.

#### 4.3.1 Chairs, armchairs, loungers, deck chairs

Position the template (5.1) with its load applied at the seat loading point on the centreline of the seat as far towards the rear as possible. Adjust its position by pushing the back loading portion on the back, so levering the seat portion forwards until the shape of the template correlates with that of the seat (see figure 1). In cases where the template can be settled in more than one position, the position having the smallest angle between the seat and back portions of the template shall be used. The angle shall in no cases be less than 90°. Mark the required loading positions from the template. If relevant, repeat the procedures on the other seat(s).

#### 4.3.2 Stools and benches

Set up the template (5.1) in order to form an angle at 90° with the 2 elements. Place it on the stool or on each sitting position as shown in figure 1. Mark the seat loading point from the template, facing mark (C).

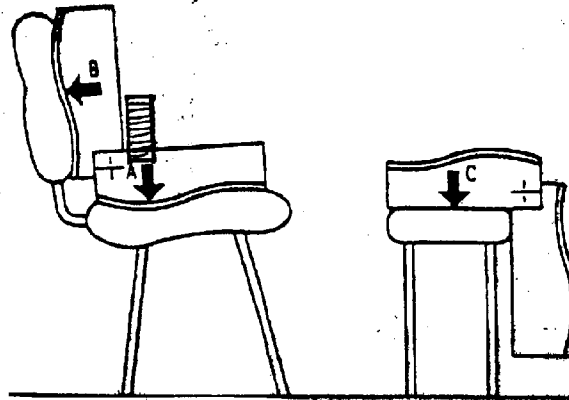


Figure 1 : Position of loading point template

#### 4.4 Determination of seat and back angle

The angle of inclination of the back from the horizontal ( $\theta$ ) and, if necessary the angle of inclination of the seat from the horizontal ( $\alpha$ ), shall be measured by determining the slope of the straight edge of the relevant portion of the seat loading point template when it is correctly positioned (see figure 2).

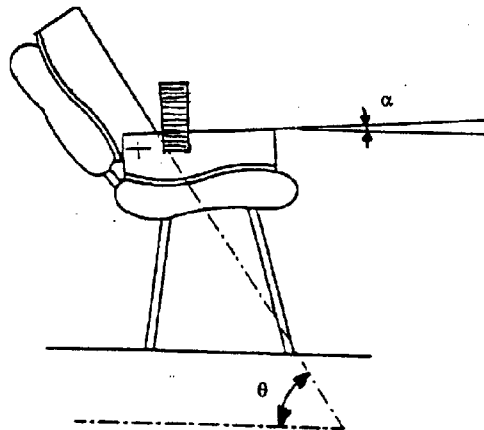


Figure 2 : Determination of back angle ( $\theta$ ) and seat angle ( $\alpha$ )

#### 4.5 Leg rests and foot rests

The loading points of a leg rest or a foot rest which are separate components, hinged or otherwise supported by the main structure, shall be determined from the centre lines of the components themselves.

When a leg rest or a foot rest is not a separate component but an extension of the seat structure, then the leg/foot rest area shall be taken as beginning at a distance of 400 mm forward of the seat loading point and the centre lines determined accordingly.

The seat front edge of chairs with extended seat structures to form a foot rest or a leg rest shall nevertheless be taken as the edge of the seat structure furthest away from the back rest.

#### 4.6 Tolerances

Unless otherwise stated :

- all forces shall have an accuracy of  $\pm 5\%$  of the nominal force ;
- all masses an accuracy of  $\pm 0,5\%$  of the nominal mass ;
- all dimensions an accuracy of  $\pm 1$  mm of the nominal dimension ;
- all angles an accuracy of  $\pm 2^\circ$  of the nominal value.

The tolerance for position of loading pads shall be  $\pm 5$  mm.



#### **4.7 Sequence of testing**

The tests shall be carried out on the same sample in the following order :

- seat strength and fatigue ;
- backrest strength and fatigue ;
- armrest strength and fatigue ;
- leg strength ;
- stability.

#### **5 Test equipment and apparatus**

Unless otherwise stated, the tests may be applied by any suitable device because results are not dependent upon the apparatus.

In the case of designs not catered for in the test procedures, carry out the test as far as possible as described and state any deviations in the test report.

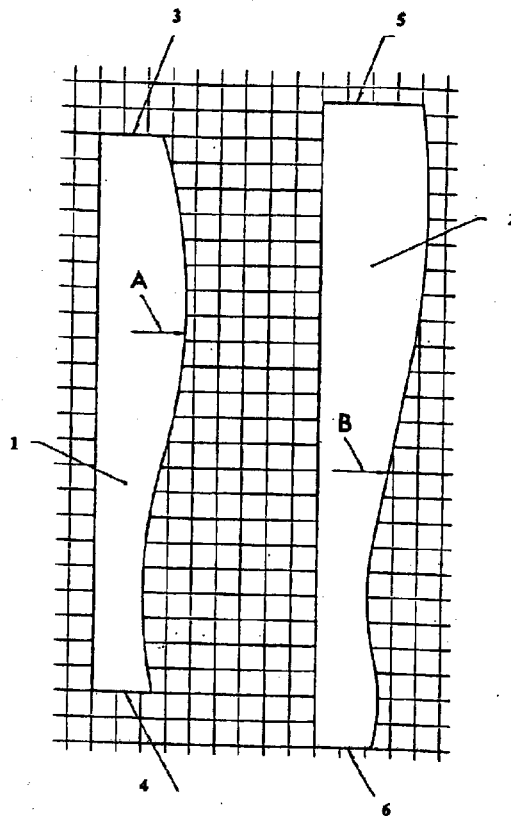
Unless otherwise stated, loading pads shall swivel and be fixed such as they do not prevent the seat from moving during the test and such as forces shall be applied on the centre line axis of the loading pads.

**5.1 Loading position template :**

Consisting of two shaped members (see figures 3 and 4) fastened together by a pivot at one end. The seat loading arm shall bear a total mass of 20 kg, applied through the seat loading point.

The apparatus is marked (A, B, C) as shown in figure 4.

So that the template can be positioned easily with the two members at 90° to each other, a line is drawn on the back portion.

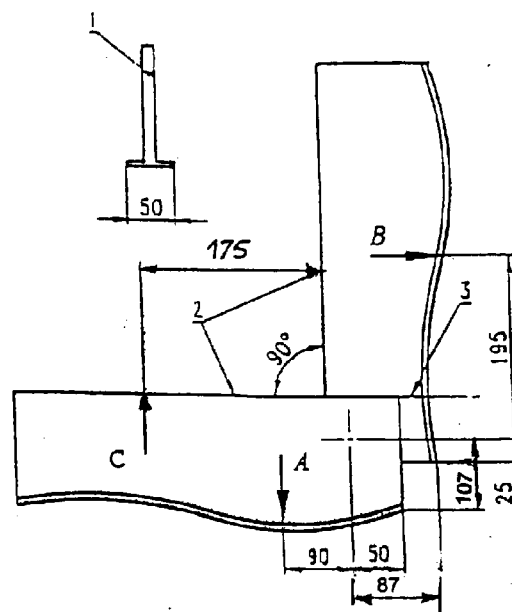


- |   |              |   |           |
|---|--------------|---|-----------|
| 1 | Seat portion | A | Seat load |
| 2 | Back portion | B | Back load |
| 3 | Rear         |   |           |
| 4 | Front        |   |           |
| 5 | Top          |   |           |
| 6 | Bottom       |   |           |

Scale : 1 square = 20 mm

**Figure 3 : Loading surface curves for seat and back loading point template**

Dimensions in millimetres



- |                               |   |
|-------------------------------|---|
| <b>A</b> - Seat load (chairs) | <b>1</b> - Section  |
| <b>B</b> - Back load (chairs) | <b>2</b> - Straight edge for determination of seat and back inclination |
| <b>C</b> - Seat load (stools) | <b>3</b> - Mark to fix 90°  |

**Figure 4 : Loading point template**

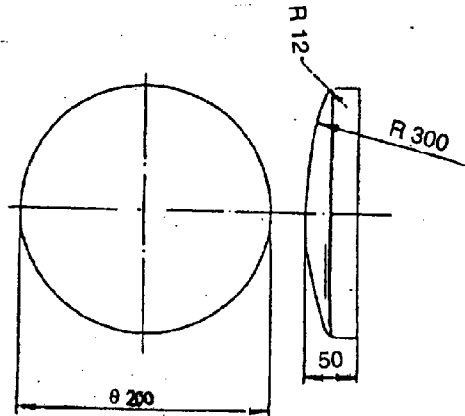
**5.2 Floor surface :**

Horizontal, flat and rigid with a smooth surface.

**5.3 Smaller seat loading pad**

Rigid circular object, 200 mm in diameter, the face of which has a convex spherical curvature of 300 mm radius with a 12 mm front edge radius (see figure 5).

Dimensions in millimetres



**Figure 5 : Smaller seat loading pad**

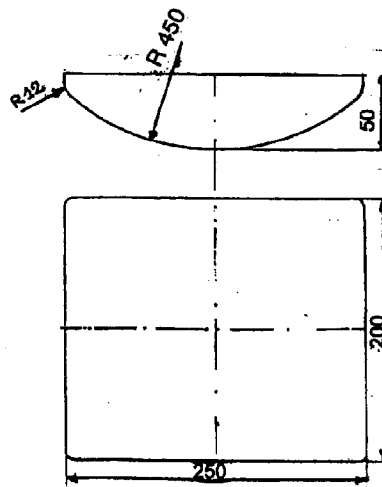
**5.4 Seat loading pad**

Naturalistically shaped rigid indenter with a hard, smooth surface.  
 Two examples are shown in annex C.

**5.5 Back loading pad**

Rigid circular object, 200 mm high and 250 mm wide, the face of which is curved across the width of the pad with a convex cylindrical curvature of 450 mm radius and with a 12 mm radius on all front edges (see figure 6).

Dimensions in millimetres

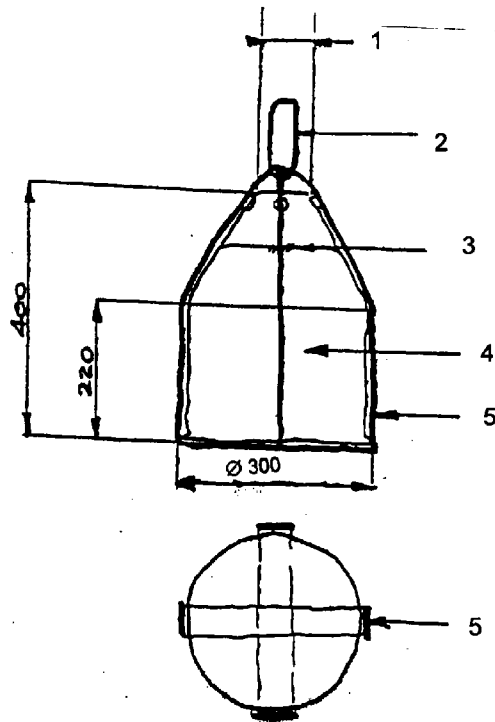


**Figure 6 : Back loading pad**

**5.6 Mass M**

Constituted of a leather bag 300 mm in diameter, 3 mm leather thickness, filled with steel shot-peen.

Dimensions in millimetres



- 1 Opening of the bag (Ø 200 mm)
- 2 Fastening
- 3 Closing of the bag
- 4 Leather bag
- 5 4 straps (l = 45 mm)

**Figure 7 : Leather bag**

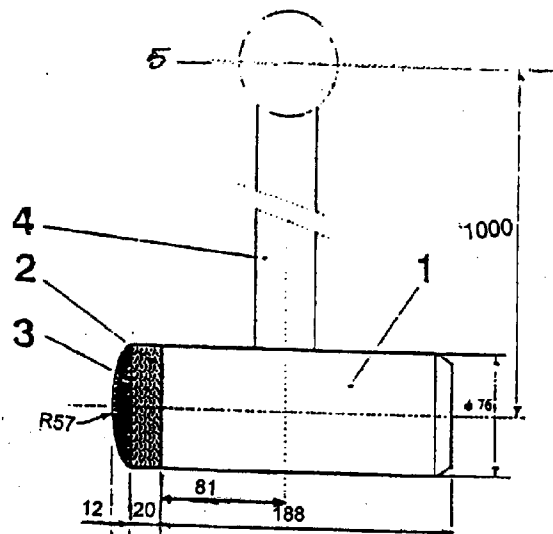
**5.7 Stops**

To prevent the article from sliding but not tilting, no higher than 12 mm except in cases where the design of the seating necessitates the use of higher stops, in which case the lowest that will prevent the item from moving shall be used.

**5.8 Impact hammer**

Cylindrical pendulum head having a mass of 6.5 kg supported from a pivot by a cold drawn seamless steel tube of 38 mm in diameter and with a wall thickness of 2 mm. The distance between the pivot and the centre of gravity of the pendulum head shall be 1 000 mm. The pendulum arm shall be pivoted by a low friction bearing (see figure 8).

Dimensions in millimetres



- 1 Pendulum head steel mass = 6.5 kg
- 2 Hard wood
- 3 Rubber 50 IRHD
- 4 Pendulum arm length 950 ; high tensile steel tube,  $\varnothing$  38 x 2 ; mass, 2 kg  $\pm$  0.2 kg
- 5 Height adjustment

Mass of assembly (1 + 2 + 3) = 6,5 kg  $\pm$  0,07 kg

**Figure 8 : Impact hammer**

### 5.9 Arm fatigue test apparatus

Apparatus capable of applying a cyclic load simultaneously to both arms of a seating. The loads shall be applied through an arm loading device.

The apparatus shall be capable of applying the test loads at varying angles to the vertical by means of low friction pivots which can be adjusted both vertically and horizontally in relation to the arms of the seating and then locked in position (see figure 9).

Dimensions in millimetres

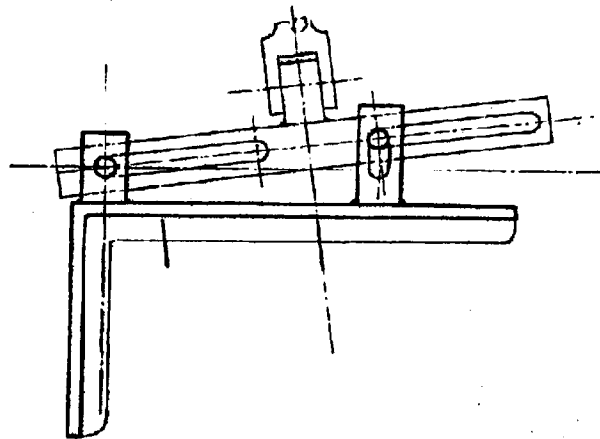


Figure 9 : Arm fatigue test - Arm loading device

### 5.10 Local loading pad

Rigid cylindrical object 100 mm in diameter, with a flat face and a 12 mm radius on the front edge.

### 5.11 Foam for use with loading pad

25 mm thick layer of polyether foam with a hardness index when measured according to ISO 2439, method A, of  $(1100 \pm 100)$  N and a bulk density of  $(125 \pm 5)$  kg/m<sup>3</sup>. Alternatively a layer of this foam may be positioned between the loading pad and the test structure.

## 6 Test methods and requirements

### 6.1 Stability

#### 6.1.1 Purpose of the test

Determination of the ability of outdoor seating to withstand forces which can cause an overturning.

#### 6.1.2 Test procedure

Apply the relevant tests described in EN 1022.

#### 6.1.3 Safety requirements

The seating shall not overturn during the test.

## 6.2 Seat strength and fatigue

### 6.2.1 Purpose of the test

Determination of the strength of the seat of outdoor seating under forces resulting from normal use.

### 6.2.2 Test procedure

#### 6.2.2.1 Seat static load test

Position the seat loading pad (5.4), firstly at the seat loading position determined by the loading position template (5.1) (point A), and subsequently at 80 mm back from the front edge of the structure at the most adverse position on the seat centre line or as near one side of the seat as possible but not less than 80 mm from the edge (point D). Load the back as specified in 6.3.2.1.

Using the seat loading pad (5.4), carry out the test simultaneously at the following positions :

- a) on each position for articles with one or two seats ;
- b) on one end position and the centre position for articles with three seats ;
- c) on two adjacent end positions followed by two adjacent centre positions for articles with four seats or more.

During the test, load the seat(s) that are not be tested with a load of 600 N applied at the seat loading position. The load(s) may consist of 60 kg mass(es).

Apply the downward force  $F_1$  for the number of cycles  $n_1$  as specified in 6.2.3 at point A and subsequently at point D (see figure 10).

In the case of stools, apply the load along the centre line of the seat at the seat loading position for stools determined by the loading position template.



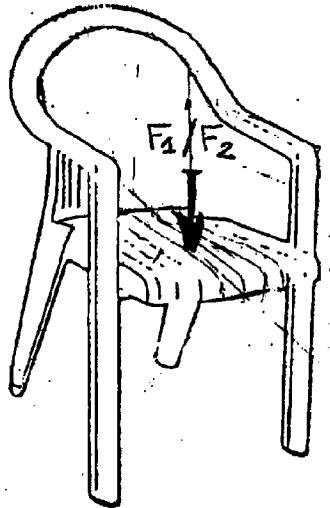
**6.2.2.2 Seat fatigue test**

Apply the force  $F_2$  by means of the seat loading pad (5.4) with the centre of the loading pad positioned at the seat loading position determined by the loading position template (5.1).

Apply the force  $F_2$ , for the number of cycles  $n_2$  as specified in 6.2.3 at a rate of approximately 15 cycles/min (see figure 10).

Carry out the test at one position or consecutively at two positions as specified in a, b or c below :

- a) on one seat for articles with one or two seats ;
- b) on one end seat and the centre seat for articles with three seats ;
- c) on one end seat and one of the centre pair of seats for articles with four seats.



**Figure 10 : Seat static load test  
 Seat fatigue test**

**6.2.2.3 Seat impact test**

Carry out by means of the mass  $M_1$  (5.6), for the number of drops  $n_3$  on the seat from height  $h_1$ , as specified in 6.2.3, with a frequency of approximately 10 cycles/min.

The points of impact on the seat are defined as follow (see figure 11) :

- (A) = defined by the loading position template,
- (B) = on the centreline of the seat at 50 mm forward from the geometrical centre.

Carry out the test at one position or consecutively at two positions as specified in a, b or c below :

- a) on one seat for articles with one or two seats ;
- b) on one end seat and the centre seat for articles with three seats ;
- c) on one end seat and one of the centre pair of seats for articles with four seats or more.

Dimensions in millimetres

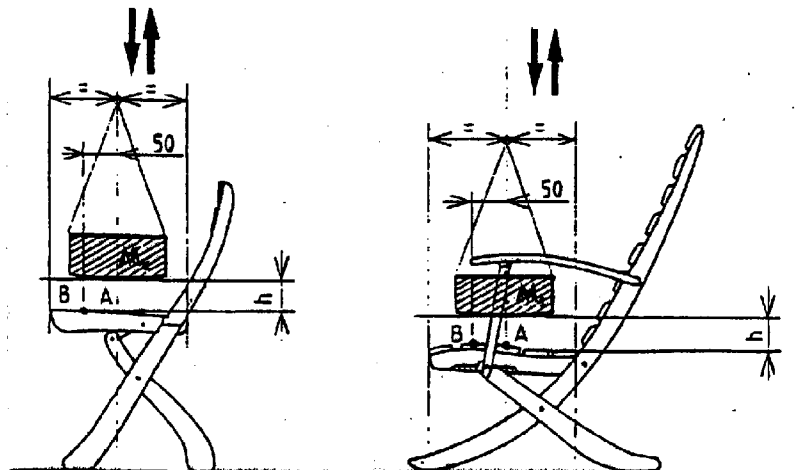


Figure 11 : Seat impact test

**6.2.3 Test parameters**

Table 1 : Test parameters for seat strength and fatigue tests

Test	Test parameter	Camping	Domestic	Contract
6.2.2.1	$F_1$	1 100 N	1 600 N	2 000 N
	$n_1$	9 cycles for 30 s. each + 1 cycle for 1/2 h.		
6.2.2.2	$F_2$	1000 N		
	$n_2$	12 500	25 000	100 000
6.2.2.3	$M_1$	50 kg		
	$n_3$	10		
	$h_1$	such that the force of the ground reaction on the seat is 2 000 N, up to a maximum of 100 mm.		

## 6.2.4 Safety requirements

At the end the test, there shall be no damage or deformation which will affect the safe use of the seating and the functions shall be maintained.

## 6.3 Backrest strength and fatigue

### 6.3.1 Purpose of the test

Determination of the strength of the backrest of outdoor seating and of their locking mechanisms, under force simulating normal use.

### 6.3.2 Test procedure

#### 6.3.2.1 Back static load test

All adjustable backs shall be set in their most upright position.

Position the centre of the back loading pad (5.5), either at the back loading position as determined by the loading position template (5.1) or at 100 mm below the top of the back, whichever is the lower. Load the seat as specified in 6.2.2.1.

Prevent the article from moving rearwards by placing stops (5.7).

Apply the back force  $F_3$  perpendicular to the back when under load and carry out  $n_4$  cycles, as specified in 6.3.3 (see figure 12).

If the article tends to overturn, reduce the back force to a magnitude that just prevents rearwards overturning. Report the actual force used.

Using the back loading pad, carry out the test simultaneously at the following positions :

- a) on each position for articles with one or two seats ;
- b) on one end position and the centre position for articles with three seats ;
- c) on two adjacent end positions followed by two adjacent centre positions for articles with four seats or more.

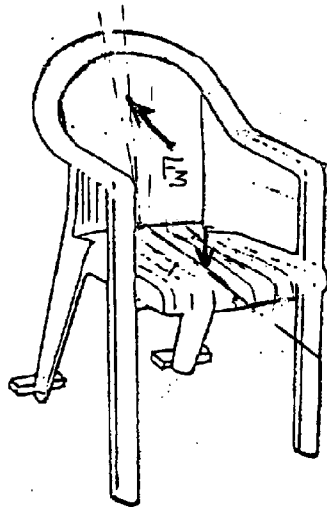


Figure 12 : Back static load test

### 6.3.2.2 Cyclic test on the backrest

Note : This test may be combined with the seat fatigue test defined in 6.2.2.2.

Place the seating on the floor surface in normal use position, with the feet secured to prevent sliding, with the backrest facing the thrust device of the test machine.

Load the seat evenly with  $M_2$  as specified in 6.3.3.

Apply by means of the pad (5.5), loads  $F_4$ , as specified in 6.3.3, in the centreline and perpendicularly to the backrest at one height between 300 and 400 mm above the seat (see figure 13).

Repeat the test for  $n_5$  cycles, as specified in 6.3.3, with a frequency of approximately 15 cycles/min, with  $F_4$  maintained for 2 seconds.

Dimensions in millimetres

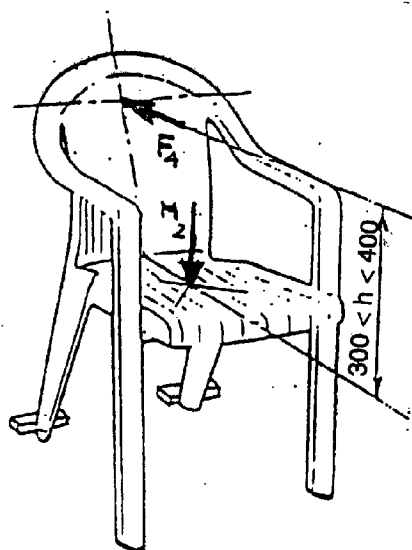


Figure 13 : Cyclic test on the backrest

**6.3.2.3 Test of alternating forces on the backrest for reclining seating**

Place the seating on the floor surface in normal use position, with the feet secured to prevent sliding, with the backrest facing the thrust device of the test machine.

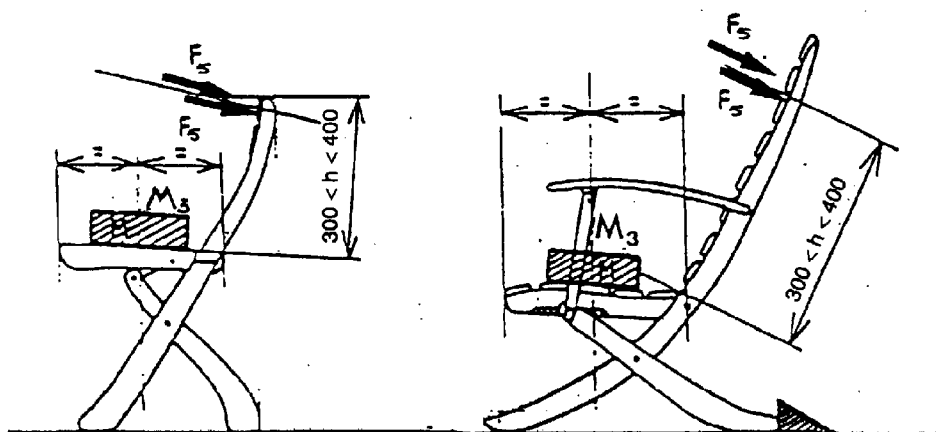
Load the seat evenly with  $M_3$  as specified in 6.3.3.

At 50 mm from the right and left outer edge of the back, apply outwards alternating forces  $F_5$ , as specified in 6.3.3, at one height between 300 mm and 400 mm above the seat (see figure 14).

Repeat the test for  $n_5$  cycles, as specified in 6.3.3, with a frequency of approximately 15 cycles/min, with  $F_5$  maintained for 2 sec.

1 cycle = 1 application of  $F_5$  on the right side  
 and  
 1 application of  $F_5$  on the left side

Dimensions in millimetres



**Figure 14 : Test of alternating forces on the backrest**

**6.3.2.4 Backrest impact test**

Carry out the test with the impact hammer (5.8).

Place the seat with its front feet prevented by stops (5.7) from moving forward.

Strike the outside of the backrest top at its centre, horizontally with the impact hammer falling from a height  $h_2$  with an angle  $\alpha_1$  as specified in 6.3.3 (see figure 15). Repeat the procedure  $n_7$  times as specified in 6.3.3.

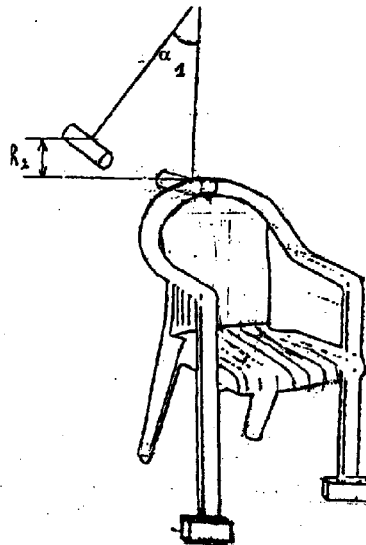


Figure 15 : Backrest impact test

**6.3.3 Test parameters**

Table 2 : Test parameters for backrest strength and fatigue tests

Test	Test parameter	Camping	Domestic	Contract
6.3.2.1	$F_3$	-	410 N	560 N
	$n_4$	-	10	10
6.3.2.2	$M_2$	100 kg		
	$n_5$	6 250	12 500	25 000
	$F_4$	of a value such that the bending moment applied to the back is 75 Nm maxi      100 Nm maxi      100 Nm maxi		
6.3.2.3	$M_3$	100 kg		
	$n_6$	6 250	12 500	25 000
	$F_5$	of a value such that the bending moment applied to the back is 75 Nm maxi      100 Nm maxi      100 Nm maxi		
6.3.2.4	$h_2$	-	80 mm	210 mm
	$\alpha_1$	-	23°	38°
	$n_7$	-	10	10

**6.3.4 Safety requirements**

At the end of the test, there shall be no damage or deformation which will affect the safe use of the seating and the functions shall be maintained.

**6.4 Armrest strength and fatigue**

**6.4.1 Purpose of the test**

Determination of strength of the armrests of outdoor seating and of their assemblies under forces simulating normal use.

**6.4.2 Test procedure**

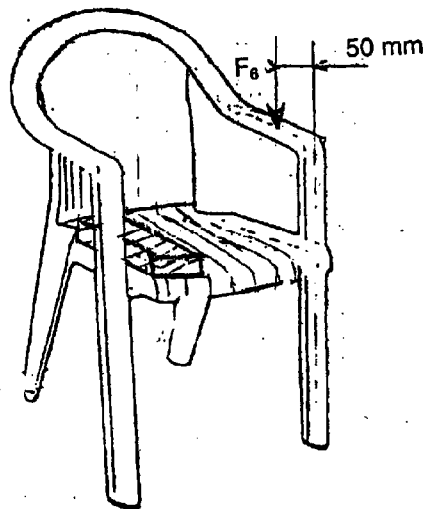
**6.4.2.1 Arm downwards static load test**

Apply a vertical force  $F_a$  for the number of cycles  $n_a$ , as specified in 6.4.3, in the middle and at 50 mm from the front of the armrest or at any other point likely to cause failure (see figure 16).

Apply the load through the smaller loading pad (5.3) and during each application, maintain the load for at least 10 seconds.

If the seat overbalances, apply a balancing load great enough to prevent the seat from overbalancing when the full force is applied, on the side of the seat opposite to that on which the full force is applied.

Dimensions in millimetres



**Figure 16 : Arm downwards static load test**

#### 6.4.2.2 Fatigue test

Place the seating on the floor surface with stops (5.7) against the outside surfaces of the feet (so as not to prevent inward deflection of the legs under the arm load). The test loads shall be applied simultaneously on both armrests, at 100 mm behind the front edge of the armrests.

Using the apparatus specified in 5.9, apply a load of 10 N simultaneously on the arm rests. With this load applied adjust the apparatus so that the loading device make an angle of  $10^\circ \pm 1^\circ$  to the vertical and the distance between the loading cylinder pivots and the horizontal surface of the arm loading devices is  $600 \text{ mm} \pm 10 \text{ mm}$  (see figure 17).

With the apparatus set as above, apply the specified load  $F_7$  for the number of cycles  $n_9$ , as specified in 6.4.3, to both arms simultaneously for seating with only one seat, and on one arm for seating with more than one seat.

Dimensions in millimetres

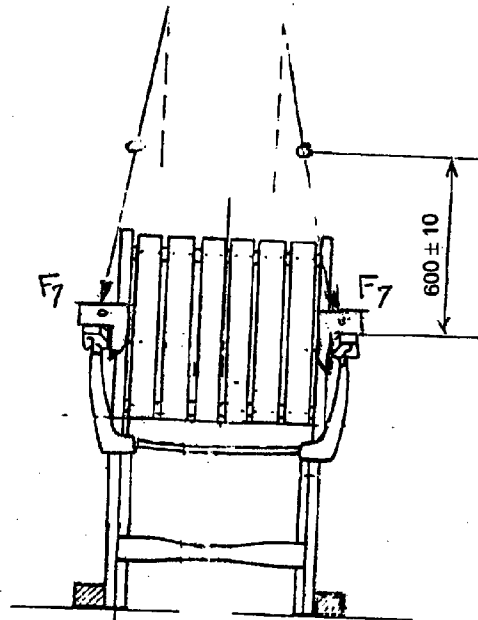


Figure 17 : Arm fatigue test



**6.4.2.3 Arm impact test**

Carry out the test with the impact hammer (5.8).

Place the seating with its feet set opposite the loading application point and prevented by stops (5.7) from moving.

Strike in an inward direction to the outside face of one arm at the position most likely to cause a failure horizontally with the impact hammer falling from a height  $h_3$  with an angle  $\alpha_2$  as specified in 6.4.3 (see figure 18). Repeat the procedure  $n_{10}$  times as specified in 6.4.3.

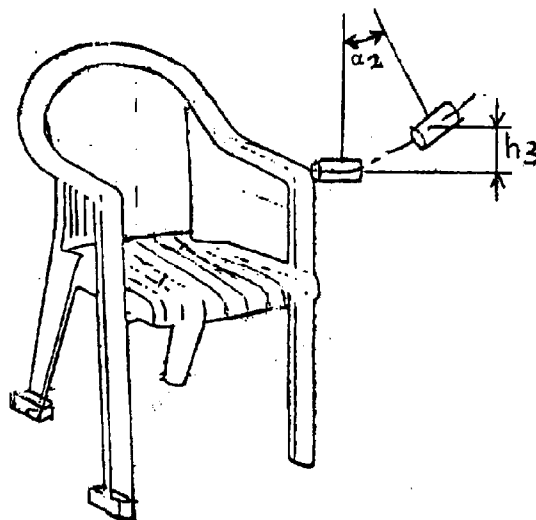


Figure 18 : Arm impact test

**6.4.3 Test parameters**

Table 3 : Test parameters for armrest strength and fatigue tests

Test	Test parameter	Camping	Domestic	Contract
6.4.2.1	$F_6$	400 N	750 N	900 N
	$n_8$	10		
6.4.2.2	$F_7$	375 N		
	$n_9$	5 000	15 000	20 000
6.4.2.3	$h_3$	-	120 mm	210 mm
	$\alpha_2$	-	28°	38°
	$n_{10}$	10		

**6.4.4 Safety requirements**

At the end of the test, there shall be no damage or deformation which will affect the safe use of the seating and the functions shall be maintained.

## 6.5 Leg strength

### 6.5.1 Purpose of the test

Determination of the strength of the leg assemblies of outdoor seating with the element(s) to which they are attached.

### 6.5.2 Test procedure

#### 6.5.2.1 Leg forward static load test

Apply the seat load  $M_4$  at the seat loading position specified by the loading position template (5.1).

Prevent the unit from movement by stops (5.7) on the front legs whilst applying a horizontal force centrally to the rear of the seat at seat level in a forward direction, by means of the local loading pad (5.10) (see figure 19). For stools with only three legs, one front foot and one other foot shall be restrained.

Apply the horizontal forward force  $F_8$  for the number of cycles  $n_{11}$  as specified in 6.5.3, and maintain each load for at least 10 sec.

If the product tends to overbalance before the appropriate load is reached, reduce the load to a magnitude that just prevents forward overbalancing, and record the actual force used.

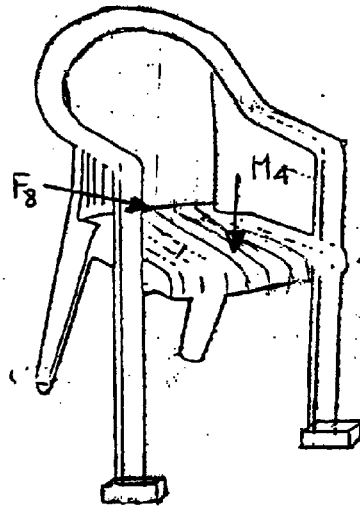


Figure 19 : Leg forward static load test

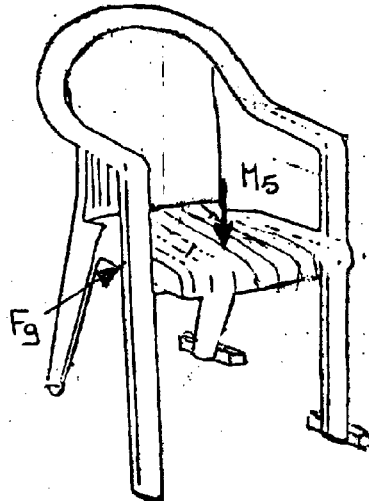
**6.5.2.2 Leg sideways static load test**

Carry out this test in the same manner as the leg forward static loading test, feet prevented by stops and set opposite the loading application point.

Apply the vertical seat load  $M_5$  at the seat loading position specified by the chair loading position template (5.1), but not more than 150 mm from the unloaded edge of the seat.

Apply a horizontal force  $F_9$  centrally to the side at seat level, towards the restraining feet for the number of cycles  $n_{12}$  as specified in 6.5.3 (see figure 20). During each application maintain the load for at least 10 sec.

If the seating tends to overbalance with the vertical seat load in its furthest position from the unloaded edge, reduce the horizontal seat loading force to a magnitude that just prevents sideways overbalancing, and record the actual force used.



**Figure 20 : Leg sideways static load test**

**6.5.3 Test parameters**

**Table 4 : Test parameters for leg strength tests**

Test	Test parameter	Camping	Domestic	Contract
6.5.2.1	$F_8$	300 N	375 N	500 N
	$M_4$	75 kg		100 kg
	$n_{11}$	10		
6.5.2.2	$F_9$	250 N	300 N	390 N
	$M_5$	75 kg		100 kg
	$n_{12}$	10		

#### **6.5.4 Safety requirements**

At the end of the test, there shall be no damage or deformation which will affect the safe use of the seating and the functions shall be maintained.

### **7 Test report**

The test report shall include the following items :

- a) reference to this European prestandard ;
- b) details of piece of furniture tested ;
- c) manner of mounting if appropriate ;
- d) any defects observed before testing ;
- e) the test results according to the applicable clauses ;
- f) details of any deviations from this European prestandard ;
- g) the name and address of the test facility ;
- h) the date of test.

**ANNEX A (NORMATIVE)**

## Behaviour of outdoor seating at high and low temperature

**A.1 General test conditions**

Seating shall be subjected to the high and low temperature tests specified in this annex, if it has load bearing components made of plastic.

A load bearing component is a part which experiences a bending load when the test forces are applied.

**A.2 Low temperature tests**

These tests are applicable to all outdoor seating including camping, domestic and contract seating.

**Test procedures**

The test sample shall be conditioned at the specified temperature for at least 6 h before testing and be kept at the request temperature until the tests are carried out.

- camping and domestic seating shall be tested at 0 °C
- contract seating shall be tested at – 10 °C

Tests may be carried out at more extreme temperature according to the marking or instructions put on by the supplier.

**A.2.1 Seat impact test**

With the sample conditioned for temperature as specified above, carry out the test described in clause 6.2.2.3.

At the end of the test, there shall be no damage affecting safety or function.

**A.2.2 Back impact test**

This test is not applicable to seating with back which is less than 300 mm high.

With the sample conditioned for temperature as specified above, carry out the test specified in clause 6.3.2.4. Except that the backrest shall be struck 10 times on the right hand side and 10 times on the left hand side on the top edge or at a height of  $\leq 600$  mm from the seat plane and not on the centre line of the back.

At the end of the test, there shall be no damage affecting safety or function.

### A.3 High temperature tests

These tests are applicable to domestic and contract outdoor furniture, but not to camping furniture.

#### Test procedures

The test sample shall be conditioned at the specified temperature for at least 6 h before testing and kept at the required temperature throughout the duration of the test.

- domestic seating shall be tested at 40 °C
- contract seating shall be tested at 50 °C

Tests may be carried out at more extreme temperatures according to the marking or instructions put on by the supplier.

#### A.3.1 Seat and back sustained load test (Figure A.1)

With the sample conditioned for temperature as specified above :

All backs shall be set in their most upright position. Seating with back that cannot be raised to an angle of inclination of more than 70 ° to the horizontal shall be tested as specified in A.3.2.

Position the seat loading pad (5.4) to conform to the seat plane, firstly at the seat loading position determined by the loading position template (5.1).

Use the seat loading pad device to carry out the test simultaneously at the following positions :

- a) on each position for article with one or two seats ;
- b) on one end position and on the centre position for articles with three seats ;
- c) on two adjacent end positions followed by two adjacent centre positions for articles with four seats or more.

During the test, load the other seat(s) that are not being tested with a force of 750 N (600 N) applied at the seat loading position.

If the seating has a back, position the centre of the back loading pad (5.5), either at the back loading position as determined by the loading position template (5.1), or at 100 mm below the top of the back, whichever is the lower. Prevent the article from moving rearwards by placing stops (5.7) behind the rear feet.

Apply a 1 100 N downward force with the seat loading pad (see points a, b, c, above) at the seat loading points.

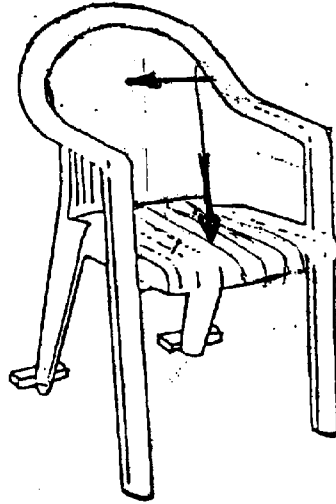
With the force maintained, apply a back force of 330 N with the back loading pad perpendicular to the back when under load.

Maintain both loads for 4 h.

When this test is applied to a stool without a backrest, or with a very low back, apply the load on the seat only.

If the seating tends to overturn, reduce the back force to a magnitude that just prevents rearwards overturning. Report the actual force used.

When this test is applied to a chair fitted with a spring rocking action base that has a tension adjustment, increase the tension so that the least possible rocking movement is obtained during the test.



**Figure A.1 : Seat and back sustained load test**

**Note :** If it is not possible to apply the back load at the back loading position due to the construction of the chair, (e.g. if the back is constructed of cross-members positioned above and/or below the back loading position), a suitable panel may be used to spread the load over the back cross-members so long as this surface does not overlap the side upright members.

**A.3.2 Additional seat and back static load test requirements for tilting chairs, reclining chairs and loungers**

One of the following additional tests are required for seats whose back is not always upright (i.e. chairs with backs capable of an angle of inclination of  $70^\circ$  or less to the horizontal).

**A.3.2.1 Loading discs**

With a mass of 10 Kg, diameter 350 mm and thickness 48 mm.

**A.3.2.2 Tilting chairs**

*Note :* This test method is valid for all values of  $\alpha$  and  $\theta$  between  $90^\circ$  and  $120^\circ$ .

Load the seating with 11 discs so that the discs are firmly settled against the chair back, as shown in Figure A.2.

Maintain load for 4 h.

**A.3.2.3 Reclining chairs with footrests**

Load the back of the seating with 8 discs and place 3 discs onto the footrest (see figure A.5) at distance Z from the intersection of the seat and back (see figure A.1).

A practical suggestion for loading the seating using the support apparatus is shown in figure A.3.

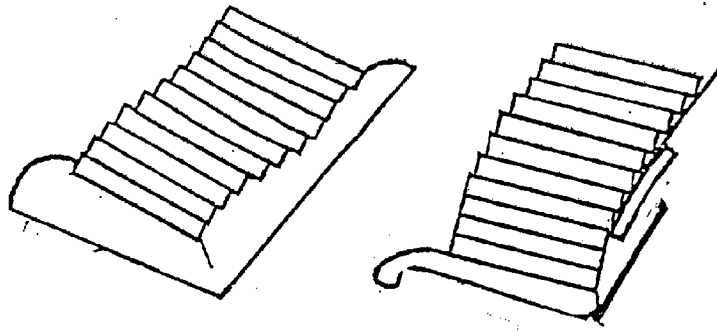
Maintain load for 4 h.

**A.3.2.4 Reclining chairs without footrests**

Load the back of the chair with 8 discs and place 3 discs on the front of the seat (see figure A.4) at distance X from the intersection of the seat and back (see figure A.5).

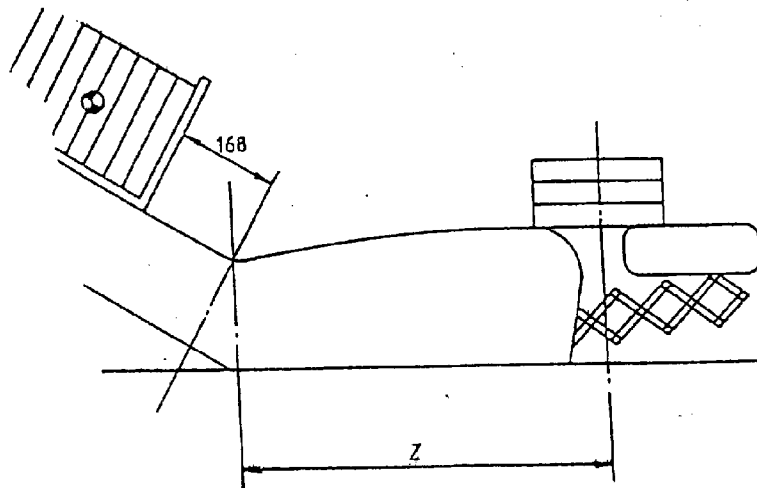
Maintain load for 4 h.

At the end of the tests, there shall be no damage affecting function or safety (including stability).



**Figure A.2 : Practical example of test method : tilting chairs**

Dimensions in millimetres



**Figure A.3 : Test for reclining chairs with footrests**



Dimensions in millimetres

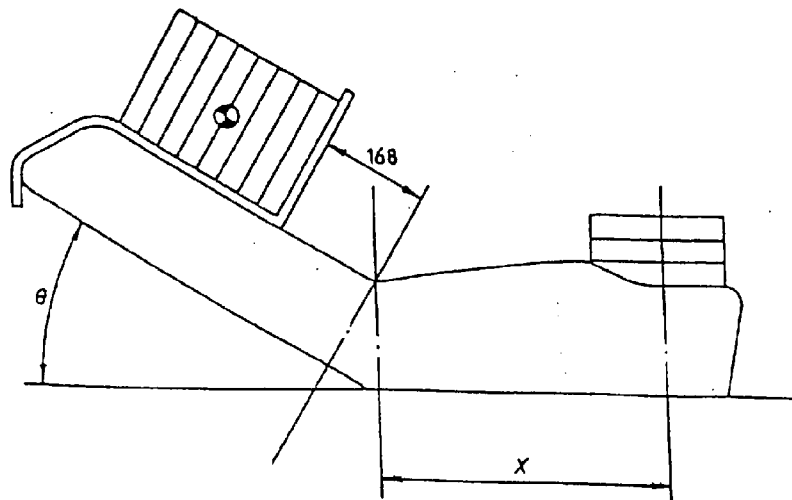


Figure A.4 : Test for reclining chairs without footrests

Table A.1 : Values of X and Z		
$\theta$ (°)	X (mm)	Z (mm)
0	474	614
10	424	564
20	375	515
30	325	464
45	252	392
60	194	314

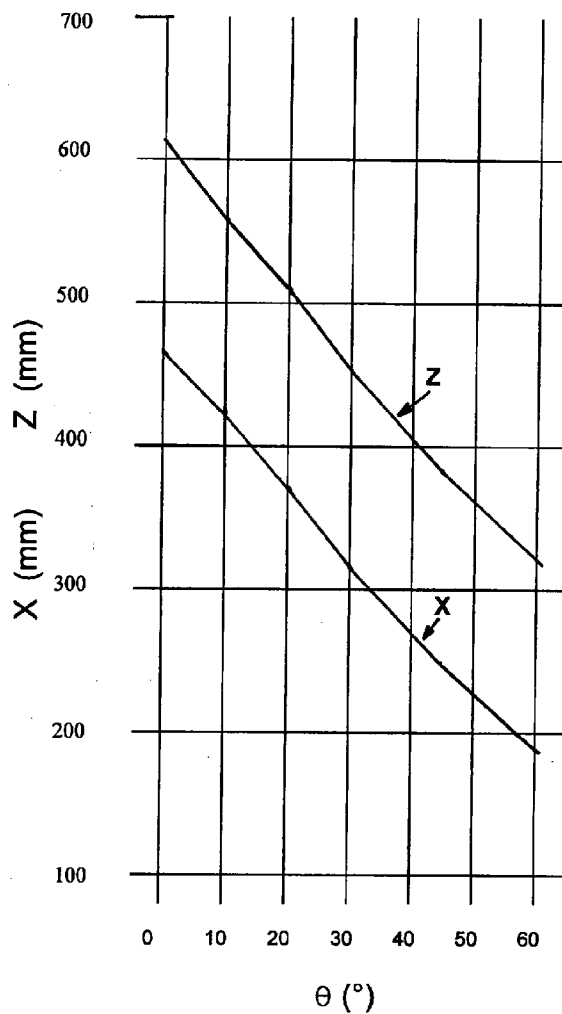


Figure A.5 : Values of Z and X

### **A.3.3 Leg rearward static load test**

With the sample conditioned for temperature as specified above, adjust the chair as specified in A.3.1 and apply the seat load specified in A.3.1.

This test shall not be applied to seating with back which cannot be raised to an angle of more than 70° to the horizontal.

Place stops (5.7) behind the rear legs if necessary and tilt the chair by applying a rearward force to the back (or the front of the seat in the case of a stool).

Continue to tilt the seating until it is just on the point of overturning rearwards and maintain it in that position for one minute.

At the end of the test, there shall be no damage affecting function or safety (including stability).

### **A.3.4 Leg forward static load test**

With the sample conditioned for temperature as specified above, carry out the test specified in clause 6.5.2.1.

The test loads shall be maintained for 1 min.

At the end of the test, there shall be no damage affecting function or safety (including stability).

### **A.3.5 Leg sideways static load test**

With the sample conditioned for temperature as specified above, carry out the test specified in 6.5.2.2.

The test loads shall be maintained for 1 min.

At the end of the test, there shall be no damage affecting function or safety (including stability).

**ANNEX B (NORMATIVE)**

**SPECIFIC TEST METHODS AND REQUIREMENTS FOR LOUNGERS**

**B.1 Introduction**

Loungers combine, by their nature and design, the use of sitting and lying rest. Due to their extended length, they invite « bysitters ». They therefore have to be tested for all of these functions individually and in combination.

Requirements and test methods with regard to the seat section shall be tested in accordance with the content of this prestandard.

Any other requirement concerning the extension of the seat section unto the full length of the lounge shall meet the requirements as specified below. Loungers without a particular seat section, (i.e. those without back rest and arm rest), shall be completely tested in accordance to the specifications below.



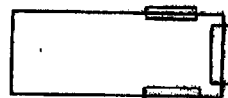
a) Loungers without backrest without armrests



b) Loungers with backrest, backrest in highest position without armrests



c) Loungers with backrest, backrest in lowest position without armrests



d) Loungers with backrest, backrest in position more likely to cause failure with armrests

**Figure B.1 : Pictograms used in this annex**

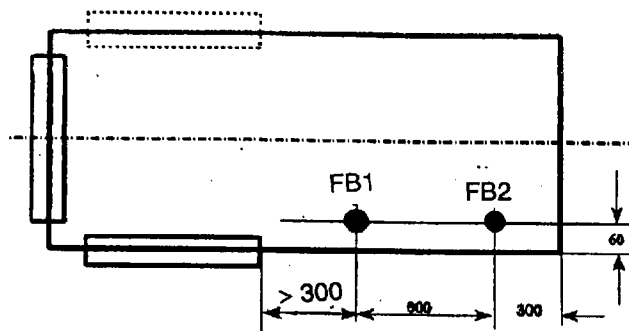
**B.2 Stability**

**B.2.1 Test procedure**

**B.2.1.1 Sideways stability**

Apply simultaneously 2 downwards forces  $F_{B.1}$  and  $F_{B.2}$  as specified in B.2.2 (see figure B.2). Maintain  $F_{B.1}$  and  $F_{B.2}$  for 30 sec minimum.

Dimensions in millimetres



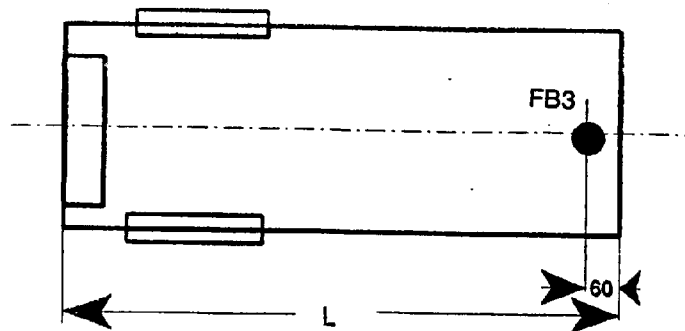
**Figure B.2 : Sideways stability**

**B.2.1.2 Forward stability**

Note : The requirement is not applicable for loungers with a height < 250 mm and a mass < 5 kg. The height should be determined by measuring the distance from the floor to the upper seating area at L/2 on the centre line of the unloaded lounger.

Apply the downwards force  $F_{B.3}$  as specified in B.2.2 (see figure B.3). Maintain  $F_{B.3}$  for 30 sec minimum.

Dimensions in millimetres



**Figure B.3 : Forward stability**

**B.2.2 Test parameters**

**Table B.1 : Test parameters for stability tests**

Test	Test parameter	Camping	Domestic	Contract
B.2.1.1	$F_{B,1}$		600 N	
	$F_{B,2}$		600 N	
B.2.1.2	$F_{B,3}$		600 N	

**B.2.3 Safety requirements**

When loaded the lounger shall not overturn.

**B.3 Strength tests**

**B.3.1 Test procedure**

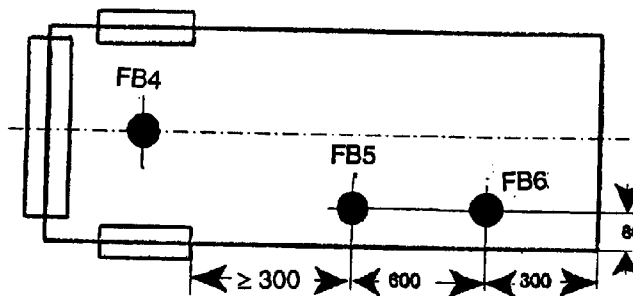
**B.3.1.1 Static test**

Apply the downwards force  $F_{B,4}$  at the seat loading position determined by the loading position template (5.1) (point A).

Apply 2 simultaneously downwards forces  $F_{B,5}$  and  $F_{B,6}$  for the number of cycles  $n_{B,1}$  as specified in B.3.2 (see figure B.4).

All adjustable parts shall be put in the position most likely to cause failure.

Dimensions in millimeters



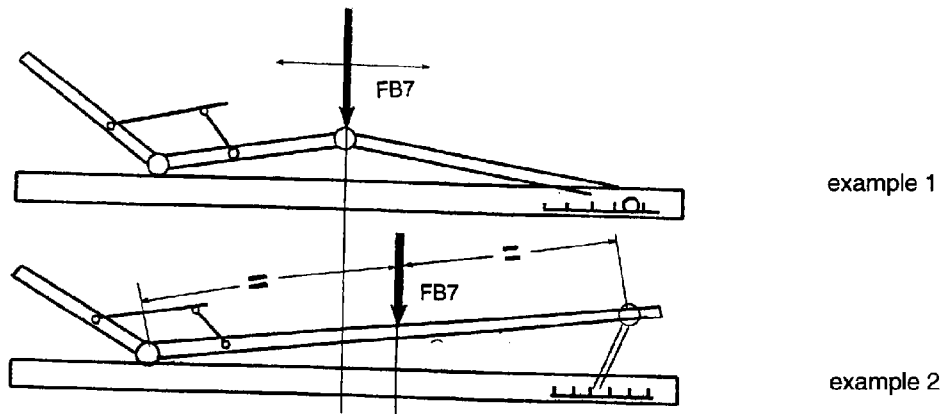
**Figure B.4 : Static test**

**B.3.1.2 Fatigue test**

Apply downwards forces  $F_{B,7}$  for the number of cycles  $n_{B,2}$ , as specified in B.3.2, in alternating order (50 % of cycles at A and 50 % at B) (see figure B.5), with a frequency of 24 cycles/min.

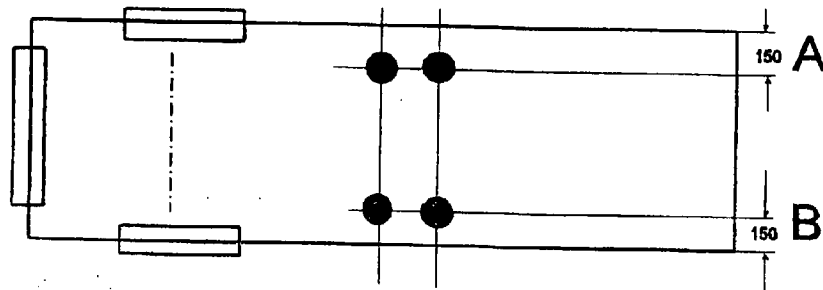
The points of application in longitudinal direction as well as any position of adjustable parts shall be in a position most likely to cause failure.

Dimensions in millimetres



top view to examples 1 and 2

etc.



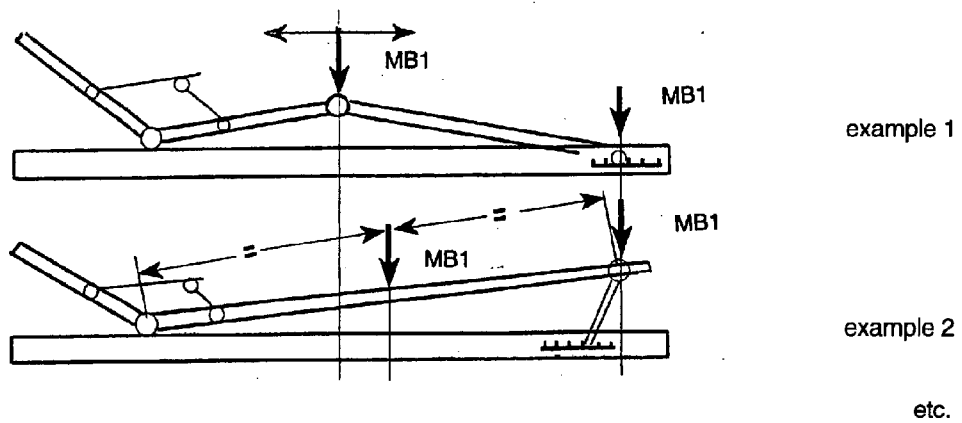
**Figure B.5 : Fatigue test**

**B.3.1.3 Impact test**

Carry out by means of the mass  $M_{B,1}$   $n_{B,3}$  drops as specified in B.3.2 on the lying section and, if applicable, on foot end locking mechanisms (see figure B.6) from height  $h_{B,1}$  as specified in B.3.2.

The points of impact shall be in longitudinal direction of seating-lying section, on points most likely to cause failure and directly above the locking mechanisms.

Dimensions in millimetres

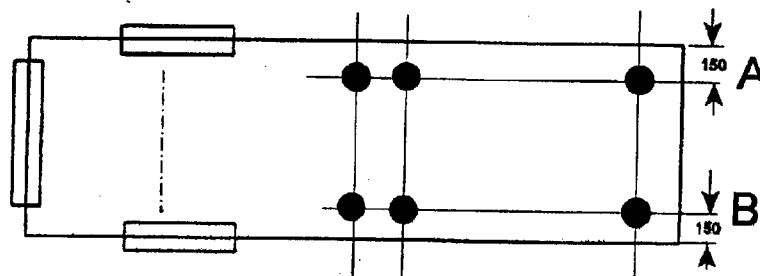


example 1

example 2

etc.

top view to examples 1 and 2



**Figure B.6 : Impact test**



**B.3.1.4 Lifting test**

Loungers being equipped with wheels and not being marked with the pictogram as specified in B.4 shall be tested as shown in figure B.7.

Apply the load  $M_{B.2}$  as specified in B.3.2 on the geometrical centre line of the lounger surface.

Lift the foot end of the lounger for the number of cycles  $n_{B.4}$ , as specified in B.3.2 up to a height so that only the wheels keep contact to the test surface.

Dimensions in millimetres

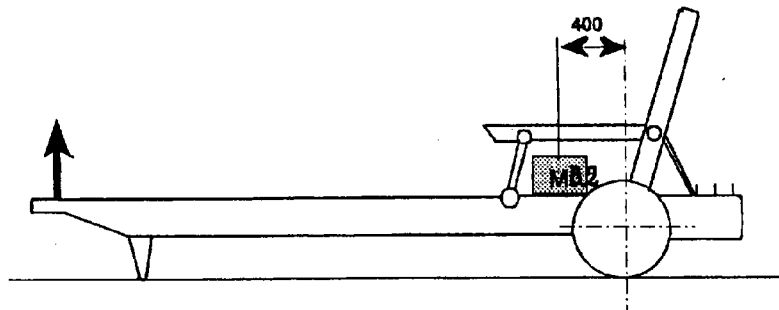


Figure B.7 : Lifting test

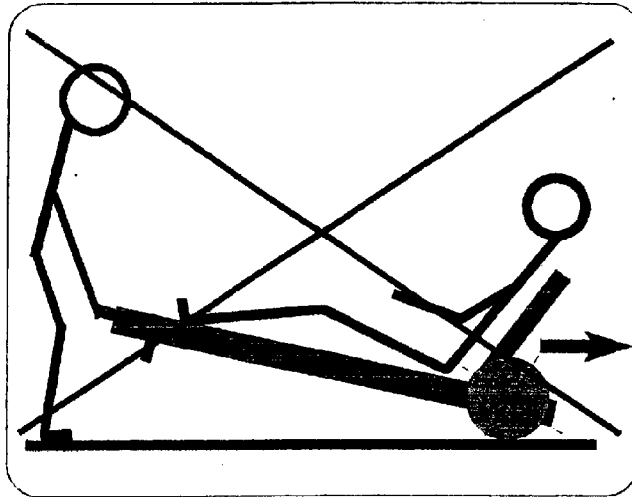
**B.3.2 Test parameters**

Table B.2 : Test parameters for strength tests

Test	Test parameter	Camping	Domestic	Contract
B.3.1.1	$F_{B.4}$	1100 N	1600 N	2000 N
	$F_{B.5}$ and $F_{B.6}$	600 N	1100 N	
	$n_{B.1}$	Apply $F_{B.4} + F_{B.5}$ for 30 min., apply subsequently 9 times $F_{B.4} + F_{B.5}$ for a period of 30 sec.. Repeat the procedure with loads $F_{B.4} + F_{B.6}$ .		
B.3.1.2	$F_{B.7}$	-	1000 N	1000 N
	$n_{B.2}$	-	25000	100000
B.3.1.3	$M_{B.1}$	50 kg		
	$n_{B.3}$	10		
	$h_{B.1}$	such that the force of the ground reaction on the seat is 2000 N, up to a maximum of 100 mm.		
B.3.1.4	$M_{B.2}$	100 kg		
	$n_{B.4}$	500	1000	2000

**B.4 Marking**

Any lounger equipped with wheels but not intended to be lifted and moved under at least the load as specified in table B.2 shall be marked with the pictogram as shown in figure B.8.



**DO NOT LIFT WHEN LOADED**

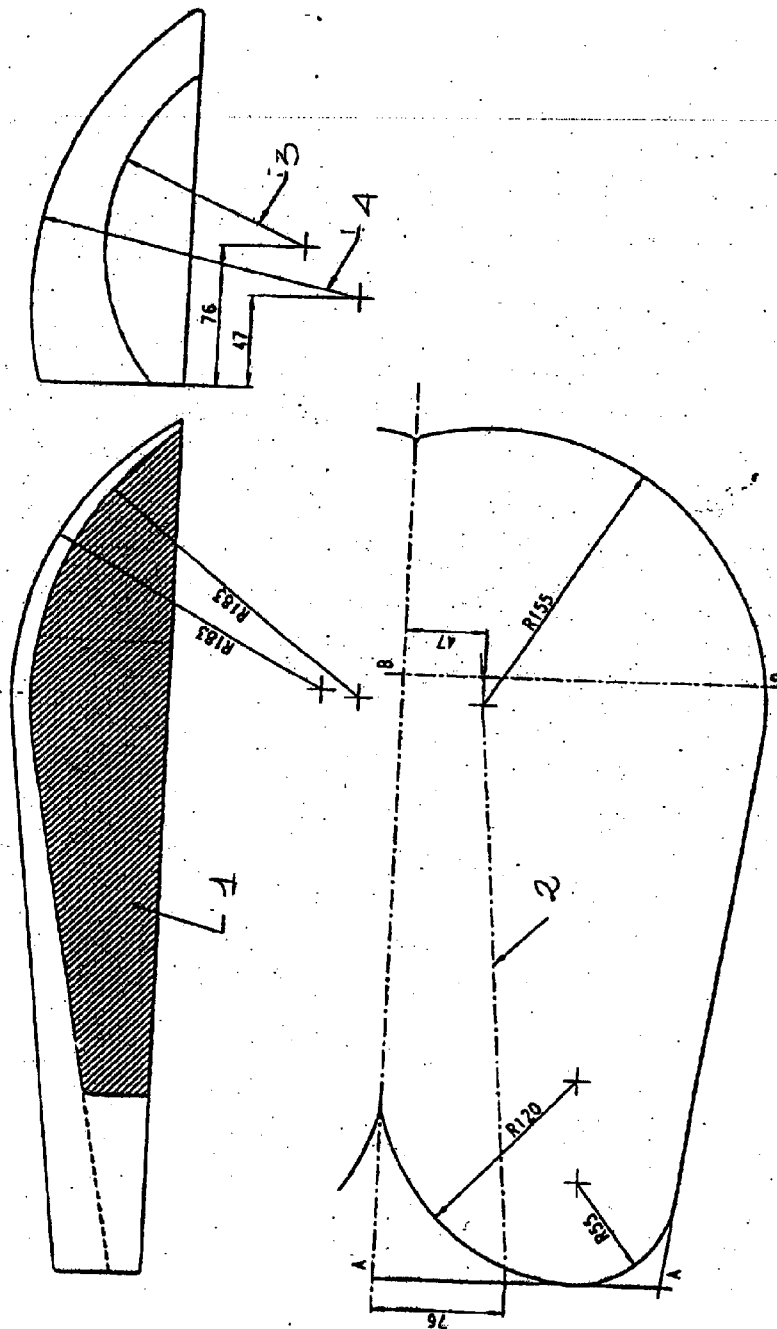
**Figure B.8 : pictogram**

### **ANNEX C (INFORMATIVE)**

#### Examples of seat loading pad

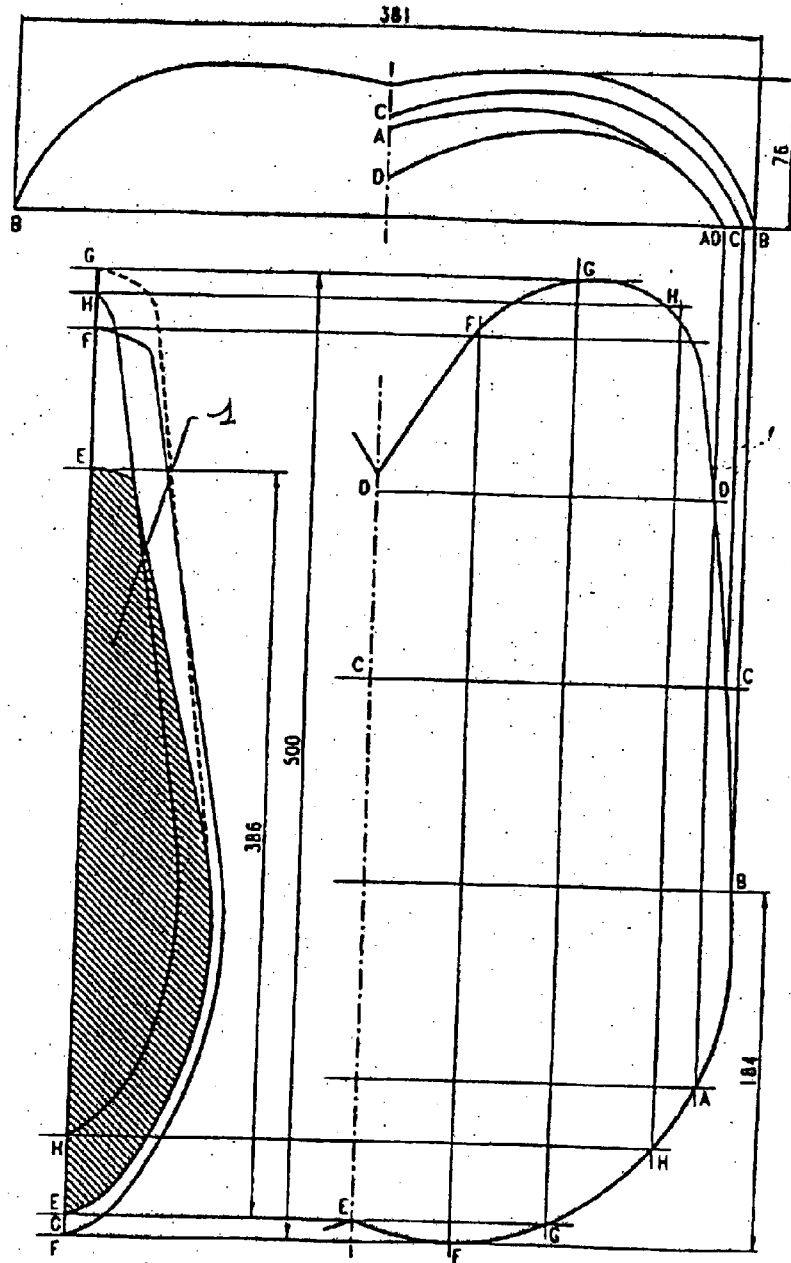
The seat loading pad defined in clause 5.4 currently exists in 2 versions ;

- a) machined in hardwood as shown in figure C.1 ;
- b) moulded from fibre glass as shown in figure C.2.



- 1 Centre section cross hatched
- 2 Axis of the cone
- 3 R105 - section A-A (see the top view)
- 4 R183 - section B-B (see the top view)

Figure C.1 : Seat loading pad geometry - Hardwood construction



1 Centre section cross hatched

Figure C.2 : Seat loading pad geometry - Moulded fibre glass construction

**DD ENV**  
**581-2:2000**

---

## **BSI — British Standards Institution**

BSI is the independent national body responsible for preparing British Standards. It presents the UK view on standards in Europe and at the international level. It is incorporated by Royal Charter.

### **Revisions**

British Standards are updated by amendment or revision. Users of British Standards should make sure that they possess the latest amendments or editions.

It is the constant aim of BSI to improve the quality of our products and services. We would be grateful if anyone finding an inaccuracy or ambiguity while using this British Standard would inform the Secretary of the technical committee responsible, the identity of which can be found on the inside front cover. Tel: 020 8996 9000. Fax: 020 8996 7400.

BSI offers members an individual updating service called PLUS which ensures that subscribers automatically receive the latest editions of standards.

### **Buying standards**

Orders for all BSI, international and foreign standards publications should be addressed to Customer Services. Tel: 020 8996 9001. Fax: 020 8996 7001.

In response to orders for international standards, it is BSI policy to supply the BSI implementation of those that have been published as British Standards, unless otherwise requested.

### **Information on standards**

BSI provides a wide range of information on national, European and international standards through its Library and its Technical Help to Exporters Service. Various BSI electronic information services are also available which give details on all its products and services. Contact the Information Centre. Tel: 020 8996 7111. Fax: 020 8996 7048.

Subscribing members of BSI are kept up to date with standards developments and receive substantial discounts on the purchase price of standards. For details of these and other benefits contact Membership Administration. Tel: 020 8996 7002. Fax: 020 8996 7001.

### **Copyright**

Copyright subsists in all BSI publications. BSI also holds the copyright, in the UK, of the publications of the international standardization bodies. Except as permitted under the Copyright, Designs and Patents Act 1988 no extract may be reproduced, stored in a retrieval system or transmitted in any form or by any means – electronic, photocopying, recording or otherwise – without prior written permission from BSI.

This does not preclude the free use, in the course of implementing the standard, of necessary details such as symbols, and size, type or grade designations. If these details are to be used for any other purpose than implementation then the prior written permission of BSI must be obtained.

If permission is granted, the terms may include royalty payments or a licensing agreement. Details and advice can be obtained from the Copyright Manager. Tel: 020 8996 7070.

---

BSI  
389 Chiswick High Road  
London  
W4 4AL