Office furniture — Office work chair —

Part 3: Safety test methods

The European Standard EN 1335-3:2000 has the status of a British Standard

ICS 97.140

National foreword

This British Standard is the official English language version of EN 1335-3:2000. BS EN 1335-3:2000, together with BS EN 1335-2:2000 and the revised edition of BS 5459-2 (when published), supersedes BS 5459-2:1990, which will be withdrawn when all three standards are published.

The UK participation in its preparation was entrusted to Technical Committee FW/3, Office furniture, which has the responsibility to:

— aid enquirers to understand the text;

— present to the responsible European committee any enquiries on the interpretation, or proposals for change, and keep the UK interests informed;

— monitor related international and European developments and promulgate them in the UK.

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

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Summary of pages

This document comprises a front cover, an inside front cover, the EN title page, pages 2 to 19 and a back cover.

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This European Standard was approved by CEN on 12 December 1999.

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

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Foreword

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

This European Standard shall be given the status of a national standard, either by publication of an identical text or by endorsement, at the latest by August 2000, and conflicting national standards shall be withdrawn at the latest by August 2000.

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

The text was prepared by CEN/TC 207/SC 3/WG 1, Office Furniture - Chairs. The Secretariat is held by DIN.

This series consists of the following parts:

EN 1335-1 Office furniture - Office work chair - Part 1: Dimensions, determination of dimensions;

EN 1335-2 Office furniture - Office work chair - Part 2: Safety requirements;

EN 1335-3 Office furniture - Office work chair - Part 3: Safety test methods.

This standard does not replace any other European Standard.

1 Scope

This part of EN 1335:2000 specifies the test methods to be applied when testing the safety of office work chairs. The corresponding safety requirements are found in EN 1335-2.

This European Standard does not specify type approval tests for chair components.

The tests in clauses 7, 8 and 9 are based upon use for eight hours a day by persons weighing up to 110 kg. For more severe conditions of use increased requirements will be necessary.

2 Normative references

This European Standard 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 Standard only when incorporated in it by amendment or revision. For undated references the latest edition of the publication referred to applies (including amendments).

EN 1022	Domestic furniture - Seating - Determination of stability.
EN 1335-1:2000	Office furniture - Office work chair - Part 1: Dimensions, determination of dimensions.
EN 1335-2	Office furniture - Office work chair - Part 2: Safety requirements.

3 Test equipment

The tests may be applied by any suitable device because results are dependent only upon correctly applied loads and not upon the apparatus.

The seat loading apparatus shall be such as not to restrain the chair from tilting rearwards nor hinder horizontal movement of the chair when back load is applied.

All loading pads shall be capable of pivoting in relation to the direction of the applied force and the pivot point shall be as close as practically possible to the load surface.

The smaller loading pads specified in 3.5 and 3.6 may be used on any loading point providing this does not influence the result of the test.

3.1 Floor surface

The floor surface shall be horizontal, flat, rigid and smooth.

3.2 Test surface for testing rolling resistance

3.2.1 For testing type W castors

A table with a horizontal smooth steel surface.

3.2.2 For testing type H castors

A table covered with textile having characteristics specified in Table 1.

Table 1 - Textile floor covering

Requirements for	Characteristic
Production method	Tufted
Upper surface	loop pile
Nap count per m²	100 000 to 130 000
Backing material	synthetic latex
Raw material used for loop pile	100 % polyamide
Yarn type	filament yarn
Pile thickness of fully trimmed sample	3,5 mm
Pile weight of fully trimmed sample	450 g/m^2

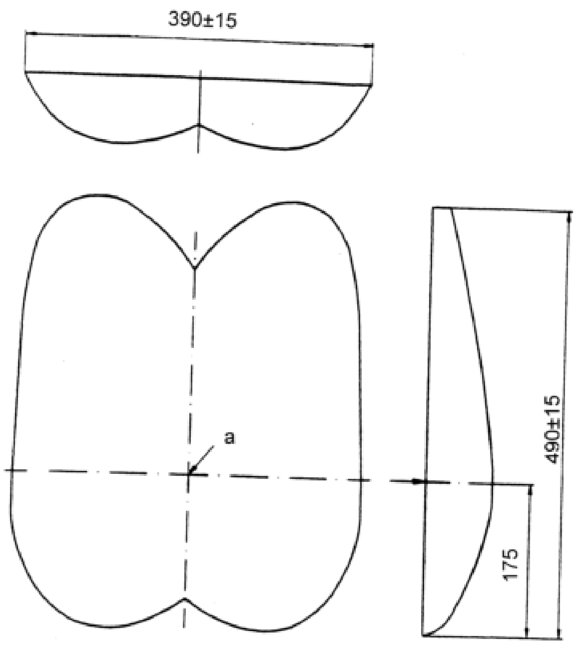
Before test values are measured the chair shall be pushed/pulled five times over the area of the covering which will be used for the test.

3.3 Stops

Stops to prevent the chair from sliding or rolling but not tilting, no higher than 12 mm except in cases where the design of the chair necessitates the use of higher stops, in which case the lowest that will prevent the chair from sliding or rolling shall be used.

3.4 Seat loading pad

The seat loading pad is a naturalistically shaped rigid indenter with a hard, smooth surface having overall dimensions within the limits shown in Figure 1. In principle, this loading pad is for use in loading points “A” and “C” (see Figure 13).



a Force application point

Figure 1 - Seat loading pad - Overall dimensions

Two examples are shown in annex A.

3.5 Smaller seat loading pad

The smaller seat loading pad is a 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 2). In principle, this loading pad is to be used in loading points “D”, “G”, “F” and “J” (see Figure 13).

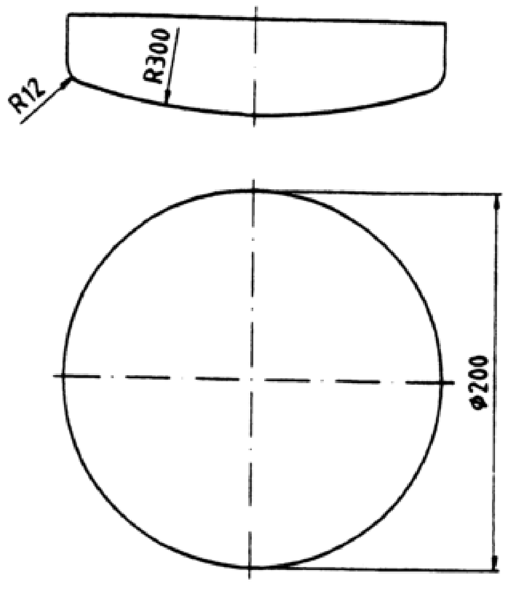


Figure 2 - Smaller seat loading pad

3.6 Local loading pad

The local loading pad is a rigid, circular object 100 mm in diameter, with a flat face and a 12 mm front edge radius.

3.7 Loading discs

Loading discs each with a mass of 10 kg, a diameter of 350 mm and a thickness of 48 mm.

3.8 Test equipment for front edge overbalancing

A 27 kg mass fixed to a 50 mm wide strap.

3.9 Back loading pad

The back loading pad is a rigid rectangular 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 3).

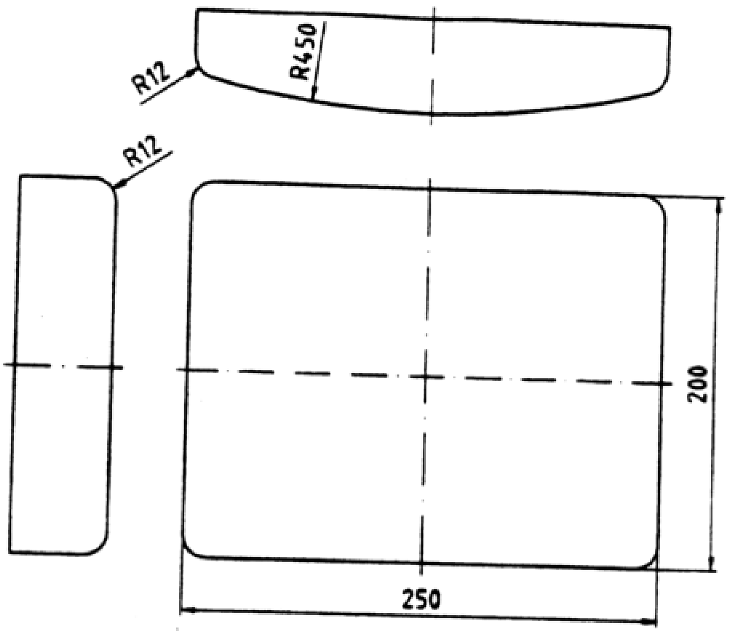


Figure 3 - Back loading pad

3.10 Arm fatigue test apparatus

An apparatus capable of applying a cyclic force simultaneously to both arm rests. The forces shall be applied through an arm rest loading device in principle functioning as shown in Figure 4.

The apparatus, made of two devices, shall be capable of applying the forces at varying angles to the vertical by means of low friction pivots. It can be adjusted both vertically and horizontally and then locked in position (see Figure 14). The apparatus shall be capable of following the deformation of the arm rests during testing.

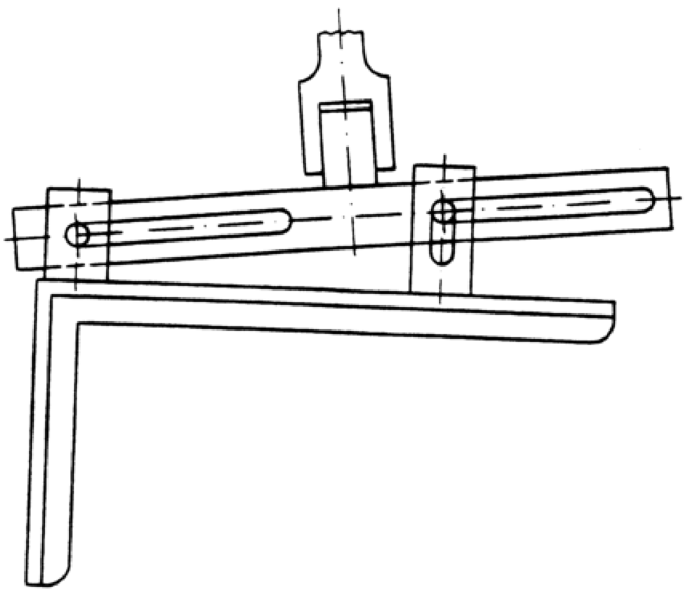


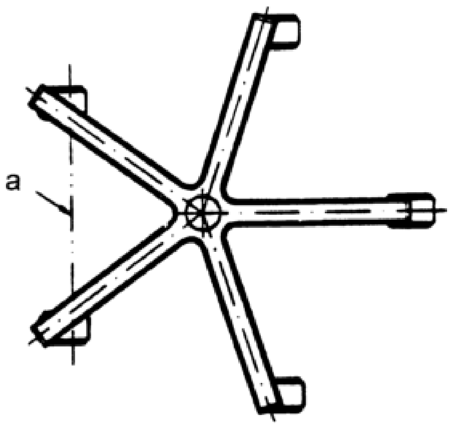
Figure 4 - Arm fatigue test - Arm loading device

4 General test conditions

4.1 Positioning

Unless otherwise stated, position the chair on the floor surface (see 3.1) with the supporting points restrained by stops (see 3.3).

The chair components, e.g. castors, shall for each test be positioned such as to ensure the most adverse configuration, i.e. the one giving the least favourable test result (see Table 2) and shall be recorded in the test report.



a Tipping axis

Figure 5 - Position of castors most likely to cause overbalancing

Table 2 - Positioning of chair components

Clause	Test	Seat height	Seat	Back rest in height	Back rest in depth	Position of castors	Arm rest
5.1	Front edge overbalancing	highest position	foremost position	highest position	foremost position	see Figure 5	most likely to cause failure
5.2	Forwards overbalancing	highest position	foremost position	highest position	foremost position	see Figure 5	most likely to cause failure
5.3.1	Sideways overbalancing for chairs without arm rests	highest position	foremost position	highest position	foremost position	see Figure 5	---
5.3.2	Sideways overbalancing for chairs with arm rests	highest position	foremost position	highest position	foremost position	see Figure 5	most likely to cause failure
5.4.1	Determination of the maximum offset of the back rest	highest position	rearmost position	most adverse position	rearmost position	see Figure 5	most likely to cause failure
5.4.2	Rearwards overbalancing of chairs without back rest inclination	highest position	rearmost position	highest position	rearmost position	see Figure 5	most likely to cause failure
5.4.3	Rearwards overbalancing of chairs with back rest inclination	highest position	rearmost position	highest position	rearmost position	see Figure 5	most likely to cause failure
6	Testing of rolling resistance	lowest position	---	---	---	---	---
7	Testing of seat and back rest	highest position	horizontal	highest position	most likely to cause failure	most likely to cause failure	---
8	Testing of back rests which are rotatable around a horizontal axis	---	---	---	---	---	---
9.1	Testing of durability of arm rests	lowest position	---	---	---	---	highest and outermost position
9.2	Vertical static load test of arm rests	lowest position	---	---	---	---	highest and outermost position

4.2 Loading points

Loading point "A", see 3.3 of EN 1335-1:2000.

Loading point "B" is the point of the back rest in the median plane (in the middle of the back rest width l), 300 mm vertically above point "A".

4.3 Test frequency

Unless otherwise stated, a rate of testing of 15 ± 5 cycles per minute is recommended. Higher or lower rates of testing are permissible providing:

a) there is no kinetic heating or dynamic forces; and
b) the variation in rate of testing is recorded in the test report.

4.4 Tolerances

For tolerances, unless otherwise stated:

- all forces shall have an accuracy of ±5 % of the nominal force;
- all masses an accuracy of ±0,5 % of the nominal mass;
- all dimensions an accuracy of ±1 mm;
- all angles an accuracy of ±2°;
- the positioning of loading pads an accuracy of ±5 mm.

Note: The tests specify the application of forces. Masses may, however, be used. The relation 10 N for 1 kg may be used for this purpose.

5 Stability tests

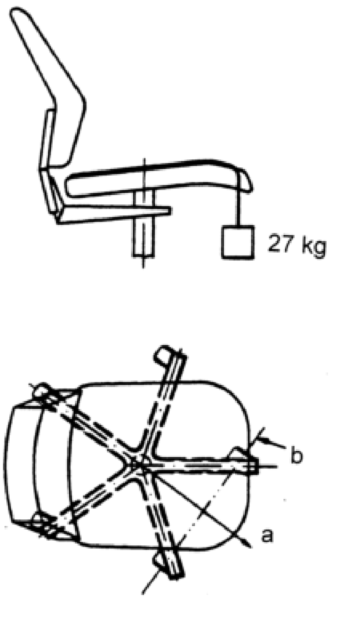
5.1 Front edge overbalancing

Do not position the chair with the stops (see 3.3) against the supporting points.

Position the chair components as specified in 4.1 and Table 2.

Fix the strap (see 3.8) to the chair as shown in Figure 6, i.e. the force is applied at the point on the front edge that is furthest from the axis of rotation, and allow the 27 kg mass to hang freely.

Record whether the chair overbalances.



a Direction of strap
b Tipping axis

Figure 6 - Front edge overbalancing

5.2 Forwards overbalancing

Position the chair with the stops (see 3.3) against the supporting points on the front. Position the chair components as specified in 4.1 and Table 2.

Apply a vertical force of 600 N by means of the smaller seat loading pad (see 3.5) acting 60 mm from the front edge of the load bearing structure at those points most likely to result in overbalancing. Apply a horizontal force of 20 N outwards from the point where the base of the loading pad meets the upper surface of the seat for at least 5 s (see Figure 7).

Record whether the chair overbalances.

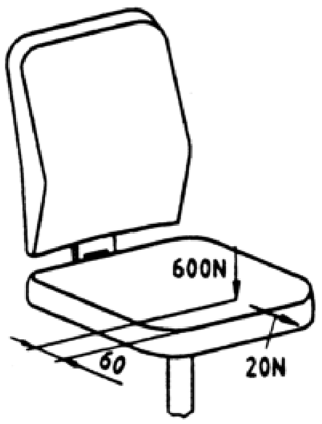


Figure 7 - Forwards overbalancing

5.3 Sideways overbalancing

5.3.1 Sideways overbalancing for chairs without arm rests

Position the chair with the stops (see 3.3) against the supporting points on one side. Position the chair components as specified in 4.1 and Table 2.

Apply a vertical force of 600 N by means of the smaller seat loading pad (see 3.5) acting 60 mm from the edge of the load bearing structure of the side nearest the stopped supporting points at those points most likely to result in overbalancing. Apply a horizontal sideways force of 20 N outwards from the point where the base of the loading pad meets the upper surface of the seat for at least 5 s (see Figure 8).

Record whether the chair overbalances.

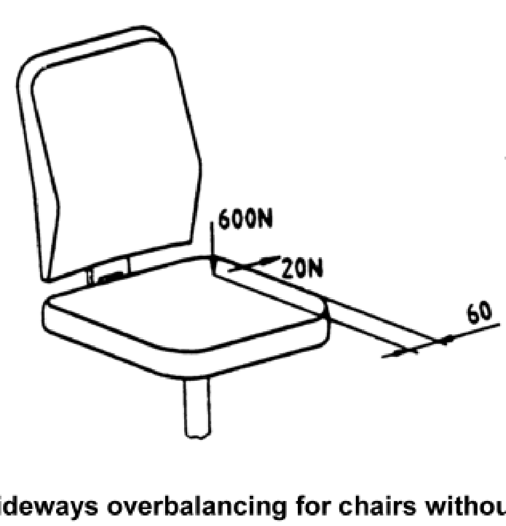


Figure 8 - Sideways overbalancing for chairs without arm rests

5.3.2 Sideways overbalancing for chairs with arm rests

Position the chair with the stops (see 3.3) against the supporting points on one side. Position the chair components as specified in 4.1 and Table 2.

Apply a vertical force of 250 N by means of the smaller seat loading pad (see 3.5) acting at a point 100 mm to the side of the median plane where the supporting points are restrained (see Figure 9) and between 175 mm and 250 mm forward of the rear edge of the seat and as close as possible to the side edge. Apply a vertical force of 350 N by means of the smaller seat loading pad (see 3.5) acting at points on the arm rest up to a maximum 40 mm inwards from the outer edge of the arm rest but not beyond the centre of the arm rest and at the most adverse position along its length. Apply a horizontal sideways force of 20 N outwards from the point where the base of the loading pad meets the upper surface of the arm rest for at least 5 s (see Figure 9).

Record whether the chair overbalances.

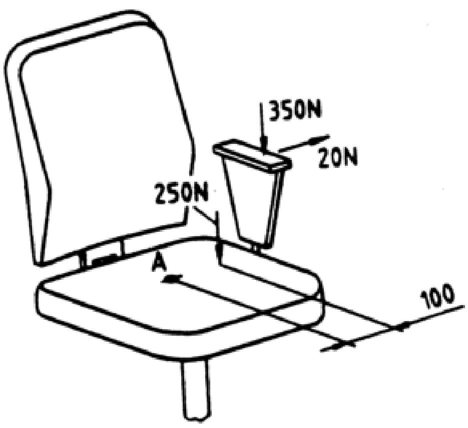


Figure 9 - Sideways overbalancing for chairs with arm rests

5.4 Rearwards overbalancing

The rearwards stability may be determined by the determination of the maximum offset of the back rest according to 5.4.1 or by the experimental method described in 5.4.2 respectively 5.4.3.

5.4.1 Determination of the maximum offset of the back rest

Position the chair with the stops (see 3.3) against the supporting points on the back. Position the chair components as specified in 4.1 and Table 2.

During the test the base of the chair shall be prevented from lifting by applying a mass of ≥ 75 kg at point "A". If applicable, the reclining force of the back rest shall be set at its lowest level. Tilting devices of the back rest shall be unlocked so that the back rest can move freely.

A force of 315 N shall be applied to the back rest at a point 220 mm (determined with the back rest in forward position) vertical above point "A" perpendicular to the back rest when fully loaded (see Figure 10).

If the back rest is rotatable around a horizontal axis the pivot point shall be set at a height of 220 mm above point "A". The force shall be applied at the pivot point. If the vertical distance between "A" and the pivot point of the back rest is smaller than 220 mm the bending moment (315 N × 0,22 m = 69,3 Nm) shall remain constant, i.e. the force shall be increased.

The offset of the back rest is the horizontal distance between the supporting point "S" of the back rest under load and the axis of rotation of the chair.

Record the maximum offset *m* of the back rest.

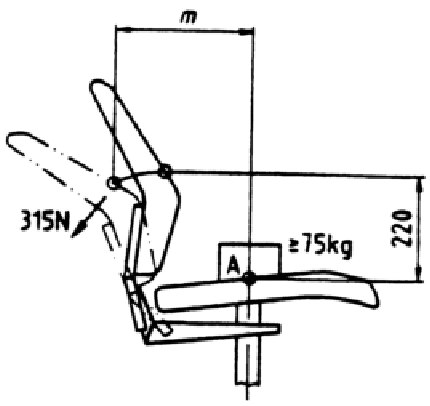


Figure 10 - Determination of the maximum offset of the back rest

5.4.2 Chairs without back rest inclination

Position the chair with the stops (see 3.3) against the supporting points on the back. Position the chair components as specified in 4.1 and Table 2.

If the back rest is rotatable around a horizontal axis and is free to move, the horizontal force shall be applied on the axis. If height adjustable, the axis shall be set as close as possible to 300 mm from point "A".

A vertical force of 600 N shall be applied at point "A" and a horizontal force of 192 N shall be applied at point "B" (see Figure 11).

Record whether the chair overbalances.

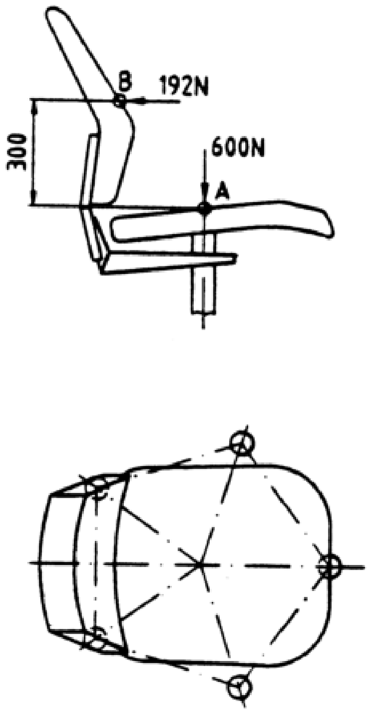


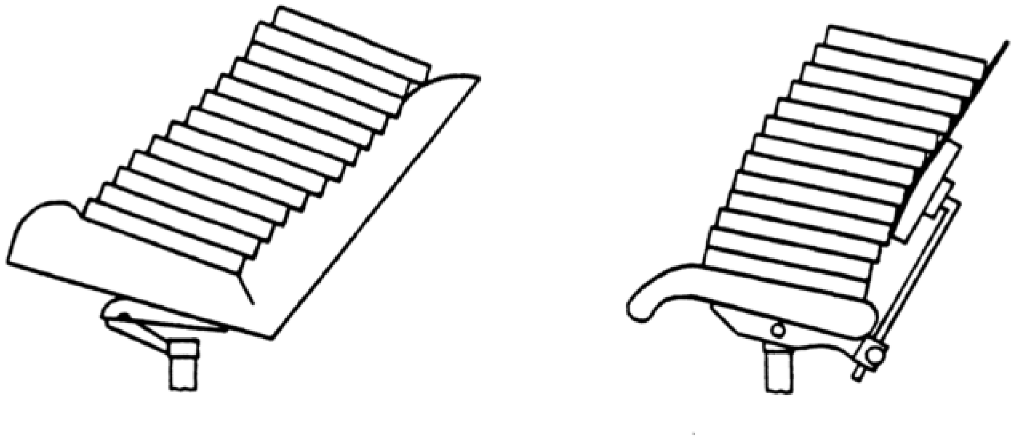
Figure 11 - Rearwards overbalancing - Chairs without back rest inclination

5.4.3 Chairs with back rest inclination

Do not position the chair with the stops (see 3.3) against the supporting points. Position the chair components as specified in 4.1 and Table 2.

Load the chair with 13 discs (see 3.7) so that the discs are firmly settled against the back rest as shown in Figure 12 a. If the height of the stack of discs exceeds the height of the back rest, prevent the upper discs from sliding off by the use of a light support (see Figure 12 b).

Record whether the chair overbalances.



a) b)

Figure 12 - Rearwards overbalancing - Chairs with back rest inclination

Note: The test is similar to EN 1022 except for the number of the discs.

6 Testing of rolling resistance of the unloaded chair

6.1 Test method

The chair shall be placed on the test surface (see 3.2) and shall be pushed or pulled over a distance of at least 550 mm. A speed of (50 $\pm$ 5) mm/s shall be maintained over the measuring distance. The force shall be applied at a height of (200 $\pm$ 50) mm above the floor surface.

Record the force used to push or to pull the chair before and after fatigue (see 6.2). The mean value of the forces measured over the distance from 250 mm to 500 mm is the rolling resistance.

6.2 Fatigue

The chair shall be placed on a rotating table with a test surface according to 3.2.1 so that the rotating axis of the chair coincides with the rotating axis of the table. The underframe shall be loosely fixed in such a way that there is no rotation of the base but that the natural movements of the castors during testing are not prevented. The castors shall be left free to swivel. The table shall be rotated with a speed of 6 min^{-1}. The angle of rotation shall be from 0° to 180° and back. At each change of direction the table stands still for 2 s. During testing the chair shall be loaded cyclically with 75 kg at point "A" for 60 s and unloaded for 30 s. The duration of the fatigue test shall be 100 h.

7 Testing of seat and back rest

7.1 Adjustment and determination of back rest loads

For seat and back rest tests the loading points are shown in Figure 13.

The loading points “B”, “E” and “H” shall be 300 mm vertically above point “A” (determined with the back rest in vertical position). If the back rest is rotatable around a horizontal axis and is free to move, the forces shall be applied on the axis. If height adjustable, the axis shall be set as close as possible to 300 mm.

If the vertical distance between “B-E-H” and “A” is smaller than 300 mm, the bending moment (320 N × 0,3 m = 96 Nm) shall remain constant, i.e. the force applied on the back rest shall be increased.

Example: Vertical distance “A” to “B” = 250 mm
required bending moment = 96 Nm

required force to the back rest $= \frac{96\ \text{Nm}}{0{,}25\ \text{m}} = 384\ \text{N}$

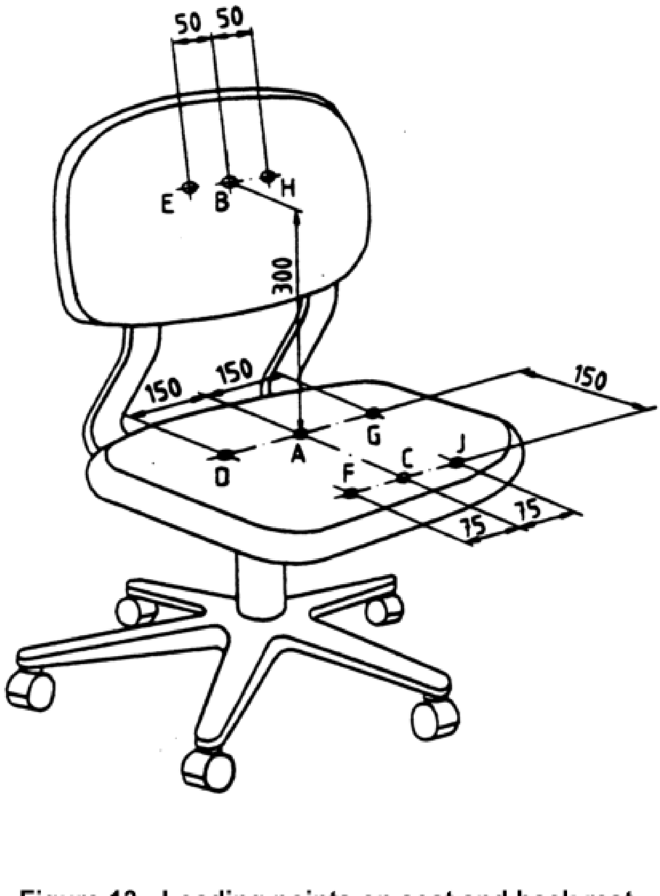


Figure 13 - Loading points on seat and back rest

7.2 Test procedure

Position the chair and its components as specified in 4.1 and Table 2. The upper part of the chair shall be rotated so that the centre of the back rest is midway between two adjacent supporting points. The seat load shall be vertical. The back rest loads (see Table 3) shall be applied at an angle of 90° ± 10° to the back rest when fully loaded.

Tilting devices of the back rest shall be unlocked so that the back rest can move freely.

The seat and back rest shall be tested as specified in Table 3.

Table 3 - Test sequence, forces and cycles of the seat and back rest test

Step	Sequence	Loading point	Force in N	Number of cycles
1	A	A	1 500	120 000
2	C - B	C	1 200	alternating
		B	320	80 000
3	J - E	J	1 200	alternating
		E	320	20 000
4	F - H	F	1 200	alternating
		H	320	20 000
5	D - G	D	1 100	alternating
		G	1 100	20 000

Each step shall be completed before going to the next.

When loading the front of the seat and the back rest alternatively (Table 3, step 2, 3 and 4), the chair shall be prevented from overbalancing. This shall be done by means of a device or mass acting in point “A” as close as practicably possible to the centre column without influencing the joint between the base and the centre column.

Record any fracture or damage to the chair.

8 Additional test for back rests which are rotatable around a horizontal axis

This test applies only to back rests which are rotatable around a horizontal axis and which are fitted with stops in the rearward direction or to back rests for which the rearward rotation may cause serious wear that may lead to rupture, e.g. back rests mounted directly on rubber bushes.

Fix the chair by any suitable means in order to hold it in the correct position during testing and to prevent it from overbalancing.

Support the back rest structure below the horizontal pivot point in order to avoid fatigue stresses in other parts than the horizontal pivot.

Apply a force of 200 N to the back rest at a point 100 mm above the horizontal pivot axis in its median plane. The force shall always be applied at an angle of 90° ± 10° to the back rest when fully loaded.

Carry out the test for 25 000 cycles.

Record any fracture or damage of the horizontal pivot or stop.

9 Testing of arm rests

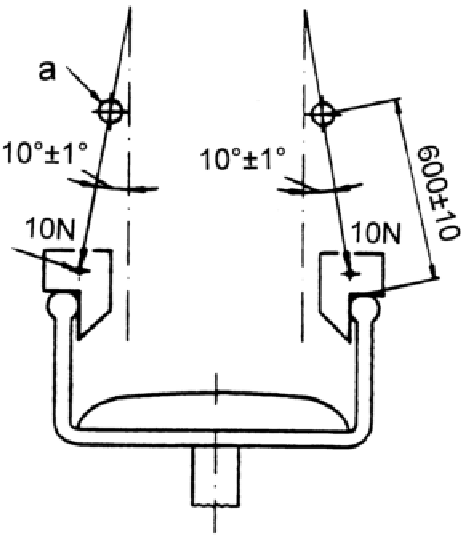
9.1 Testing of durability

With the seat height set at its lowest position, the arm rests shall be loaded simultaneously and cyclically at points 100 mm behind the foremost point of the arm rest length *n* (see 6.12 of EN 1335-1:2000).

Using the test principles shown in Figure 14 and in Figure 4, apply a force of 10 N. With this force applied adjust the apparatus so that each "arm" of the test apparatus has an angle of 10° ± 1° to the vertical. The length of the "arm" of the test apparatus shall be 600 mm ± 10 mm when the "arm" is unloaded. The arm rests shall be allowed to deform freely.

Each arm rest shall be loaded with 400 N, 60 000 times.

Record any fracture or damage to the chair.



a Low friction pivot

Figure 14 - Testing of durability of arm rests

9.2 Vertical static load test

The arm rests shall be loaded vertically by means of a loading pad covering 150 mm of the length of the arm rest and at least as wide as the arm rest, e.g. the smaller seat loading pad (see 3.5). The loading points shall be at the centre points of the width of the arm rests as specified in 6.13 of EN 1335-1:2000 and at any point along the length of the arm rests as specified in 6.12 of EN 1335-1:2000 most likely to cause failure, but not less than 100 mm from each end of the arm rests.

The force shall be applied for a period of 10 s ± 2 s to both arm rests simultaneously or to one arm rest and then to the other using a suitable counterbalancing load.

The arm rests shall be allowed to deform freely.

9.2.1 Functional load

Apply a force of 750 N five times to each arm rest.

Record any fracture or damage to the chair.

9.2.2 Overload

Apply a force of 900 N five times to each arm rest.

Record any fracture of the chair.

10 Test report

The test report shall include at least the following information:

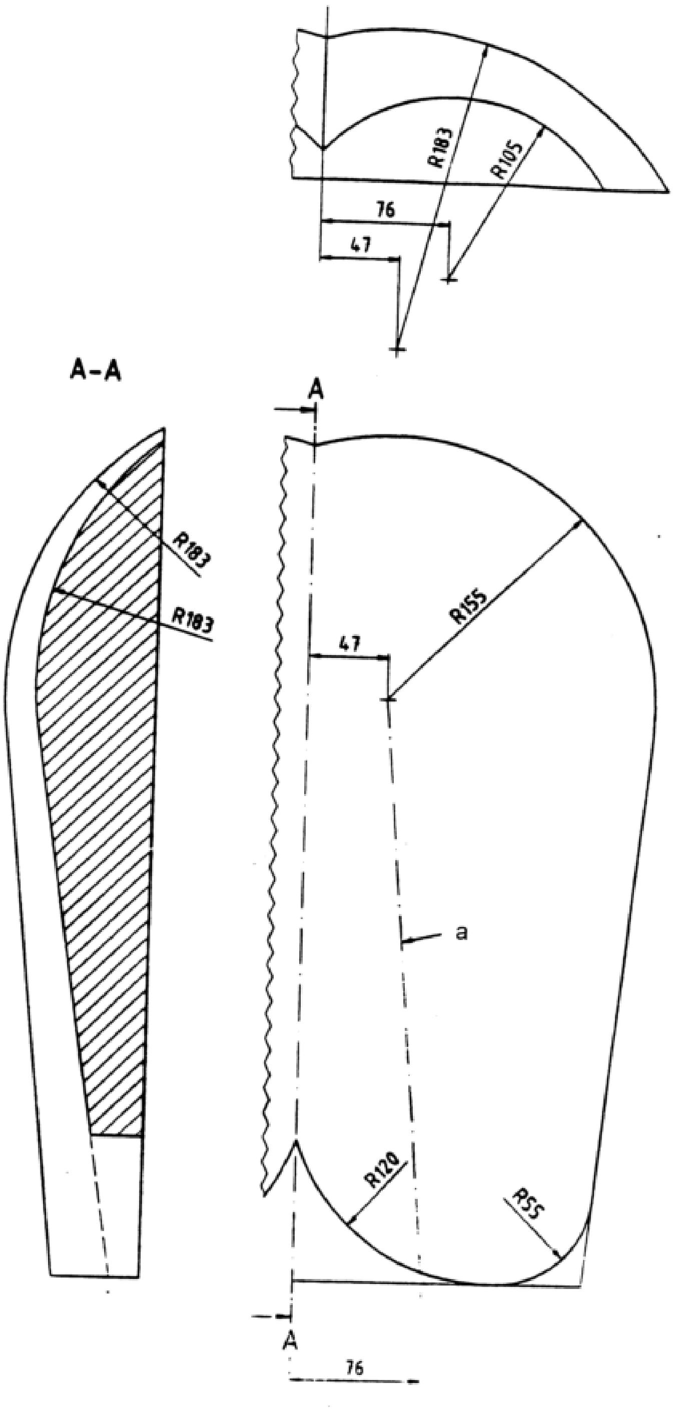
a) a reference to this European Standard;
b) relevant data of the test item;
c) details of any defects before testing;
d) positioning of chair components;
e) rearwards overbalancing test method;
f) test results;
g) details of any deviation from this European Standard;
h) the name and the address of the test laboratory;
i) the date of the test.

Annex A (normative)

Seat loading pad data

The seat loading pad specified in 3.4 of this European Standard currently exists in two versions.

a) Machined in hardwood, as shown in Figure A.1.
b) Moulded from the fibre glass, as shown in Figure A.2.



a Axis of the cone

Figure A.1 - Seat loading pad geometry - Hardwood construction

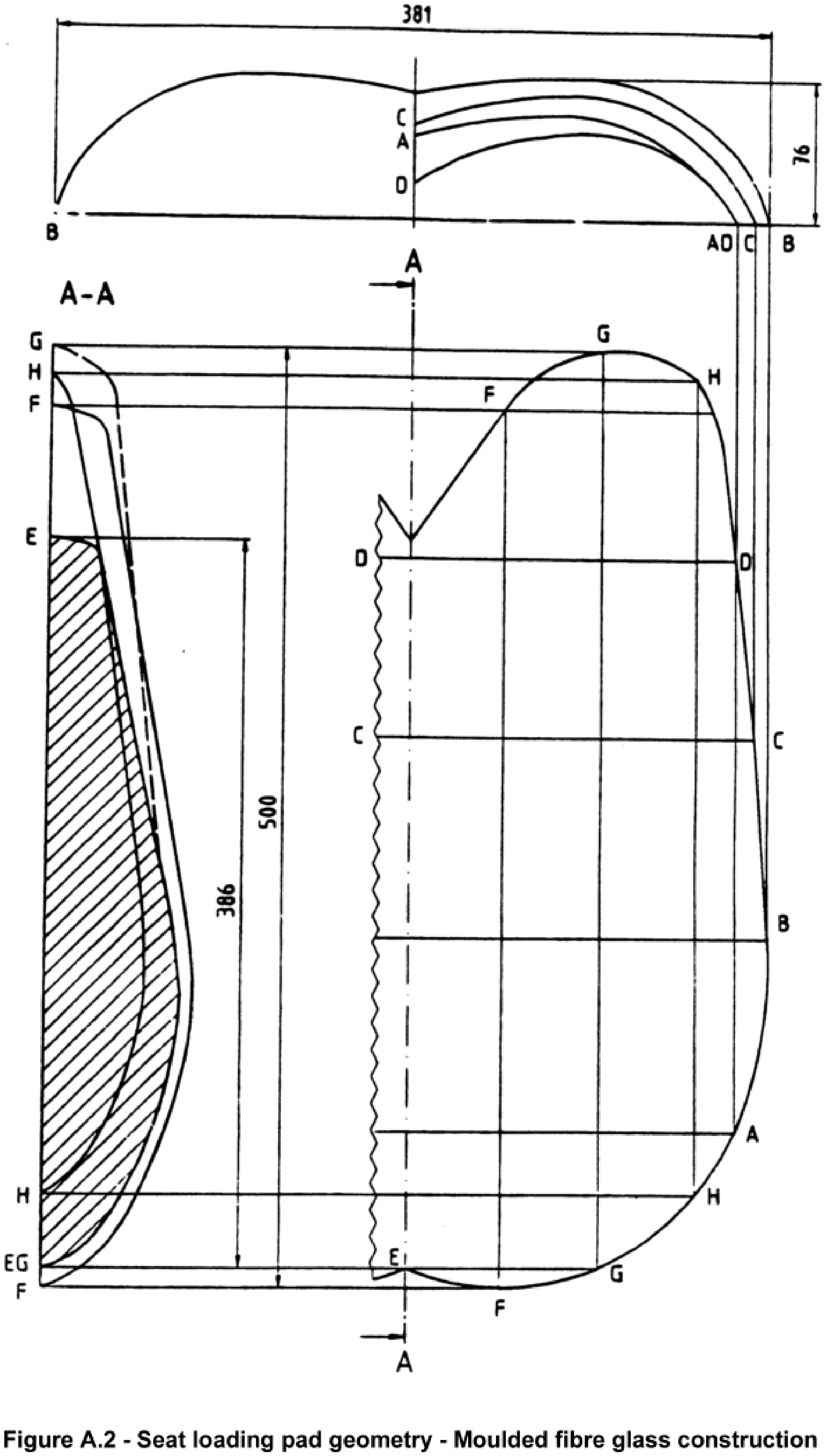


Figure A.2 - Seat loading pad geometry - Moulded fibre glass construction