भारतीय मानक
Indian Standard

IS 17631 : 2022

[*Superseding* IS 3499 (Part 1) : 1985, IS 3499 (Part 2) : 1985 *and* IS 11525 : 1986]

कार्य कुर्सियाँ — विशिष्टि

Work Chairs — Specification

ICS 97.140

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Furniture Sectional Committee, CED 35

FOREWORD

This Indian Standard was adopted by the Bureau of Indian Standards, after the draft finalized by the Furniture Sectional Committee had been approved by the Civil Engineering Division Council.

The Indian Standards on different type of office work chairs were published/revised as IS 3499 (Part 1) : 1985 'Specification for metal chairs for office purposes Part 1 Non-revolving and non-tilting' and IS 3499 (Part 2) : 1985 'Specification for metal chair for office purposes Part 2 Revolving and tilting' and IS 11525 : 1986 'Specification for wooden chairs for office purposes'. In view in the diversification in the use of different materials and finishing system in the furniture industry, this standard has been brought out and supersedes IS 3499 (Part 1) : 1985, IS 3499 (Part 20) : 1985 and IS 11525 : 1986. In this version, the requirements related to the performance and safety in terms of strength, stability and durability for work chairs have been specified. This standard applies to completely manufactured/fabricated work chairs. It also applies to ready-to-assemble units; in that case the requirements of this standard shall apply to the assembled units. The tests are designed to evaluate properties without regard to materials, design/construction or manufacturing processes.

The forces and dimensions are applicable to work chairs intended for adult persons. The tests given in the standard are to check against surface requirements and the application, to various parts of the item, forces simulating normal functional use, as well as misuse that can reasonably be expected to occur.

The loads and cycles specified in the requirements of this standard are for all types of work chairs irrespective of their construction or materials used. Usage of these performance criteria for work chairs in industrial areas not identical to office use are not covered in the scope of this standard.

The figures given in this Indian Standard are typical and the suggested test procedures shall be followed.

In the formulation of this standard, considerable assistance has been derived from ISO 21015 : 2007 'Office furniture — Office work chairs — Test methods for the determination of stability, strength and durability'.

The composition of the Committee responsible for the formulation of this standard is given in Annex C.

For the purpose of deciding whether a particular requirement of this standard is complied with the final value, observed or calculated, expressing the result of a test or analysis shall be rounded off in accordance with IS 2 : 1960. 'Rules for rounding off numerical values (*revised*)'. The number of significant places retained in the rounded off value should be the same as that of the specified value in this standard.

Indian Standard

WORK CHAIRS — SPECIFICATION

1 SCOPE

This standard covers the requirements of work chairs. This standard applies to completely manufactured/fabricated work chairs. It also applies to ready-to-assemble units; in that case the requirements of this standard shall apply to the assembled units.

2 REFERENCES

The following Indian standards contain provisions which through reference in this text, constitute provisions of this standard. At the time of publication, the editions indicated were valid. All standards are subject to revision, and parties to agreements based on this standard are encouraged to investigate the possibility of applying the most recent editions of the standards indicated in below:

IS No.	*Title*
3663 : 2018	Dimensions of tables and chairs for office purposes (*third revision*)
17524 : 2021/ ISO 22880 : 2016	Castors and wheels — Requirements for castors for swivel chairs
17637 : 2021	Performance requirements of surface finishes for furniture applications

3 TERMINOLOGY

For the purposes of this part of standard, the following definitions shall apply.

3.1 Arm Rest Length — Distance between vertical lines through the front and rear edges of the arm-top.

NOTE — In the case of an arm rest that is not horizontal or that is curved, the length is measured in a horizontal plane 20 mm below the highest point of the arm rest.

3.2 Column — Work chair's component that connects the base and the seat structure.

3.3 Durability Tests — Tests simulating the repeated movement of components occurring during long-term use and assessing the strength of the furniture under such conditions.

3.4 Locking Device — Device that inhibits or limits the movement of the seat action and/or of the back rest.

3.5 Stability Tests — Tests for the ability to withstand load in all normal use conditions without the product toppling or creating unsafe use case like injury to user or inability to perform task the product is meant for.

3.6 Strength Tests — Tests for the capacity of the product to withstand force or pressure as per usage conditions considering the extreme use conditions for a limited frequency of use.

3.6.1 *Static Tests* — Tests consisting of heavy loads being applied statically one or more times to ensure that the furniture has sufficient strength to perform its function under the highest levels of loading that might reasonably be expected to occur.

3.6.2 *Impact Tests* — Tests to assess the strength of the furniture under the rapid rates of loading that occasionally occurs.

3.7 Supporting Point — Generally, the two types of castors used for swivel chairs are as follows:

a) Castors with plain wheels defined as type *H*, hard tread. These castors are suitable for carpeted floors.

b) Castors with resilient tyre wheels defined as type *W*, soft tread. These castors are suitable for hard stone, wooden or tiled floors or those featuring non-textile covering.

3.8 Surface Finish Tests — Tests for surfaces of finished furniture to assess the resistance against given external conditions.

3.9 Work Chair — Piece of seating furniture for one person for office or commercial use, with a back rest, with or without arm rests and with or without provisions of reclining, whose upper part, which includes the seat, can rotate in the horizontal plane and can be adjusted in height.

NOTE — Other adjustments may be included.

4 DESIGN AND WORKMANSHIP

4.1 Design/model shall be as declared by the manufacturer.

4.2 The exposed/accessible edges and protruding parts shall be free from burrs, sharp edges and shall be rounded or chamfered. The ends of accessible hollow components shall be closed or capped. Movable and adjustable parts shall be designed so that injuries and inadvertent operations are avoided. In case of wooden components, the same shall be free from any stain, unless it is intended as part of design feature.

4.3 Castors or wheels shall be as per IS 17524 (except the dimensions given in clause **4.4** of IS 17524).

5 DIMENSIONS

The dimensions of chairs shall be as per IS 3663 where applicable.

NOTE — Any other dimensions and design specifications of chairs may be used as agreed between the manufacturer and the purchaser as per their requirements.

6 SURFACE PERFORMANCE

6.1 The test sample's rigid surfaces shall be tested for the following tests and shall qualify the minimum performance ratings specified in IS 17637.

a) Resistance to mechanical damage;
b) Pencil hardness;
c) Resistance to wet heat;
d) Resistance to dry heat;
e) Resistance to marking by cold liquids;
f) Resistance to marking by cold oils and fats; and
g) Adhesive performance.

The test samples for surface performance are to be tested on materials only and not on assembled chair.

6.2 Fabric and Leather (Synthetic and Natural) Performance

For fabric and/or leather (synthetic and natural) surfaces, the test sample surfaces shall be tested for the following tests and shall conform the minimum performance requirements specified in IS 17637.

a) *For Fabric and Synthetic Leather:*
   1) Breaking load,
   2) Elongation at break,
   3) Tear strength,
   4) Colour fastness to light,
   5) Colour fastness to rubbing,
   6) Colour fastness to perspiration,
   7) Colour fastness to water,
   8) Pilling resistance,
   9) Coating adhesion strength,
   10) Seam slippage,
   11) Resistance to damage by flexing,
   12) Abrasion resistance,
   13) Bursting strength, and
   14) Resistance to cold.
b) *For Natural Leather*
   1) Tear strength,
   2) Flexing endurance,
   3) Finish adhesion,
   4) Colour fastness to artificial light,
   5) Colour fastness to rubbing,
   6) Colour fastness to water spotting,
   7) Water vapour permeability, and
   8) Colour fastness to water.

The test samples for surface performance are to be tested on materials only and not on assembled chair.

7 SAFETY REQUIREMENTS

7.1 General

The general test conditions and test apparatus requirements for the safety tests shall be as given in Annex A and Annex B respectively. The forces mentioned in this standard are suitable for office work chairs considering a maximum user mass of 110 kg and used for 40 h per week. For chairs made for use by heavier people and/or for more hours per week, the following principles shall apply:

a) *For heavier people* — Multiply the forces by the actual weight divided by 110; example, for a chair for a 165 kg person, multiply the forces by 1.5.
b) *For more hours per week* — Multiply the number of cycles by the actual hours divided by 40; example, for a chair for 120 h use per week, multiply the cycles by 3. However, for continuous use throughout the week, multiply the cycles by 4.2.

NOTE — The stipulation in (b) is applicable only to durability test.

For chairs made for use both by heavier people and for more hours per week, carry out the multiplication of both forces and cycles.

7.2 Loading Points (*see* Fig. 1)

7.2.1 *Loading Point A*

This shall be the point in which the chair's axis of rotation intersects with the seat surface with the seat in a position as close as possible to the horizontal.

7.2.2 *Loading Point B*

This shall be the point on the centreline of the back rest, 300 mm above loading point *A* (*see* **7.2.1**), measured when the seat is loaded with 640 N through the seat-loading pad.

7.2.3 *Loading Point C*

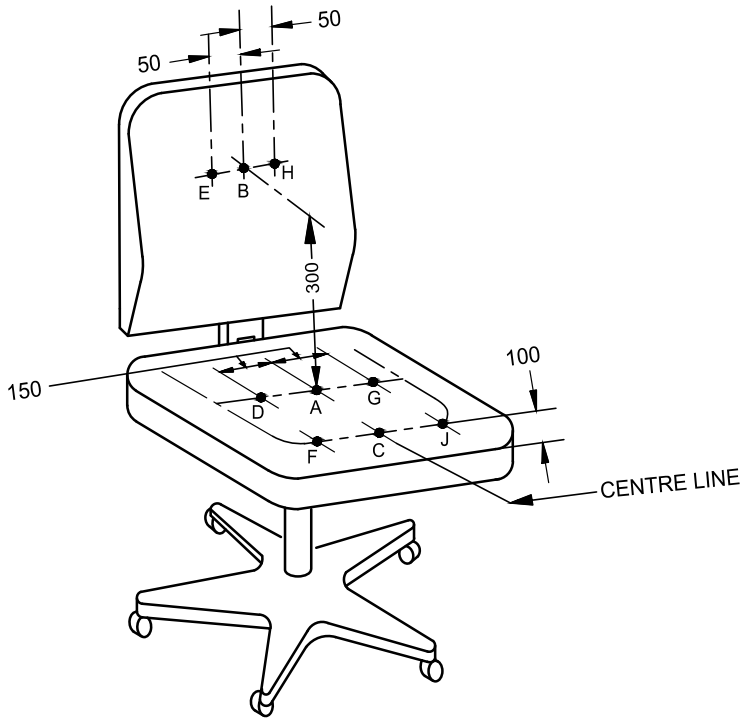
This shall be a point in front of loading point *A* (*see* **7.2.1**) along the centreline of the seat, 100 mm from the structure of the seat edge.

7.2.4 *Loading Point D*

This shall be the point 150 mm to the right of loading point *A* (*see* **7.2.1**).

7.2.5 *Loading Point E*

This shall be the point 50 mm to the right of loading point *B* (*see* **7.2.2**).



All dimensions in millimetres

FIG. 1 LOADING POINTS

7.2.6 *Loading Point F*

This shall be a point in front of loading point *D* (*see* **7.2.4**) on a line parallel to the centreline, 100 mm from the structure of the seat edge.

7.2.7 *Loading point G*

This shall be the point 150 mm to the left of loading point *A* (*see* **7.2.1**).

7.2.8 *Loading Point H*

This shall be the point 50 mm to the left of loading point *B* (*see* **7.2.2**).

7.2.9 *Loading Point J*

This shall be a point in front of loading point *G* (*see* **7.2.7**) on a line parallel to the centreline, 100 mm from the structure of the seat edge.

7.3 Stability Test

Position the chair on the test surface (*see* **B-2**) with its components as specified in **A-1** and Table 4.

7.3.1 *Front Edge Overturning*

Arrange the chair set-up as per Table 4 without any stops which hinder normal use condition. Fix the strap (*see* **B-9**) to the chair as shown in Fig. 2, so that, the force is applied at the point on the front edge that is furthest from the axis of rotation and allow the mass (*M*) to hang freely. The magnitude of mass shall be as given in Table 1. Record and assess defects in accordance with **8.4**.

7.3.2 *Forwards Overturning*

Position the chair with two adjacent supporting points (*see* **3.7**) on the front against the stops (*see* **B-3**).

Apply a vertical force (F_1) by means of the stability-loading device (*see* **B-10**), acting 60 mm from the front edge of the load bearing structure of the seat at those points most likely to result in overturning. Apply a horizontal outwards force (F_2) from the point on the seat surface where the vertical force is applied, (*see* Fig. 3), for 5 s. The magnitude of forces shall be as given in Table 1. Record and assess defects in accordance with **8.4**.

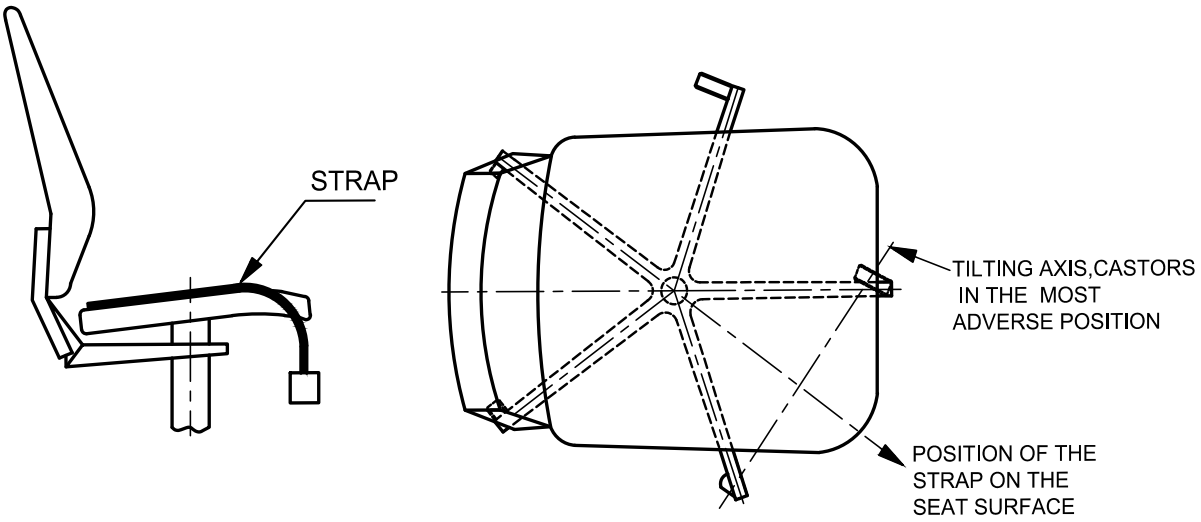
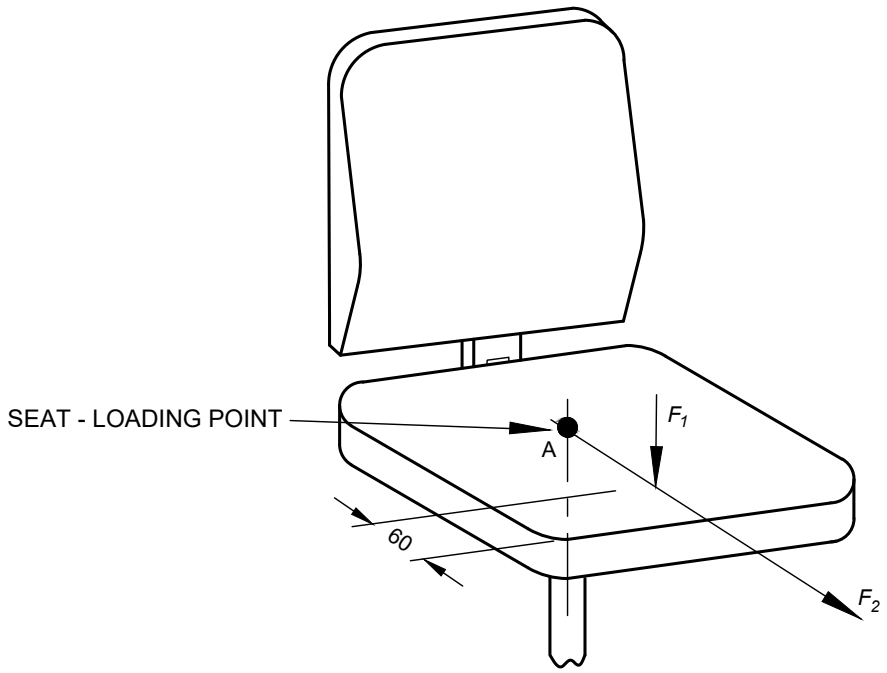


FIG. 2 FRONT EDGE OVERTURNING



All dimensions in millimetres

FIG. 3 FORWARD OVERTURNING

7.3.3 *Forwards Overturning for Chairs with Foot Rest*

For chairs with foot rests repeat the procedure as given in **7.3.2** on the foot rest. For round cross-section ring-shaped foot rests, the force shall be applied through the centre of the ring cross section. The magnitude of forces shall be as given in Table 1. Record and assess defects in accordance with **8.4**.

7.3.4 *Sideways Overturning for Chairs Without Arm Rests*

Position the chair with two adjacent supporting points (*see* **3.7**) on one side against the stops (*see* **B-3**).

Apply by means of the stability-loading device (*see* **B-10**) a vertical force, F_1, acting 60 mm from the edge (of the load bearing structure) of the side nearest to the stopped supporting points at those points most likely to result in overturning. Apply a horizontal sideways force, F_2, outwards from the point on the seat surface where the vertical force is applied (*see* Fig. 4), for 5 s. The magnitude of forces shall be as given in Table 1. Record and assess defects in accordance with **8.4**.

7.3.5 *Sideways Overturning for Chairs With Arm Rests*

Position the chair with two adjacent supporting points (*see* **3.7**) on one side against the stops (*see* **B-3**).

Apply by means of the stability-loading device (*see* **B-10**) a vertical force, F_1, acting at a point 100 mm from the centreline (front to rear edge) of the seat at the side where the supporting points (*see* **3.7**) are restrained (*see* Fig. 5) and between 175 mm and 250 mm forward of the rear edge of the seat. Apply a vertical downward force, F_2, acting at points on the arm rest that is on the same side as the restrained supporting points (*see* **3.7**) up to a maximum 40 mm inwards from the outer edge of the upper surface 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, F_3, outwards from the same point for 5 s (*see* Fig. 5). The magnitude of forces shall be as given in Table 1. Record and assess defects in accordance with **8.4**.

7.3.6 *Rearwards Overturning for Chairs Without Back Rest Inclination*

Position the chair with two adjacent supporting points (*see* **3.7**) on the back against the stops (*see* **B-3**). When an independent lumbar adjustment is fitted, it shall be set in the most adverse configuration.

A vertical force, F_1, shall be applied at point A (*see* **7.2.1**) and a horizontal force, F_2, shall be applied at point B (*see* **7.2.2**) (*see* Fig. 6). If the back rest pad is pivoting around a horizontal axis above the height of the seat and is free to move, the horizontal force shall be applied on the axis. If the back rest is height-adjustable, the axis shall be set as close as possible to 300 mm above point A (*see* **7.2.1**). The magnitude of forces shall be as given in Table 1. Record and assess defects in accordance with **8.4**.

7.3.7 *Rearwards Overturning for Chairs with Backrest Inclination*

Do not position the chair with the supporting points (*see* **3.7**) against the stops (*see* **B-3**). When an independent lumbar adjustment is fitted, it shall be set in the most adverse configuration.

Load the chair with discs (*see* **B-11**) so that the discs are firmly settled against the back rest as shown in Fig. 7. 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. The magnitude of forces shall be as given in Table 1. Record and assess defects in accordance with **8.4**.

7.4 Static-load Tests

Position the chair and its components as specified in **A-1** and Table 4 on the test surface (*see* **B-2**). Prevent the chair from movement by placing stops (*see* **B-3**) at supporting points.

7.4.1 *Seat Front Edge Static Load Test*

Position the smaller seat loading pad (*see* **B-5**) at loading point *F* (*see* **7.2.6**) or *J* (*see* **7.2.9**). Apply a vertical downward force (F_1), through the centre of the loading pad. The forces and their number of cycles shall be as given in Table 3. Record and assess defects in accordance with **8.4**.

7.4.2 *Combined Seat and Back Static Load Test*

Prevent the chair from moving rearwards by placing stops (*see* **B-3**) behind two adjacent supporting points (*see* **3.7**) at the rear of the chair.

Chairs with a locking device(s) for seat and/or back rest angle movements shall be tested first with the device(s) locked for half of the cycles and then with the device(s) unlocked for the other half of the cycles. For the first half of the cycles, the back rest shall be in the upright position.

Apply a vertical force (F_1), through the seat loading pad (*see* **B-4**) at point A (*see* **7.2.1**). Keep the seat loaded and apply a force (F_2) perpendicular to back seat, through the centre of the back loading pad (**B-7**) at point B (*see* **7.2.2**). When fully loaded, the force shall act at 90° ± 10° to the back rest plane (*see* Fig. 8). Remove the back force and then the seat force. The forces and their number of cycles shall be as given in Table 3. Record and assess defects in accordance with **8.4**.

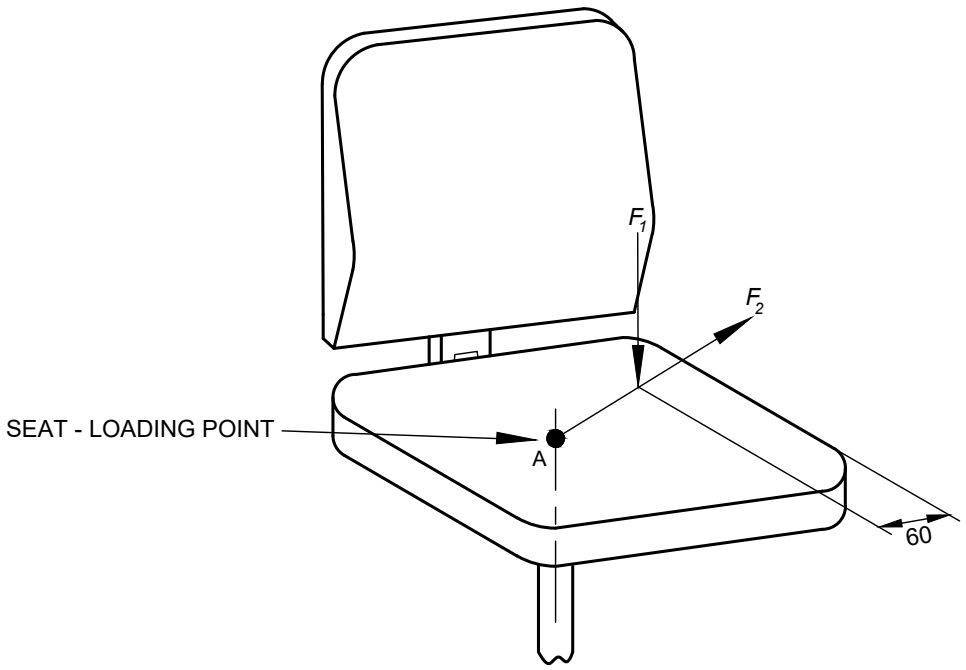
7.4.3 *Arm Rest Downward Static Load Test — Central*

The arm rests shall be loaded vertically by means of the local loading pads (see **B-6**). The loading points shall be at the mid-point of the arm rest length (*see* **3.1**). The loading pads shall be centred side to side. Apply the force (*F*) to both armrests simultaneously (*see* Fig. 9).

Table 1 Forces for Stability Tests

(*Clauses* 7.3.1, 7.3.2, 7.3.3, 7.3.4, 7.3.5, 7.3.6*, and* 7.3.7)

Sl No.	Tests	Mass/Force/Number	
		Type	Magnitude
(1)	(2)	(3)	(4)
i)	Front edge overturning	Mass (M), kg	27
ii)	Forwards overturning	Downwards force (F_1), N	600
		Horizontal force (F_2), N	20
iii)	Forwards overturning for chairs with footrest	Downwards force (F_1), N	1 100
		Horizontal force (F_2), N	20
iv)	Sideways overturning for chairs without arm rests	Downwards force (F_1), N	600
		Horizontal force (F_2), N	20
v)	Sideways overturning for chairs with arm rests	Downwards force (F_1), N	250
		Downwards force (F_2), N	350
		Horizontal force (F_3), N	20
vi)	Rearwards overturning for chairs without back-rest inclination	Downwards force (F_1), N	600
		Horizontal force (F_2), N	192
vii)	Rearwards overturning for chairs with back-rest inclination	Number of discs	13



All dimensions in millimetres

FIG. 4 SIDEWAYS OVERTURNING FOR CHAIRS WITHOUT ARM RESTS

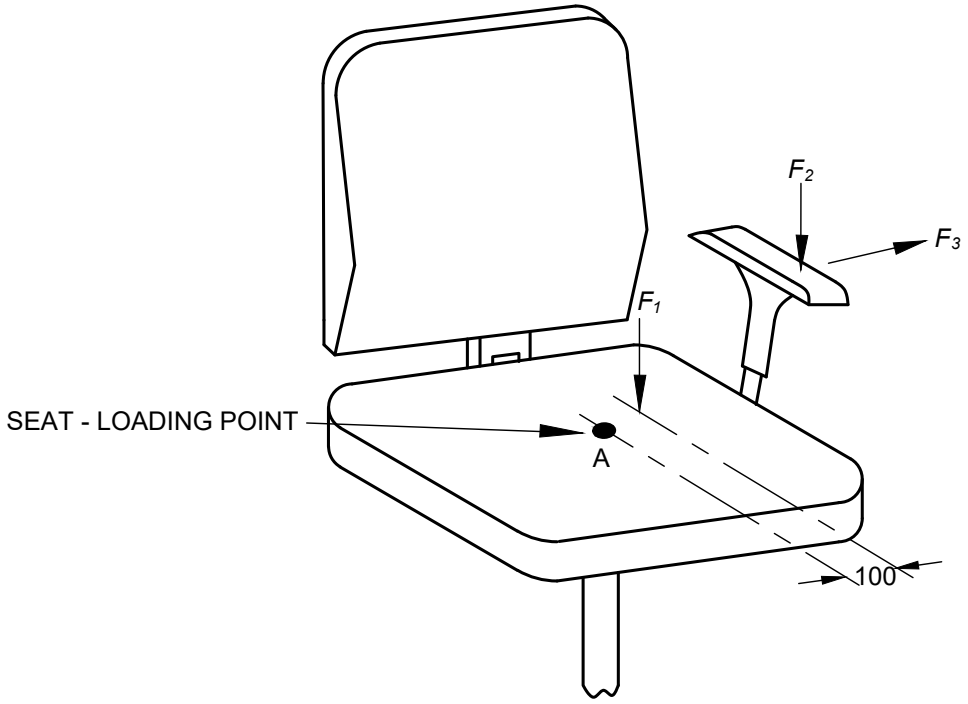


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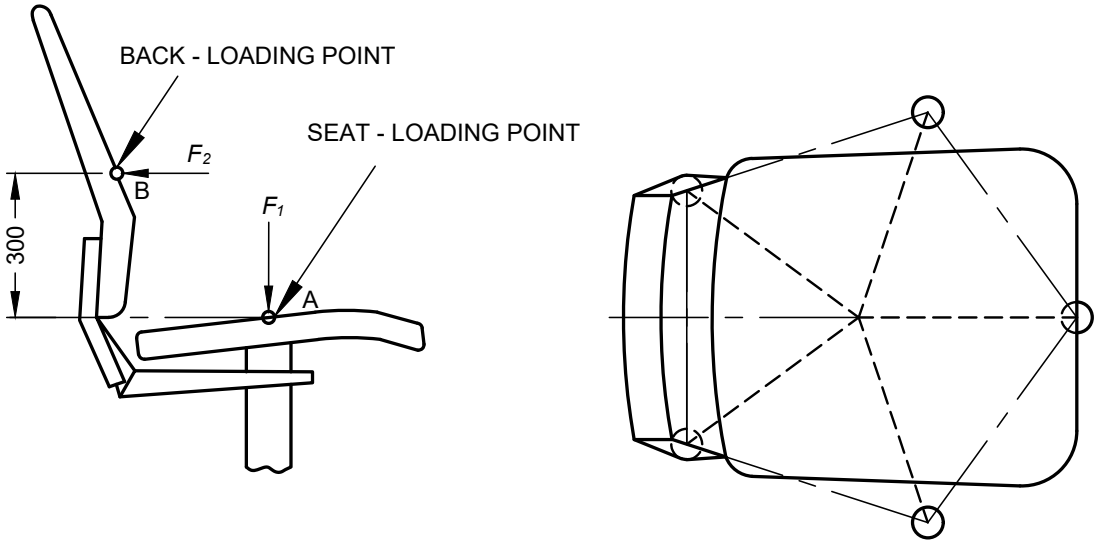
FIG. 5 SIDEWAYS OVERTURNING FOR CHAIRS WITH ARM RESTS



All dimensions in millimetres

FIG. 6 REARWARDS OVERTURNING FOR CHAIRS WITHOUT BACK-REST INCLINATION

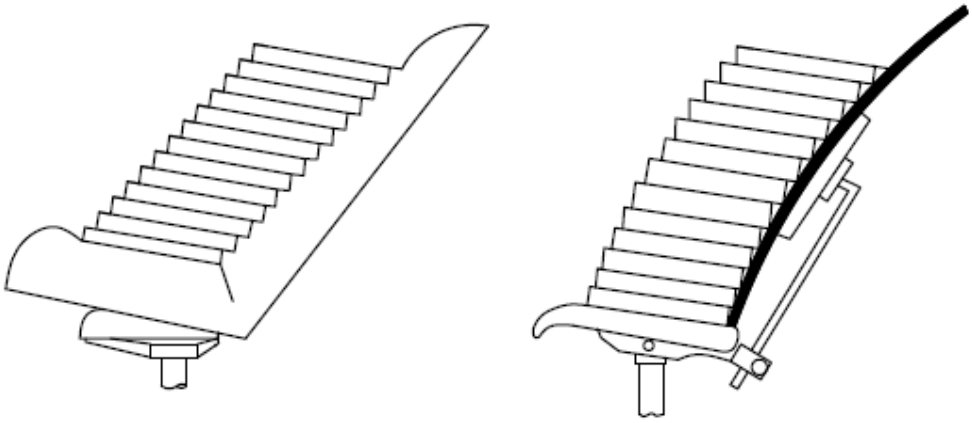


FIG. 7 REARWARDS OVERTURNING FOR CHAIRS WITH BACK-REST INCLINATION

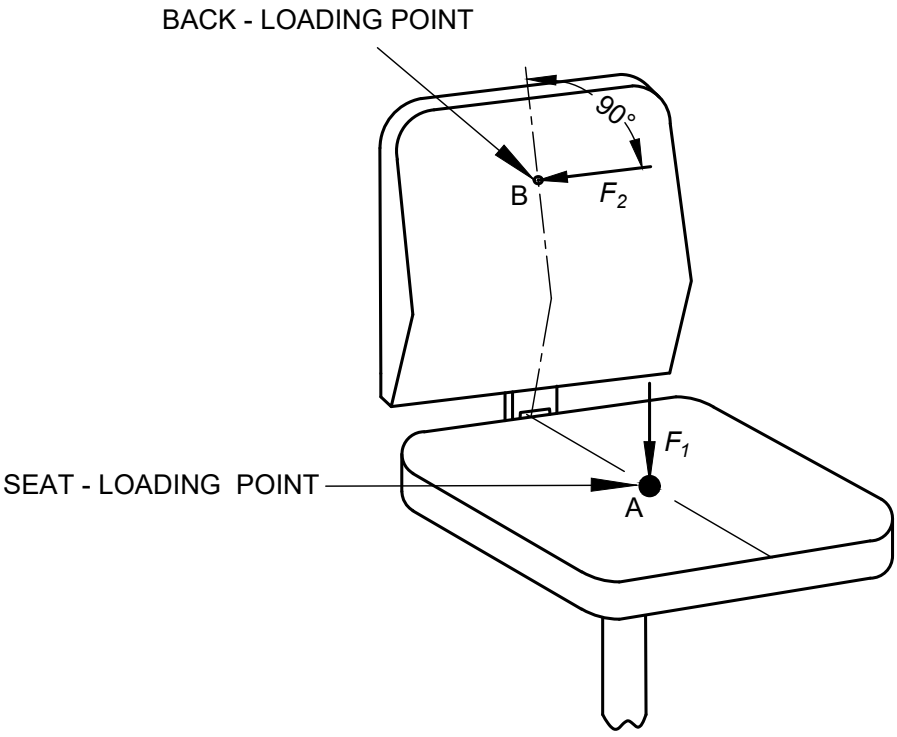


FIG. 8 COMBINED SEAT AND BACK STATIC-LOAD TEST

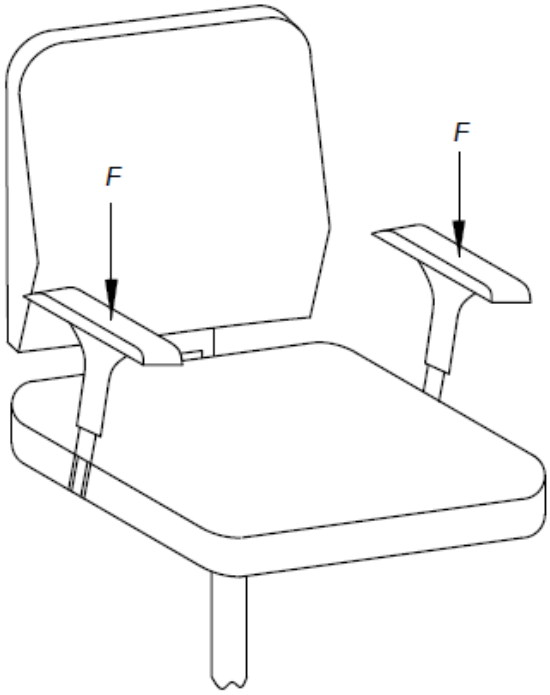


FIG. 9 ARM REST DOWNWARD STATIC-LOAD TEST – CENTRAL

The forces and their number of cycles shall be as given in Table 3. Record and assess defects in accordance with **8.4**.

7.4.4 *Arm Rest Downward Static Load Test — Front*

The arm rests shall be loaded vertically by means of the local loading pads (*see* **B-6**). The loading points shall be on the centreline of the arm-rest length (*see* **3.1**) and 75 mm from the front edge. Apply the forces to both arm rests simultaneously (*see* Fig. 10).

The forces and their number of cycles shall be as given in Table 3. Record and assess defects in accordance with **8.4**.

7.4.5 *Arm Rest Sideways Static Load Test*

Apply an outward horizontal force to both arm rests simultaneously. Apply the forces (*F*) to the edge of the arm rests at the point along the arm rests most likely to cause failure but not less than 75 mm from the front or rear edge (*see* Fig. 11).

The forces and their number of cycles shall be as given in Table 3. Record and assess defects in accordance with **8.4**.

7.4.6 *Foot Rest Static Load Test*

Apply a vertical force (*F*) acting 80 mm from front edge of the load bearing structure of the foot rest at those points most likely to cause failure. For round cross-section ring-shaped foot rests, the force shall be applied through the centre of the ring cross section. If the chair tends to overturn, load the seat to prevent overturning and report this test.

The forces and their number of cycles shall be as given in Table 3. Record and assess defects in accordance with **8.4**.

7.5 Durability Tests

Position the chair and its components as specified in **A-1** and Table 4 on the test surface (*see* **B-2**), Unless otherwise specified, prevent the chair from movement by placing stops (*see* **B-3**) at supporting points, except for the castor and chair-base durability test (**7.5.5**).

7.5.1 *Seat and Back Durability*

The upper part of the chair shall be positioned so that the centre of the back rest is midway between two adjacent supporting points (*see* **3.7**) of the base with stops (*see* **B-3**) against these supporting points.

The seat load shall be applied vertically using the seat-loading pad (*see* **B-4**). The back rest force shall be applied at an angle of 90° ± 10° to the back rest when fully loaded using the back-loading pad (*see* **B-7**).

All chairs shall be tested according to steps 1 to 5 (*see* Table 2).

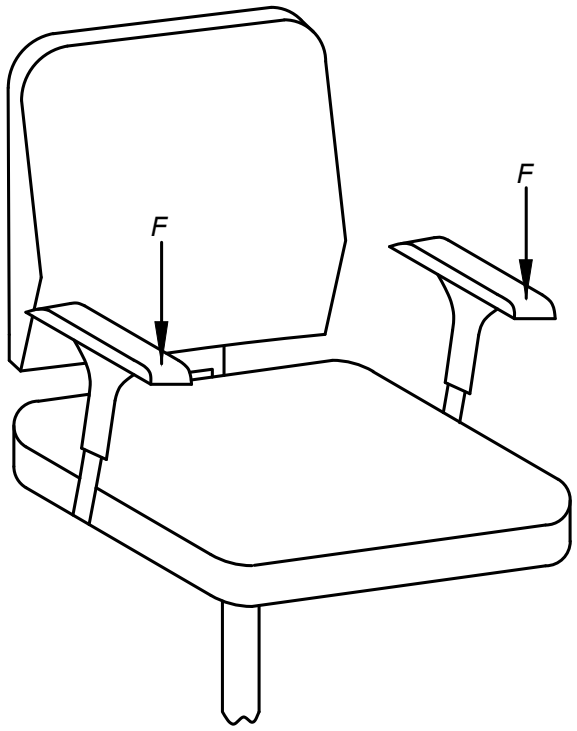


FIG. 10 ARM REST DOWNWARD STATIC-LOAD TEST – FRONT

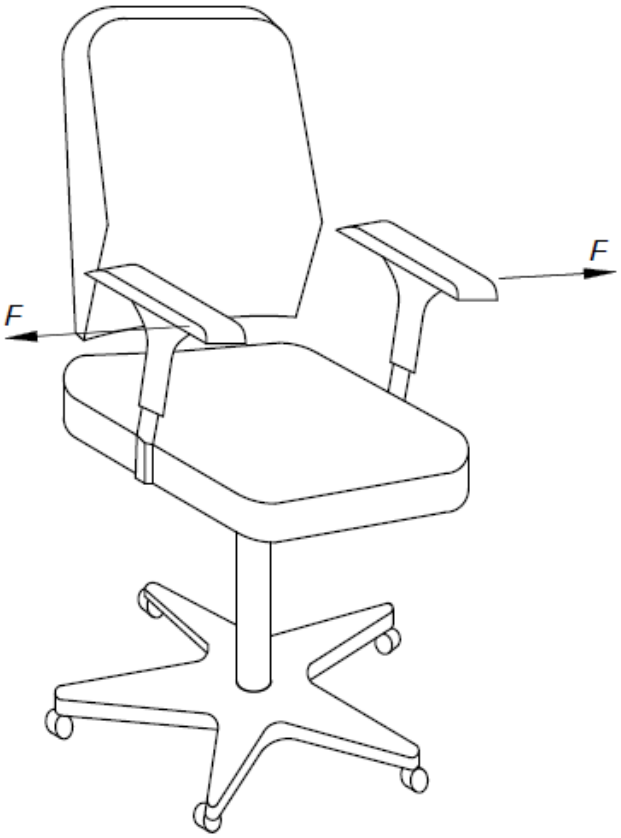


FIG. 11 ARM REST SIDEWAYS STATIC-LOAD TEST

Table 2 Seat and Back Durability Testing Sequence

(*Clause* 7.5.1)

Sl No.	Step	Loading Point (*see* Fig. 1)
(1)	(2)	(3)
i)	1	A
ii)	2	C - B
iii)	3	J - E
iv)	4	F - H
v)	5	D - G

In step 2, chairs with a locking device(s) for seat and/or back-rest angle movements shall be tested, first with the device(s) locked for half of the cycles and then with the device(s) unlocked for the other half of the cycles. For the first half of the cycles, the back rest shall be in the upright position. In steps 3, 4 and 5, the mechanism shall be set free to move.

One cycle shall consist of the application and removal of the force(s) at the respective loading point(s). Each step shall be completed before going to the next.

The seat force shall be applied first and maintained while the back-rest force is applied.

If the back rest pad is pivoting around a horizontal axis above the height of the seat 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 above point *A* (*see* **7.2.1**). If the axis cannot be adjusted to 300 mm, adjust the force to produce the same bending moment.

The forces to be applied and their number of cycles shall be as given in Table 3. Record and assess defects in accordance with **8.4**.

7.5.2 *Arm Rest Durability*

Apply simultaneously and cyclically the force (*F*) on each arm rest at points 100 mm behind the foremost point of the arm rest length (*see* **3.1**). Using the apparatus shown in principle in Fig. 17, apply a force of (10 ± 5) N through the loading device, an example of which is shown in Fig. 18. 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. The arm rests shall be allowed to deform freely. The forces and their number of cycles shall be as given in Table 3. Record and assess defects in accordance with **8.4**.

7.5.3 *Swivel Test*

The base of the chair shall be secured on a rotating table with a test surface according to **B-2** so that the rotating axis of the chair coincides with the rotating axis of the table. The upper part of the chair shall be loosely fixed in such a way as not to hinder the rotation of the base. Load the seat at loading point *A* (*see* **7.2.1**) with a mass, M_1, and at loading point *C* (*see* **7.2.3**) with a mass, M_2, or any equivalent loading that results in the same downwards force and bending moment on the chair. The angle of rotation shall be 360° at a rate of 10 ± 5 cycles/minute. Change direction after each rotation. The forces to be applied and their number of cycles shall be as given in Table 3. Record and assess defects in accordance with **8.4**.

7.5.4 *Foot-rest Durability*

Using the local loading pad (*see* **B-6**), apply a vertical downward force (*F*) to the foot rest at the point most likely to cause failure but not less than 80 mm from the front edge. For round cross-section ring-shaped foot rests, the force shall be applied through the centre of the ring cross section. The forces to be applied and their number of cycles shall be as given in Table 3. Record and assess defects in accordance with **8.4**.

The test can be common to all work chair using the same gas-lift with height adjustment and rotation feature.

7.5.5 *Castor and Chair-Base Durability*

This test does not apply to chairs with castors that are braked when the chair is loaded. The chair shall be placed on a rotating table with a test surface according to **B-2** so that the rotating axis of the chair coincides with the rotating axis of the table. Load the seat at point *A* (**7.2.1**) with a mass (*M*) as specified in Table 3. The base 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 rate of (6 ± 1) cycles per minute. The angle of rotation shall be from 0° to 180° and back. One rotation forward and one rotation backward constitutes one cycle.

Alternatively, attach the chair to a device that provides a linear movement of (760 ± 10) mm and a test surface according to **B-2**. Load the seat at point *A* (*see* **7.2.1**) with a mass (*M*) as specified in Table 3. The base shall be loosely fixed in such a way that the natural movements of the chair base and castors during testing are not prevented. One movement forward and one movement backward constitutes one cycle. The number of cycles shall be as given in Table 3. Record and assess defects in accordance with **8.4**.

8 SAMPLING AND CRITERIA OF CONFORMITY

8.1 All chairs of same model/design and manufactured from same raw materials offered for inspection shall constitute a lot.

NOTE — Chairs made in different colours are considered to be the same lot.

8.2 The required number of chairs shall be selected at random and depend upon the size of the lot.

8.3 The sample selected as per **8.2** shall be subjected to the tests as per **4, 5, 6** and **7** as applicable. The lot shall be declared as conforming to the requirements of this standard, if the sample meets the requirements of all the tests mentioned therein.

8.4 The criteria of the conformity for the tests as per **6** shall be same as specified therein. However, for the tests as per **7**, the criteria of conformity shall be as follows:

a) No damage/deformation or wear of any part or component such that its functioning is impaired. The structural element should not be deformed in a way that there is loss of serviceability;
b) No overturning of chair for stability tests and for chairs undergone durability test;
c) No fractures/breakage of any member, joint or component;
d) No loosening of joints intended to be rigid or that its function is impaired; and

9 MARKING

9.1 Each chair shall be indelibly and legibly marked with the following particulars:

a) Manufacturer's name, brand name or his recognized trade mark, if any;
b) Date of manufacture;
c) Design/Model Number (as declared by the manufacturer); and
d) Batch/lot number.

9.2 Each work chair meant to be assembled by the customer shall have the instruction for assembly provided as a leaflet and/or available in digital document file.

9.3 BIS Certification Marking

The product(s) conforming to the requirements of this standard may be certified as per the conformity assessment schemes under the provisions of *Bureau of Indian Standards Act*, 2016 and the Rules and Regulations framed thereunder, and the product(s) may be marked with the Standard Mark.

Table 3 Forces and Number of Cycles for Strength and Durability Tests

(*Clauses* 7.4.1, 7.4.2, 7.4.3, 7.4.4, 7.4.5, 7.4.6, 7.5.1, 7.5.2, 7.5.3, 7.5.4 *and* 7.5.5)

Sl No.	Test	Force/Mass			Cycles
		Type	Location	Magnitude	
(1)	(2)	(3)	(4)	(5)	(6)
i)	Seat front edge static load test	Downwards force (F_1), N	–	1 600	10
ii)	Combined seat and back static load test	Downwards force (F_1), N	Seat	1 600	10
		Horizontal force (F_2), N	Back	560	–
iii)	Arm rest downward static load test – Central	Downwards force (F), N	–	750	5
iv)	Arm rest downward static load test – Front	Downwards force (F), N	–	375	5
v)	Arm rest sideways static load test	Horizontal force (F), N	–	400	10
vi)	Foot rest static load test	Downwards force (F), N	–	1 300	10
vii)	Seat and back durability:	Horizontal and vertical forces (as per loading point locations), N	Point *A*	1 100	120 000
	Step 1: *A*		Point *C*	1 100	80 000
	Step 2: *C* –*B*		Point *B*	320	
	Step 3: *J* – *E*		Point *J*	1 100	20 000
	Step 4: *F* –*H*		Point *E*	320	
	Step 5: *D* – *G* (alternating)		Point *F*	1 100	20 000
			Point *H*	320	
			Point *D*	1 100	20 000
			Point *G*	1 100	
viii)	Arm rest durability	Downwards force (F), N	–	400	60 000
ix)	Swivel test	Mass (M_1), kg	Seat	60	120 000
		Mass (M_2), kg		35	
x)	Foot rest durability	Downwards force (F), N	–	900	50 000
xi)	Castor and chair base durability (rotational or linear)	Mass (M), kg	–	110	100 000

ANNEX A

(*Clause* 7.1)

GENERAL TEST CONDITIONS

A-1 PRELIMINARY PREPARATION

The furniture unit shall be tested as delivered or it shall be assembled according to the instructions supplied with it. If the furniture can be assembled or combined in different ways, the most adverse configuration intended for use shall be used for each test (*see* Table 4). If mounting or assembly instructions are not supplied, the assembly method shall be recorded in the test report. Fittings shall be tightened before testing and shall not be retightened unless specifically required by the manufacturer.

All the safety tests shall be carried out on the same sample. The tests shall be carried out in indoor ambient conditions in the range of 15 °C to 35 °C. For furniture products including hygroscopic materials it needs to be to conditioned to ambient environment's relative humidity prior to testing.

Levelling devices shall be opened to their midpoint of adjustment, but not more than 10 mm. During testing, the unit shall be placed on the floor and levelled, unless otherwise specified.

Before beginning the testing, visually inspect the unit thoroughly.

Record any defects so that they are not assumed to have been caused by the tests.

A-2 APPLICATION OF FORCES

The test forces in the static load tests shall be applied slowly enough to ensure that negligible dynamic force is applied. Unless otherwise indicated, each force shall be maintained for (10 ± 2) s. Unless otherwise specified, the number of cycles for each static load test shall be considered as one.

The test forces in durability tests shall be applied at a rate such that excessive heating does not occur. Unless otherwise specified, each test force shall be maintained for (2 ± 1) s.

The forces may be replaced by masses. The relationship 10 N = 1 kg shall be used.

A-3 TOLERANCES

The following tolerances are applicable:

a) Forces : ± 5 percent of the nominal force;

b) Masses : ± 1 percent of the nominal mass;

c) Dimensions : ± 5 mm of the nominal dimension on soft surfaces and ± 2 mm of the nominal dimension on all other surfaces; and

d) Angles : ± 2° of the nominal angle.

The accuracy for the position of loading pads and impactor shall be ± 5 mm.

A-4 SEQUENCE OF TESTING

All applicable tests as mentioned in **7** shall be carried out on the same sample and in the sequence as the clauses are numbered in this standard. Stability test shall be repeated also after durability test.

Table 4 Positioning of Chair Components for Testing

(*Clauses* 7.3.1, 7.4, 7.5 *and* A-1)

Sl No.	Test	Seat Height	Seat	Back Rest in Height	Back Rest in Depth	Tilt Stiffness Adjustment	Castors and Base	Arm Rest	Foot Rest
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
i)	Front edge overturning	Highest position	Foremost position	Highest position	Foremost position	Maximum tension	Most likely to cause overturning	Most likely to cause overturning	–
ii)	Forwards overturning	Highest position	Foremost position	Highest position	Foremost position	Maximum tension	Most likely to cause overturning	Most likely to cause overturning	–
iii)	Forwards overturning for chairs with foot rest	Highest position	Foremost position	Lowest position	Foremost position	Maximum tension	Most likely to cause overturning	Most likely to cause overturning	Most likely to cause overturning
iv)	Sideways overturning for chairs without arm rests	Highest position	Foremost position	Highest position	Foremost position	Maximum tension	Most likely to cause overturning	–	–
v)	Sideways overturning for chairs with arm rests	Highest position	Foremost position	Highest position	Foremost position	Maximum tension	Most likely to cause overturning	Most likely to cause overturning	–
vi)	Rearwards overturning of chairs without back-rest inclination	Highest position	Rearmost position	Highest position	Rearmost position	Minimum tension	Most likely to cause overturning	Most likely to cause overturning	–
vii)	Rearwards overturning of chairs with back rest inclination	Highest position	Rearmost position	Highest position	Rearmost position	Minimum tension	Most likely to cause overturning	Most likely to cause overturning	–
viii)	Seat front edge static-load test	Highest position	Foremost position	–	–	–	–	–	–
ix)	Combined seat and back static-load test	Highest position	Most adverse position	Highest position	Rearmost position	Mid-range	Least likely to cause overturning	–	–
x)	Arm-rest downward static-load test – Central	Lowest position	Horizontal	–	–	–	–	Most likely to cause failure	–
xi)	Arm-rest downward static-load test – Front	Lowest position	Horizontal	–	–	–	–	Highest, foremost position	–
xii)	Arm-rest sideways static load test	Lowest position	Horizontal	–	–	–	–	Highest, widest position	–
xiii)	Foot-rest static load test	–	–	–	–	–	Least likely to cause overturning	–	Highest position
xiv)	Seat and back durability	Highest position	Horizontal and foremost	Highest position	Most likely to cause failure	Mid-range	90° to the base arm	–	–
xv)	Arm-rest durability	Lowest position	Horizontal	–	–	Maximum tension	–	Highest, widest position	–
xvi)	Swivel test	Highest position	Horizontal, foremost position	Highest position	Rearmost position	–	–	–	–
xvii)	Foot-rest durability	–	–	–	–	–	Least likely to cause overturning	–	Lowest position
xviii)	Castor and chair-base durability	Lowest position	Horizontal	–	–	–	Aid free movement	–	–

ANNEX B

(*Clauses* 7.1, 7.3, 7.3.1, 7.3.2, 7.3.4, 7.3.5, 7.3.6, 7.3.7, 7.4, 7.4.1, 7.4.2 7.4.3, 7.4.4, 7.5, 7.5.1, 7.5.3, 7.5.4 *and* 7.5.5)

TEST APPARATUS

B-1 GENERAL

The equipment shall not inhibit deformation nor cause unnatural deformation of the unit/component, that is, it shall be able to move such that it can follow the deformation of the unit/component during testing.

All loading pads shall be capable of pivoting in all directions. The pivot point shall be as close as practically possible to the load surface.

B-2 TEST SURFACE

The test surface shall be horizontal, rigid and flat with a smooth surface.

B-3 STOPS

Stops are devices to prevent the chair from sliding or rolling but not overturning. They shall be 3 mm high for stability tests and 12 mm high for all other tests, except in cases where the design of the chair or the test method necessitates the use of higher stops, in which case the lowest that prevents the chair from sliding or rolling shall be used.

B-4 SEAT-LOADING PAD

The seat-loading pad is a naturalistically shaped rigid indenter with a hard, smooth surface (*see* Fig. 12). In principle, this loading pad is for use in loading points *A* (*see* **7.2.1**) and *C* (*see* **7.2.3**) (*see* Fig. 1).

The seat loading pad mainly exists in the following two types:

a) Machined in hardwood, as shown in Fig. 13, and
b) Moulded from fibre glass, as shown in Fig. 14.

B-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 blend radius between the face and the side (*see* Fig. 15). In principle, this loading pad shall be used in loading points *D* (*see* **7.2.4**), *G* (*see* **7.2.7**), *F* (*see* **7.2.6**) and *J* (*see* **7.2.9**) (*see* Fig. 1).

B-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 blend radius between the face and the side.

B-7 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 blend radius between the face and the sides (*see* Fig. 16).

B-8 ARM REST DURABILITY TEST APPARATUS

It is an apparatus capable of applying a cyclic force simultaneously to both arm rests. The forces shall be applied through an arm-rest loading device, which functions in principle as shown in Fig. 17.

The apparatus shall be capable of applying the forces at varying angles to the vertical. It shall be adjustable both vertically and horizontally and set as specified in **7.5.2**. The apparatus shall be capable of freely following the deformation of the arm rests during testing (*see* Fig. 18). The length of the loading pad shall be 100 mm with the force acting through the centre of its length.

B-9 STRAP

It is a 50 mm wide strap capable of bearing a mass as specified in safety tests.

B-10 STABILITY-LOADING DEVICE

It is a loading device in principle functioning as shown in Fig. 21. Figures 19 and 20 show the details of the stability-loading device.

B-11 LOADING DISC

It is a circular horizontal smooth surface disc of mass 10 kg and a thickness of 48 mm. The centre of gravity shall be in the centre of the disc.

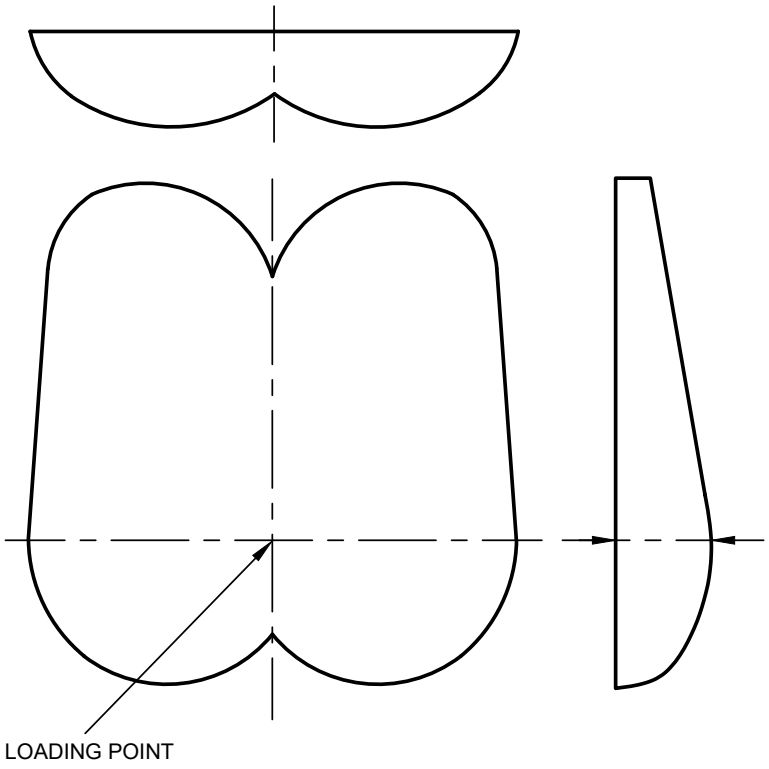
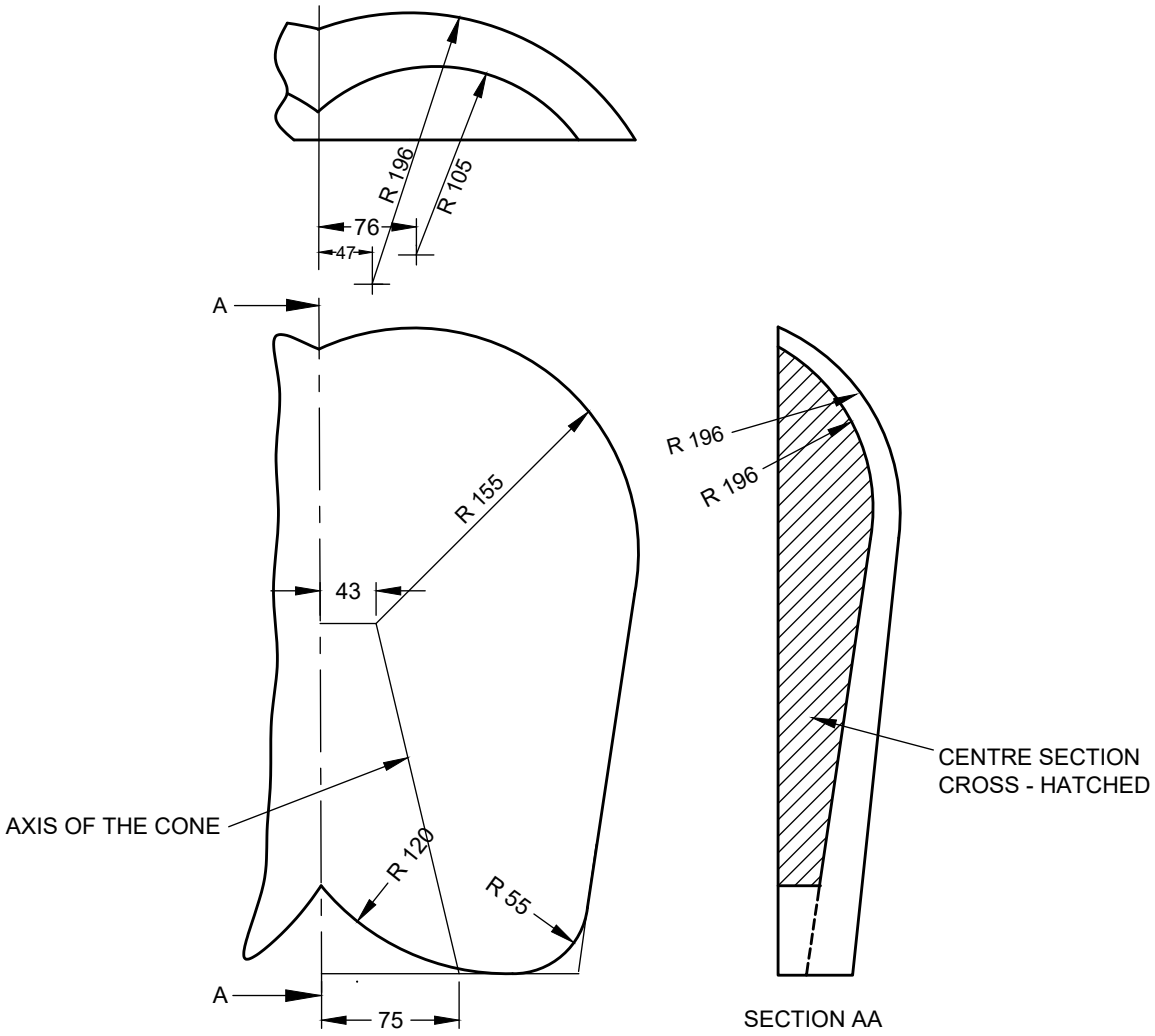
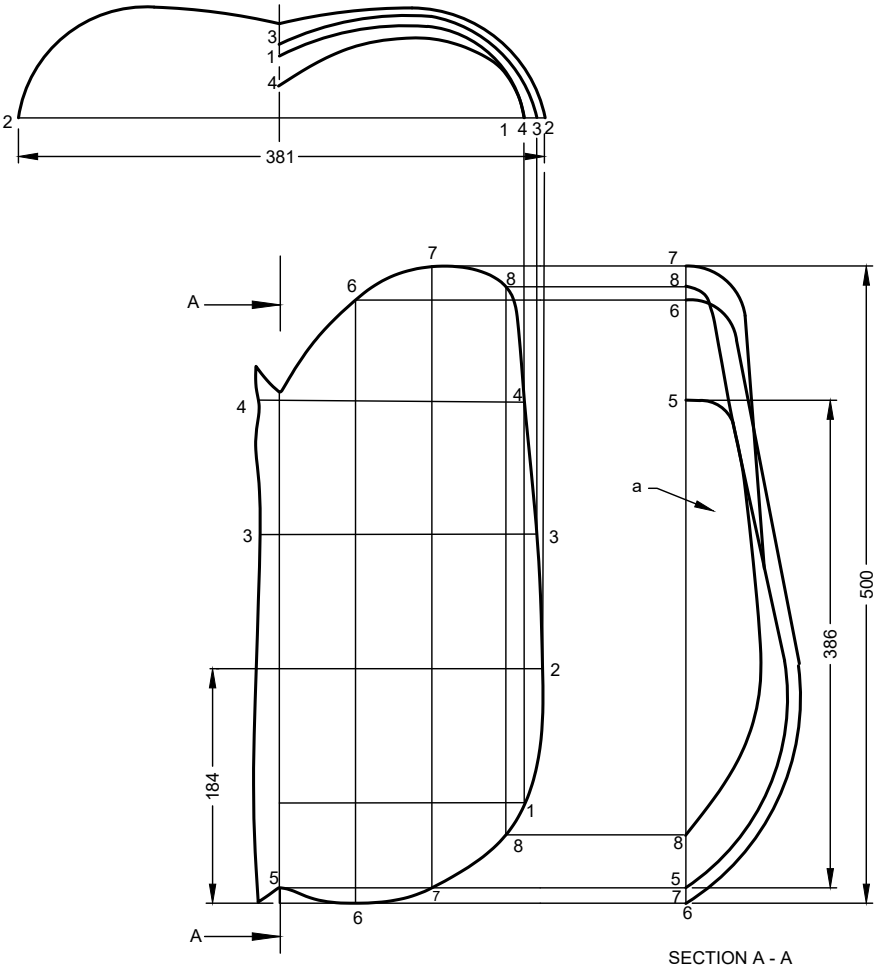


FIG. 12 SEAT LOADING PAD



All dimensions in millimetres

FIG. 13 SEAT LOADING PAD GEOMETRY – HARDWOOD CONSTRUCTION

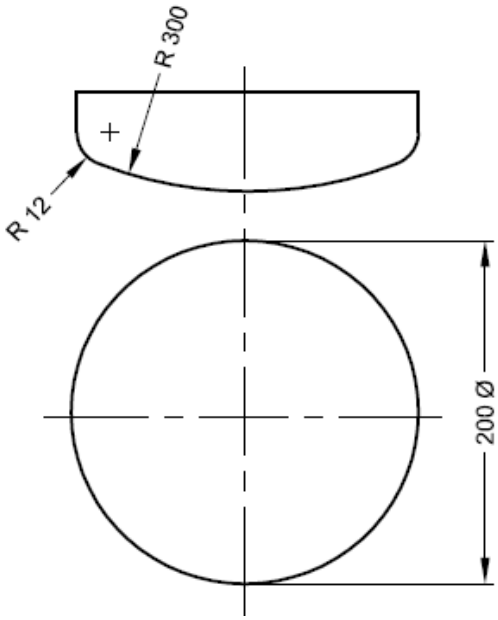


KEY

1 TO 8 - LINES TO HELP MOULD THE DUMMY
a - CENTRE SECTION CROSS - HATCHED

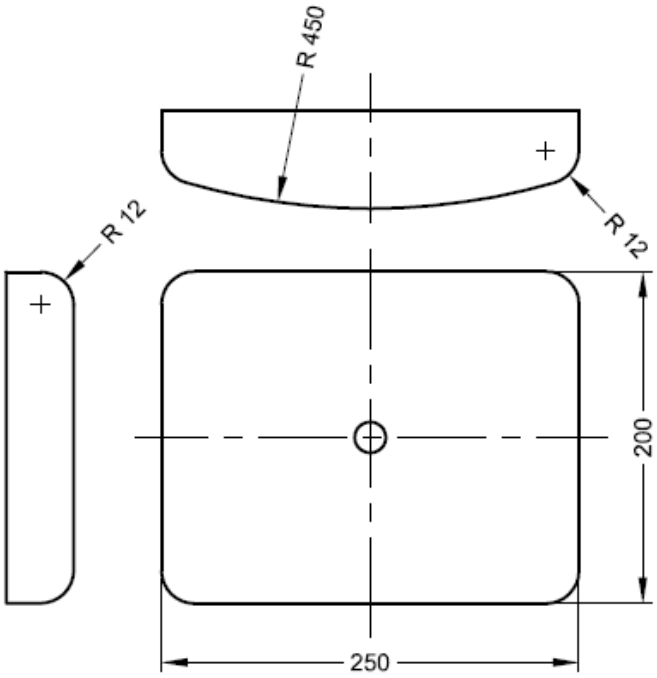
All dimensions in millimetres

FIG. 14 SEAT LOADING PAD GEOMETRY – MOULDED FIBRE GLASS CONSTRUCTION



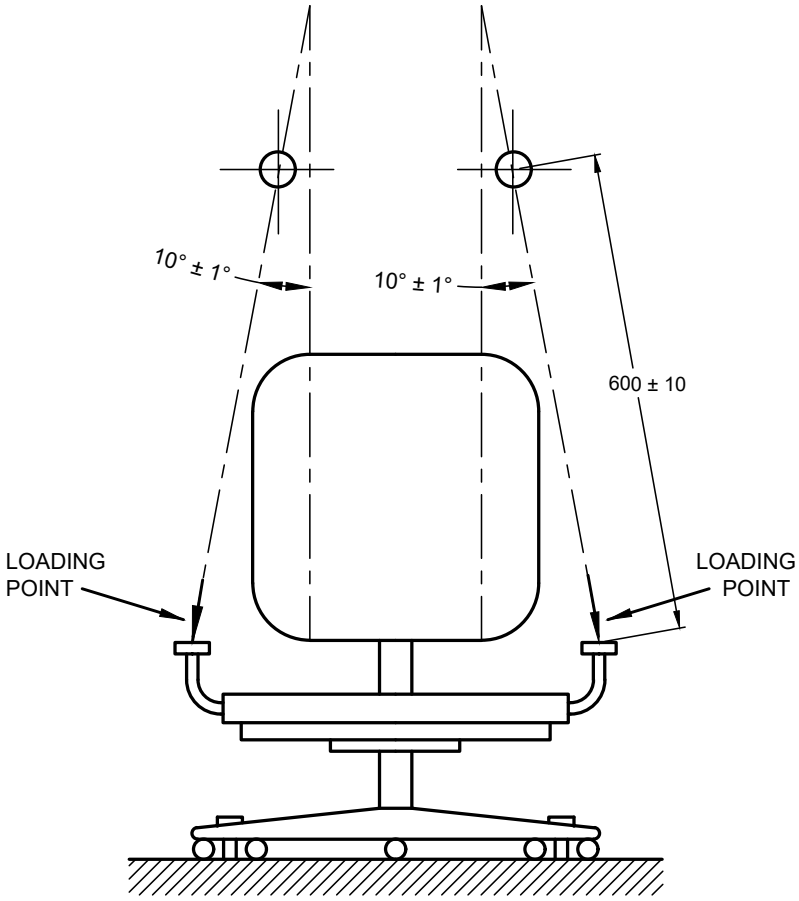
All dimensions in millimetres

FIG. 15 SMALLER SEAT-LOADING PAD



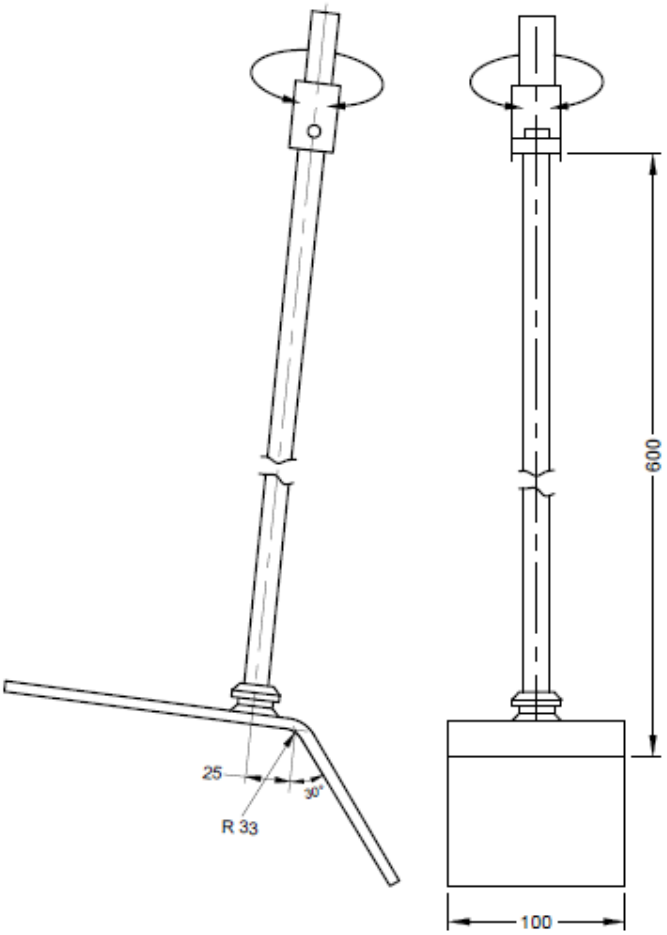
All dimensions in millimetres

FIG. 16 BACK LOADING PAD



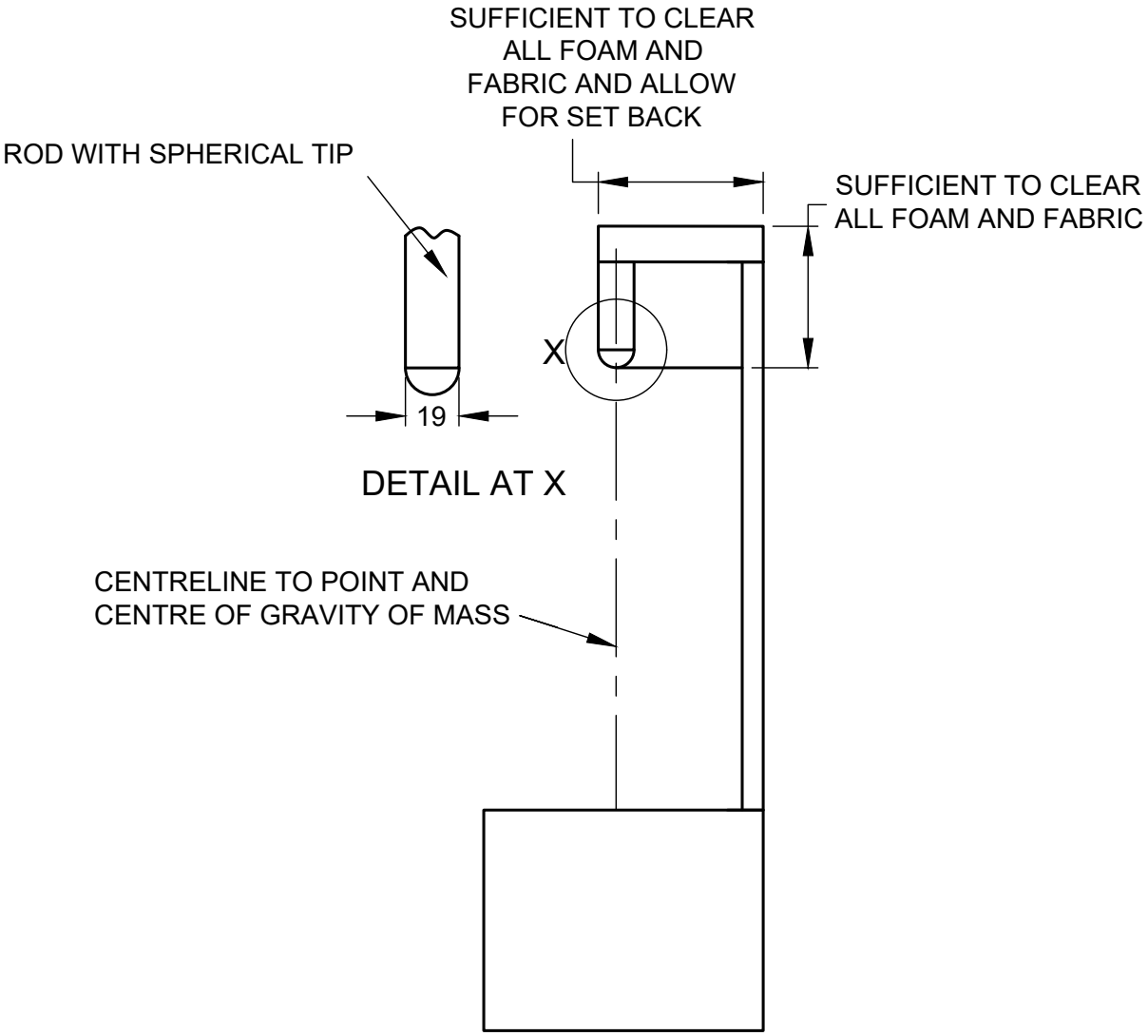
All dimensions in millimetres

FIG. 17 ARM REST TEST PRINCIPLE



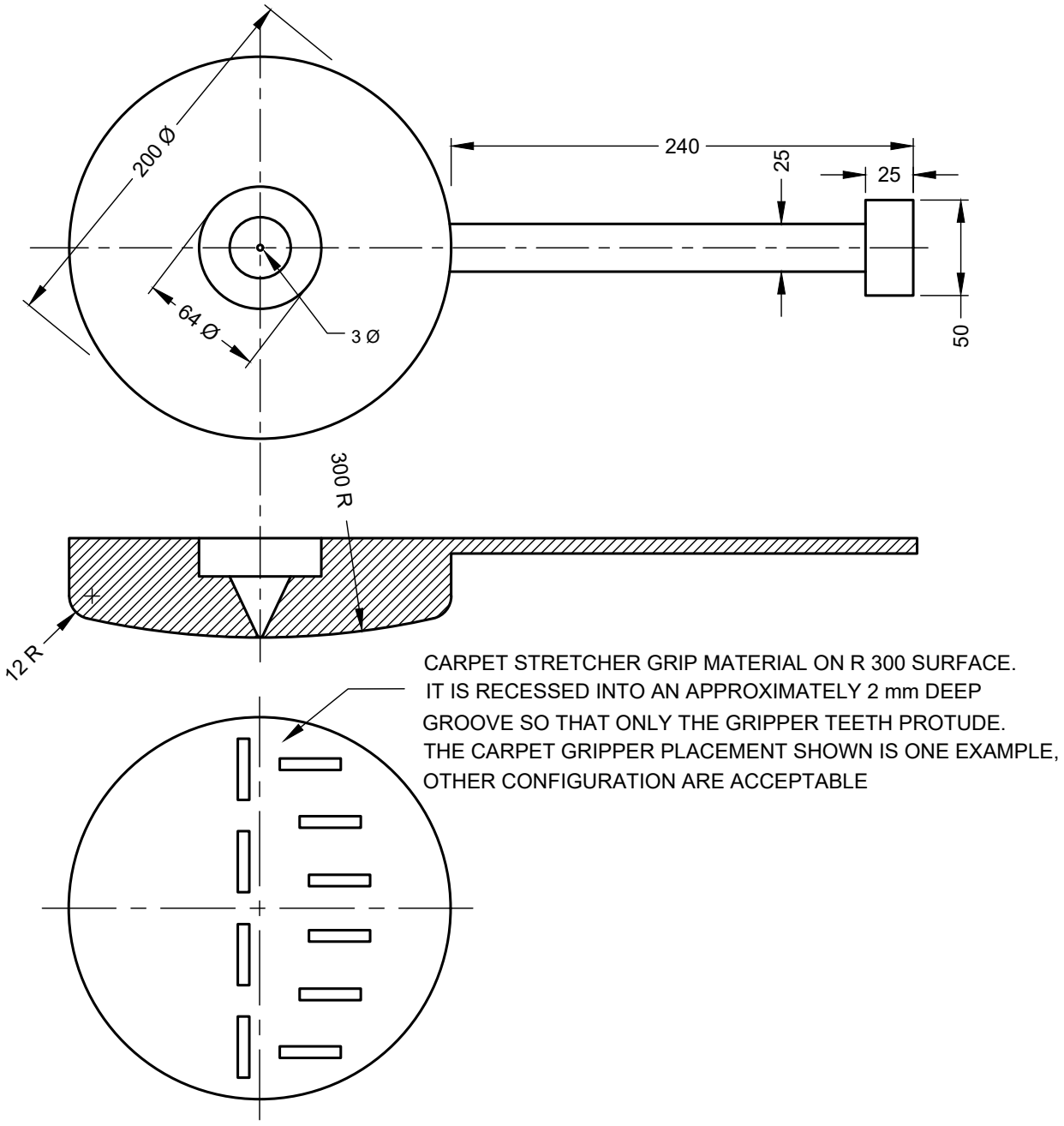
All dimensions in millimetres

FIG. 18 EXAMPLE OF ARM-REST LOADING PAD



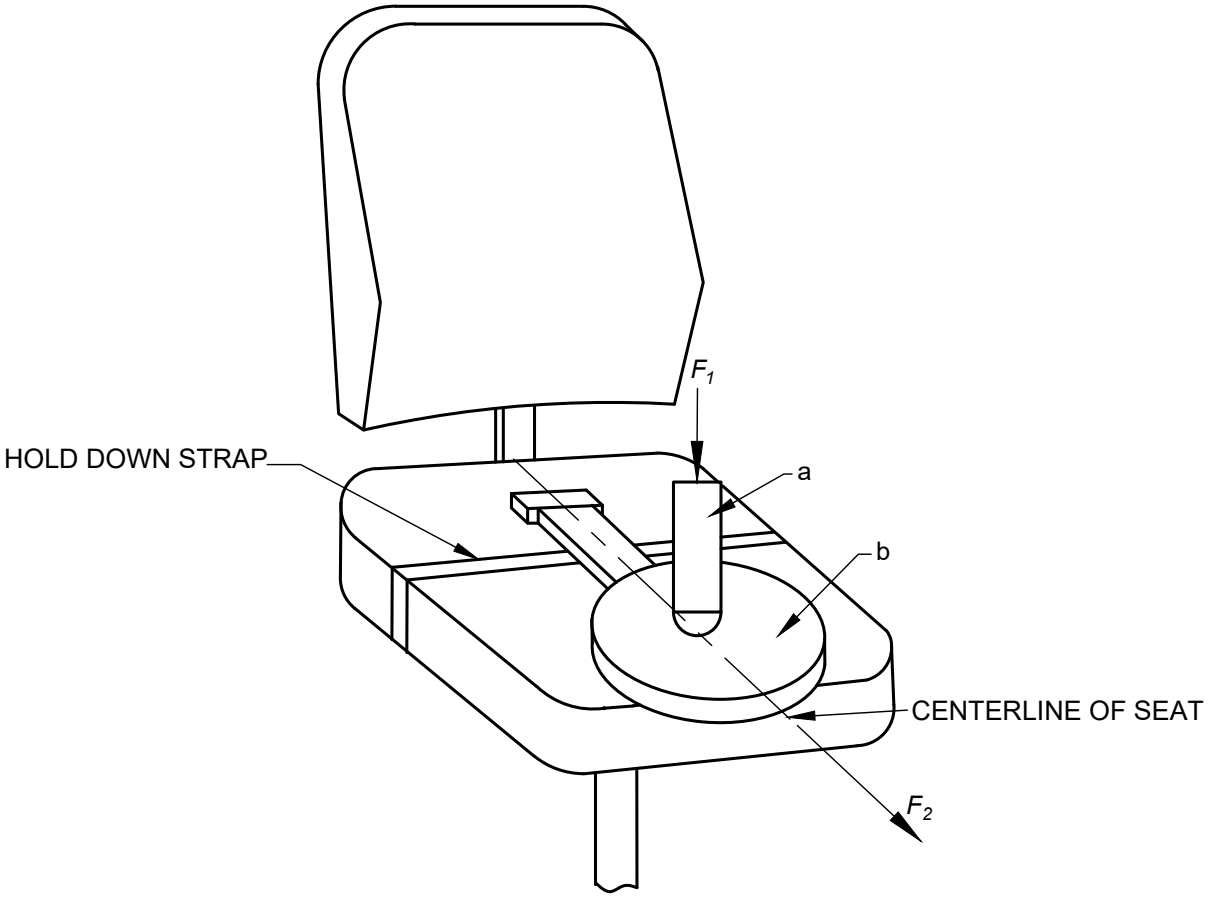
All dimensions in millimetres

FIG. 19 FRONT STABILITY LOADING FIXTURES



All dimensions in millimetres

FIG. 20 FRONT STABILITY-LOADING DISK



a - FOR DETAILS SEE FIG.19
b - FOR DETAILS SEE FIG.20

FIG. 21 STABILITY-LOADING DEVICES-PRINCIPLE

ANNEX C

(*Foreword*)

COMMITTEE COMPOSITION

Furniture Sectional Committee, CED 35

Organization	*Representative(s)*
In Personal Capacity (*II A, K-11, Ground Floor, Kailash Colony, New Delhi 110048*)	Shri Balbir Verma (***Chairman***)
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Organization	*Representative(s)*
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The Supreme Industries Limited, New Delhi	Shri Sanjeev Jain Shri Mukesh Kaul (*Alternate* I) Shri Sanjay Dogra (*Alternate* II)
In Personal Capacity (*Pratap Nursery Lane, Near Gurudwara Sahib, Panditwari, Dehradun*)	Shri K. S. Pruthi
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Review of Indian Standards

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Amend No.	Date of Issue	Text Affected

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