INTERNATIONAL STANDARD

ISO 19833

First edition
2018-03

Furniture — Beds — Test methods for the determination of stability, strength and durability

Ameublement — Couchages — Méthodes d'essai pour la détermination de la stabilité, de la résistance et de la durabilité

Reference number
ISO 19833:2018(E)

ISO copyright office
CP 401 • Ch. de Blandonnet 8
CH-1214 Vernier, Geneva
Phone: +41 22 749 01 11
Fax: +41 22 749 09 47
Email: copyright@iso.org
Website: www.iso.org

Published in Switzerland

Contents

Page

Foreword

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The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular the different approval criteria needed for the different types of ISO documents should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see www.iso.org/directives).

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For an explanation on the voluntary nature of standards, the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the World Trade Organization (WTO) principles in the Technical Barriers to Trade (TBT) see the following URL: www.iso.org/iso/foreword.html.

This document was prepared by ISO/TC 136, *Furniture*.

Furniture — Beds — Test methods for the determination of stability, strength and durability

1 Scope

This document specifies test methods for determining the stability, strength and durability of all types of fully assembled beds including bed frames and bed bases.

This document applies to adult beds for domestic and non-domestic use. It does not apply to waterbeds, airbeds, foldaway beds, bunk beds and beds for people with special needs, nor to beds for healthcare and medical purposes.

Test methods for the assessment of ageing, degradation, fire resistance and electrical functions are not included in this document.

Other methods for the strength and durability of storage components, seating surfaces and other features associated with beds are covered by other standards.

Where a bed incorporates additional functions such as storage, electrical adjustability or conversion from a sofa to a bed, additional tests are applicable.

This document does not specify requirements for the choice of loads, cycles or forces. These can be specified in a requirements document. If this is not available, suggested loads and cycles can be found in Annex A (informative).

The tests are not intended to assess the durability of upholstery, e.g. filling materials and covers.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO 2439:2008, *Flexible cellular polymeric materials — Determination of hardness (indentation technique)*

3 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

— IEC Electropedia: available at http://www.electropedia.org/

— ISO Online browsing platform: available at https://www.iso.org/obp

3.1
unframed slat base
bed base consisting of separate slats flexibly held together normally by means of textile, rubber or plastic tape

Note 1 to entry: When loading one slat, the load is transferred to the support by that slat only.

3.2
framed base
bed base consisting of slats, springs, etc., which are connected to a structural frame system

Note 1 to entry: When loading one component only, e.g. a slat or a spring, the load is distributed by the frame to the support.

4 General test conditions

4.1 Preliminary preparation

The tests are designed to be applied to a bed that is fully assembled and ready for use. The bed shall be assembled in accordance with instructions supplied by the manufacturer. If the bed can be assembled or combined in different ways, the most adverse combination shall be used for each test. If mounting or assembly instructions are not supplied, the mounting or assembly method shall be recorded in the test report. Fastenings shall be tightened before testing and shall not be re-tightened unless this is specified in the manufacturer's instructions. If the configuration needs to be changed in order to produce the worst-case conditions, this shall be recorded in the test report.

Unless otherwise specified by the manufacturer, the test item shall be stored in indoor ambient conditions for at least 24 h immediately prior to testing.

The tests shall be carried out in indoor ambient conditions at a temperature between 15 °C and 25 °C. If, during a test, the temperature is outside this range, the maximum and/or minimum temperature shall be recorded in the test report.

Before beginning the test, visually inspect the bed thoroughly. Record any defects so that they are not assumed to have been caused by the tests.

4.2 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. Forces shall be as specified in the requirements document or should be as suggested in Annex A.

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.

4.3 Tolerances

Unless otherwise stated, the following tolerances are applicable:

— forces: ±5 % of the nominal force;

— masses: ±1 % of the nominal mass;

— dimensions: all dimensions less than 200 mm shall have an accuracy of ±1 mm of the nominal dimension; the other dimensions shall have an accuracy of ±0,5 %; the dimension of the spherical curvature of 300 mm radius on the loading pad (5.3) shall have an accuracy of ± 5 mm.

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

NOTE For the purposes of uncertainty measurement, test results are not considered to be adversely affected when the above tolerances are met.

4.4 Sequence of testing

Unless otherwise specified in the requirements document, all applicable tests as shown in Table 1 shall be carried out on the same sample and in the sequence as the clauses are numbered in this document.

4.5 Loading

Unless otherwise specified, all storage components supplied with beds, which are not subject to testing, shall be uniformly loaded with the load(s) as specified in the requirements document or should be loaded with the load(s) as suggested in Annex A.

5 Test apparatus

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

The equipment shall not inhibit deformation nor cause unnatural deformation of the unit/component, i.e. it shall be able to move so 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.

5.1 Floor surface.

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

For the test in 6.5.2, the surface shall be smooth high-pressure plastic laminate or equivalent.

5.2 Stops.

The stops are devices to prevent the article from sliding but not tilting. They shall not be higher than 12 mm, except where the design of the bed necessitates the use of higher stops, in which case the lowest stop that will prevent the item from moving shall be used. If greater than 12 mm, the height of the stop used shall be recorded in the test report.

5.3 Loading pad.

The loading pad shall be a rigid circular object, 200 mm in diameter, the face of which shall have a convex spherical curvature of 300 mm radius with a 12 mm front edge radius (see Figure 1).

Dimensions in millimetres

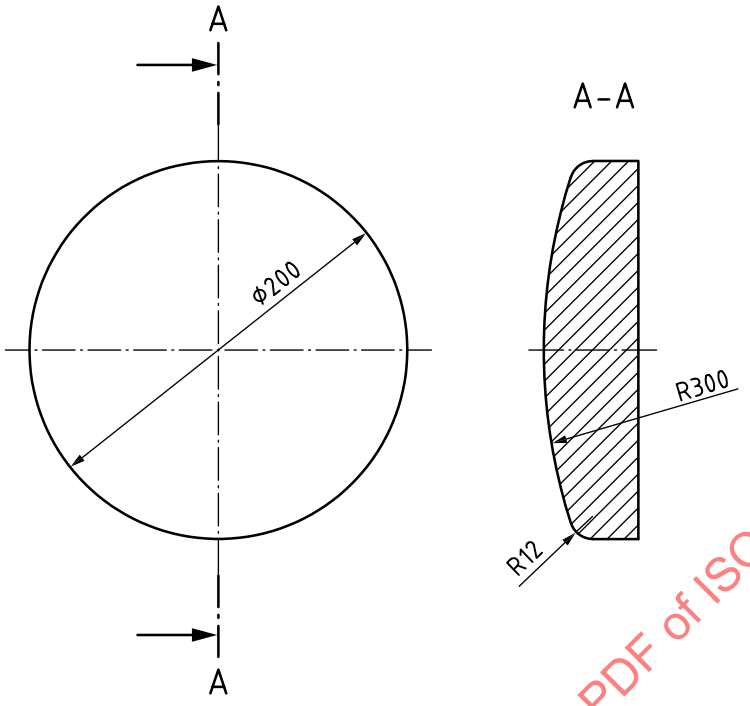


Figure 1 — Loading pad

5.4 Small loading pad.

The small loading pad shall be a rigid disc 100 mm in diameter, with a flat face and a 12 mm front edge bend radius. Where space prevents the use of a 100 mm diameter loading pad, a 50 mm diameter loading pad with similar properties may be used.

5.5 Test mattress.

The test mattress shall be a soft polyether foam sheet with a thickness of 100 mm, a bulk density of (35 ± 3,5) kg/m^3 and an indentation hardness index of (170 ± 40) N in accordance with Method A, $HA_{(40\%/30s)}$ as given in ISO 2439:2008. The size shall be such as to overlap the size of the loading pad by at least 200 mm all round. The test mattress may have a light soft cotton cover with a mass not greater than 120 g/m^2.

The same part of the standard test mattress shall not be reused within 2 h and the mattress shall be replaced if damaged, or after 10 complete bed tests, whichever occurs first.

5.6 Impactor.

The impactor shall be as shown in Figure 2 and comprised of the following:

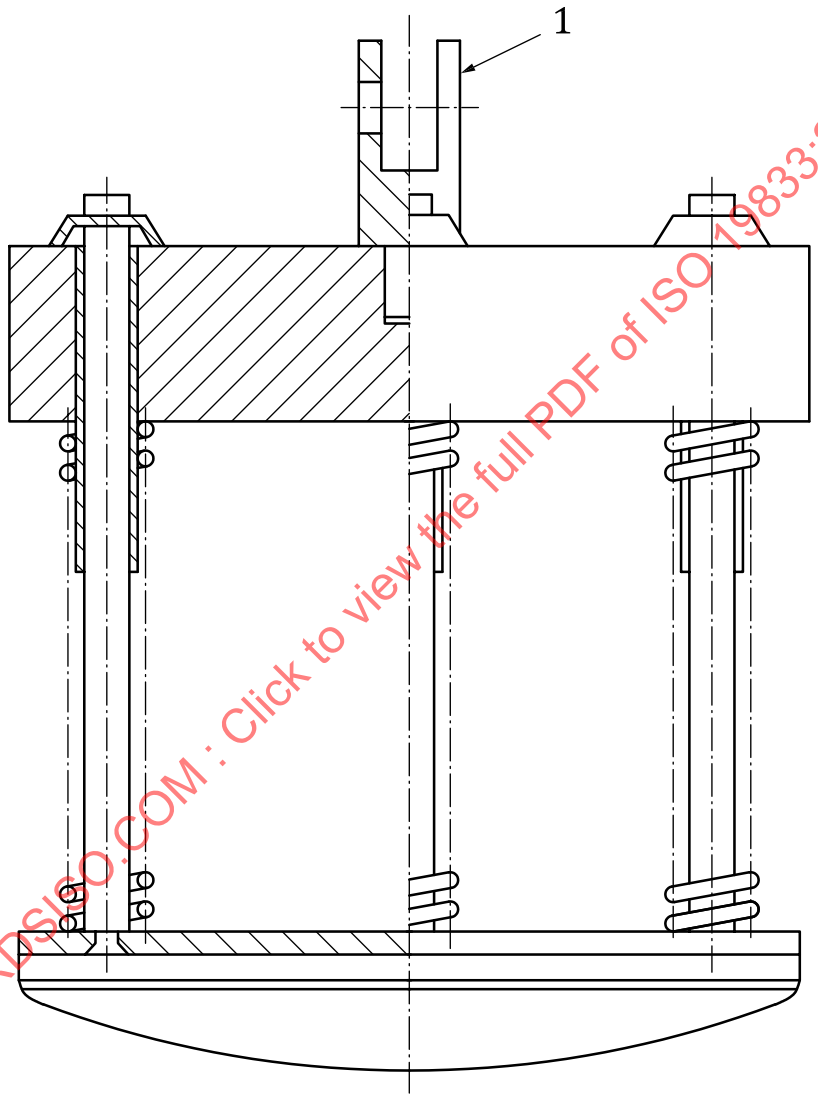
5.6.1 Circular body, approximately 200 mm in diameter separated from the striking surface by helical compression springs and free to move relative to it on a line perpendicular to the plane of the central area of the striking surface.

The body and associated parts minus the spring shall have a mass of (17 ± 0,1) kg and the whole apparatus shall have a mass of (25 ± 0,1) kg.

5.6.2 Springs, which shall be such that the combined spring system has a nominal spring rate of (7 ± 2) N/mm and the total friction resistance of the moving parts is less than 1 N.

The spring system shall be compressed to an initial load of (1 040 ± 5) N (measured statically) and the amount of spring compression movement available from the initial compression point to the point where the springs become fully closed shall be not less than 60 mm.

5.6.3 Striking surface, which shall be 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.



Key

1 joint of lifting device not inhibiting free fall

Figure 2 — Impactor

5.7 Test bed base (unframed).

The slats should be made of solid wood with a minimum modulus of elasticity of 8 000 N/mm^2 [e.g. European beech (*Fagus sylvatica*) or Pine (*Pinus ssp*), etc.].

The cross section of the slats shall be 20 mm × 95 mm and the distance between the slats shall be (60 ± 2) mm.

If the free span of the slats is >1 000 mm, support the slats along the centre line.

The length of the slats shall be 10 mm shorter than the nominal width of the bed frame.

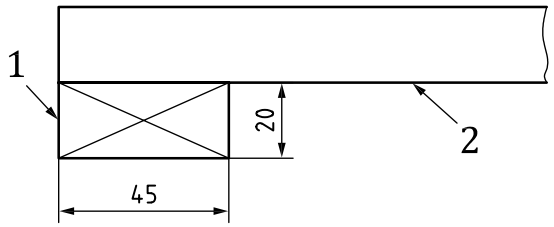
5.8 Test bed base (framed).

The slats shall be as described in 5.7.

They shall be mounted on a frame made of wooden material defined in 5.7 with a cross section of 20 mm × 45 mm (see Figure 3).

The width of the bed base shall be 20 mm smaller than the nominal width of the bed frame.

Dimensions in millimetres



Key

1 frame

2 slat

Figure 3 — Test bed base (framed)

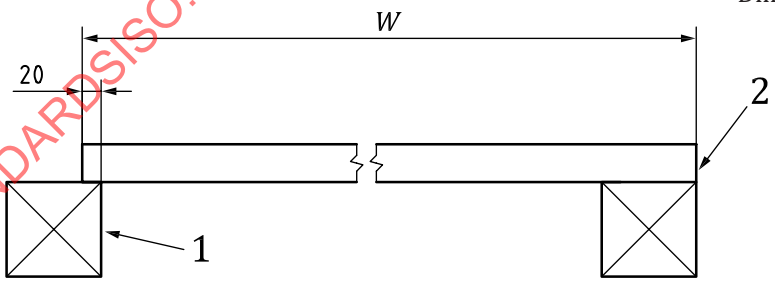
5.9 Test support (unframed bed bases).

The base shall be suitably supported along its whole length.

The total overhang on one side (see Figure 4) shall be (20 ± 1) mm.

If the bed base is not prevented from moving during the tests, it shall be fixed in a suitable manner.

Dimensions in millimetres



Key

1 test support

2 slat

W width of the base

Figure 4 — Test support (unframed bed bases)

5.10 Test support (framed bed bases).

Supports of 50 mm width, suitable to carry the bed base and the test loads, shall be placed 150 mm from the ends of the frame (see Figure 5).

Dimensions in millimetres

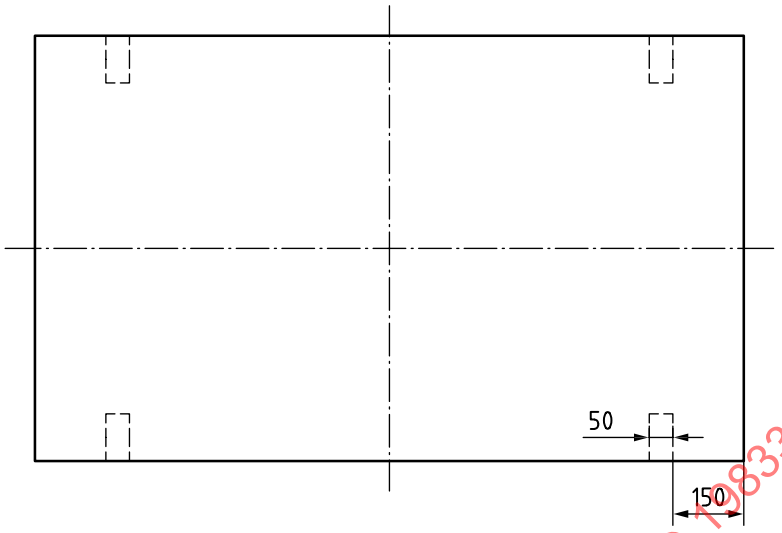


Figure 5 — Test support (framed bed bases)

5.11 Test mass.

A mass of 75 kg should be distributed over an area of approximately 300 mm × 300 mm or a diameter of approximately 340 mm.

6 Test procedures — Stability, strength and durability

6.1 General

Unless otherwise specified, the test shall be carried out in the configuration most likely to cause failure.

When the mattress, bed base and frame (if applicable) are supplied together as a bed set, they shall be tested together.

When other components are supplied separately, they shall be tested using the test mattress, test support or test bed base described in Clause 5, unless otherwise specified by the manufacturer of the components under test.

If a test cannot be carried out as specified in this document, e.g. because a loading pad cannot be used to apply a force due to the shape of a product, the test shall be carried out as closely as possible to the specifications of this document, and any deviations shall be recorded in the test report.

Table 1 shows which tests are applicable to a bed set and which to parts of a bed.

Table 1 — Testing of beds, bed frames and bed bases

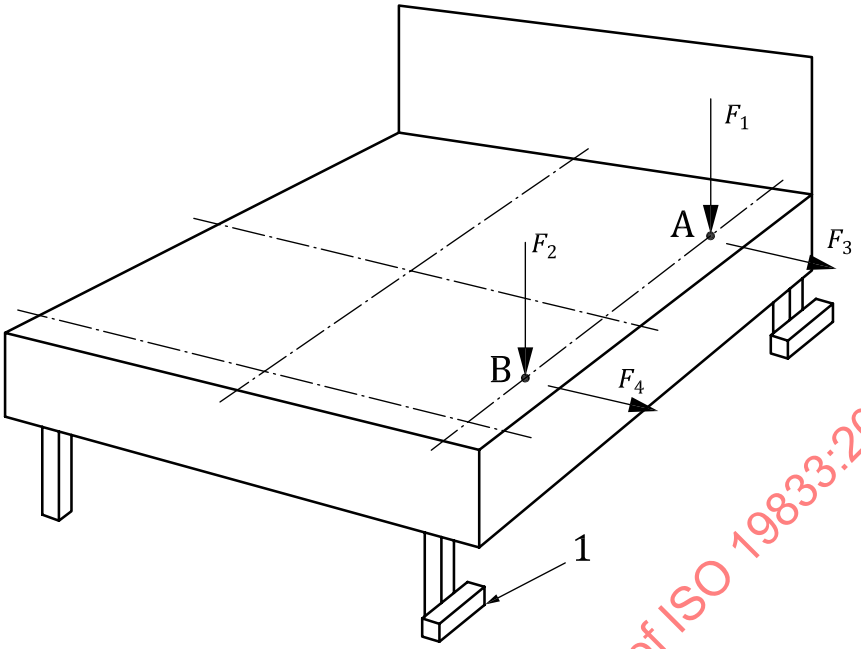
Test	6.2	6.3.1	6.3.2	6.4	6.5.1	6.5.2	6.6
Complete bed	√	√	√	√	√	√	√
Bed base	(√)	√	(√)	(√)	√	(√)	√
Bed frame	√	√	√	√	(√)	√	(√)
(√) = if applicable √ = test to be carried out							

6.2 Stability test

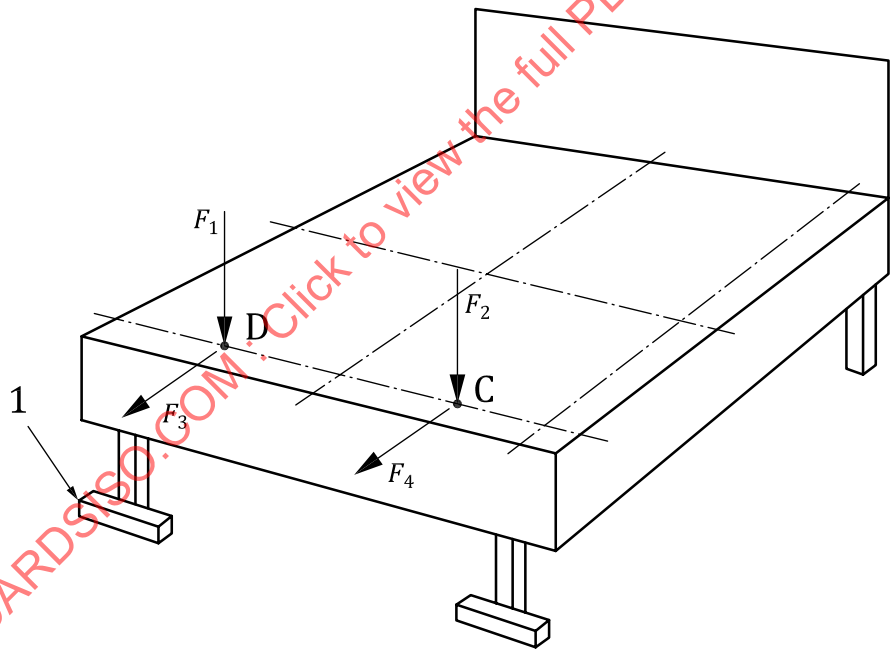
Position the bed on the floor surface with the legs or base restrained by stops. See Figure 6 a) and Figure 6 b).

Apply two downward forces F_1 and F_2 simultaneously by means of the small loading pad (5.4) at point A and point B, 60 mm behind the front edge of the bed sides. At each loaded position, apply two outward forces F_3 and F_4 simultaneously for at least 5 s along a horizontal line extended forward from the point where the base of the loading pad meets the upper surface of the bed side/bed frame. The forces shall be as specified in the requirements document or should be as suggested in Annex A. See Figure 6 a) and Figure 7. If the construction of the bed is symmetrical in width direction, perform the test at one side only.

Repeat the same test at one end of the bed. If the headboard and footboard are of the same construction, perform the test at the side containing the footboard. See Figure 6 b) and Figure 7.



a)



b)

Key

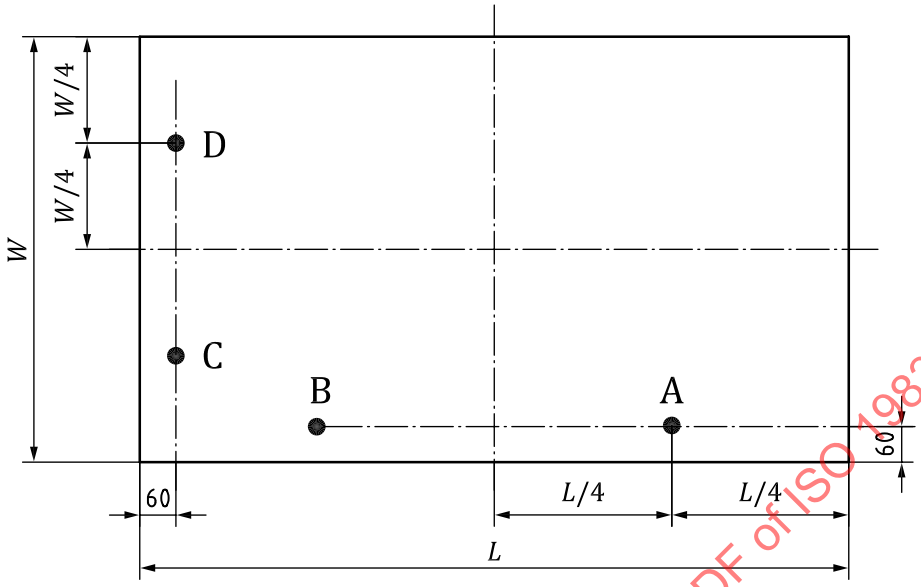
1	stop
F_1, F_2	downward force
F_3, F_4	outward force
A, B, C, D	force loading points

Figure 6 — Stability test

Position A and B are 1/4 length of bed base. Position C and D are 1/4 width of bed base. See Figure 7.

If the construction of the bed is not symmetrical with the weight not evenly distributed or the legs not positioned symmetrically, perform the test in the most adverse position.

Dimensions in millimetres



Key

L	length of bed base
W	width of bed base
A, B, C, D	force loading points

Figure 7 — Vertical loading points of stability test

6.3 Vertical static load tests

6.3.1 Vertical static load on bed base

Apply the vertical force downwards using the loading pad (5.3). The force shall be as specified in the requirements document or should be as suggested in Annex A.

Apply the force at all points of the bed base where failure is likely to occur, but not less than 100 mm from any edge. If there are several such positions, carry out the test at a maximum of 4 different positions.

Each force shall be applied for the number of cycles specified in the requirements document or should be applied for the number of cycles suggested in Annex A.

6.3.2 Vertical static load on side rail

Using two small loading pads (5.4), apply two vertical downward forces F_1 and F_2 simultaneously for 1 min on the centre line of the top surface of one side rail. The forces shall be as specified in the requirements document or should be as suggested in Annex A.

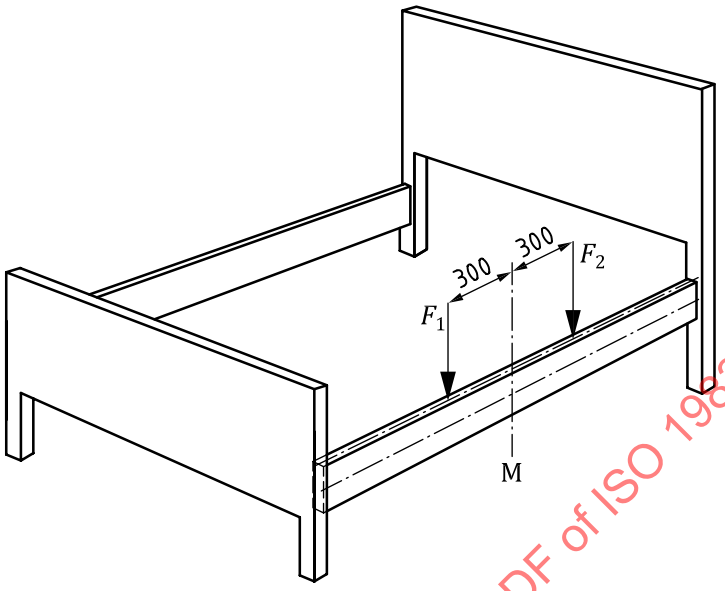
The loading points shall be 300 mm either side of the middle point line of the side rail (M), as shown in Figure 8.

The bed shall be loaded sufficiently to prevent it from overturning.

If the materials/constructions are not identical, repeat the test on the other side rail.

The test shall be carried out for the number of cycles specified in the requirements document or should be carried out for the number of cycles suggested in Annex A.

Dimension in millimetres



Key

F_1, F_2	vertical static forces
M	middle point line of the side rail

Figure 8 — Vertical static load on side rails

6.4 Horizontal static load tests

6.4.1 Horizontal static load on headboard of beds ≤ 1 200 mm in width

This test only applies to beds with headboards or equivalent structures which are designed to be leant against by users.

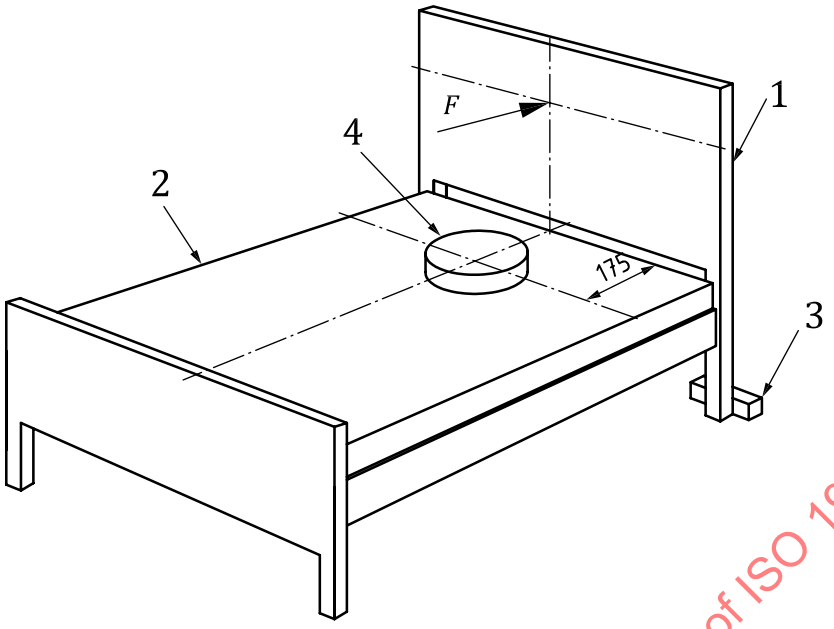
This test is not applicable to beds without headboards or whose headboard's upper edge is less than 300 mm high from the upper surface of the bed base.

Place the stops behind the legs/base to prevent the bed from moving during the test.

Apply the mass on the centre line of the bed base, 175 mm from the headboard. Apply the outward force using the loading pad (5.3). The loading point shall be at 600 mm above the upper surface of the bed base or at a point 100 mm below the upper edge of the headboard, whichever is the lower. The loading point shall be at the centre line of the headboard (see Figure 9).

The mass, the force and the number of cycles to be used to carry out the test shall be as specified in the requirements document or should be as suggested in Annex A.

Dimensions in millimetres



Key

1 headboard
2 mattress
3 stop
4 mass
F horizontal outward force

Figure 9 — Horizontal static load on headboard of beds ≤ 1 200 mm in width

6.4.2 Horizontal static load on headboard of beds > 1 200 mm in width

This test only applies to beds with headboards or equivalent structures which are designed to be leant against by users.

This test is not applicable to beds without headboards or whose headboard's upper edge is less than 300 mm high from the upper surface of the bed base.

Place the stops behind the legs/base to prevent the bed from moving during the test.

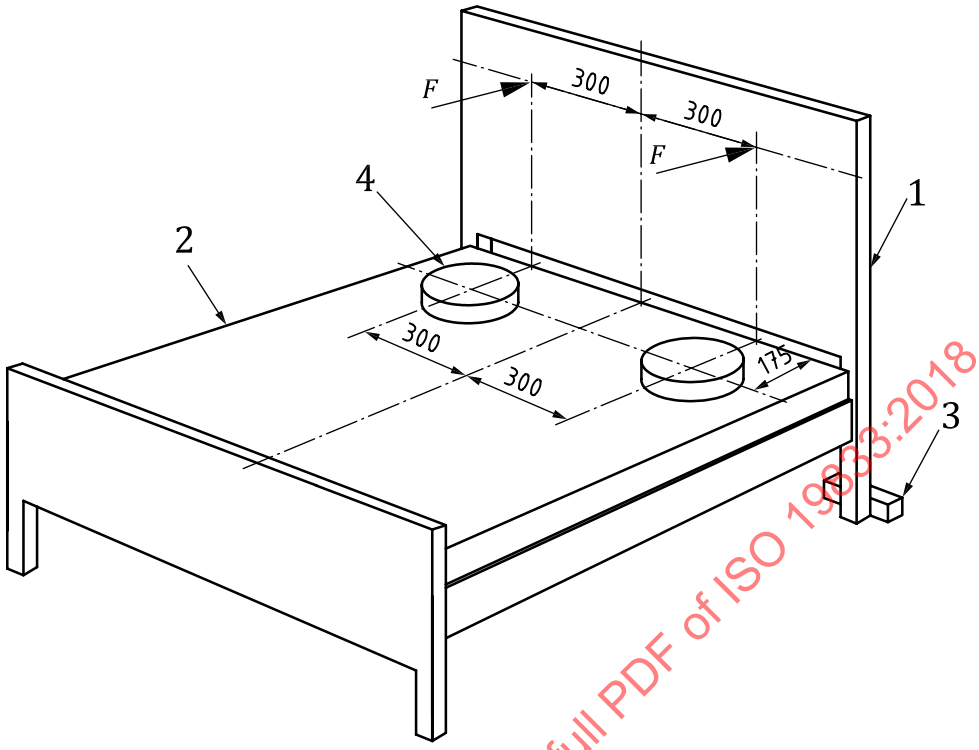
Apply two masses simultaneously at points on a line 175 mm from the headboard, 300 mm on either side of the centre line of the bed base.

Apply two horizontal outward forces simultaneously using the loading pad (5.3). The loading points shall be at 600 mm above the upper surface of the bed base or at a point 100 mm below the upper edge of the headboard, whichever is the lower. See Figure 10.

The loading points shall be 300 mm on either side of the centre line of the headboard. See Figure 10.

The masses, the forces and the number of cycles to be used to carry out the test shall be as specified in the requirements document or should be as suggested in Annex A.

Dimensions in millimetres



Key

1 headboard
2 mattress
3 stop
4 mass
F horizontal outward forces

Figure 10 — Horizontal static load on the headboard of beds > 1 200 mm in width

6.4.3 Horizontal static load test for beds without headboards

This test applies to the beds without headboards or whose headboard's upper edge is less than 300 mm high from the upper surface of the bed base.

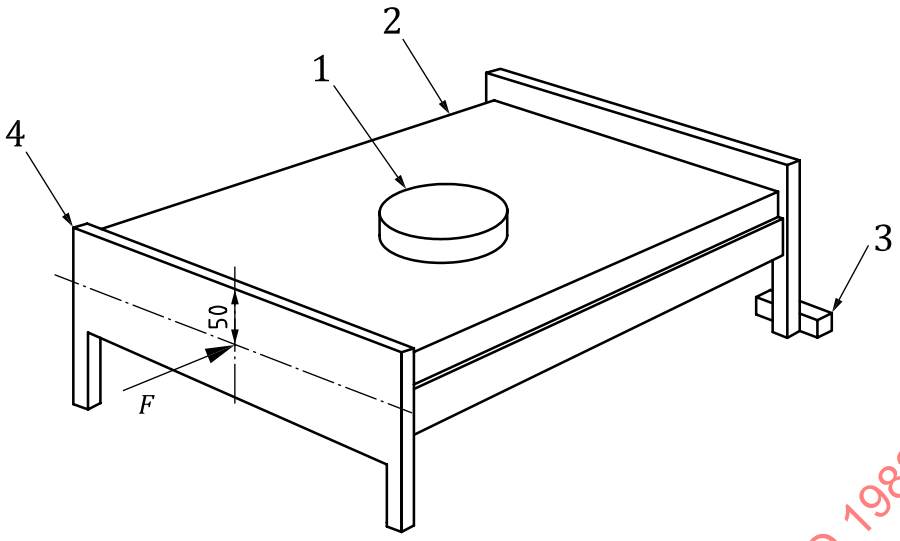
Place the stops behind the legs/base to prevent the bed from moving during the test.

Place the mass (5.11) at the approximate centre of the bed base.

Apply the horizontal force using the loading pad (5.3). The loading point shall be at the centre line of the end member, 50 mm below the upper edge of the end member which is furthest away from the stops. See Figure 11.

The mass, the force and the number of cycles to be used to carry out the test shall be as specified in the requirements document or should be as suggested in Annex A.

Dimensions in millimetres



Key

1 test mass
2 mattress
3 stop
4 end member
F horizontal force

Figure 11 — Horizontal static load test for beds without headboards

6.5 Durability tests

6.5.1 Vertical durability test of bed base

Apply the vertical downward force by using the loading pad (5.3) at each position as follows (see Figure 12):

a) centre of the bed base (point A);

b) point 300 mm from the adjacent edges (point B);

c) point opposite of B (point C);

d) point on the transverse centreline, 200 mm from the long edge (point D).

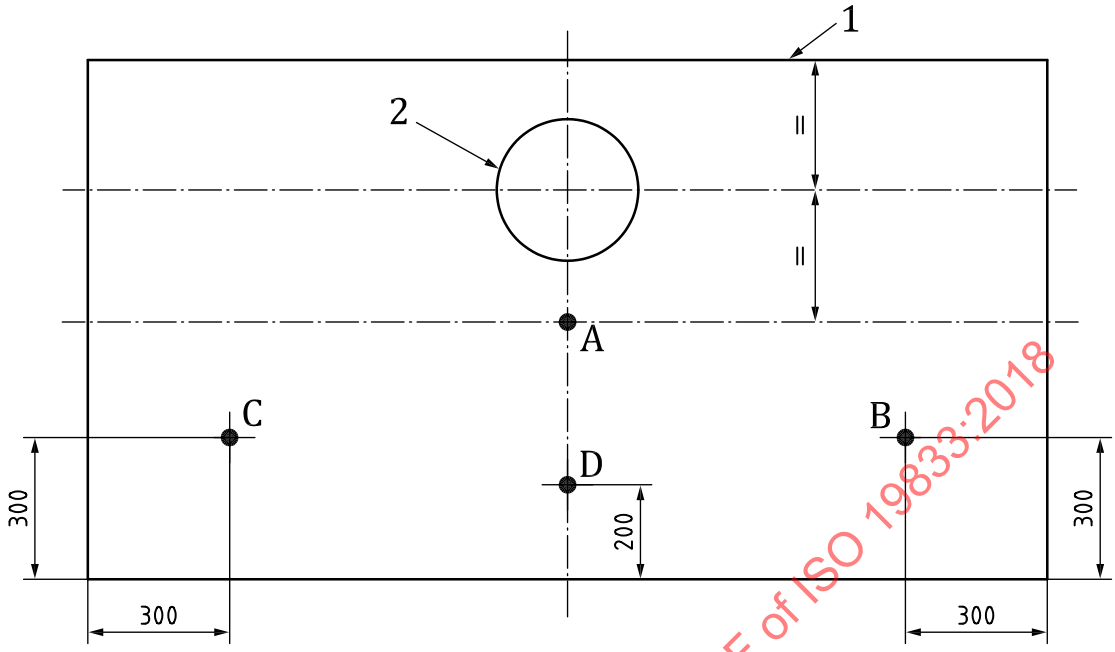
In the case where the supporting structure of head and feet is identical, the test shall be performed in the middle and to one end only.

For beds > 1 200 mm in width, position the test mass (5.11) at the geometric centre of the unloaded half part of the bed base. See Figure 12.

For beds ≤ 1 200 mm in width, apply the vertical downward force without positioning the test mass. If the bed tends to overturn, load the bed base gradually to prevent overturning.

The force and the number of cycles to be used to carry out the test shall be as specified in the requirements document or should be as suggested in Annex A.

Dimensions in millimetres



Key

1	bed base
2	test mass
A, B, C, D	force application points

Figure 12 — Vertical durability test of bed base

6.5.2 Horizontal durability test of bed frame

When the bed is supplied without a mattress, position the mass at the centre of the bed base.

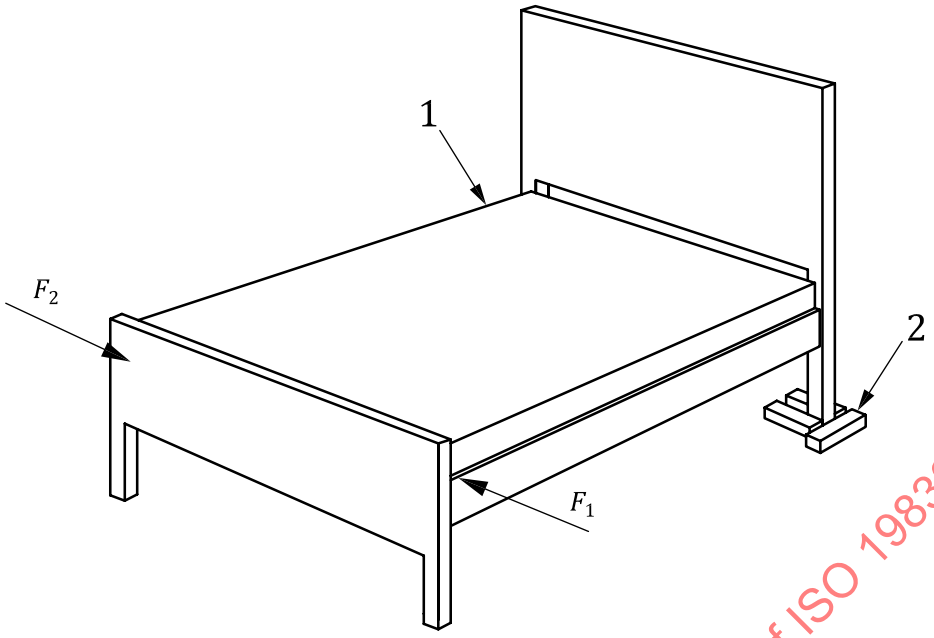
Place stops around the legs or base at one end. If there is a headboard, place the stops at that end (see Figures 13 and 14).

Apply two horizontal forces F_1 and F_2 alternately by means of the small loading pad (5.4) at the unrestrained bed end and perpendicular to the longitudinal axis of the side rail. See Figures 13 and 14.

The loading points shall be at the height of the upper surface of the bed base, 100 mm inboard from the outside plane of the end member (see Figure 14).

One application of the force in each direction represents one cycle.

The mass, the forces and the number of cycles to be used to carry out the test shall be as specified in the requirements document or should be as suggested in Annex A. The cycle rate shall not exceed 5 cycles per minute.

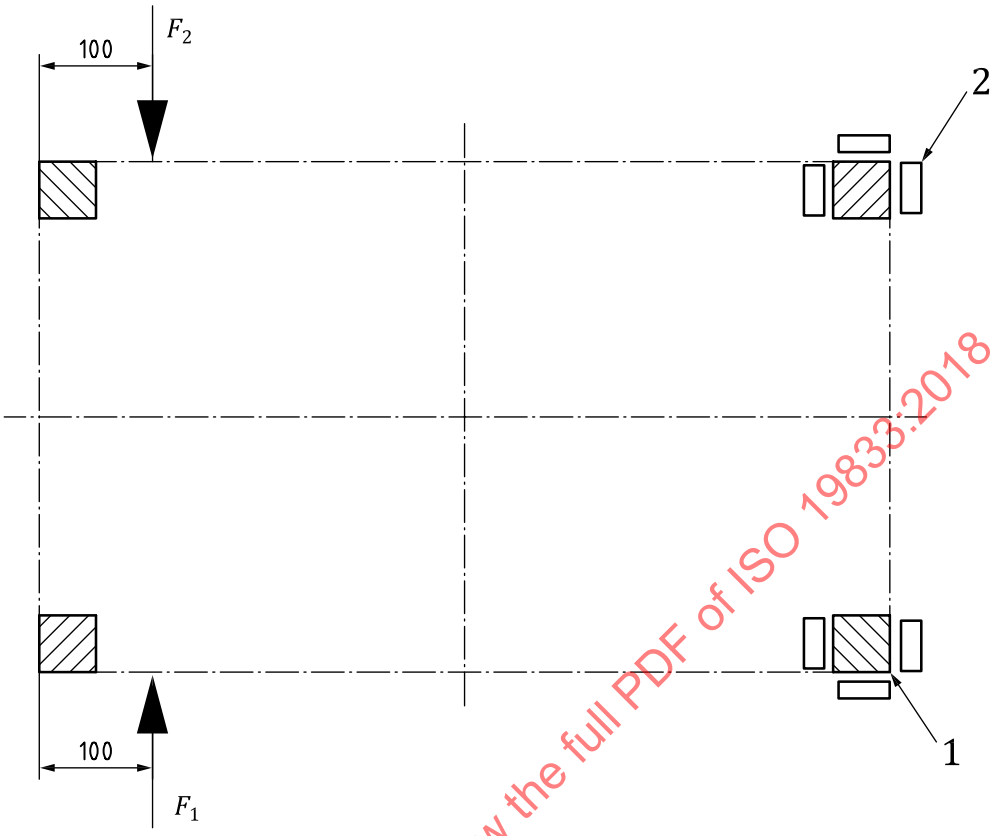


Key

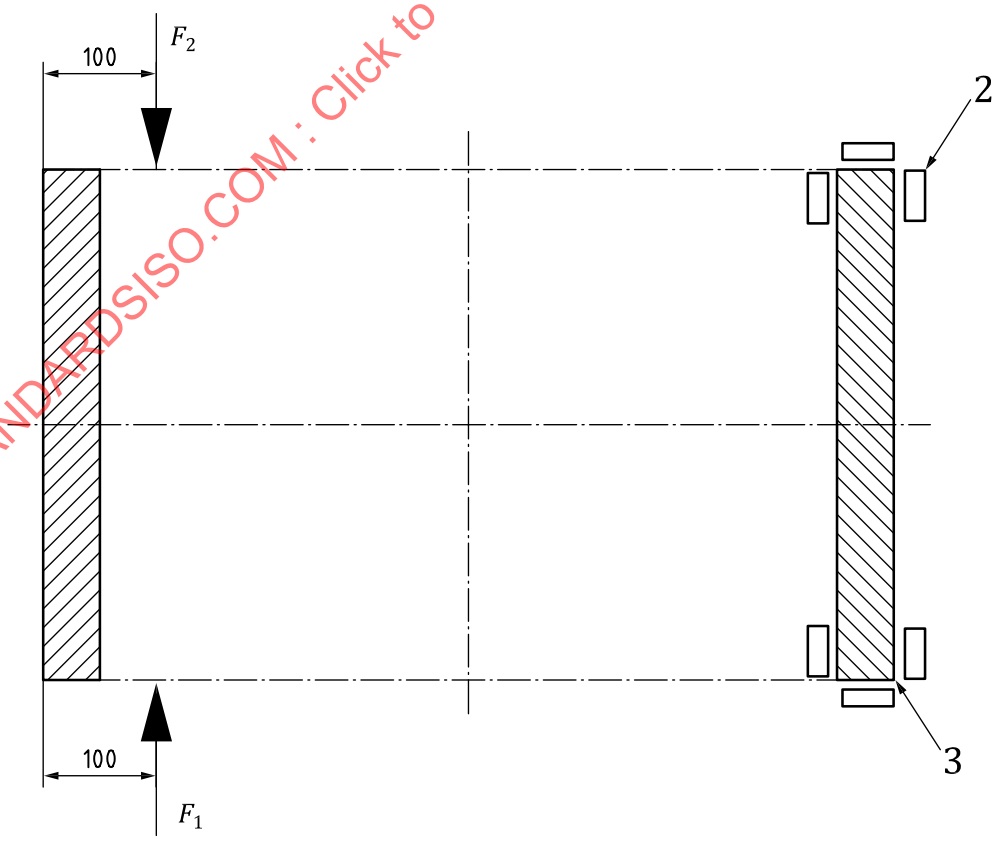
1	mattress
2	stop
F_1, F_2	horizontal forces

Figure 13 — Horizontal durability test of bed frame

Dimensions in millimetres



a) Example — Bed with feet



b) Example — Bed with panel ends

Key

1	leg
2	stop
3	panel end
F_1, F_2	horizontal forces

Figure 14 — Horizontal durability test of bed frame — Force application points and directions

6.6 Vertical impact test

The impactor (5.6) shall be lifted to the height (measured from the top face of the unloaded mattress) specified in the requirements document or should be lifted to the height as suggested in Annex A. Let it drop freely onto the mattress, at the following positions (see Figure 15):

a) centre of the bed base (point A);

b) one third of the longitudinal axis from the middle (point B);

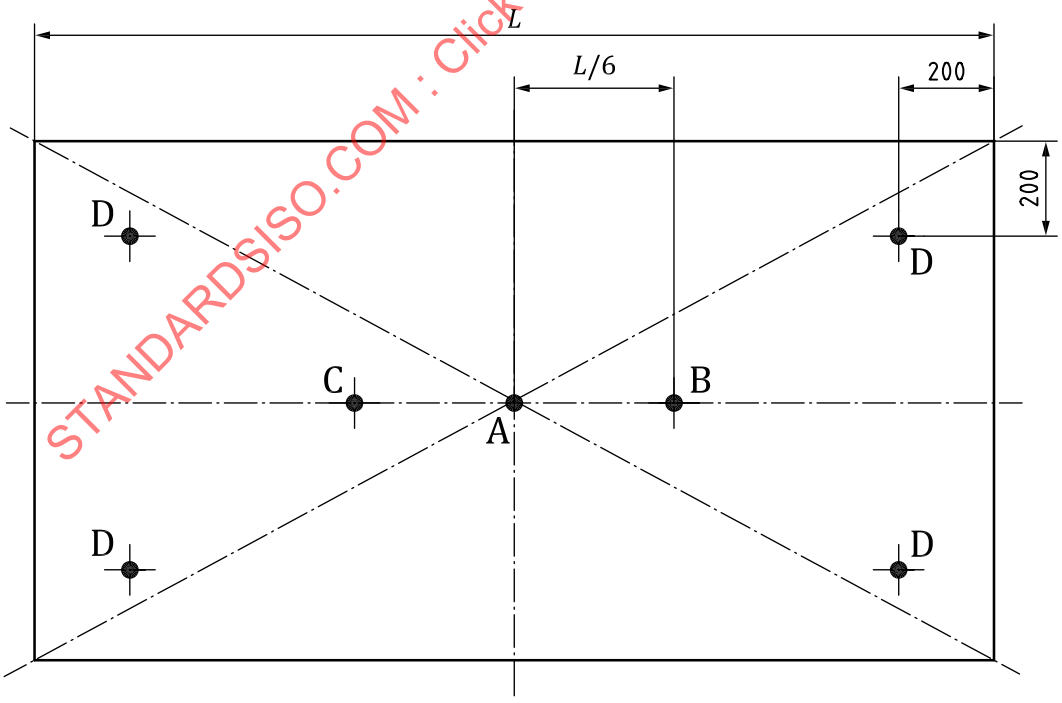
c) point opposite of B (point C);

d) point 200 mm from the adjacent inside edges (point D);

e) one other point of the bed base where failure is most likely to occur.

Drop the impactor at each of the selected positions of impact (see Figure 15). The number of cycles shall be as specified in the requirements document or should be as suggested in Annex A. Each of the 4 selected D points in Figure 15 shall be impacted. The impactor shall be permitted to fall freely but may be guided by a guide rail.

Dimensions in millimetres



Key

L	length of bed base
A,B,C,D	selected positions of impact

Figure 15 — Impact positions