भारतीय मानक
Indian Standard

IS 17636 : 2021

बंक बेड्स — विशिष्टि

Bunk Beds — Specification

ICS 97.140

भारतीय मानक ब्यूरो
BUREAU OF INDIAN STANDARDS
मानक भवन, 9 बहादुरशाह ज़फर मार्ग, नई दिल्ली – 110002
MANAK BHAVAN, 9 BAHADUR SHAH ZAFAR MARG
NEW DELHI-110002
www.bis.gov.in www.standardsbis.in

December 2021 **Price Group 8**

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.

This standard specifies requirements related to the performance and safety of bunk beds for domestic and non-domestic use. This standard also applies to single beds for use at a height of the bed base of 800 mm or more above finished floor level, irrespective of the use to which the space below is put. This standard applies to completely manufactured/fabricated beds. 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 be applied to a freestanding bunk bed that is fully assembled and ready for use. The tests consist of the application, to various parts of the bunk bed, of loads or forces simulating normal functional use, as well as misuse that can reasonably be expected to occur. They are designed to evaluate properties without regard to materials, design and construction, or manufacturing processes. Only the sleeping function is considered. The tests are designed to be applied to a freestanding bunk bed that is fully assembled and ready for use. The figures given in this Indian Standard are typical and the test procedures shall be followed.

In the formulation of this standard, considerable assistance has been derived from the following:

1) ISO 9098-1 : 1994 ‘Bunk beds for domestic use — Safety requirements and tests — Part 1: Safety requirements’,
2) ISO 9098-2 : 1994 ‘Bunk beds for domestic use — Safety requirements and tests — Part 2: Test methods’,
3) BS EN 747-1 : 2012+A1 : 2015 ‘Furniture — Bunk beds and high beds, Part 1: Safety requirements’,
4) BS EN 747-2:2012+A1 : 2015 ‘Furniture — Bunk beds and high beds, Part 2: Test methods’.

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

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

BUNK BEDS — SPECIFICATION

1 SCOPE

1.1 This standard covers the requirements relating to the performance and safety that is strength, stability and durability of bunk beds for domestic and non-domestic use. This standard also applies to single beds for use at a height of the bed base of 800 mm or more above finished floor level, irrespective of the use to which the space below is put.

1.2 This standard applies to completely manufactured/ fabricated bunk beds. 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 listed 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*
5533 : 1969	Recommendation for dimensions of spaces for human activities
7888 : 1976	Methods of test for flexible polyurethane foam
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 Bed Base — Base or support structure for a mattress.

3.2 Bed End Structures — Upright unit at the head and foot of the bed, to which the side rails and bed base are attached.

3.3 Bunk Bed — Set of components that can be assembled as beds, one stacked upon the other, or any bed in which the upper surface of the bed base is 800 mm or more above finished floor level. *See* Fig.1A) and 1B).

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

3.5 Safety Barrier — Component intended to prevent an occupant from falling out of the bed.

3.6 Side Rail — Longitudinal member attached to the bed end structure by which the bed base can be supported.

3.7 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.

3.8 Strength Tests — Tests for the capacity of the product to withstand force or pressure as specified in the standard considering the extreme use conditions for a limited frequency of use.

3.8.1 *Static Tests* — Tests consisting of heavy loads being applied a few 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.

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

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

4 DESIGN AND WORKMANSHIP

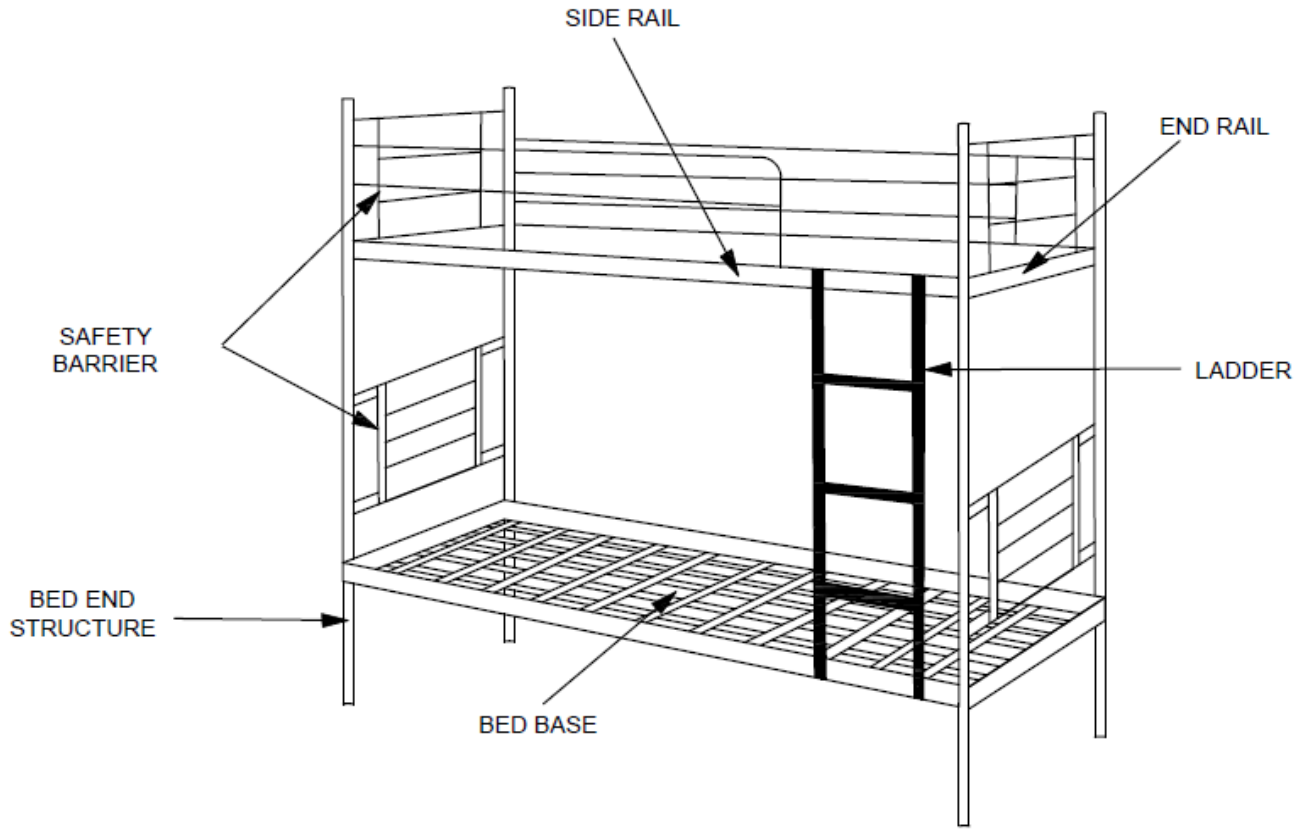
4.1 Design/model shall be as declared by the manufacturer.

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 operation are avoided. In case wooden components, the same shall be free from any stain, unless it is intended as part of design feature.

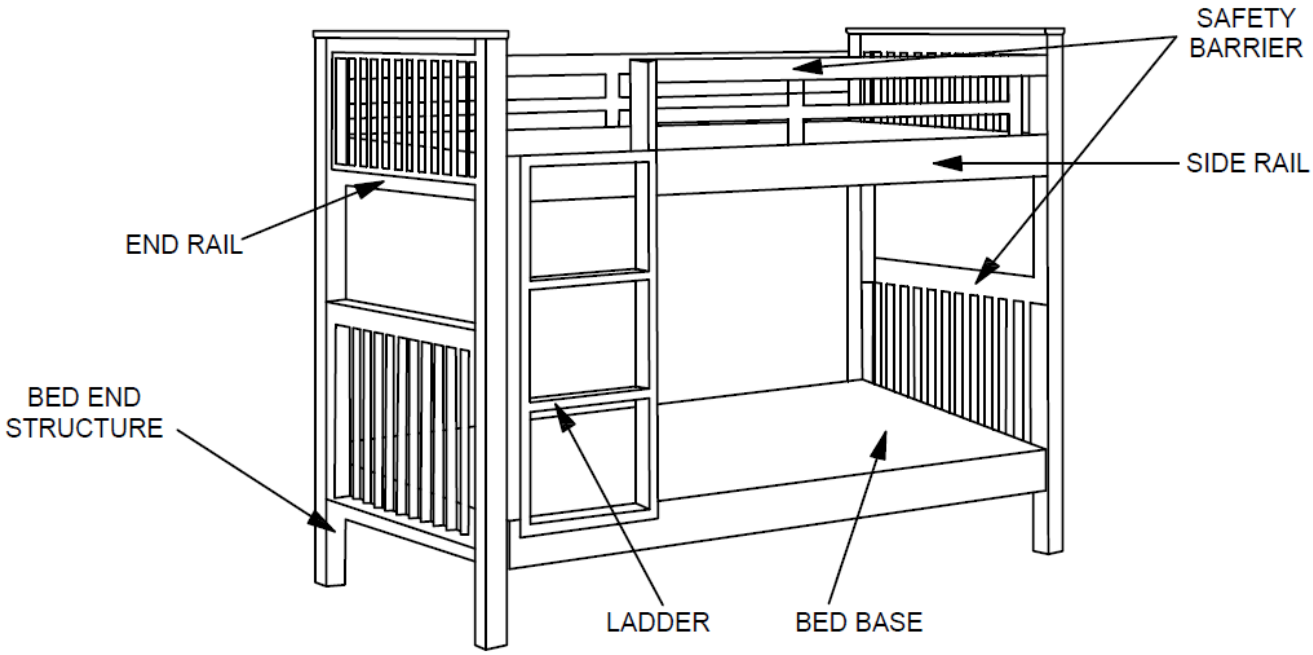
5 DIMENSIONS

The minimum dimensions of spaces for human activities of the assembled bunk bed shall be as per IS 5533.

NOTE — Any other dimensions as agreed to between the manufacturer and the purchaser or as per the design requirements may also be used.



1A Steel Bunk Bed



1B Wooden Bunk Bed

Fig 1 Illustration of Bunk Beds

6 SURFACE PERFORMANCE

6.1 The test sample 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 unit.

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 unit.

7 SAFETY REQUIREMENTS

7.1 The general test conditions, test apparatus and test procedures for the safety tests are given in Annex A, Annex B and Annex C respectively.

7.2 Top Bed Safety Barriers

7.2.1 Any bed which can be used as a top bed shall be equipped with four safety barriers. The safety barriers shall be secured against accidental loosening. The safety barriers shall not be damaged or loosened when tested in accordance with **C-2.2**, with horizontal and vertical forces. Also, it shall not be possible to remove the safety barriers without the aid of a tool.

7.2.2 The distance between the upper edge of the safety barriers and the upper side of the bed base shall be minimum 260 mm. The top of the mattress shall be minimum 160 mm below the upper edge of the safety barriers. The maximum thickness of the mattress shall be marked permanently with a line on the bed, showing the maximum level of the mattress upper surface. One long side of the safety barriers may be completely interrupted by a ladder. The interruption shall be minimum of 300 mm and a maximum of 400 mm. The position of the ladder shall be indicated in the instructions for use.

7.2.3 The safety barrier shall be so designed that in one direction at least the clear space between two adjacent retaining elements, for example, bands, filling bars, shall be in between 60 mm to 75 mm, or ≤ 5 mm when tested in accordance with **C-1**.

7.2.4 After this test the permanent deflection of the retaining elements shall not exceed 2 mm.

7.3 Gaps

7.3.1 The requirements for specific gaps or spaces for top bed safety barrier, bed base and dimensions of treads shall be as given in **7.2**, **7.4** and **7.5.2** respectively.

7.3.2 All other accessible gaps or spaces of the bed construction shall be either:

a) ≤ 25 mm but not less than 12 mm, when tested as per **C-1**;
b) In between 60 mm to 75 mm, when tested as per **C-1**; and
c) ≥ 200 mm.

7.4 Bed Base

7.4.1 All gaps between the bed base and the sides or ends shall not be more than 25 mm, when measured in accordance with **C-1**. The clear distance between the upper and lower bed bases shall be minimum 750 mm. The bed base shall be allowed for ventilation.

7.4.2 When tested in accordance with **C-2.3** to **C-2.5**, no element of the bed base shall break, fall down or become loose. The bed base and/or its elements of the upper bed shall remain in place when tested in accordance with **C-2.**

7.5 Ladder

7.5.1 *Attachment, Deflection and Strength of Ladder and Treads*

7.5.1.1 The bed shall be provided with the ladder. When tested as per **C-4.1**, with a downward static load of 1 000 N and a perpendicular static load of 500 N, the ladder shall not move and shall be connected as it is.

7.5.1.2 Ladders and treads shall not deflect permanently by more than 5 mm and nor shall they break when tested in accordance with **C-4.1** to **C-4.4**. The ladder or the device that allows access to or leaving the upper bed shall have sufficient supports for the feet, and handgrips.

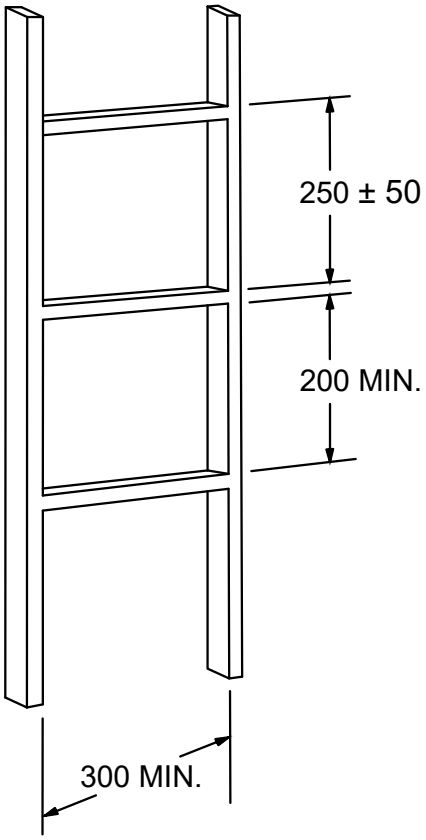
NOTE — The ladder may be an integral part of the bed construction.

7.5.2 *Dimensions of Treads*

7.5.2.1 The dimensions of the treads shall be as followed (*see* Fig. 2):

a) Distance between the upper surfaces of two successive treads shall be 250 mm ± 50 mm.
b) The clear distance between two successive treads shall be minimum 200 mm.
c) The usable width of the tread shall be minimum 300 mm.
d) The distance between the treads shall be equal, with an upper surfaces tolerance of ± 5 mm.
e) The distance from the floor to the upper surface of the first tread shall be minimum 400 mm.

7.5.2.2 Any foothold shall comply with these requirements. The step depth and the gap between any treads and any part of the bed construction shall be as shown in Fig. 3. Frame parts of the bed, situated in the vicinity of treads, may not interfere with the usable area of the tread.



All dimensions in millimetre

FIG. 2 DIMENSIONS OF TREADS

7.5.2.3 The requirements shall be checked both before and after testing of the bunk bed.

7.6 Strength of Frame and Fastenings

Supporting fastenings, for example, between bedpost and bedframe, shall not be damaged or detached when tested in accordance **C-2.3** and **C-3**.

7.7 Stability

When tested in accordance with **C-5**, with a force of 120 N, not more than one leg or corner of the bed shall lift from the floor.

7.8 Fastening of Upper Bed to Lower Bed

The upper bed shall be connected to the lower bed in such a manner that it does not disconnect, when tested in accordance with **C-6**, with a force of 500 N.

8 SAMPLING AND CRITERIA OF CONFORMITY

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

8.2 The required number of bunk beds 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**, other than specified the criteria of conformity shall be as follows:

a) The bed does not overturn during and after stability test;
b) There are no fractures of any member, joint or component;
c) There is no loosening of joints intended to be rigid;
d) No major structural element is significantly deformed; and
e) The bed fulfils its functions after removal of the test loads.

9 INSTRUCTIONS FOR USE

Any bunk in accordance with this standard shall be provided with instructions for use. The instructions shall contain:

a) Instructions that the top of the mattress shall not come above the line marked on the bed;
b) Assembly instructions;
c) Positioning and connection of the ladder;
d) A list of the parts supplied and details of any tools required to assemble the bed; and
e) The sentence: “Be aware of the danger of young children (under 6) falling from the upper bunk.”

10 MARKING

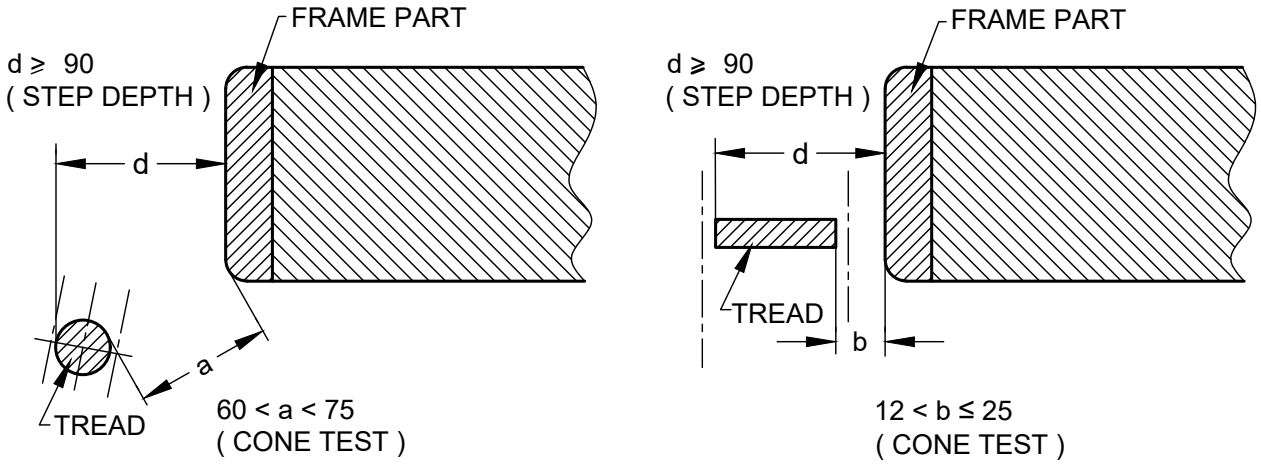
10.1 Each bunk bed shall be indelibly and legibly marked with the following particulars:

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 number.

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

10.3 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.



All dimensions in millimetre

FIG. 3 GAPS AND STEP DEPTH – EXAMPLE OF CONSTRUCTION

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. 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 of the configuration needs to be changed in order to produce the worst case conditions, this shall be recorded in the test report.

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.

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

Other than surface requirements, all applicable tests as mentioned in **7** shall be carried out on the same sample and in the sequence as the clauses as numbered in this standard.

ANNEX B

(*Clause* 7.1)

TEST APPARATUS

B-0 GENERAL

The equipment shall not inhibit deformation nor cause unnatural deformation of the unit/component, that is, 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 test forces may, unless otherwise stated, be applied by any suitable device because results are dependent only upon correctly applied forces and loads, and not upon the apparatus.

B-1 MEASURING CONES

Made of plastics or other hard, smooth material mounted on a force-measuring device (*see* Fig. 4). These cones shall be used with the diameters 25 mm, 60 mm and 75 mm.

B-2 BED BASE IMPACTOR (*see* Fig. 5).

B-2.1 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 springs shall have a mass of (17 ± 0.1) kg and the whole apparatus, including mass, springs and striking surface, shall have a mass of (25 ± 0.1) kg.

B-2.2 Springs

It shall be such that the combined spring system has a nominal spring rate of (6.9 ± 1) N/mm and the total friction resistance of the moving parts is between 0.25 N and 0.45 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.

B-2.3 Striking Surface

Approximately flat, leather pad containing fine dry sand.

B-3 LOADING PAD

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* Fig. 6).

B-4 TEST MATTRESS

The test mattress shall be a soft polyurethane foam sheet with a thickness of 100 mm, a bulk density of (30 ± 2) kg/m^3 and 40 percent indentation force Deflection (IFD) of 170 N ± 40 N when tested as per **6** of IS 7888, with dimensions approximately the same as those of the bed base tested. The test mattress shall not have any cover. The same part of the test mattress should not be reused within 2 h and the mattress should be replaced after 20 tests.

B-5 TEST LOAD

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

B-6 STOPS

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

B-7 FLOOR SURFACE

Horizontal and flat.

B-8 TREAD IMPACTOR

As shown in Fig. 11.

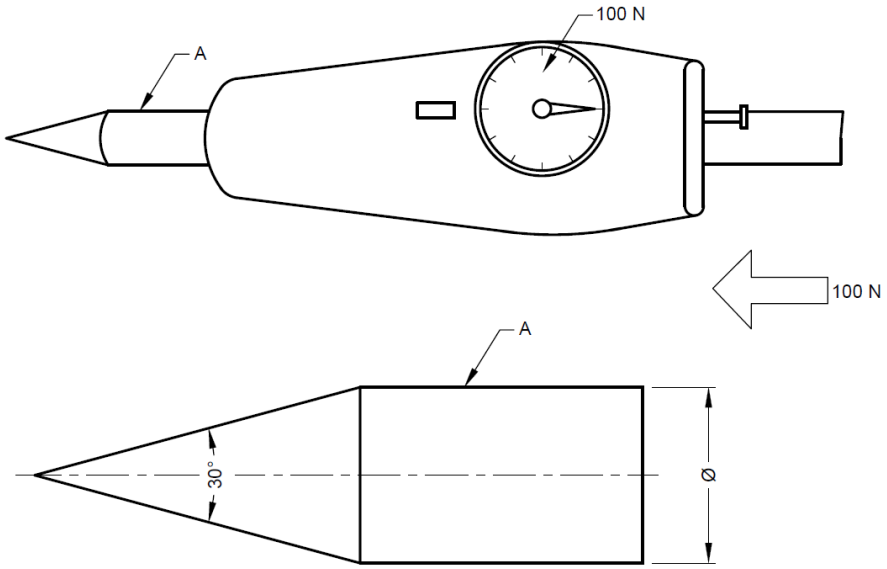


FIG. 4 AN ILLUSTRATION OF MEASURING CONE

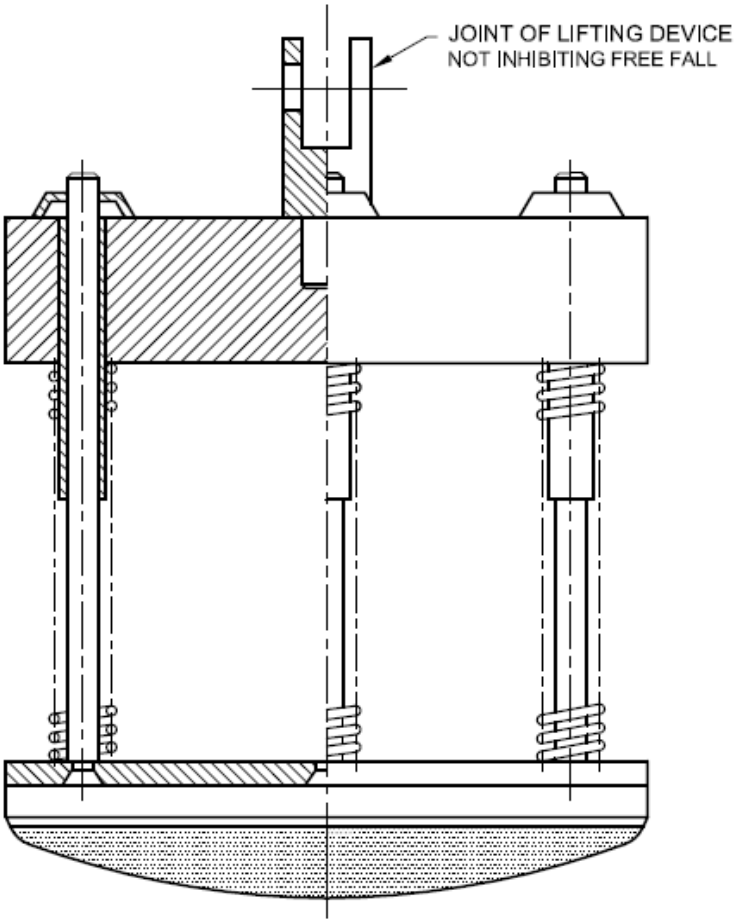
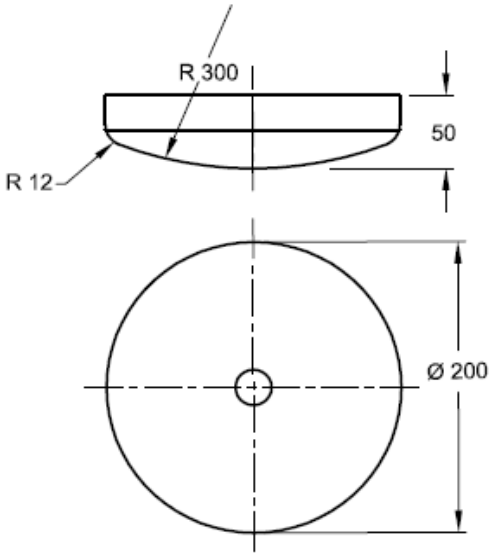


FIG. 5 AN ILLUSTRATION OF BED BASE IMPACTOR



All dimensions in millimetres

FIG. 6 DETAILS OF LOADING PAD

ANNEX C

(*Clause* 7.1)

TEST PROCEDURES

Before starting of the tests, the preliminary preparation and inspection shall be done as per **A-1**.

C-1 MEASURING CLEARANCE BETWEEN SIDE SLATS AND BETWEEN BED BASE AND SIDES (SAFETY BARRIERS)

Check all gaps of the assembled bunk bed specified in this standard, as follows:

Test and Clause	*Loaded/Unloaded*	*Test Equipment*
(1)	(2)	(3)
Top safety barrier (**7.2**)	Loaded	60 mm and 75 mm cones
	Unloaded	Appropriate gauges
Bed base (**7.4**)	Loaded	25 mm cone
Ladder (**7.5**)	Loaded	60 mm and 75 mm cones
	Unloaded	Appropriate gauges

For gaps smaller than 25 mm and from 60 mm to 75 mm, one of the measuring cones (*see* **B-1**) shall be used. All other gaps shall be measured with appropriate gauges. When carrying out the cone test press the cone into the gap with a force of 100 N. Note whether or not the cone can pass through the gap. After removal of the force, measure the residual deflection of all components which have been loaded by the cones,

C-2 STRENGTH TESTS

C-2.1 Positioning of Bed

Position the bed on the floor with all legs against stops (*see* **B-6**).

C-2.2 Static Load of Safety Barriers

Apply separately:

a) horizontal force 500 N outwards,

b) horizontal force 500 N inwards, and

c) vertical force 200 N upward,

At the centre and one end of each side for load duration of 30 s. Apply the force, 10 times at each position. The

loading point shall be 50 mm below the top edge of the structure at each position.

Apply a vertical force of 1 000 N downwards 10 times each for duration of 30 s at the side which appears the weakest. The loading point for applying the force shall be at the top of the safety barrier located 250 mm away from the intersection point of the centre-lines of the adjacent side and end slats.

Record any fracture or deformation or any other damage.

C-2.3 Upwards and Downwards Static Load on Bed Base

Place the test mattress (*see* **B-4**) flat on the bed base. Apply a vertical force of 1 200 N downwards using the loading pad shown in Fig. 6. Apply the load 10 times for duration of 30 s, at any point on the bed base where failure is considered likely to occur.

Apply a vertical force of 500 N upwards for four periods of 30 s, using the loading pad shown in Fig. 6. The point of application shall be the most adverse position.

C-2.4 Impact Load of Bed Base

Place the test mattress (*see* **B-4**) flat on the bed base.

The impacts shall be made at the following positions (*see* Fig. 7):

a) The centre of the bed base (point a);
b) One-third along the longitudinal axis from the middle (point b);
c) The point opposite b (point c);
d) A point 200 mm inside, measured from the adjacent edges (point d); and
e) Any place where the bed base appears weakest (the position of impact shall be recorded in the test report).

Drop the impactor (*see* **B-2**) 10 times from a distance of 180 mm above the bed base onto the test mattress at each of the selected positions of impact (*see* Fig. 7). The impactor shall be permitted to fall freely and may guide by a guide rail. If the constructions of upper and lower bed base are different, then this test shall be carried out at both the bed bases.

Remove the test mattress and examine the specimen to determine if parts of the bed base are broken or if the base has loosened from its fastenings.

C-2.5 Durability Test on Bed Base

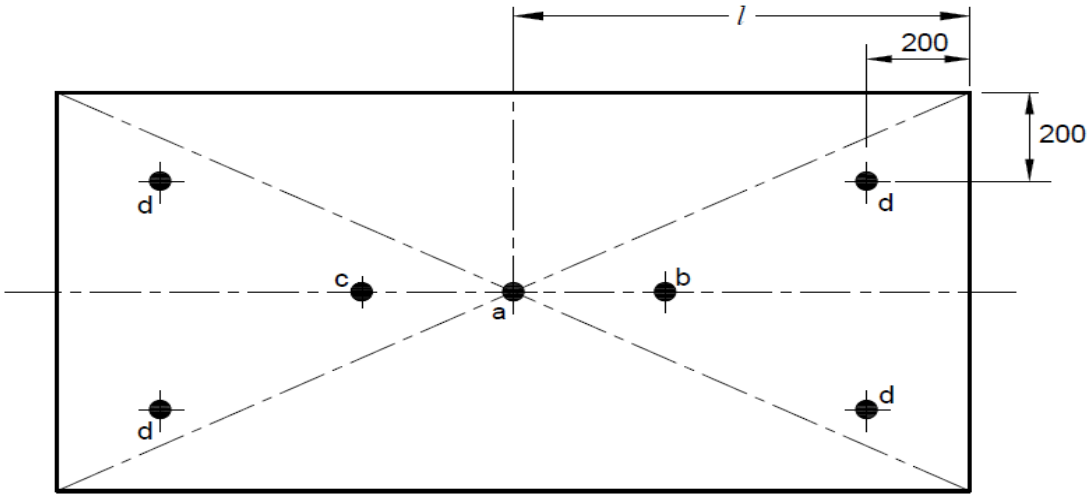
Place the test mattress (*see* **B-4**) flat on the bed base.

Apply a vertical force of 1 000 N downwards using the loading pad (*see* **B-3**). Apply the load 10 000 times at each of the two positions shown in Fig. 8 at a rate of not more than 24 loads per minute.

C-3 DURABILITY TEST OF FRAME AND FASTENINGS

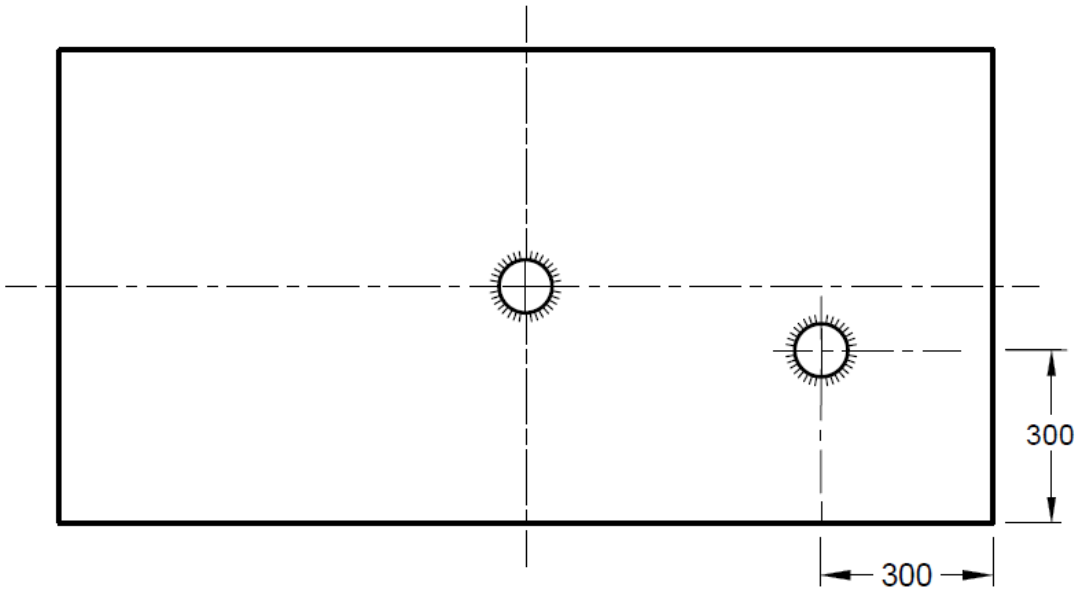
Position the test load (*see* **B-5**) at the centre of the base of the upper bed. The points for applying the test force (A-B-C-D in Fig. 9) are located at 50 mm from the centre of the junction at the height of the upper bed base.

Apply an alternating force of 300 N for 10 000 cycles at each point in the order A-B-C-D in each direction (*see* Fig. 9), at a rate of not more than 24 loads per minute. After the applications, examine the frame and fastenings and note if they have been damaged in any way or detached, and check the function of the fastenings.



All dimensions in millimetres

FIG. 7 POSITION OF IMPACTS



All dimensions in millimetres

FIG. 8 POSITION OF LOADINGS

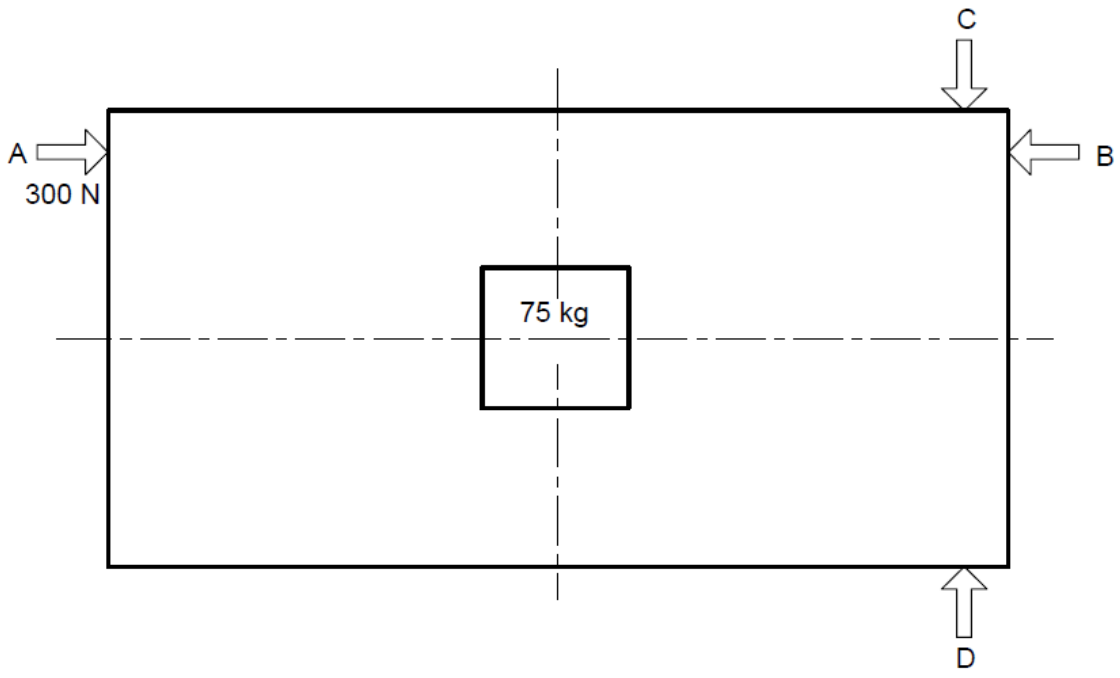


FIG. 9 APPLICATION OF LOAD AND FORCES

C-4 LADDER

C-4.1 Attachment and Deflection

Position the bed on the floor with all legs against stops (*see* **B-6**). The vertical components of the ladder shall not be blocked.

Apply a 1 000 N load vertically downwards to the centre of the middle tread or, in a case of an equal number, 500 N to each of the two middle treads.

Apply horizontal static loads as specified in **7.5.1.1** in the order shown in Fig. 10, one after the other. The load duration shall be 60 s. The loads shall be applied to the vertical slats at the height of the top tread or if this is not possible just above the top tread (the uppermost horizontal ladder component).

Examine the attachments for deflection as specified in **7.5.1**.

NOTE — All the forces symbolized by arrows are applied separately and successively

C-4.2 Treads Impact Test

Set the ladder in its position of use. Position the impactor (*see* Fig. 11) at the side of the tread and in the middle of the tread, at a sufficient distance to permit it to be dropped freely onto the tread. Apply the impact test as illustrated in Fig. 11. Carry out the test 10 times on the top, the bottom and the most central of the treads.

Examine the treads for any break, deformation or loosening.

C-4.3 Vertical Static Load on Treads

Position the assembled bunk bed on the floor with the legs against stops (*see* **B-6**) but without restraining the upright components of the means of access.

Apply a 1 200 N vertical downwards force, by means of the loading pad (*see* **B-3**) to the tread most likely to cause failure. The load application shall be at the mid-point of the tread. The load shall be applied 10 times for 30 s each time.

Examine the attachments for deflection as specified in **7.5.1.2**.

C-4.4 Durability of Treads

Using the loading pad (*see* **B-3**) apply a vertical load of 1 000 N to the tread nearest to the centre of the ladder with the ladder in its intended position, for a total of 10 000 cycles at a rate not more than 24 loads per minute.

Examine the attachments for deflection as specified in **7.5.1.2**.

C-5 STABILITY TEST

Position the bed, without mattresses, on the floor with the legs against stops (*see* **B-6**). The tilting tendencies shall not be restrained. Apply a force as specified in **7.7**, horizontally to the highest point of the outer frame at any position.

Examine whether more than one leg lifts away from the floor during the test.

C-6 FASTENING OF UPPER BED TO LOWER BED

Apply a vertical static force as specified in **7.8**, upwards next to each bed post of the upper bed. The load duration shall be 30 s. After removal of the force, examine whether the upper bed base and/or the upper bed has become loose.

NOTE — If the lower bed tends to lift from the floor during this test, load it just enough to prevent it from lifting.

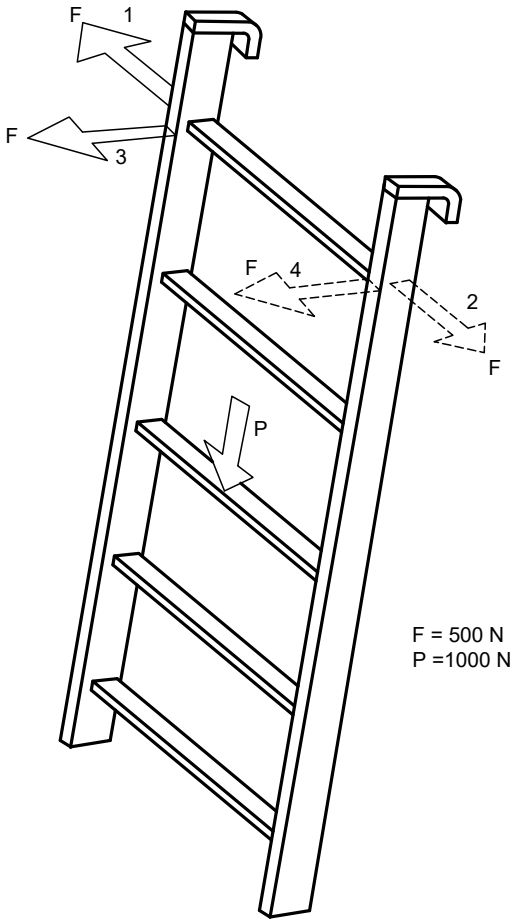
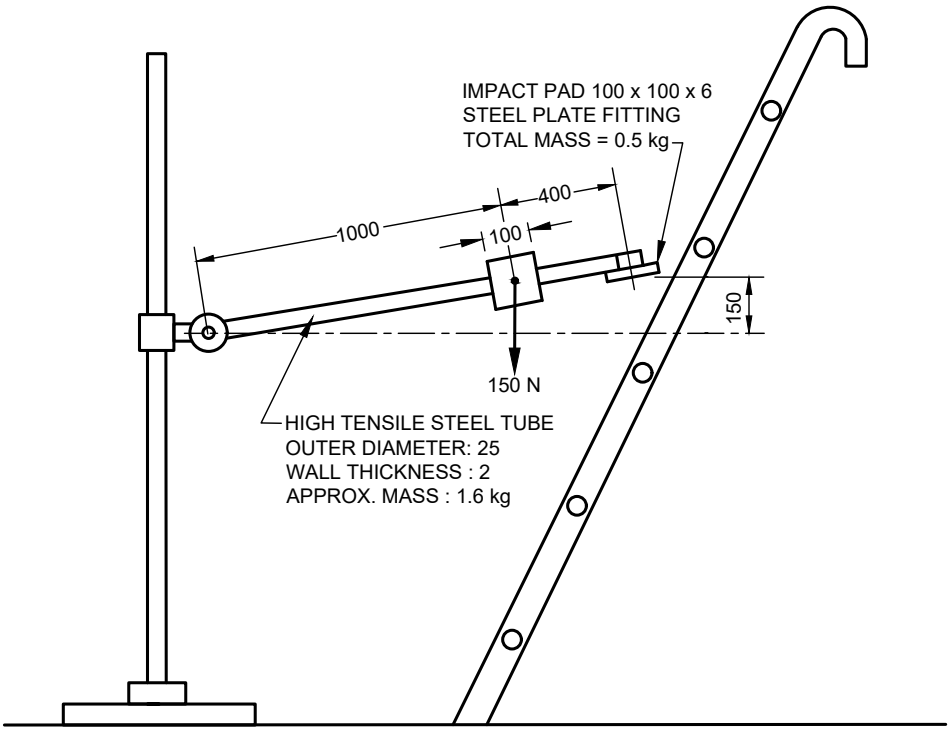


FIG. 10 LADDER ATTACHMENTS AND DEFLECTIONS



All dimensions in millimeters.

FIG. 11 LADDER IMPACT TEST

ANNEX D

(*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***)
Association of Furniture Manufacturers and Traders (I), Mumbai	Representative
Blowplast (BP) Ergonomics Ltd, Mumbai	Dr Nitin Sudame Dr Gita Piramal (*Alternate*)
Central Public Works Department, New Delhi	Shri A. K. Sharma Shrimati Nandni Mukopadhyay (*Alternate*)
Centre for Environmental Planning and Technology (CEPT) University, Ahmedabad	Prof Shrutie Tamboli Prof Snehal Nagarsheth (*Alternate*)
CSIR-Central Building Research Institute, Roorkee	Shri S. K. Negi Shri Ashok Kumar (*Alternate*)
Directorate of Education, Govt of NCT of Delhi, Delhi	Representative
Forest Research Institute, Dehradun	Dr Sadhna Tripathi Dr Kishan Kumar (*Alternate*)
Godrej & Boyce Mfg Co Ltd, Mumbai	Shri Ega Venkateshwarlu Shri Nirav Shah (*Alternate* I) Shri Lalitesh Mandrekar (*Alternate* II)
Government e-Marketplace, New Delhi	Representative
Indian Furniture Products Ltd (Zuari), Tiruvallur	Shri C. M. Satheesh Kumar Shri S. Saravanan (*Alternate*)
Institute of Indian Interior Designers, Mumbai	Shrimati Chirashree Thakkar
Kendriya Bhandar, New Delhi	Representative
Military Engineer Services, Engineer-in-Chief's Branch, Integrated HQ of MoD (Army), New Delhi	Shrimati Rivoo Mahendru Shri S. K. Mishra (*Alternate*)
Ministry of Women and Child Development, New Delhi	Representative
National Institute of Design, Ahmedabad	Shri P. Rama Krishna Rao Shri C. S. Susanth (*Alternate*)
National Institute of Occupational Health (NIOH), Ahmedabad	Shri J. Majumdar
Nilkamal Limited, Mumbai	Shri V. S. Iyer Shri Arvind Janardanam (*Alternate*)
Office of Development Commissioner, Micro Small and Medium Enterprises, New Delhi	Shri K. L. Rao Shri K. K. Funda (*Alternate*)
School of Planning and Architecture, New Delhi	Prof Manoj Mathur Prof Aruna Ramani Grover (*Alternate*)
The Indian Institute of Architects, Mumbai	Ar Vikramray Pramodray Pandya

Organization	*Representative(s)*
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
BIS Directorate General	Shri Sanjay Pant, Scientist 'F' and Head (Civil Engineering) [Representing Director General (*Ex-officio*)]

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This Indian Standard has been developed from Doc No.: CED 35 (16974).

Amendments Issued Since Publication

Amend No.	Date of Issue	Text Affected

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Published by BIS, New Delhi