भारतीय मानक
Indian Standard

IS 2095 (Part 1) : 2023

जिप्सम के प्लास्टर बोर्ड — विशिष्टि

भाग 1 सादे जिप्सम के प्लास्टर बोर्ड

(चौथा पुनरीक्षण)

Gypsum Plaster Boards — Specification

Part 1 Plain Gypsum Plaster Boards

(Fourth Revision)

ICS 91.100.10

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FOREWORD

This Indian Standard (Fourth Revision) was adopted by the Bureau of Indian Standards, after the draft finalized by the Building Limes and Gypsum Products Sectional Committee had been approved by the Civil Engineering Division Council.

The internal surfaces of walls and ceilings of most of the buildings are finished internally by applying plaster in one or more coats. In order to reduce the demand of site labour, the use of buildings board as covering for walls and ceilings is increasing steadily. Gypsum plaster boards have the specific advantage of being lighter than the boards of similar nature, such as fibre hard boards and asbestos cement building boards. Gypsum plaster boards also possess better fire resistance, thermal and sound insulation properties.

Sufficient quantities of natural gypsum and by-product gypsum are available in India. Though natural gypsum has been mostly used in the manufacture of gypsum plaster boards, by-product gypsum after suitable treatment, if required, is also equally suitable for manufacturing such boards.

Gypsum plaster board have been covered in the standard in three parts, as follows:

Part 1 Plain gypsum plaster boards
Part 2 Coated/laminated gypsum plaster boards
Part 3 Reinforced gypsum plaster boards and ceiling tiles

The plain gypsum plaster board is made with paper lining, where lining is an integral part of the board. In coated/laminated gypsum plaster board, the board is coated/laminated with laminate such as wood veneer, plastic film, paper, etc. The reinforced gypsum boards (and ceiling tiles) are made using considerable amount of fibres, such as sisal, coconut, jute or glass fibres, without any paper lining or coating/lamination.

The boards may be used to provide dry lining finishes to masonry walls, ceilings, steel or timber framed partitions, or as claddings to structural steel columns and beams, or in the manufacture of prefabricated partition panels. Laminated gypsum plaster boards are used for drywall (partition), ceiling and wall lining, and panelling in buildings. Glass reinforced gypsum plaster boards (GRG) are pseudo-ductile materials having reasonably high flexural breaking load and impact resistance. GRG can be sawn, drilled, screwed or nailed like timber. It is non-combustible. Being isotropic in character, thin GRG panels may be used as compared to timber panels. GRG composite can be used for panel doors, wall panelling, partitions, false ceiling, etc and also as furniture components.

The gypsum plaster boards may be fixed by screwing or sticking with gypsum based adhesive plaster directly on structure to avoid plastering work or two boards together with other chemical adhesives for increased sound insulation. They may also be inserted in lay-in grids and/or secured by clips.

This standard was first published in 1964 and subsequently revised in 1982 and 1996. This standard (Part 1) was first brought out as a separate part in 1996 and subsequently revised in 2011. In this revision, the following major modifications have been incorporated:

a) Various types of boards with additional features and combinations of features have been now covered,
b) The classification of boards has been modified and made more comprehensive accordingly,
c) Corresponding test procedures have been incorporated to evaluate conformity of various types of gypsum plaster boards,
d) Two new edge and end profiles have been added, namely half rounded edge and half rounded tapered edge,
e) New test for water absorption, surface hardness, density and fire resistance have been introduced,
f) Marking clause has been made comprehensive, and
g) References to various Indian Standards have been updated.

(*Continued on third cover*)

Indian Standard

GYPSUM PLASTER BOARDS — SPECIFICATION

PART 1 PLAIN GYPSUM PLASTER BOARDS

(Fourth Revision)

1 SCOPE

This standard (Part 1) lays down the requirements for plain gypsum plaster board intended to be used for drywall (partition), ceiling and wall lining, and panelling in buildings. It includes boards manufactured to receive either direct surface decoration or gypsum plaster finishes.

2 REFERENCES

The Indian Standards listed below 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 listed below:

IS No.	*Title*
IS 1288 : 1982	Method of test for mineral gypsum (*second revision*)
IS 2469 : 2023	Glossary of terms relating to gypsum (*first revision*)
IS 2720 (Part 26) : 1987	Method of test for soils: Part 26 determination of *p*H value (*second revision*)
IS 8272 : 1984	Specification for gypsum plaster for use in the manufacture of fibrous plaster boards (*first revision*)
IS 12679 : 2023	By-product gypsum for use in plaster, blocks and boards — Specification (*first revision*)
IS/ISO 834 (Part 8) : 2000	Fire resistance tests — Elements of building construction: Part 8 Specific requirements for non-load bearing vertical separating elements
IS 4905 : 2015/ISO 24153 : 2009	Random sampling and randomization procedures (*first revision*)

3 TERMINOLOGY

For the purpose of this standard, the definitions given in IS 2469 shall apply.

4 TYPES

Gypsum plaster boards are classified as given in Table 1:

5 MATERIALS

5.1 Gypsum Plaster

Gypsum (natural gypsum or by product gypsum) is used for making the gypsum plaster. Gypsum plaster used for the manufacturing of gypsum plaster board shall comply with the requirements given in Table 2. If by product gypsum is used for making gypsum plaster, it shall comply with IS 12679.

NOTE — In place of above methods, use of XRF may the resorted. However, in case of any conflict, the above methods shall be treated as referee method.

5.2 Additives

Suitable additives like glass fibres, silicon oil and other ingredients may be added as appropriate to achieve the specific performance/quality requirement of the end product.

Table 1 Classification of Plain Gypsum Plaster Board
(*Clause* 4)

Sl No.	Type of Gypsum Plasterboard	Suggested Uses
(1)	(2)	(3)
i)	Type A — Plain gypsum plaster board	Internal construction of partitions, ceiling and wall lining.
ii)	Type D — Gypsum plaster board with controlled density	For use in drywall (partition), ceiling and wall lining where greater levels of sound insulation are required, like auditoriums, theatres and multiplexes.
iii)	Type F — Gypsum plaster board with fire resistance properties (manufacture in 12.5 mm and above thickness)	Where specific fire resistance ratings are required in partition wall and ceiling systems; also for protection to structural steel.
iv)	Type H1 and H2 — Gypsum plaster board with moisture resistance properties	Wet area application, drywall (partition) and ceiling; also as a base for tiling in wet use areas.
v)	Type FH — Gypsum plaster board with fire and moisture resistance properties	For shaft walls, wherein the application is both dry and wet having a requirement of increased fire protection can be used in drywall (partition), wall lining and ceiling systems to give increased fire protection and moisture resistance as required; also for protection to structural steel.
vi)	Type R1 and R2 — Gypsum plaster board with impact resistance (manufacture in 12.5 mm and above thickness)	Type R1 — For use in drywall (partition) system to give greater impact resistance in heavy traffic area wherein direct loading on gypsum plaster board is not a criterion. Type R2 — Designed for direct loading/unplanned loading onto gypsum plaster board for drywall (partition) application.
vii)	Type W — Gypsum plaster board with mold and moisture resistance properties	For wet area drywall (partition) with tile/marble fixing or any other desired finish and for humid to very humid area ceilings.

Table 2 Requirements of Gypsum
(*Clause* 5.1)

Sl No.	Characteristics	Requirement	Method of Test, Ref to
(1)	(2)	(3)	(4)
i)	$CaSO_4$. $2H_2O$, *Min*	70 percent	IS 1288
ii)	Free water, percent, *Max*		
	a) Natural (mineral) gypsum	5 percent	IS 1288
	b) By-product gypsum	13 percent	
iii)	*p*H		
	a) Natural (mineral) gypsum	6-8	IS 2720 (Part 26)
	b) By-product gypsum	5-9	
iv)	SiO_2, *Max*	8 percent	IS 1288
v)	Chloride content, *Max*	500 ppm	IS 8272

5.3 Paper Liner

Strong durable paper liners shall be used for lining purpose. The paper liner shall have minimum grammage per square metre is 150 g/m^2.

6 MANUFACTURING

Gypsum plaster boards consist of a gypsum plastercore with or without fibre encased in and firmly bonded to strong durable paper liners on both side of the board, to form a boards. Core shall be dried across full width. The face and back papers shall be securely bonded to the core. The paper surfaces may vary according to the use of the particular type of board, and the core may contain an additive to impart additional properties. The longitudinal edges are paper covered and profiled to suit the application.

7 REQUIREMENTS

7.1 Dimensions and Tolerances

7.1.1 The dimensions of the gypsum plaster board shall be as given in Table 3.

Table 3 Dimensions of Gypsum Plaster Board
(*Clause* 7.1.1)

Sl No.	Parameter	Requirement mm	Tolerance mm
(1)	(2)	(3)	(4)
i)	Width	600/1 220	0 - 5
ii)	Length	1 800 to 3 600	0 - 6
iii)	Thickness	9.5/12.5/15	± 0.5

NOTE — Gypsum plaster boards with other dimensions may be manufactured subject to mutual agreement between the purchaser and the manufacturer, however same tolerances shall be applicable.

7.1.2 *Tolerance on Shape*

7.1.2.1 *Tolerance on straightness of edge*

The maximum tolerance on the straightness of the edge shall be 3 mm when tested as per Annex A.

7.1.2.2 *Tolerance on squareness of edge*

The maximum tolerance on squareness of the edge shall be 2.5 mm when tested as per Annex A.

7.1.3 *Edge and End Profiles*

7.1.3.1 The edge and end profile of gypsum plasterboard shall be manufactured as given in Fig. 1. Other edge and end profile may be produced for special purposes subject to mutual agreement between purchaser and manufacturer. The ends of gypsum plaster board are square-cut.

7.1.3.2 For the tapered edges and the half-rounded tapered edge profile, when measured, each individual reading shall be between the following limits when tested as per Annex B:

a) Depth of taper : between 0.6 mm and 1.9 mm; and
b) Width of taper : between 40 mm and 60 mm.

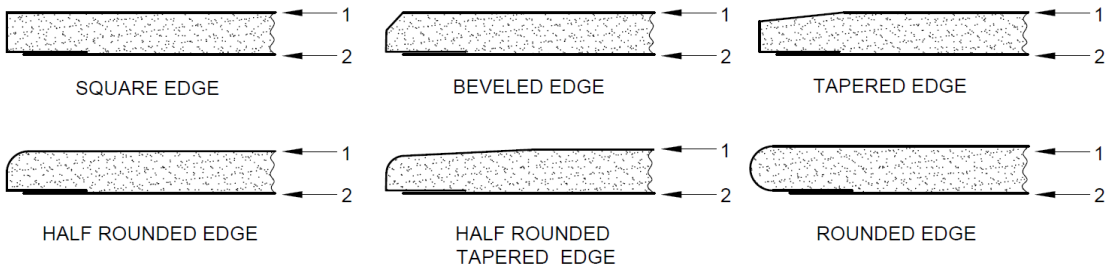
The depth of the gypsum plaster board after taper shall not be less than 8.0 mm for 9.5 mm board, and 11 mm for 12.5 mm board.

7.2 Density

The gypsum plaster board when tested for density as per Annex C, shall be as per Table 4.

7.3 Flexural Breaking Load

The minimum flexural breaking load when tested in accordance with Annex D, shall be as per Table 5.



key

1 Face
2 Back

FIG. 1 TYPICAL DETAIL OF EDGE AND END PROFILE

Table 4 Density of Gypsum Plaster Board
(*Clause* 7.2)

Sl No.	**Type of Gypsum Plaster Board**	**Density,** *Min* kg/m^3
(1)	(2)	(3)
i)	Type A	550
ii)	Type H1 and H2	600
iii)	Type D	800
iv)	Type F, FH	800
v)	Type R1	850
vi)	Type R2	950
vii)	Type W	850

Table 5 Minimum Flexural Breaking Load
(*Clause* 7.3)

Sl No.	Type of Gypsum Plaster Board	Thickness	Flexural Breaking Load in Transverse Direction	Flexural Breaking Load in Longitudinal Direction
		mm	N	N
(1)	(2)	(3)	(4)	(5)
i)	Type A, H1 and H2	a) 9.5	140	360
		b) 12.5	180	500
		c) 15	220	600
		d) Other thickness	14.4 x thickness	40 x thickness
ii)	Type D, F, FH	a) 9.5*	160	400
		b) 12.5	210	550
		c) 15	250	650
		d) Other thickness	16.8 x thickness	43 x thickness
iii)	Type R1 and R2	a) 12.5	300	725
		b) 15	360	870
		c) Other thickness	24 x thickness	58 x thickness
iv)	Type W	a) 12.5	210	540
		b) 15	250	640
		c) Other thickness	16.8 x thickness	43 x thickness

* Only applicable for Type D gypsum plaster board

7.4 Impact Resistance

This test is applicable for Type R1 and Type R2 gypsum plaster board for a declared composition, whenever any change in composition is perforce this test shall be done. The gypsum plaster board when tested for impact resistance as per Annex E, shall be as per Table 6.

Table 6 Impact Resistance
(*Clause* 7.4)

Sl No.	Parameter	Impact Energy Nm		Requirement
		Type R1	Type R2	
(1)	(2)	(3)	(4)	(5)
i)	Small hard body impact			
	a) Surface damage	3	6	No damage
	b) Perforations	5	15	No perforation
ii)	Large soft body impact			
	a) damage	20	40	2 mm deformation, *Max*

7.5 Surface Hardness

This test is applicable on Type R1 and Type R2 gypsum plaster board. The gypsum plaster board when tested for surface hardness as per Annex F, the diameter of any impression shall not exceed 15 mm.

7.6 Loading Capability

This test is applicable on Type R2 gypsum plaster board.

Install one gypsum plaster board vertically with all edges screw fixed (300 mm maximum, centre to centre) or as per the manufacturer's instruction. Hang a mass of 20 kg each from four self-tapping cross recessed countersunk flat head wood screws (number 10 having maximum shank diameter 5 mm) placed 110 mm diagonally from the centre of the board in each of the four quadrant. Care should be taken so that minimum spacing between two screws is not less than 155 mm. Minimum length of the screw should be equal to board thickness plus 10 mm.

No crack shall be developed at the end of 3 min.

7.7 Water Absorption

This test is applicable on Type H1, H2, FH and W gypsum plaster boards. The gypsum plaster board when tested for water absorption as per Annex G, shall be as per Table 7.

Table 7 Water Absorption
(*Clause* 7.7)

Sl No.	Type of Gypsum Plaster Board	Water Absorption, *Max* Percent
(1)	(2)	(3)
i)	Type H1	5
ii)	Type H2	10
iii)	Type FH	5
iv)	Type W	5

7.8 Fire Resistance

This test is applicable on Type F and FH gypsum plaster board, the gypsum plaster board (12.5 mm and above thickness) when tested for fire resistance as per IS/ISO 834 (Part 8), shall have minimum fire resistance of 60 min.

The specimen for fire resistance test shall be made of minimum one gypsum plaster board screw fixed (*Max* 300 mm c/c) on both sides of a metal frame. The frame is supported by vertical and horizontal stiffeners centrally, if no joint is provided. Horizontal and vertical stiffeners shall be provided in all joints, if required. Stone wool or rockwool with minimum density of 40 kg/m^3 or glasswool with minimum density of 20 kg/m^3 is used as insulating material for this testing. This test shall be carried out on the gypsum plaster board only when there is any change in composition of the gypsum plaster board.

7.9 Finish

The surface of the boards shall be true and free from imperfection that would render the board unfit for use.

8 SAMPLING AND CRITERIA FOR CONFORMITY

8.1 Scale of Sampling

8.1.1 *Lot*

In any consignment, all the gypsum plaster boards of the same size, manufactured from set of same materials, under similar condition of production shall be grouped together to constitute a lot.

8.1.2 The gypsum plaster board shall be selected from the lot at random. In order to ensure the randomness of selection, the procedure given in IS 4905 may be followed. The number of gypsum plaster boards to be selected from the lot depends upon the lot size and shall be in accordance with Table 8.

Table 8 Sampling of Gypsum Plaster Board
(*Clauses* 8.1.2, 8.2.1 *and* 8.2.2)

Sl No.	Lot Size (Nos)	Sample Size for Dimensional Requirements	Acceptance Number	Sample Size for Other Tests
(1)	(2)	(3)	(4)	(5)
i)	Up to 500	5	0	2
ii)	501 to 1 000	8	0	3
iii)	1 001 to 3 000	13	1	5
iv)	3 001 and above	20	1	8

8.2 Number of Tests and Criteria for Conformity

8.2.1 Each gypsum plaster board selected in accordance with col (2) and (3) of Table 8 shall be subjected to the tests for the dimensional and finish requirements. Any board failing to meet one or more of the requirements shall be considered defective. If the number of gypsum plaster board found defective is less than or equal to the corresponding acceptance number given in col (4), the lot shall be considered as conforming to the dimension requirements.

8.2.2 The lot which has been found as conforming to the dimensional requirement shall then be subjected to density, flexural breaking load, impact resistance, surface hardness, loading capability, water absorption and fire resistance tests. For this purpose, the number of gypsum plaster boards to be selected shall be in accordance with col (2) and (5) of Table 8. The lot shall be considered as conforming to these requirements if no defect is found.

8.2.3 The lot shall be considered as conforming to the requirements of this standard if **8.2.1** and **8.2.2** are satisfied.

9 REQUIREMENTS FOR ECO MARK

9.1 General Requirement

9.1.1 The product shall conform to the requirements of quality and performance as specified in the standard.

9.1.2 The manufacturer shall produce to the Bureau of Indian Standards, environmental consent clearance from the concerned State Pollution Control Board as per the provisions of the *Water* (*Prevention and Control of Pollution) Act*, 1974 and *Air* (*Prevention and Control of Pollution*) *Act*, 1981 along with the authorization, if required under the *Environment* (*Protection) Act*, 1986, while applying for ECO-Mark.

9.1.3 The product or product packaging may display in brief the criteria based on which the product has been labelled environment friendly.

9.1.4 The material used for product packing shall be recyclable, reusable or biodegradable.

9.2 Specific Requirements

For ECO Marking, gypsum plaster boards shall be manufactured using by-product gypsum.

NOTE — The manufacturer shall provide documentary evidence by way of certificate or declaration to this effect to Bureau of Indian Standards while applying for ECO Mark.

10 PACKING AND MARKING

10.1 The gypsum plaster board shall be transported so as to be kept dry, free from moisture and any kind of damage.

10.2 The gypsum plaster board shall be packed in such packages which are made from recyclable, reusable or biodegradable materials as declared by the manufacturer and may be accompanied with detailed instructions for proper use.

10.3 Each gypsum plaster board shall be legibly and indelibly marked with the following information:

a) Manufacturer's name or trade-mark, if any;
b) Size;
c) Batch number and date of manufacture; and
d) The criteria under which product has been labelled an ECO Mark, if applicable and the list of identified critical ingredients in descending orders of quantity, percent by mass.

11 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 the *Bureau of Indian Standards Act*, 2016 and the Rules and Regulations framed thereunder, and the products may be marked with the Standard Mark.

ANNEX A
(*Clauses* 7.1.2.1 *and* 7.1.2.2)

METHOD OF TEST FOR EDGE STRAIGHTNESS AND SQUARENESS

A-1 PROCEDURE FOR EDGE STRAIGHTNESS

The straightness of the edges and ends of gypsum plaster board shall be verified against a straight edge not less than the full length of the board. If the edge on the end of the board is convex, it shall be held against the straight edge in such a way as to give an approximately equal gap at each end. The largest gap between the straight edge and the edge shall be measured to the nearest millimetre and recorded.

A-2 PROCEDURE FOR SQUARENESS

The squareness of the board shall be checked with a square with arms 500 mm long by applying one arm of the square to the board. The maximum width of the gap shall be recorded.

ANNEX B
(*Clause* 7.1.3.2)

TEST METHODS FOR END PROFILES

B-1 DETERMINATION OF TAPER PROFILE

B-1.1 Taper Width

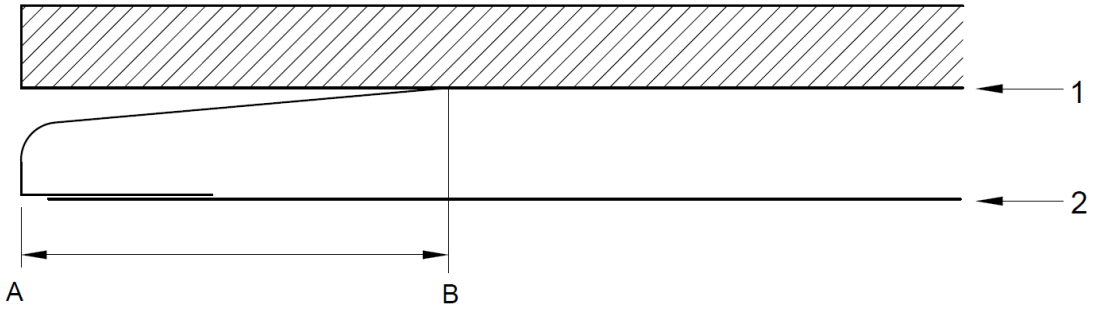
B-1.1.1 *Apparatus*

A flat metal rule at least 250 mm long permitting reading to the accuracy of 0.5 mm.

B-1.1.2 *Procedure*

Measure the taper width on each edge (300 ± 50) mm from each end.

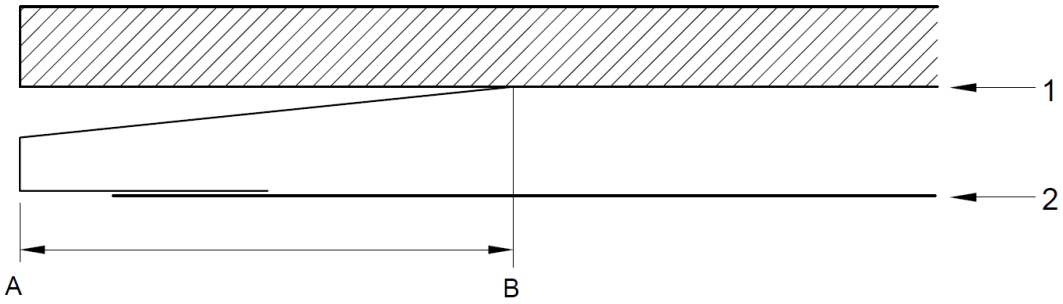
Determine the taper width, AB by applying a metal rule to the face of the board parallel to the end as shown in Fig. 2 for half-rounded tapered edge boards and in Fig. 3 for tapered edge boards.



Key

1 Face
2 Back

FIG. 2 TYPICAL ARRANGEMENT FOR DETERMINATION OF TAPER WIDTH — HALF ROUNDED TAPERED EDGE



Key

1 Face
2 Back

FIG. 3 TYPICAL ARRANGEMENT FOR DETERMINATION OF TAPER WIDTH — TAPERED EDGE

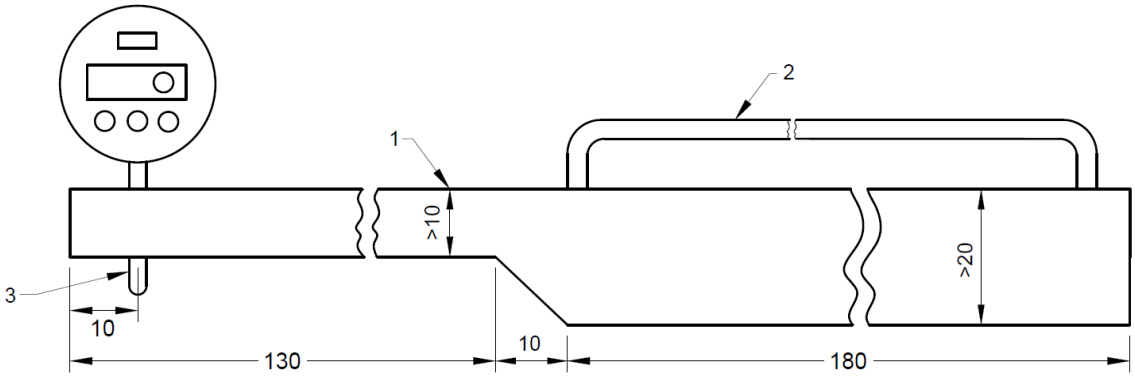
B-1.1.3 *Expression of Results*

Record the distance in millimeters between the edge of the board (point A) and (point B) at which the rule touches the face of the board as the taper width, taking two measurements on each edge.

B-1.2 Taper Depth

B-1.2.1 *Apparatus*

A dial gauge mounted on a special measuring device as shown in Fig. 4 permitting readings to the accuracy of 0.01 mm.



Key

1 Width to be 25 mm, *Min*
2 GRIP
3 Diameter 2 mm to 5 mm with hemispherical tip

All dimensions in millimetres.

FIG. 4 TYPICAL DETAIL OF DEVICE FOR DETERMINATION OF TAPER DEPTH

B-1.2.2 *Procedure*

Measure the taper depth on each edge (300 ± 50) mm from each end. Place the board on a flat surface. Place the measuring device on the face of the board, with the gauge 150 mm from the edge and adjust the scale to zero.

Move the device towards the edge and take the reading (10 ± 1) mm from the edge, for the tapered edge board and (20 ± 1) mm from the edge for the half-rounded tapered edge board.

B-1.2.3 *Expression of Results*

Record each measurement of taper depth to the nearest 0.1 mm.

ANNEX C
(*Clause* 7.2)

DETERMINATION OF DENSITY

C-1 PRINCIPLE

The density shall be calculated from the measured mass and the dimensions of the specimen.

C-2 APPARATUS

a) Metal rule or tape permitting readings to the accuracy of 1 mm;
b) Micrometer, dial gauge, or callipers with an anvil diameter not less than 10 mm and permitting readings to the accuracy of 0.01 mm; and
c) Balance permitting readings to the accuracy of 0.01 g.

C-3 PROCEDURE

Prepare three specimens of size 400 mm x 300 mm. The specimen shall be conditioned by drying in oven at temperature of 35 °C to 40 °C to constant mass, that is two successive mass after 4 h of further drying do not vary by more than 0.1 percent. Weigh the specimens to the accuracy of 0.1 g. Measure the specimen dimensions.

C-4 EXPRESSION OF RESULTS

Calculate the density of each specimen (in kg/m^3) by dividing the mass (in kg) by the volume (in m^3) determined from the measured dimensions of the specimen. The density is the average of the three individual results rounded to 10 kg/m^3.

ANNEX D
(*Clause* 7.3)

DETERMINATION OF FLEXURAL BREAKING LOAD

D-1 PRINCIPLE

The flexural breaking load of gypsum plaster board is estimated by subjecting the specimen of size 400 mm x 300 mm to a load which is increased at a controlled rate until failure occurs.

D-2 APPARATUS

A loading machine capable of being read to 2 percent accuracy and capable of applying the load not more than 300 N/min and not less than 175 N/min.

D-3 PROCEDURE

D-3.1 Preparation of Specimens

Take three gypsum plaster boards and cut two specimens from each board measuring (400 ± 1.5) mm x (300 ± 1.5) mm with all edges square from each board as shown in Fig. 5.

One specimen is taken in the longitudinal direction (designated *L*) and the other in the transverse direction (designated *T*) (*see* Fig. 5).

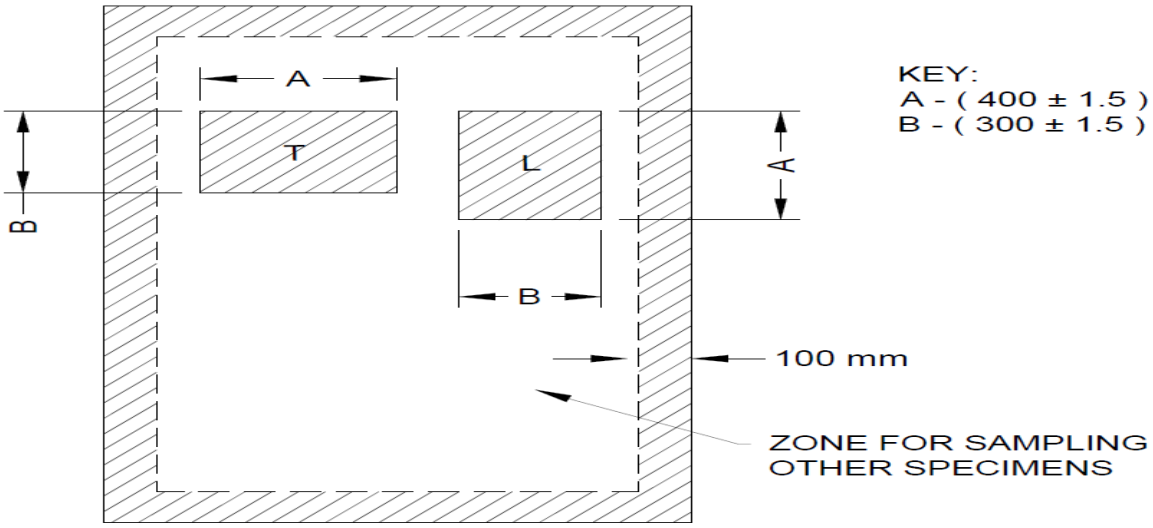
Cut the above specimens at least 100 mm from ends and edges of the board, except in the case of boards of less than 600 mm width, where the distance from the edge may be reduced and shall be equal on either side of the sample.

The specimen shall be weighed within 1 g and stored at a temperature of (27 ± 2) °C in an atmosphere having a relative humidity of (65 ± 5) percent. The specimen shall be weighed once in a day until mass has become constant to within 0.1 percent.

D-3.2 Testing

Place each specimen in the loading machine, face down in the case of longitudinal specimens and face up in the case of transverse specimens, on two parallel supports A and B rounded to a radius of 20 mm, with the centres (350 ± 1) mm apart, and midway C also rounded to a radius of 20 mm (*see* Fig. 6).

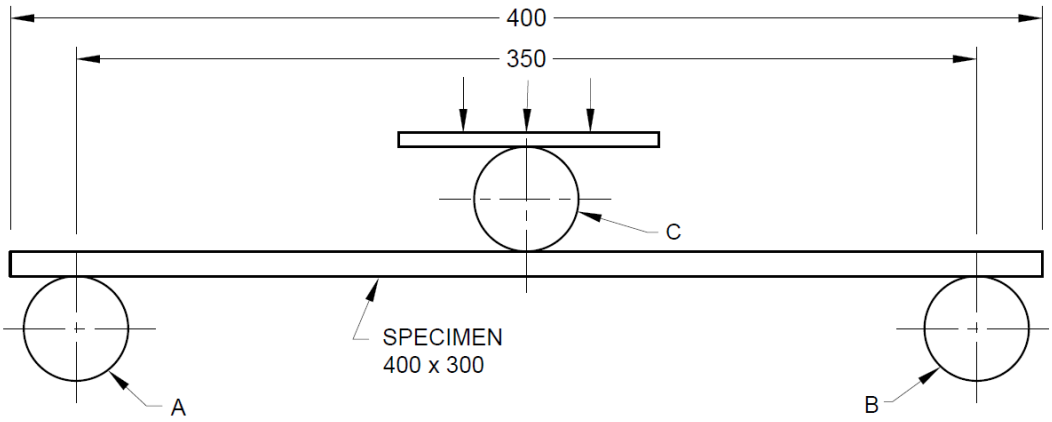
The load shall be applied at a uniform rate through bearer C, the rate of loading shall not exceed 300 N/min and shall not be less than 175 N/min.



All dimensions in millimetres.

FIG. 5 TYPICAL ARRANGEMENT FOR SAMPLING OF SPECIMENS FOR DETERMINATION OF FLEXURAL BREAKING LOAD

(EXAMPLE FOR 1 220 MM WIDE BOARD)



All dimensions in millimetres.

FIG. 6 TYPICAL ARRANGEMENT OF LOADING

D-4 EXPRESSION OF RESULTS

Record each individual value and calculate the flexural breaking load as the mean of the three longitudinal specimens (*L*) values or of the three transverse specimens (*T*) values.

ANNEX E
(*Clause* 7.4)

IMPACT RESISTANCE

E-1 DETERMINATION OF SURFACE DAMAGE AND PERFORATION BY SMALL HARD BODY IMPACT

E-1.1 Principle

The test determines the resistance of the partition to damage from impacts by small, hard objects. A 3 kg impactor, with its head being a (50 ± 0.5) mm diameter steel sphere, is swung to impact approximately perpendicularly the face of the specimen. The nature and extent of any damage to the specimen are recorded.

E-1.2 Specimen

One unit of gypsum plaster board shall be taken each for surface damage and perforation test.

E-1.3 Apparatus

The Apparatus shall comprise the following:

a) Impactor, having a head comprising a (50 ± 0.5) mm diameter steel sphere mounted on a shaft not exceeding 20 mm diameter, weighted to bring the total mass of the impactor to 3 kg. The head shall be mounted as a pendulum (600 ± 1) mm long (as shown in Fig. 7) from a bearing allowing it to swing freely in a vertical plane perpendicular to the plane of the specimen, but prevented from sideways movement. The arm of the pendulum shall be in the form of a metal rod or tube of approximate mass 1.3 kg/m length. The centre line of the pendulum arm shall meet the shaft of the impactor head 125 mm from the centre of the 50 mm sphere. At least 80 mm of the shaft of the impactor head, between the sphere and the attachment for the pendulum arm, shall be unobstructed to facilitate penetration.

b) Support frame for impactor, to allow impactor pendulum to be positioned as required for test, to hold pivot of pendulum in position during impact, and incorporating release mechanism to control pendulum's angle of swing. (as shown in Fig. 7)

c) Measuring instrument, to measure the depth of indentation to the nearest 0.1 mm.

NOTE — A convenient instrument for this purpose is a dial gauge mounted in the middle of a reference bar with a flattened knife edge at one end and a single rounded point contact at the other, forming a 100 mm bridge.

E-1.4 Procedure

Install the gypsum plaster board vertically with all edge screws fixed (maximum 300 mm centre to centre) on metal frame or as per manufacturer's instruction. Set up the test apparatus at the impact position, such that when at rest the impactor just touches the face of the specimen (as shown in Fig. 7).

The impact position should be the centre of the sample. Raise the impactor to the angle of swing required for the impact energy being tested, as shown in Table 9 and Table 10.

Release the impactor once only and prevent it from bouncing.

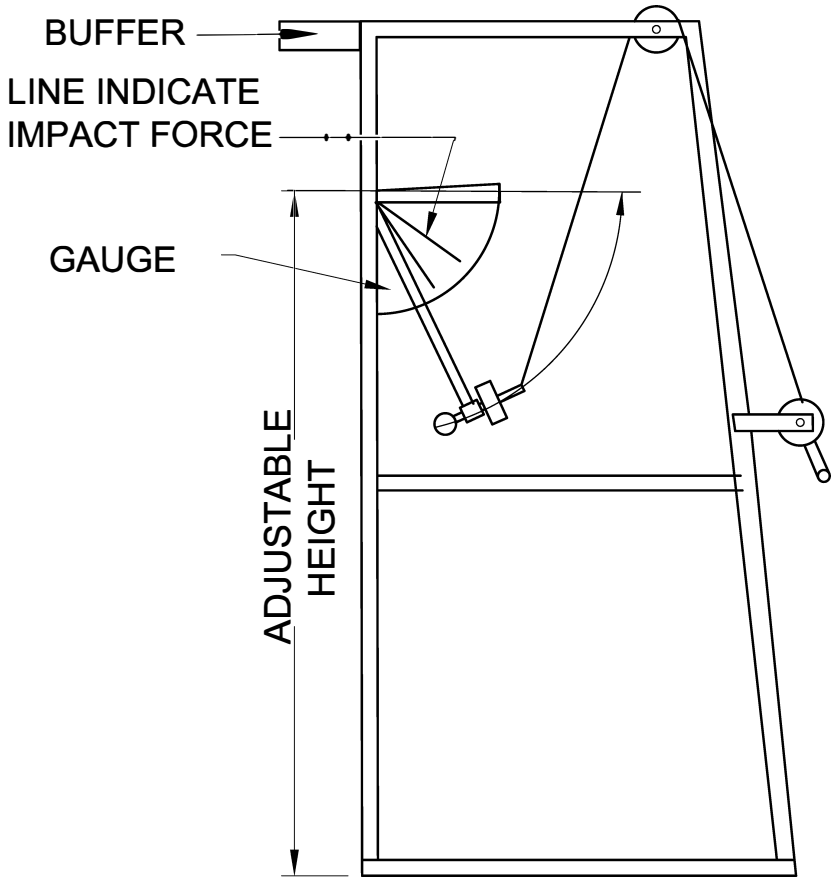


FIG. 7 TYPICAL ARRANGEMENT OF APPARATUS FOR SMALL HARD BODY IMPACT TEST

Table 9 Angles of Swing for Small Hard Body Impact Test : Surface Damage
(*Clause* E-1.4)

Sl No.	Type of Board	Impact Energy	Pendulum Head Drop Height	Angle of Swing
		Nm	m	
(1)	(2)	(3)	(4)	(5)
i)	R1	3	0.1	33.6°
ii)	R2	6	0.2	48.2°

Table 10 Angles of Swing for Resistance to Perforation Test
(*Clause* E-1.4)

Sl No.	Type of Board	Impact Energy	Pendulum Head Drop Height	Angle of Swing
		Nm	m	
(1)	(2)	(3)	(4)	(5)
i)	R1	5	0.17	43.8°
ii)	R2	15	0.5	80.4°

E-1.5 Expression of result

No damage like indentation, delamination, fracture of surface, etc shall be found. There shall be no perforation. Measure the depth of indentation to the nearest 0.1 mm.

E-2 DETERMINATION OF RESISTANCE TO DAMAGE BY LARGE SOFT BODY IMPACT

E-2.1 Principle

The test requires that the specimen is subjected to impact from a soft body impactor in the form of a spheroconical bag capable of being swung at the partition to determine the resistance to damage. The impact is applied by a bag suspended from the test rig. The bag is positioned so that when at rest it just touches the face of the specimen at the point of intended impact.

E-2.2 Specimen

One unit of gypsum plaster board shall be taken.

E-2.3 Apparatus

The apparatus shall comprise the following:

a) Spheroconical bag, having a mass of (50 ± 0.5) kg made of eight sections sewn together. The bag when filled shall be the form of a sphere of (400 ± 1) mm diameter inscribed in a cone, the top of which is located at a distance of (400 ± 1) mm from the centre of the sphere. The bottom of the bag is strengthened by a circular piece of leather of (120 ± 1) mm diameter sewn into it. The top of the bag is slightly truncated in order to make an opening of (80 ± 1) mm diameter. This opening is strengthened by a leather strip sewn onto the bag, to which are fixed four equidistant rings held together by a suspension ring. The bag is filled with hardened glass beads of nominal (3 ± 0.1) mm diameter (*see* Fig. 8).

b) Two pulleys and a suspension line, with means of attachment to the test rig (*see* Fig. 9).

c) Winding and release mechanisms for suspending the bag at the required drop height.

d) Measuring instrument, capable of measuring, to an accuracy of 0.01 mm, the deformation of the specimen.

E-2.3.1 Devices that position the measuring instrument and ensure its stability during the test.

E-2.4 Procedure

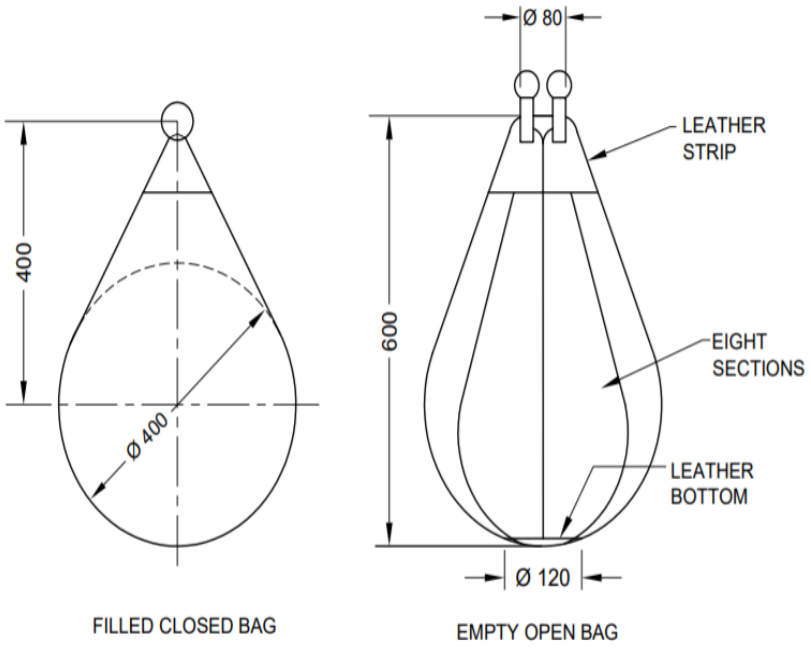
Install the gypsum plaster board vertically with all edges fixed. The impact position should be the centre of the specimen.

Select the position of impact within the horizontal band 1.2 m and 1.75 m above the bottom of the specimen considering the most critical to damage.

The level of impact energy shall be as given in Table 11 for the grade being tested. The line needs to be long enough to ensure that its angle to the plane of the partition does not exceed 65°. Release the line allowing the bag to impact the partition. Restrain the bag to prevent rebounding. Allow the partition to stabilize for 5 min. Examine and record any damage to the specimen. Measure and record the permanent deformation to the nearest 0.5 mm.

Table 11 Drop Height for Damage Test
(*Clause* E-2.4)

Sl No.	Type of Impact Resistance Board	Impact Energy	Drop Height
		Nm	mm
(1)	(2)	(3)	(4)
i)	R1	20	41
ii)	R2	40	82



All dimensions in millimetres.

FIG. 8 TYPICAL ARRANGEMENT OF 50 KG SPHEROCONICAL BAG

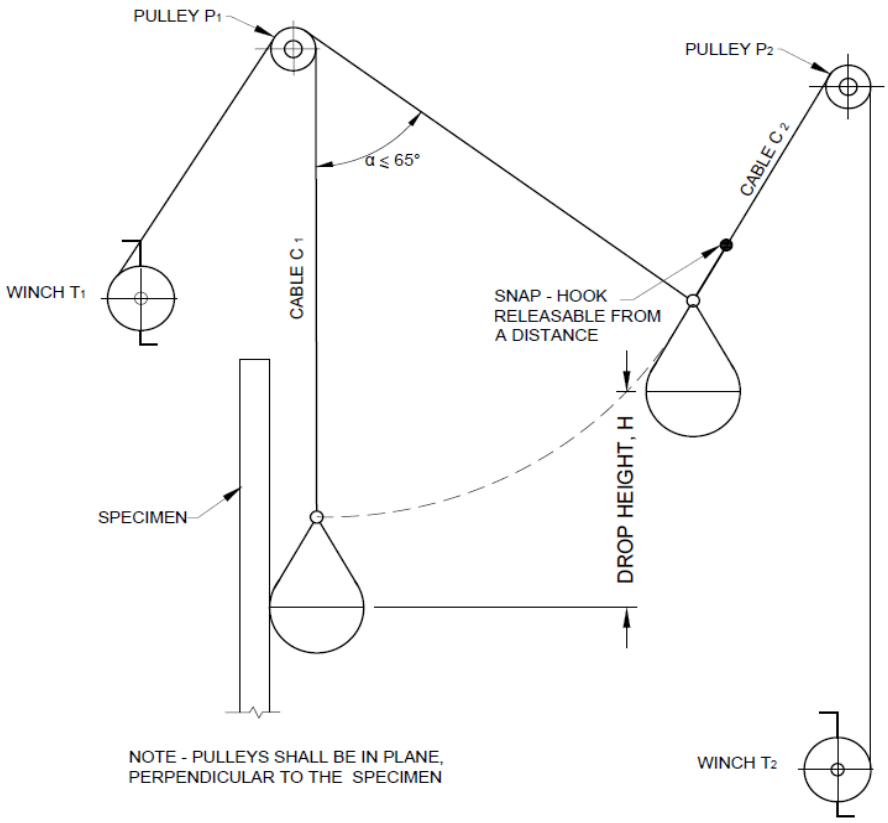


FIG. 9 TYPICAL DETAILS OF TEST APPARATUS FOR LARGE SOFT BODY IMPACT TEST

ANNEX F
(*Clause* 7.5)

SURFACE HARDNESS OF THE BOARD

F-1 PRINCIPLE

The surface hardness of the board is measured in terms of the surface damage caused by a small steel sphere dropped from a predetermined height.

F-2 APPARATUS

The apparatus shall comprise the following:

a) Steel sphere with a diameter of (50 ± 0.5) mm and a mass of (510 ± 10) g;

b) Rigid, flat and horizontal table large enough to support the whole surface of the specimen with inertia sufficient to withstand the impact (for example, a steel table with a thickness of steel top of 20 mm);

c) Carbon paper;

d) Graduated rule permitting readings to the accuracy of 0.01 mm; and

e) Support for the steel sphere.

F-3 PROCEDURE

F-3.1 Preparation of Specimen

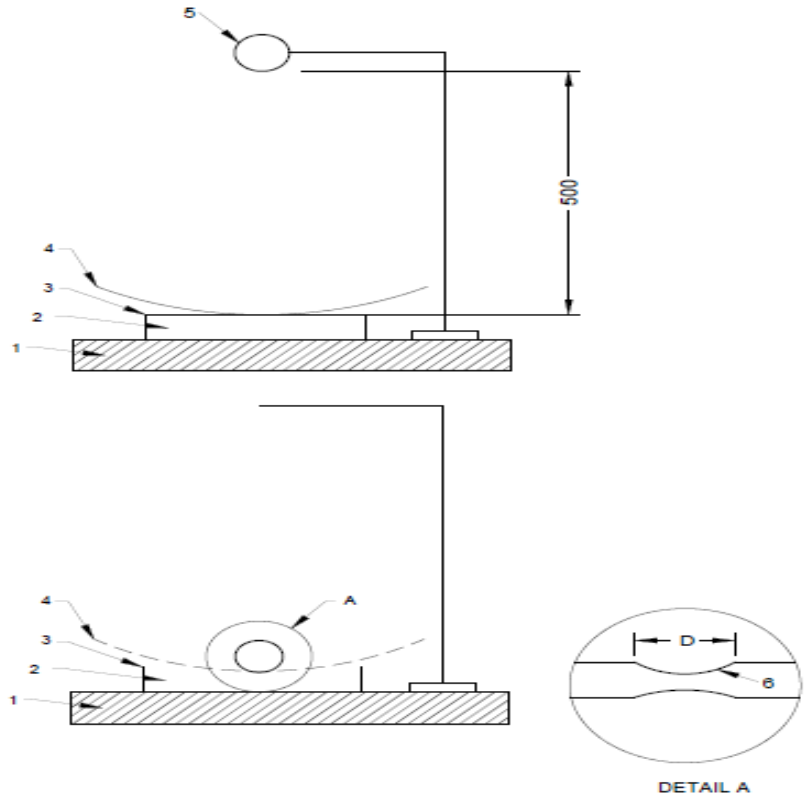
Cut one specimen measuring 300 mm x 400 mm from the board to be tested. The specimen shall be weighed within 1 g and conditioned it by drying in oven at temperature of (40 ± 2) °C to constant mass, that is two successive mass after 4 hours of further drying do not vary by more than 0.1 percent.

F-3.2 Testing

Place the specimen, face up, on the rigid table and cover it with the carbon paper, then place the sphere between the clamps of the support with a distance of (500 ± 5) mm from the board surface to the underside of the sphere, as given in Fig. 10.

Let the sphere fall down onto the board. Then take off the carbon paper and measure to the nearest mm, the diameter of the coloured impact onto the board.

Repeat this test three times on the same specimen.



Key

1 Rigid Table
2 Specimen (Board)
3 Face of the Board
4 Carbon Paper
5 Steel Sphere
6 Coloured Impact

All dimensions in millimetres.

FIG. 10 TYPICAL ARRANGEMENT FOR SURFACE HARDNESS TEST

F-4 EXPRESSION OF RESULTS

Calculate for each specimen the average of the three measured values to the nearest mm.

The surface hardness of the board shall be characterised by this average value.

ANNEX G
(*Clause* 7.7)

WATER ABSORPTION

G-1 PRINCIPLE

Conditioned specimens are immersed in water for 2 h at (27 ± 2) °C and the percentage increase in mass is determined, as the water absorption.

G-2 APPARATUS

The apparatus shall comprise the following:

a) Balance permitting readings to the accuracy of 0.01 g.

b) Water bath at (27 ± 2) °C large enough to hold the specimen.

G-3 PROCEDURE

Cut a specimen measuring 300 mm x 300 mm from each board approximately half-way between the edges. Do not treat the edges of the specimen.

Condition the specimens to constant mass at (27 ± 2) °C and (50 ± 5) percent relative humidity, weigh to the nearest 0.1 g and carry out the test immediately.

Immerse the specimen in a water bath at (27 ± 2) °C covered with 25 mm to 35 mm of water for 2 h ± 2 min.

Place the specimen horizontally but not resting flat on the bottom of the container.

After removal from the bath, wipe excess water from the surface and edges of the specimen and weigh immediately to the nearest 0.1 g.

G-4 EXPRESSION OF RESULTS

Calculate increase in mass for each specimen. The average of the three values as a percentage of the initial mass shall be recorded as the water absorption of the gypsum plaster board.

ANNEX J
(*Foreword*)

COMMITTEE COMPOSITION

Building Lime and Gypsum Products Sectional Committee, CED 04

Organization	*Representative(s)*
School of Planning and Architecture, New Delhi	SHRIMATI ANURADHA CHATURVEDI (***Chairperson***)
AIMIL Ltd, New Delhi	SHRI ROHITASH BARUA SHRI MADAN KUMAR SHARMA (*Alternate*)
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Organization	*Representative(s)*
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SCIENTIST 'D'/JOINT DIRECTOR
(CIVIL ENGINEERING), BIS

(*Continued from second cover*)

A scheme for labelling environment friendly products known as ECO Mark is also included. The ECO Mark would be administered by the Bureau of Indian Standards (BIS) under the *BIS Act*, 1986 as per Resolution No. 71 dated 21 February 1991 and No. 425 dated 28 October 1992 published in the Gazette of the Government of India. For a product to be eligible for marking with ECO logo, it shall also carry the ISI Mark of BIS besides meeting additional optional environment friendly requirements. For this purpose, the Standard Mark of BIS would be a single mark being a combination of the ISI Mark and the ECO logo. Requirements to be satisfied for a product to qualify for the BIS Standard Mark for ECO friendliness will be optional; manufacturing units will be free to opt for the ISI Mark alone also.

The composition of the committee responsible for the formulation of this standard is listed in Annex J.

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 : 2022 ‘Rules for rounding off numerical values (*second revision*)'. The number of significant places retained in the rounded off value should be the same as that of the specified value in this standard.

Bureau of Indian Standards

BIS is a statutory institution established under the *Bureau of Indian Standards Act*, 2016 to promote harmonious development of the activities of standardization, marking and quality certification of goods and attending to connected matters in the country.

Review of Indian Standards

Amendments are issued to standards as the need arises on the basis of comments. Standards are also reviewed periodically; a standard along with amendments is reaffirmed when such review indicates that no changes are needed; if the review indicates that changes are needed, it is taken up for revision. Users of Indian Standards should ascertain that they are in possession of the latest amendments or edition by referring to the website-www.bis.gov.in or www.standardsbis.in.

This Indian Standard has been developed from Doc No.: CED 04 (18820).

Amendments Issued Since Publication

Amend No.	Date of Issue	Text Affected

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