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Mazdoor Kisan Shakti Sangathan

“The Right to Information, The Right to Live”

“पुराने को छोड़ नये के तरफ”

Jawaharlal Nehru

“Step Out From the Old to the New”

IS 2380-1 to 21 (1977): Methods of Test for Wood Particle Boards and Boards from Other Lignocellulosic Materials [CED 20: Wood and other Lignocellulosic products]



“ज्ञान से एक नये भारत का निर्माण”

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“Invent a New India Using Knowledge”



“ज्ञान एक ऐसा खजाना है जो कभी चुराया नहीं जा सकता है”

Bhartrhari—Nitiśatakam

“Knowledge is such a treasure which cannot be stolen”

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Indian Standard
**METHODS OF TEST FOR WOOD PARTICLE
BOARDS AND BOARDS FROM OTHER
LIGNOCELLULOSIC MATERIALS**
(First Revision)

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AMENDMENT NO. 1 SEPTEMBER 1980

TO

IS:2380(Parts I to XXI)-1977 METHODS OF TEST FOR
WOOD PARTICLE BOARDS AND BOARDS FROM OTHER
LIGNOCELLULOSIC MATERIALS

(First Revision)

PART I PREPARATION AND CONDITIONING OF TEST SPECIMENS

Alteration

(Pages 7 and 8, clause 2.3) - Substitute the following for the existing clause:

'2.3 Soaking of Specimens for Test - The specimens to be tested, if required to be soaked, shall be submerged horizontally in water at $27 \pm 2^{\circ}\text{C}$ for 24 hours before test and shall be tested immediately after removal from the water. The specimens shall be separated by at least 15 mm from each other and from the bottom and sides of the container. These shall be covered by 25 mm of water at the top. When it is desired to obtain the effect of complete saturation, the specimens may be soaked for such longer period as may be necessary. The duration of soaking and the amount of water absorbed shall be determined and recoded.'

PART XVII DETERMINATION OF SWELLING IN WATER

Alteration

(Page 55, clause 2.2.1) - Substitute the following for the existing clause:

'2.2.1 Each test specimen shall be immersed horizontally in fresh clean water having a temperature of

27 \pm 2°C, the water being renewed for each test. The test specimens shall be separated by at least 15 mm from each other and from the bottom and sides of the container. These shall be covered by approximately 25 mm of water.'

(BDC-20)

AMENDMENT NO. 2 MAY 1984

TO

**IS : 2380 (Parts I to XXI) -1977 METHODS OF TEST
FOR WOOD PARTICLE BOARDS AND BOARDS
FROM OTHER LIGNOCELLULOSIC MATERIALS**

(*First Revision*)

**PART I PREPARATION AND CONDITIONING
OF TEST SPECIMENS**

Alteration

[*Page 7, clause 2.3 (see also Amendment No. 1)*] — Substitute the following for the existing clause:

‘ 2.3 Soaking for Specimens for Test — The specimens to be tested, if required to be soaked, shall be sealed by coating with wax or other suitable sealant material on all the four edges of the specimen and shall then be submerged horizontally under 25 mm fresh clean water maintained at a temperature of $27 \pm 2^{\circ}\text{C}$ for 24 hours before test and shall be tested immediately after removal from the water. The test specimen shall be separated by at least 15 mm from each other and from the bottom and sides of the container. When it is desired to obtain the effect of complete saturation, the specimen may be soaked for such longer period as may be necessary. The duration of soaking and the amount of water absorbed shall be determined and recorded. ’

PART XVI DETERMINATION OF WATER ABSORPTION

Alterations

(*Page 53, clause 3.2, first sentence*) — Substitute the following for the existing sentence:

‘ The specimen shall be sealed by coating with wax or other suitable sealant material on all the four edges of the specimen and shall then be submerged horizontally under 25 mm fresh clean water maintained at a temperature of $27 \pm 2^{\circ}\text{C}$ ’.

(Page 54, clause 4.1, first sentence) — Substitute the following for the existing sentence:

The amount of water absorbed shall be calculated from the increase in mass of the specimen during the submersion, and the water absorption shall be expressed as the percentage of mass based on the mass, after conditioning '.

PART XVII DETERMINATION OF SWELLING IN WATER

Alterations

[Page 55, clause 2.2.1 (see also Amendment No. 1)] — Substitute the following for the existing clause:

' 2.2.1 Each test specimen shall be sealed by coating with wax or other suitable sealant material on all the four edges of the specimen and shall then be submerged under 25 mm fresh clean water maintained at a temperature of $27 \pm 2^\circ\text{C}$, the water being renewed for each test. The short edges of the test specimens shall be vertical, with the measured edges lower most, and the test specimen shall be separated by at least 15 mm from each other and from the bottom and sides of the container. '

(Page 55, clause 2.2.2, line 1) — Substitute ' additional period of 22 hours ' for ' such other period as may be specified '.

(BDC 20)

AMENDMENT NO. 3 JANUARY 1993
TO
IS 2380 (Parts 1 TO 21) : 1977 METHODS OF TEST
FOR WOOD PARTICLE BOARDS AND BOARDS
FROM OTHER LIGNOCELLULOSIC MATERIALS

(First Revision)

PART I PREPARATION AND CONDITIONING OF TEST
SPECIMENS

(Page 7, clause 2.1) — Substitute the following for the existing clause:

‘2.1 Size of Specimen — The required test specimens shall be cut to the specified size (*see relevant methods of test*). Each test piece shall be with all edges cut square to the surface. The dimensions of specimens, that is, length, width and thickness, shall be measured to an accuracy of 0.02 mm provided the dimension measured is less than or equal to 15 cm. In case the dimension is more than 15 cm, the accuracy shall be to nearest 0.5 mm.’

(Page 7, clause 2.2) — Substitute the following for the existing clause:

‘2.2 Conditioning — The test specimen shall be exposed to an atmosphere maintained at a relative humidity of 65 ± 5 percent and a temperature of $27 \pm 2^{\circ}\text{C}$ until their masses are constant.’

(Page 7, clauses 2.2.1 and 2.2.2) — Delete.

PART III DETERMINATION OF MOISTURE CONTENT AND
DENSITY

(Page 12, clause 3.2.2, line 2) — Substitute the words ‘to an accuracy given in 2.1 of IS 2380 (Part 1) : 1977‡’ for ‘to an accuracy of not less than ± 0.3 percent’.

(Page 12, foot-note) — Insert the following at the end:

‡Methods of test for wood particle boards and boards from other lignocellulosic materials: Part 1 Preparation and conditioning of test specimens (*first revision*).

**PART IV DETERMINATION OF STATIC BENDING STRENGTH
(MODULUS OF RUPTURE AND MODULUS OF ELASTICITY
IN BENDING)**

(*Page 13, clause 1.1, Note*) — Delete 'or 2.2.1'.

(*Page 13, clause 2.1, lines 6 and 7*) — Substitute the words 'to the accuracy given in 2.1 of IS 2380 (Part 1) : 1977*' for 'to an accuracy of not less than ± 0.3 percent'.

**PART V DETERMINATION OF TENSILE STRENGTH
PERPENDICULAR TO SURFACE**

(*Page 19, clause 2.1, line 2*) — Delete 'or 2.2.1'.

(*Page 19, clause 3.1, lines 6 and 7*) — Substitute the words 'to the accuracy given in 2.1 of IS 2380 (Part 1) : 1977*' for 'to an accuracy of not less than ± 0.3 percent'.

**PART VI DETERMINATION OF TENSILE STRENGTH
PARALLEL TO SURFACE**

(*Page 23, clause 2.1, line 2*) — Delete 'or 2.2.1'.

(*Page 25, clause 3.1, line 2*) — Substitute the words 'to the accuracy given in 2.1 of IS 2380 (Part 1) : 1977*' for 'to the accuracy of not less than ± 0.3 percent'.

(*Page 25, foot-note*) — Insert the following foot-note at the end:

'*Methods of test for wood particle boards and boards from other lignocellulosic materials:
Part 1 Preparation and conditioning of test specimens (*first revision*).'

PART VIII COMPRESSION PARALLEL TO SURFACE TEST

(*Page 29, clause 2.1, line 8*) — Substitute '2.2' for '2'.

**PART IX DETERMINATION OF RESISTANCE TO SHEAR IN
PLANE OF THE BOARD**

(*Page 31, clause 3.1, line 1*) — Substitute '2.2' for '2'.

PART XI SURFACE HARDNESS

(*Pages 39 to 41, clauses 2.1, 3.1 and 4.1, last line*) — Substitute the words 'to the accuracy given in 2.1 of IS 2380 (Part 1) : 1977†' for 'to an accuracy of not less than ± 0.3 percent'.

(*Page 39 to 41*) — Insert the following foot-note at the end:

†Methods of test for wood particle boards and boards from other lignocellulosic materials
Part 1 Preparation and conditioning of test specimens (*first revision*)'

PART XIII LONG TIME LOADING BENDING TEST

(*Page 45, clause 2.1, line 5*) — Substitute '2.2' for '2'.

PART XVI DETERMINATION OF WATER ABSORPTION

(*Page 53, clause 2.1, line 2*) — Substitute '2.2' for '2.2.1'.

PART XVII DETERMINATION OF SWELLING IN WATER

(*Page 55, clause 2.1, line 2*) — Substitute '2.2' for '2.2.1'.

PART XVIII DETERMINATION OF MASS AND DIMENSIONAL CHANGES CAUSED BY MOISTURE CHANGES

(*Page 59, clause 2.1, line 2*) — Substitute '2.2' for '2.2.1'.

(CED 20)

AMENDMENT NO. 4 NOVEMBER 1998
TO
IS 2380 (Parts 1 to 21) : 1977 METHODS OF TEST FOR
WOOD PARTICLE BOARDS AND BOARDS FROM
OTHER LIGNOCELLULOSIC MATERIALS
PART 16 DETERMINATION OF WATER ABSORPTION

(First Revision)

[*Page 53, clause 3.2, first sentence (see also Amendment No. 2)*] —
Substitute the following for the existing:

‘The specimen shall be submerged horizontally under 25 mm fresh clean water maintained at a temperature of $27 \pm 2^{\circ}\text{C}$, the water being renewed for each test.’

PART 17 DETERMINATION OF SWELLING IN WATER

[*Page 55, clause 2.2.1, (see also Amendments No. 1 and 2)*] — Substitute the following for the existing :

‘2.2.1 Each test specimen shall be submerged under 25 mm fresh clean water maintained at a temperature of $27 \pm 2^{\circ}\text{C}$, the water being renewed for each test. The short edges of the test specimens shall be vertical with the measured edges lower most, and the test specimen shall be separated by at least 15 mm from each other and from the bottom and sides of the container.’

(*Page 56, clause 3.1, line 2*) — Substitute ‘2’ for ‘3’.

(CED 20)

Indian Standard
METHODS OF TEST FOR WOOD PARTICLE
BOARDS AND BOARDS FROM OTHER
LIGNOCELLULOSIC MATERIALS
(*First Revision*)

0. FOREWORD

0.1 This Indian Standard (First Revision) was adopted by the Indian Standards Institution on 16 August 1977, after the draft finalized by the Wood Products Sectional Committee had been approved by the Civil Engineering Division Council.

0.2 This standard has been formulated to specify methods of tests for evaluating the important characteristics of boards composed of wood particles or other lignocellulosic materials. However, it may not be necessary to apply all the tests to any particular board for use in any particular situation and it is, therefore, necessary to select those tests which are appropriate to each end use of the board.

0.3 The number of test specimens required for each test is not specified in this standard nor is any guidance given on sampling procedures. The reason for this is that the tests given in this standard may be used for research purposes as manufacturer's control tests or as purchaser's acceptance tests. However, care should be exercised to use samples which are representative of the material under consideration and a record should be made of the sampling procedure adopted and the number of tests made. Some types of boards have markedly different properties in different directions. This is particularly true of extruded boards but applies in varying degree to platen pressed boards. It may then be necessary to carry out some of the tests on test specimens cut from the board in two directions at right angles to one another.

0.4 This standard was first published in 1963. This is the first revision of the standard. While revising the standard in light of the experience gained over these years, it has been considered advisable, for the sake of using these methods of tests and for keeping them up to date to publish the various methods of tests applicable to wood particle boards and boards from other lignocellulosic materials as separate parts of IS : 2380.

IS : 2380 (Parts I to XXI) - 1977

0.5 In the formulation of this standard due weightage has been given to international co-ordination among the standards and practices prevailing in different countries in addition to relating it to the practices in the field in this country.

0.6 In reporting the results of a test or analysis made in accordance with this standard, if the final value, observed or calculated, is to be rounded off, it shall be done in accordance with IS : 2-1960*.

*Rules for rounding off numerical values (*revised*).

Indian Standard

METHODS OF TEST FOR WOOD PARTICLE BOARDS AND BOARDS FROM OTHER LIGNOCELLULOSIC MATERIALS

PART I PREPARATION AND CONDITIONING OF TEST SPECIMENS

(First Revision)

1. SCOPE

1.1 This standard (Part I) covers preparation and conditioning of test specimens before subjecting them to tests covered in other parts.

2. PREPARATION AND CONDITIONING OF TEST SPECIMENS

2.1 Size of Specimen

2.1.1 The required test specimens shall be cut to the specified size (*see* relevant methods of test) subject to a tolerance of ± 2 mm on the length and width, except where otherwise specified. Each test piece shall be rectangular, with all edges cut square to the surface.

2.2 **Conditioning** — Unless precise conditioning is specified, the test specimens, where required, shall be conditioned by freely exposing them for at least 48 hours immediately before testing to the atmosphere of a well-ventilated room.

2.2.1 Where precise conditioning is specified or otherwise required, the test specimens shall be exposed to an atmosphere maintained at a relative humidity of 65 ± 5 percent and at a temperature of $27 \pm 2^\circ\text{C}$ until their masses are nearly constant. The test specimens shall be kept in this controlled atmosphere until they are required for testing.

2.2.2 In certain circumstances, where comparison with other materials is required or to expedite testing, a different conditioning procedure may be used. However, in all cases, the conditioning procedure adopted shall be recorded.

2.3 **Soaking of Specimens for Test** — The specimens to be tested, if required to be soaked, shall be submerged in water at $27 \pm 2^\circ\text{C}$ for 24 hours before test and shall be tested immediately after removal from the

IS : 2380 (Part I) - 1977

water. The specimens shall be placed in the water vertically with a gap of at least 15 mm between specimens. They shall be covered by 25 mm of water at the top. When it is desired to obtain the effect of complete saturation, the specimens may be soaked for such longer period as may be necessary. The duration of soaking and the amount of water absorbed shall be determined and recorded.

2.4 Recording — The method of conditioning adopted shall be recorded in all cases.

Indian Standard

**METHODS OF TEST FOR WOOD PARTICLE
BOARDS AND BOARDS FROM OTHER
LIGNOCELLULOSIC MATERIALS**

PART II ACCURACY OF DIMENSIONS OF BOARDS

(First Revision)

1. SCOPE

1.1 This standard (Part II) covers the method of measuring the dimensions of boards and the extent of accuracy of these dimensions.

2. STRAIGHTNESS

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

3. SQUARENESS

3.1 The squareness of boards shall be checked with a 120 × 120 cm square, by applying one arm of the square to the board and measuring to the nearest millimetre the gap between the other arm of the square and the edge of the board. The maximum width of the gap shall be recorded.

4. WIDTH

4.1 The width of boards shall be measured at each end, 25 mm from the end, to an accuracy of 2 mm. Both measurements shall be recorded. The average for each board shall be reported separately.

5. LENGTH

5.1 The length of boards shall be measured to an accuracy of 2 mm at each edge of the board, 25 mm from the edge. Both measurements shall be recorded. The average for each board shall be reported separately.

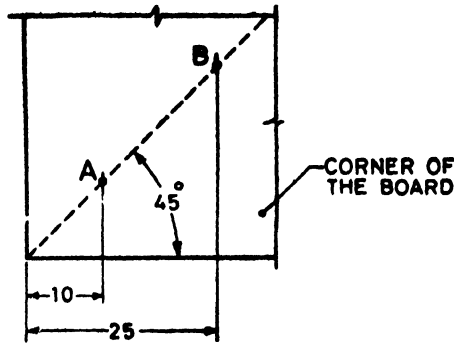
6. THICKNESS

6.1 The thickness of boards shall be measured along the edges of the boards to an accuracy of ± 0.1 mm, measurements being taken 25 mm from the edge. Each measurement, and the average of all measurements for each board shall be recorded.

6.1.1 The contacting surfaces of the measuring instrument shall be flat and shall have a diameter of at least 6 mm and care shall be taken that the surfaces of the board are not deformed when the thickness is measured.

7. DUBBING

7.1 The thickness at each corner of the board shall be measured to an accuracy of 0.01 mm by centering a micrometer at two points *A* and *B*, as indicated in Fig. 1. The difference in the thickness of the values at *A* and *B* shall be reported as dubbing value for each corner.



All dimensions in millimetres.

FIG. 1 MEASUREMENT OF EDGE THICKNESS

*Indian Standard*METHODS OF TEST FOR WOOD PARTICLE
BOARDS AND BOARDS FROM OTHER
LIGNOCELLULOSIC MATERIALSPART III DETERMINATION OF MOISTURE CONTENT
AND DENSITY*(First Revision)***1. SCOPE**

1.1 This standard (Part III) covers method of determination of moisture content and density of boards.

2. MOISTURE CONTENT

2.1 Test Specimens — The specimens shall be of the full thickness of the material and shall be 7.5 cm wide and 15 cm long. Smaller specimens may be used when deemed necessary. When the moisture content of test specimens of any other test is required, the same shall be determined from a coupon cut as near the failure of the specimen, as possible, and shall be of the maximum possible size available from the same. When for any reason additional determinations of moisture content are required, separate samples shall be prepared from the same material as is used in preparing the test specimens. The test shall be carried out immediately after cutting the specimen.

2.2 Procedure — Each specimen shall be weighed to an accuracy of not less than ± 0.2 percent. The specimens shall then be dried in a ventilated oven at a temperature of $103 \pm 2^\circ\text{C}$ until the mass is constant to ± 0.2 percent between two successive weighings made at an interval of not less than 1 hour.

2.3 Calculation and Report — The moisture content, expressed as a percentage of the oven-dry mass, is given by the formula:

$$\text{Moisture content} = \frac{M_1 - M_0}{M_0} \times 100$$

where

M_1 = initial mass, and

M_0 = oven-dry mass.

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2.4 The percentage moisture content of each test specimen and the average for each board shall be reported.

3. DENSITY

3.1 Weighing and Measuring Whole Boards — The width, length and thickness of each board shall be measured in the manner specified in IS : 2380 (Part II)-1977*. The mass shall be determined to an accuracy of ± 0.2 percent.

3.2 Weighing and Measuring Test Specimens

3.2.1 Test Specimens — Where independent determinations of density are to be made, test specimens of size specified under **2.1** shall be used. Where density of the specimen used for the static bending test is to be determined, the specimen used for the static bending test may be used for the determination of density [see **3.4** of IS : 2380 (Part IV)-1977†].

NOTE — After the density determination, the test pieces may be kept for use in the

Indian Standard

METHODS OF TEST FOR WOOD PARTICLE BOARDS AND BOARDS FROM OTHER LIGNOCELLULOSIC MATERIALS

PART IV DETERMINATION OF STATIC BENDING STRENGTH (MODULUS OF RUPTURE AND MODULUS OF ELASTICITY IN BENDING)

(First Revision)

1. SCOPE

1.1 This standard (Part IV) covers method of determination of static bending strength of boards.

NOTE — Static bending tests may be made both on specimens conditioned according to 2.2 or 2.2.1 and soaked according to 2.3 of IS : 2380 (Part I)-1977*.

2. TEST SPECIMEN

2.1 Each test specimen shall be 75 mm in width if the nominal thickness is greater than 6 mm, and 50 mm in width if the nominal thickness is 6 mm or less. The thickness shall be the thickness of the material. The length of each specimen shall be $50 + 24t$ mm (*see* Note) where t is the nominal thickness of the board in millimetres. The width, length and thickness of each specimen shall be measured to an accuracy of not less than ± 0.3 percent. One half of the test specimens shall be prepared with the long dimension parallel and the other half with the long dimension perpendicular to the long dimension of the board in order to evaluate directional properties. The specimen shall be weighed correct to ± 0.2 percent.

NOTE — Long span specimens are desired for tests in bending so that the effects of deflections due to shear deformations will be minimized and the values of moduli of elasticity obtained from the bending tests will approximate the true moduli of the materials.

3. PROCEDURE

3.1 Span and Supports — The span (centre-to-centre distance between supports) for each test shall be 24 times the nominal thickness (*see* Note 1).

*Methods of test for wood particle boards and boards from other lignocellulosic materials: Part I Preparation and conditioning of test specimens (*first revision*).

IS : 2380 (Part IV) - 1977

The supports shall be such that no appreciable crushing of the specimen will occur at these points during the test. The supports shall either be rounded or shall be knife-edges provided with rollers and plates under the specimen at these points. When rounded supports, such as those shown in Fig. 1 are used, the specimen shall be simply supported, the radius of the rounded portion shall be at least one-and-a-half times the thickness of the material being tested. If the material under test deviates from a plane (see Note 2), laterally adjustable supports shall be provided (see Fig. 2).

NOTE 1 — Establishment of a span-depth ratio is required to allow an accurate comparison of test values for materials of different thicknesses. It should be noted that the span is based on the nominal thickness of the material and it is not intended that the spans be changed for small variations in thickness.

NOTE 2 — The laterally adjustable supports may be necessary for the specimens tested in the soaked condition because of warping or twisting that may occur due to soaking.

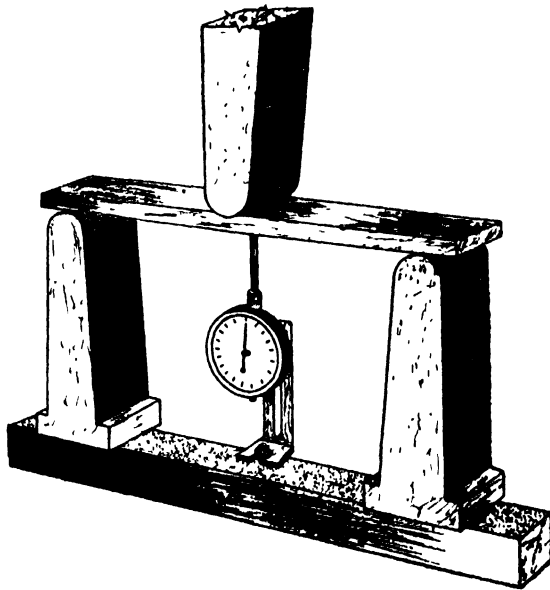


FIG. 1 BEND TEST ASSEMBLY

3.2 Loading — The specimens shall be loaded at the centre of the span with the load applied to the finished face at a uniform rate through a loading block rounded as shown in Fig. 1. The bearing blocks shall be at least 75 mm in width and shall have a thickness (in a direction parallel to the span) equal to twice the radius of curvature of the rounded portion of the loading block. The radius of the rounded portion shall be approximately equal to one-and-a-half times the thickness of the specimen.

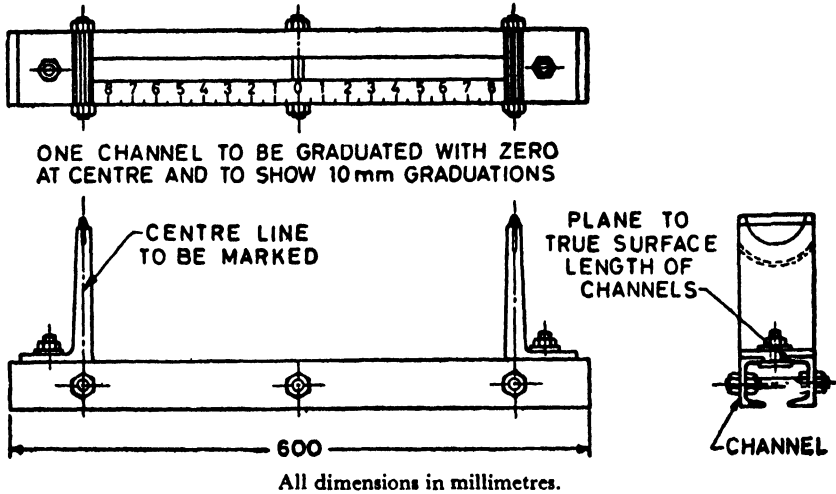


FIG. 2 TYPICAL LATERALLY ADJUSTABLE SUPPORTS FOR STATIC BENDING TEST

3.2.1 Rate of Loading — The load shall be applied continuously throughout the test at a uniform rate of motion of the movable crosshead of the testing machine as calculated by the following formula (*see* Note):

$$N = \frac{\zeta L^3}{6t}$$

where

N = rate of motion of moving head in cm/min,

ζ = unit rate of fibre strain of outer fibre length per minute
= 0.005,

L = span in cm, and

t = thickness of specimen in cm.

NOTE — The testing machine speed used shall be recorded on the data sheet. The crosshead speed shall mean the free running or no-load crosshead speed for testing machines of the mechanical drive type and the loaded crosshead speed for testing machines of the hydraulic loading type.

3.3 Observations

3.3.1 The deflection of the centre of the specimen shall be measured by measuring the deflection of the neutral axis or alternatively by measuring the deflection of the bottom of the specimen with reference to their respective initial positions. The deflection shall be measured by means of a dial gauge placed suitably below the specimen or by means of a telescope and scale fixed on the moving head of the testing machine. Readings of deflection shall be taken to the accuracy of 0.1 mm.

IS : 2380 (Part IV) - 1977

Deflections shall be measured at convenient load intervals so that there are at least six to eight points before reaching the proportional limit, and thereafter the machine shall be kept in balance up to or beyond the maximum load as the case may be and loads will be read at suitable intervals of deflections. The test shall be carried until the specimen completely fails or the deflection is three times the thickness.

3.3.2 Failure — The character of the failure shall also be observed.

3.4 Moisture Content and Density — After the test a moisture coupon, 25 mm long and of the full width of specimen, shall be cut from the body of the specimen. The moisture content and density of each specimen shall be determined in accordance with IS : 2380 (Part III)-1977*.

4. CALCULATION AND REPORT

4.1 The readings of the deflections and the loads shall be recorded (see 3.3.1) and a load-deflection curve shall be drawn. While drawing a load-deflection curve, the straight line of proportionality at the initial part of the curve shall be drawn in such a way that maximum number of points lie on the straight line or nearest to it. No consideration need be given to the initial two or three points. A typical load-deflection curve is shown in Fig. 3.

4.1.1 When the straight line does not pass through the origin, a parallel line shall be drawn through the origin and the deflection and load at the limit of proportionality shall be measured on this line. The points beyond the elastic limit and up to maximum load may be connected by smooth curve but the points beyond the maximum load shall be joined from point to point. Load and deflection at first failure and maximum load shall also be noted.

4.2 Modulus of Rupture — The modulus of rupture shall be calculated for each specimen by the following formula, and the values reported. The average values for the lengthwise specimens and the breadthwise specimens shall also be reported separately:

$$R = \frac{3PL}{2bd^2}$$

where

R = modulus of rupture in kgf/cm²,

P = maximum load in kgf,

L = length of span in cm,

b = width of specimen in cm, and

d = depth of specimen in cm.

*Methods of test for wood particle boards and boards from other lignocellulosic materials: Part III Determination of moisture content and density (first revision).

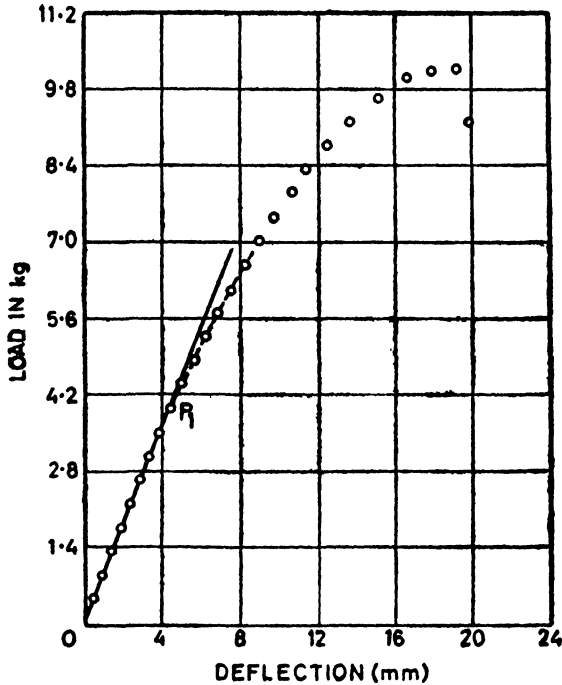


FIG. 3 TYPICAL LOAD-DEFLECTION CURVE FOR BEND TEST

4.3 Stress at Limit of Proportionality — The stress at limit of proportionality shall be calculated for each specimen by the following formula and the values reported. The average values for the lengthwise specimens and breadthwise specimens shall also be reported separately:

$$S_{p1} = \frac{3P_1L}{2bd^2}$$

where

S_{p1} = stress at proportional limit in kgf/cm²;

P_1 = load in kgf at the limit of proportionality, which shall be taken as the point on the load-deflection curve at which the graph deviates from straight line (see Fig. 3); and

L , b and d have the same significance as in 4.2.

4.4 Modulus of Elasticity — The modulus of elasticity shall be calculated for each specimen by the following formula and the values reported. The

IS : 2380 (Part IV) - 1977

average for the lengthwise specimens and the breadthwise specimens shall also be reported separately;

$$E = \frac{P_1 L^3}{4bd^3 y_1}$$

where

E = apparent modulus of elasticity in kgf/cm²,

y_1 = central deflection at limit of proportionality load in cm,
and

P_1 , L , b , and d have the same significance as in 4.2 and 4.3.

4.5 Work to Maximum Load — The work to maximum load shall be calculated for each specimen by the following formula and the values determined shall be included in the report. The average values for the lengthwise specimens and the breadthwise specimens shall also be reported separately:

$$W_{m1} = \frac{CA}{bdL}$$

where

W_{m1} = work to maximum load in kgf.cm/cm²;

C = area constant, that is, the energy represented by 1 cm² which is equal to load in kgf represented by 1 cm on the ordinate multiplied by deflection in cm represented by 1 cm on the abscissa;

A = area under load-deflection curve to maximum load in cm²; and

b , d and L have the same significance as in 4.2.

4.6 The moisture content and density of each specimen shall also be reported.

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METHODS OF TEST FOR WOOD PARTICLE
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PART V DETERMINATION OF TENSILE STRENGTH
PERPENDICULAR TO SURFACE

(*First Revision*)

1. SCOPE

1.1 This standard (Part V) covers method of determination of tensile strength perpendicular to surface.

2. GENERAL

2.1 The test of tensile strength perpendicular to surface shall be made on specimens conditioned according to **2.2** or **2.2.1** of IS : 2380 (Part I)-1977*.

3. TEST SPECIMEN

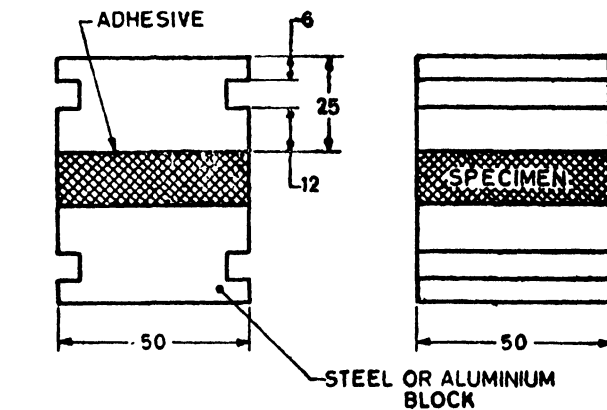
3.1 Each test specimen shall be 50 mm square and of the thickness of the finished board. Loading blocks of steel or aluminium alloy 50 mm square and 25 mm in thickness shall be bonded with a suitable adhesive (*see Note*) to the 50 mm square faces of the specimen as shown in Fig. 1 which gives details of the specimen and loading fixtures. Cross-sectional dimensions of the specimen shall be measured to an accuracy of not less than ± 0.3 percent.

NOTE — The adhesive shall be such that failure does not occur at or near the glue line. Any suitable adhesive and the corresponding technique of application may be employed for the blocks to be glued to the specimen. Steam refined pitch, PVA adhesives and epoxy resins are some of the commonly used adhesives.

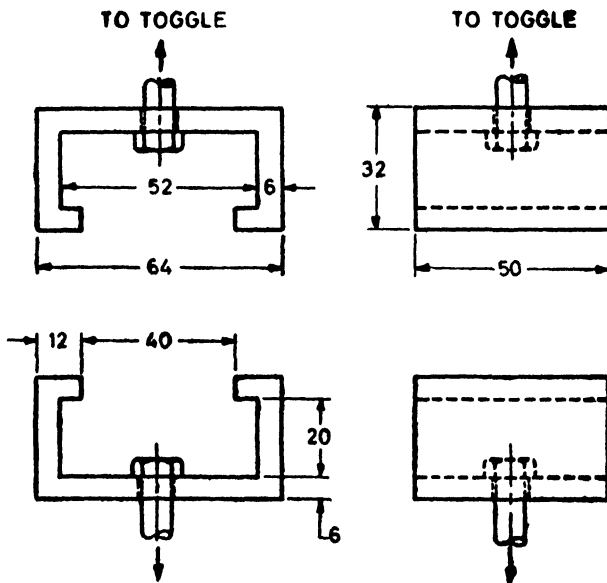
4. PROCEDURE

4.1 Loading fixtures, such as shown in Fig. 1, attached to the heads of the testing machine, shall engage the blocks attached to the specimen. The specimen shall be stressed by separation of the heads of the testing machine until failure occurs. The direction of loading shall be as nearly perpendicular to the faces of the board as possible and the centre of load shall pass through the centre of the specimen.

*Methods of test for wood particle boards and boards from other lignocellulosic materials : Part I Preparation and conditioning of test specimens (*first revision*).



DETAIL OF SPECIMEN



DETAIL OF LOADING FIXTURE

All dimensions in millimetres.

FIG. 1 DETAIL OF SPECIMEN AND TYPICAL LOADING FIXTURE FOR TENSION TEST PERPENDICULAR TO SURFACE

IS : 2380 (Part V) - 1977

4.1.1 Rate of Loading — The load shall be applied continuously throughout the test at a uniform rate of motion of the movable crosshead of the testing machine of 0.08 cm per centimetre of thickness per minute.

4.1.2 Moisture Content — The moisture content of each test specimen shall be determined as specified in IS : 2380 (Part III)-1977* on a separate sample prepared from the same material.

5. TEST DATA AND REPORT

5.1 Maximum loads shall be determined from which the stress at failure shall be calculated for each specimen. Strength values shall be calculated in kgf/cm² for which the measured dimensions of the specimen shall be used. The location of the line of failure, the individual and the average strength values shall be reported.

*Methods of test for wood particle boards and boards from other lignocellulosic materials: Part III Determination of moisture content and density (*first revision*).

Indian Standard

**METHODS OF TEST FOR WOOD PARTICLE
BOARDS AND BOARDS FROM OTHER
LIGNOCELLULOSIC MATERIALS**

**PART VI DETERMINATION OF TENSILE STRENGTH
PARALLEL TO SURFACE**

(First Revision)

1. SCOPE

1.1 This standard (Part VI) covers the method of determination of tensile strength parallel to surface.

2. GENERAL

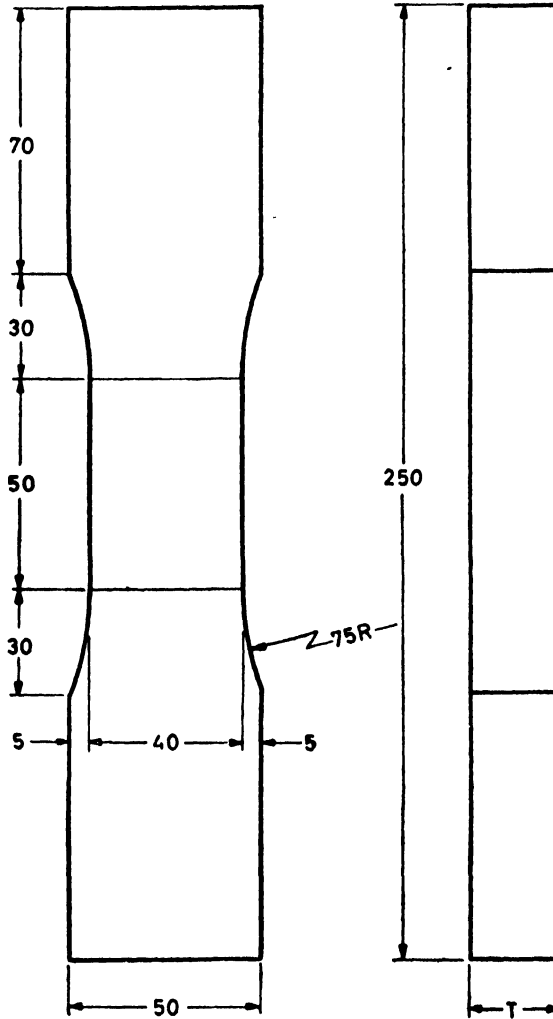
2.1 The test of tensile strength parallel to surface shall be made on specimens both conditioned according to 2.2 or 2.2.1 of IS : 2380 (Part I)-1977* and soaked according to 2.3 of IS : 2380 (Part I)-1977*. Tests shall be made of specimens both with the long dimensions parallel and perpendicular to the long dimension of the board to determine whether or not the material has directional properties.

This test may be applied to material 25 mm or less in thickness. When the material exceeds 25 mm in thickness, crushing at the grips during test is likely to affect adversely the test values obtained. It is recommended that for material greater than 25 mm in thickness, the material be sawn to not less than 12 mm thickness and tested. Test values obtained from specimens so sawn may be only approximate, because strengths of material near the surface may vary from the remainder. It is also recommended that both the portions obtained by sawing be tested and the average obtained. With boards varying in strength across their thickness such laterally sawn specimens would not be of much value.

3. TEST SPECIMEN

3.1 Each test specimen shall be prepared as shown in Fig. 1. The reduced section shall be cut with a hand saw, to the size shown. A sharp saw shall be used to ensure a smooth surface in the centre section. The thickness of

*Methods of test for wood particle boards and boards from other lignocellulosic materials : Part I Preparation and conditioning of test specimens (*first revision*).



T = Thickness of material 25 mm, *Max.*
All dimensions in millimetres.

FIG. 1 DETAILS OF SPECIMEN FOR TENSION TEST PARALLEL TO SURFACE

the board and the minimum width of the reduced section shall be measured to an accuracy of not less than ± 0.3 percent. These two dimensions shall be used to determine the net cross-sectional area for determining maximum stress.

4. PROCEDURE

4.1 Method of Loading—Self-aligning, self-tightening grips with serrated gripping surfaces at least 50 mm in width and at least 50 mm in length shall be used to transmit the load from the testing machine to the specimen. A typical assembly for the tension test of specimens is shown in Fig. 2.

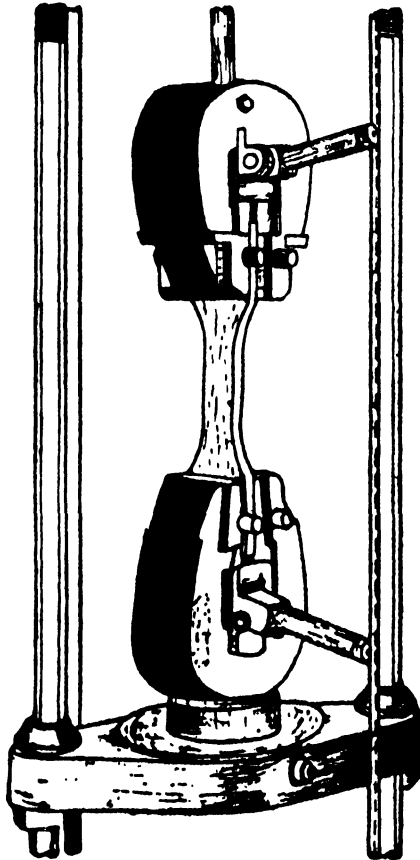


FIG. 2 ASSEMBLY FOR TENSION TEST PARALLEL TO SURFACE

IS : 2380 (Part VI) -1977

4.2 Rate of Loading — The load shall be applied continuously throughout the test at a uniform rate of motion of the movable crosshead of the testing machine of 4 mm per minute.

The maximum loads at which the specimens fail shall be noted.

4.3 Moisture Content — The moisture content of each test specimen shall be determined by the method specified in IS : 2380 (Part III)-1977*.

5. TEST DATA AND REPORT

5.1 The stress at failure shall be calculated (*see also 3.1*) from the maximum loads for each specimen and reported. If the failure is within 10 mm of either grip, the test value shall be discarded. The report shall also include maximum loads for each specimen, the average for the lengthwise specimens and the breadthwise specimens separately, and the location and description of the failures.

*Methods of test for wood particle boards and boards from other lignocellulosic materials : Part III Determination of moisture content and density (*first revision*).

Indian Standard

METHODS OF TEST FOR WOOD PARTICLE BOARDS AND BOARDS FROM OTHER LIGNOCELLULOSIC MATERIALS

PART VII DETERMINATION OF COMPRESSION PERPENDICULAR TO PLANE OF THE BOARD

(First Revision)

1. SCOPE

1.1 This standard (Part VII) covers the method of determination of compression perpendicular to the plane of the board.

2. TEST SPECIMEN

2.1 The test specimen shall be $50 \times 50 \times 50$ mm. The specimen shall be prepared by gluing two or more thickness of the board. Before testing, all the test specimen shall be conditioned as specified in 2.2 of IS : 2380 (Part I)-1977*. The size of the specimen shall be measured correct to 0.1 mm and the mass shall be taken correct to 0.01 g. Test may also be conducted in soaked condition, if required, and the soaking shall be done as given in 2.3 of IS : 2380 (Part I)-1977*.

3. PROCEDURE

3.1 The test shall be carried out at room temperature on a suitable testing machine. The specimen shall be placed horizontally on the platform of the machine in flat position. The load shall be applied vertically on the specimen through a bearing plate placed on the specimen and covering the whole surface, at a constant rate of loading of 0.6 mm per minute.

The deformation shall be measured correct to 0.01 mm by means of a dial gauge placed suitably between the platform and the moving head of the machine. Initially a load of 10 kg will be given on the specimen and this shall be taken as zero position. Then the deformation shall be taken at a regular load interval of 50 kg and the test is continued till a

*Methods of test for wood particle boards and boards from other lignocellulosic materials: Part I Preparation and conditioning of test specimens (*first revision*).

IS : 2380 (Part VII) - 1977

load of 500 kg is reached. This load is maintained for 10 minutes. The deformation shall be read after the lapse of 10 minutes and shall be recorded as the value of compressibility. The load shall then be released and the specimen shall be taken out of the machine. The thickness shall again be measured. The difference between the original thickness and the thickness of the compressed specimen shall be recorded as the value of retention of compression.

3.2 Moisture Content — The moisture content shall be determined by the method specified in IS : 2380 (Part III)-1977*.

4. REPORT

4.1 The average value of compressibility and retention of compression, expressed as the percentage of the original thickness of the specimen shall be reported for each type of the board alongwith the moisture content.

*Methods of test for wood particle boards and boards from other lignocellulosic materials : Part III Determination of moisture content and density (*first revision*).

Indian Standard
METHODS OF TEST FOR WOOD PARTICLE
BOARDS AND BOARDS FROM OTHER
LIGNOCELLULOSIC MATERIALS

PART VIII COMPRESSION PARALLEL TO SURFACE TEST

(First Revision)

1. SCOPE

1.1 This standard (Part VIII) covers method of determination of compression parallel to surface test.

2. TEST SPECIMEN

2.1 The test specimen shall be $2.5 \times 2.5 \times 10$ cm. If the thickness of the board is less than 2.5 cm, two or more thicknesses of the board shall be laminated by some epoxy resin as to give the thickness about 2.5 cm. While laminating, care shall be taken that the pressure should not be so high as to give any appreciable compression in the board. A pressure below 3.5 kgf/cm^2 is recommended. The specimen from the laminated board may be cut at least after 8 hours' curing of the resin at room temperature. The specimen shall be conditioned as specified in 2 of IS : 2380 (Part I)-1977*. The cross-section and the length shall be measured to an accuracy of 0.1 mm and mass shall be taken to an accuracy of 0.01 g. If the specimen is required to be tested under soaked condition it shall be submerged in water according to 2.3 of IS : 2380 (Part I)-1977*. It may be noted that the length of few specimens shall be taken parallel to the long dimension and few perpendicular to long dimensions of the board to determine whether the material has any directional properties.

3. PROCEDURE

3.1 The specimen shall be compressed vertically in the direction of length (10 cm) by means of a spherical and self-aligning type loading block in a universal testing machine at a uniform rate of strain of 0.6 mm/min till a

*Methods of test for wood particle boards and boards from other lignocellulosic materials: Part I Properties and conditioning of test specimens (*first revision*).

IS : 2380 (Part VIII) - 1977

failure in the specimen is indicated. If load deformation readings are required the deformation shall be read correct to 0.002 mm by means of Lamb's Roller Compressometer or equally accurate instrument at equal increments of load. Increments of load shall be chosen so that about 12 to 15 readings may be obtained before elastic limit. Compressometer shall be attached at the central portion of the length and the gauge points shall be at least 2.5 cm from the ends of the specimens.

From the load-deformation curve maximum load, and load and deformation at elastic limit shall be recorded.

4. REPORT

4.1 Maximum compressive stress, crushing stress at elastic limit and modulus of elasticity shall be calculated and reported alongwith the moisture percent and density determined according to relevant clause of IS : 2380 (Part III)-1977*. The type of the failure shall also be described.

*Methods of test for wood particle boards and boards from other lignocellulosic materials : Part III Determination of moisture content and density (*first revision*).

Indian Standard

METHODS OF TEST FOR WOOD PARTICLE BOARDS AND BOARDS FROM OTHER LIGNOCELLULOSIC MATERIALS

PART IX DETERMINATION OF RESISTANCE TO SHEAR IN PLANE OF THE BOARD

(First Revision)

1. SCOPE

1.1 This standard (Part IX) covers methods of determination of resistance to shear in the plane of the board.

2. GENERAL

2.1 Shear strength tests shall be made on specimens prepared by laminating each specimen so that the plane of the shear failure will be in the board proper and not in the glue lines.

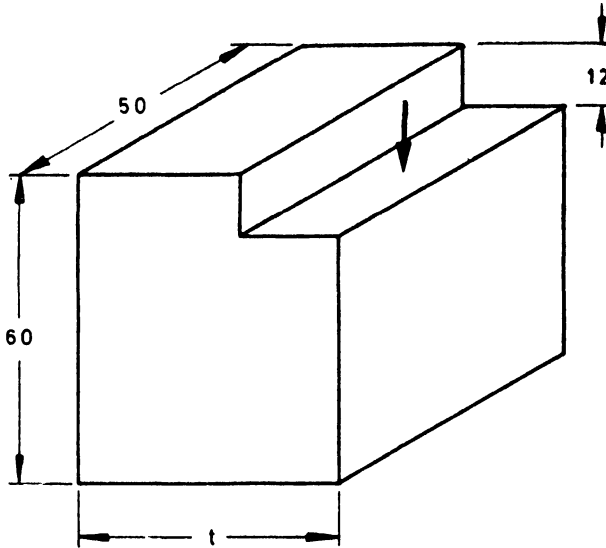
3. TEST SPECIMEN

3.1 The test specimen shall be measured and conditioned as specified in 2 of IS : 2380 (Part I)-1977*. Each test specimen shall be of size 50 × 60 mm and of full thickness of board. In case where it is necessary to increase the thickness of the specimen to facilitate its fixing in the jig, the same shall be done by gluing required number of boards together provided actual plane of shear is well within the material. Test specimen shall be as shown in Fig. 1. The actual area of shear surface shall be measured; each individual dimension shall be measured to an accuracy of 0.1 mm.

4. PROCEDURE

4.1 The test shall be carried on a suitable testing machine with the help of a special shear tool in cage. The tool provides 3 mm offset between the inner edge of the supporting surface and the plane along which failure occurs. The general arrangement of the testing machine is shown in Fig. 2.

*Methods of test for wood particle boards and boards from other lignocellulosic materials: Part I Preparation and conditioning of test specimens (*first revision*).



All dimensions in millimetres.

FIG. 1 SHEAR PARALLEL TO SURFACE TEST SPECIMEN

The load shall be applied to the specimen along the direction indicated by the large arrow in Fig. 1. Care shall be taken in placing the specimen in the shear tool to see that the cross bar is adjusted so that the edges of the specimen are vertical and the end rests evenly on the support throughout the contact area. The maximum load only shall be observed.

4.2 Rate of Loading — The load shall be applied continuously throughout the test at a rate of motion of the movable crosshead of 0.6 mm per minute.

4.3 Moisture Content — The moisture content of each specimen shall be determined by the method specified in IS : 2380 (Part III)-1977*. The portion of the specimen that is sheared shall be used for this determination.

5. REPORT

5.1 The character and type of failure shall be recorded. In all cases where the failure at the base of the specimen extends back on to the

*Methods of test for wood particle boards and boards from other lignocellulosic materials: Part III Determination of moisture content and density (first revision).

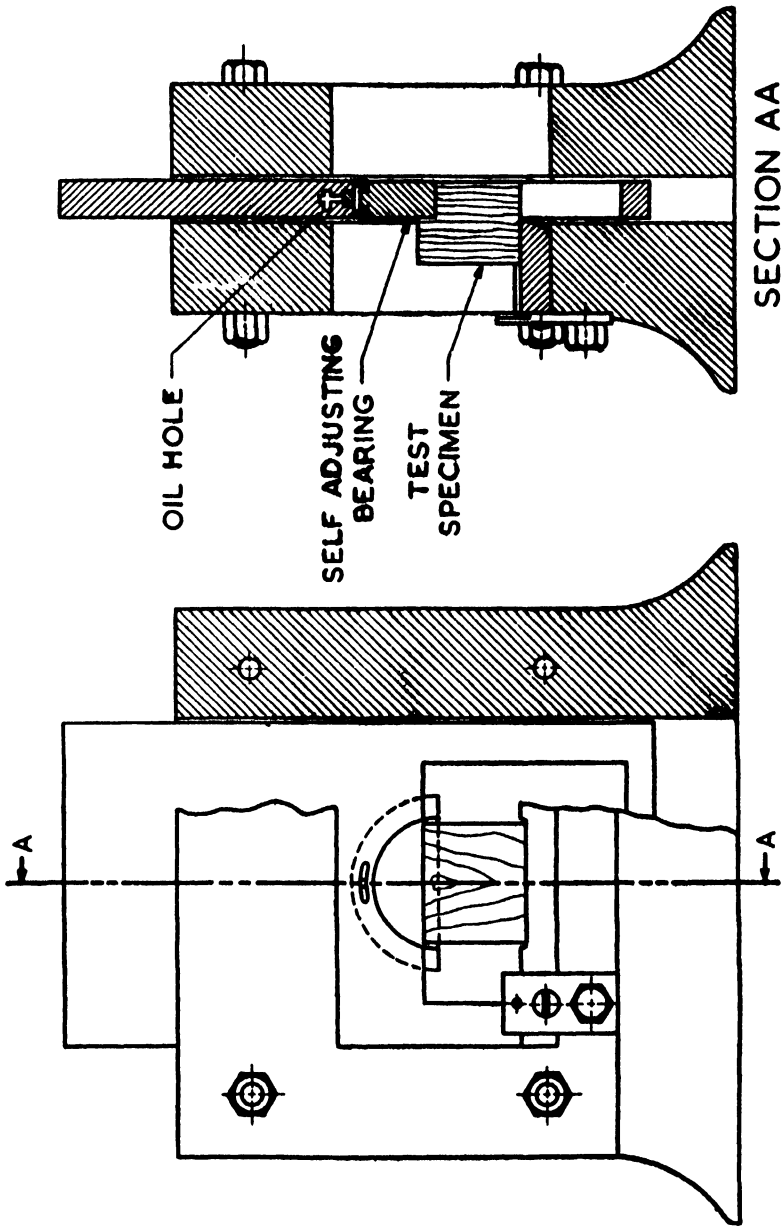


FIG. 2 TESTING ARRANGEMENT FOR SHEAR PARALLEL TO GRAIN

IS : 2380 (Part IX) - 1977

supporting surface, the test shall be rejected. The failing load of each test piece shall be recorded in kilograms. The shear strength in kg/cm^2 shall be calculated by dividing the failing load by the measured cross-sectional area (in Fig. 1 the shearing area is $50 \times 50 \text{ mm}$). The average shear strength of each board of which the specimens form part shall also be reported.

5.2 If the gluing property of multilayer boards is required the test specimen shall be prepared such that the corner shall extend to but not beyond the glue line and the test shall be so conducted that one of the glue lines shall be in the plane of shear.

Indian Standard
METHODS OF TEST FOR WOOD PARTICLE
BOARDS AND BOARDS FROM OTHER
LIGNOCELLULOSIC MATERIALS
PART X FALLING HAMMER IMPACT TEST
(*First Revision*)

1. SCOPE

1.1 This standard (Part X) covers falling hammer impact test of boards.

2. TEST SPECIMEN

2.1 Test specimen shall be 35×35 cm and shall be of thickness of the board. Each specimen shall be conditioned as specified in 2.2 of IS : 2380 (Part I)-1977* and the thickness shall be measured to the second decimal place of centimetre.

3. PROCEDURE

3.1 The test specimen shall be clamped firmly between 2 frames made of 2 cm thick and 5 cm wide hardwood strips by 8 bolts of 1 cm diameter placed at equal distances from the corner (*see* Fig. 1). This frame containing the specimen shall be held rigidly on 4 pillars at its corners. It may be noted that the internal area of the test specimen shall be 25×25 cm. A block having a mild steel hemispherical end with a radius of 25 mm shall be arranged to fall freely on the centre of the specimen by suitable means (*see* Fig. 2).

The mass of the block together with any associated falling part shall be 1.2 or 4 kg whichever is more suited to the strength and thickness of the board to be tested. The block shall be allowed to fall first from a height of 25 mm measured from the upper surface of the specimen and then from successive heights rising in increments of 25 mm until final failure of the specimen occurs.

The failure of the specimen may take the form of a puncture or a visible fracture at the bottom of the specimen.

*Methods of test for wood particle boards and boards from other lignocellulosic materials : Part I Preparation and conditioning of test specimens (*first revision*).

IS : 2380 (Part X) - 1977

3.2 Moisture Content — The moisture content shall be determined by the method specified in IS : 2380 (Part III)-1977*.

4. OBSERVATION AND REPORT

4.1 Height of drop causing the final failure in the specimen shall be recorded. The average height of drop for a particular type and thickness of the board shall be reported alongwith the mass of the hammer and the moisture content.

*Methods of test for wood particle boards and boards from other lignocellulosic materials : Part III Determination of moisture content and density (*first revision*).

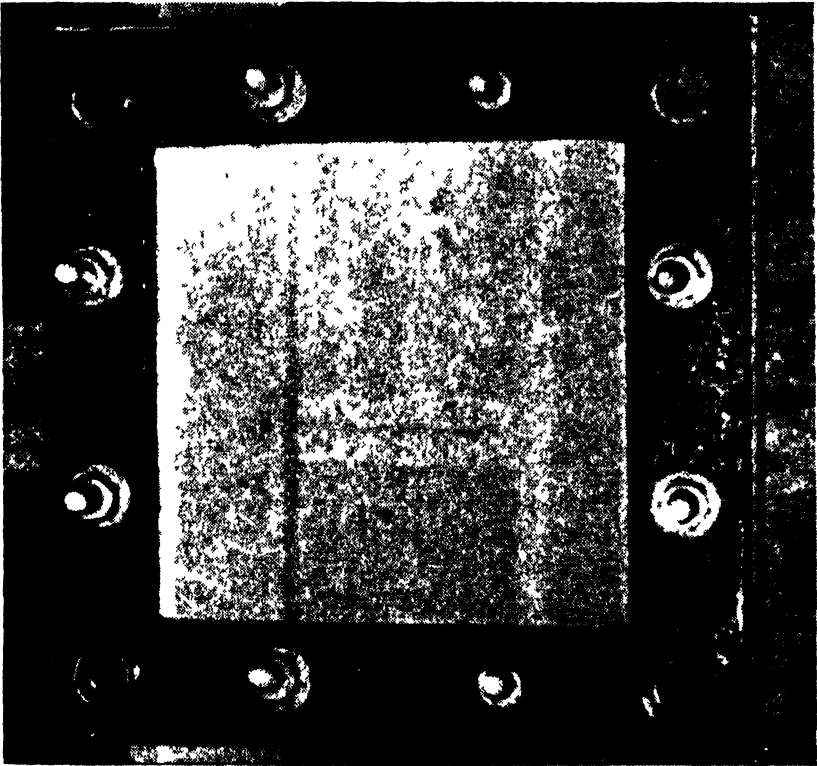


FIG. 1 FRAME FOR HOLDING THE SPECIMEN

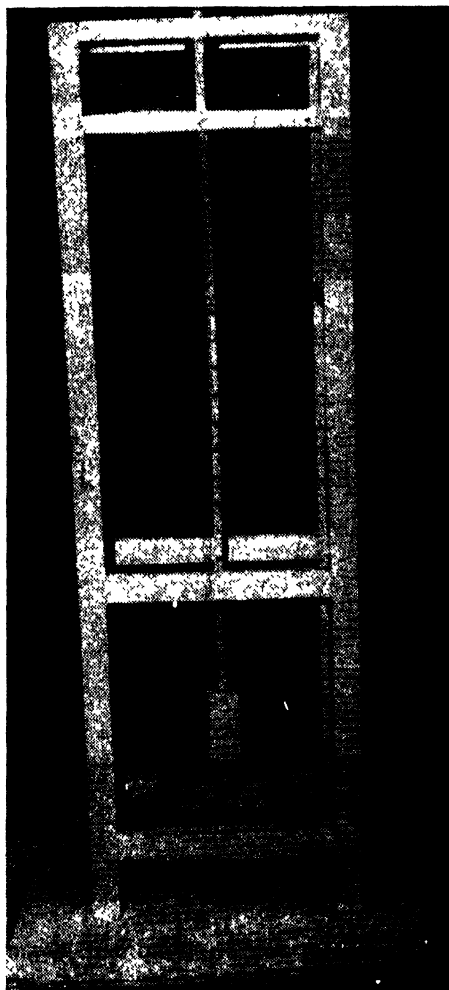


FIG. 2 TYPICAL APPARATUS FOR FALLING HAMMER
IMPACT TEST

Indian Standard
METHODS OF TEST FOR WOOD PARTICLE
BOARDS AND BOARDS FROM OTHER
LIGNOCELLULOSIC MATERIALS

PART XI SURFACE HARDNESS

(First Revision)

1. SCOPE

1.1 This standard (Part XI) covers method of determination of hardness of boards.

2. JANKA BALL TEST METHOD (INDENTATION TEST)

2.1 Test Specimen — Each specimen shall be nominally 7·5 cm in width and 15 cm in length and at least 25 mm thick. If necessary, the specimen for test shall be made by bonding together several layers of the particle board to make the required thickness. A rubber cement or other suitable flexible adhesive shall be used. The initial specimen shall be trimmed after bonding so that edges are smooth. The dimensions of the specimen shall be measured to an accuracy of not less than $\pm 0\cdot3$ percent.

2.2 Procedure — A steel indenter with a hemispherical end $11\cdot3 \pm 0\cdot05$ mm in diameter (1 cm^2 projected area) shall be used for determining hardness. The indenting ball shall be advanced till it has penetrated to one-half of its diameter into the specimen. The load required shall be recorded.

2.2.1 Number of Penetrations — Two penetrations shall be made on each of the two flat faces of the particle board. The locations of the points of penetration shall be at least 25 mm from the edges and the ends of the specimen and far apart from each other so that one penetration will not affect another.

2.2.2 Speed of Test — The load shall be applied continuously throughout the test at a uniform rate of motion of the movable cross head of the testing machine of 6 mm per minute.

2.2.3 Moisture Content — The moisture content of the test specimen shall also be determined by the method described in IS : 2380 (Part III) - 1977*.

*Methods of test for wood particle boards and boards from other lignocellulosic materials: Part III Determination of moisture content and density (*first revision*).

IS : 2380 (Part XI) - 1977

2.3 Report — The average maximum load required to embed the ball to one-half of its diameter shall be reported for each face separately. The moisture content shall also be reported.

3. STEEL BALL METHOD TEST (ALTERNATE TEST)

3.1 Test Specimen — Each specimen shall be nominally 7.5 cm in width, 15 cm in length and at least 25 mm thick. The specimen may be made by bonding together several layers of the particle board to make the required thickness. A rubber cement or other suitable flexible adhesive shall be used. The finished specimen shall be trimmed after bonding so that edges are smooth. The dimensions of the specimen shall be measured to an accuracy of not less than ± 0.3 percent.

3.2 Procedure — A steel ball 30 mm in diameter shall be used for determining hardness. The test specimen shall be placed on the flat bed of a testing machine and the steel ball pressed into the upper face of the specimen at a load related to the type of particle board as indicated by the density, as follows:

| <i>Load, kgf</i> | <i>Specific Gravity of Particle Board</i> |
|------------------|--|
| 200 | Above 0.90 |
| 100 | Greater than 0.40 and up to and including 0.90 |
| 50 | Greater than 0.25 and up to and including 0.40 |
| 25 | 0.25 and below |

The width of the impression remaining on the specimen after removal of the steel ball shall be measured on two mutually perpendicular diameters to an accuracy of at least 1 percent and the average of the two measurements calculated. Measurement may often be facilitated by coating the steel ball with carbon or by placing a carbon paper between the steel ball and the specimen. Rubbing the test area with a chalk (of contrasting colour) sufficiently long to span the impression will also facilitate measurement.

NOTE — This method of test gives a measure of the residual indentation remaining after removal of the penetrating ball rather than the actual deformation under load. For certain extremely dense boards, it may be necessary to apply loads greater than those specified. The actual load used shall be indicated in the report. Certain board surfaces may fail by an irregular breaking, making it impossible to obtain an accurate measurement of the width of the impression. For such materials, the maximum diameter of the disturbed area shall be reported.

3.2.1 Number of Penetrations — Two penetrations shall be made on each of the two flat faces of the particle board. The locations of the points of

penetration shall be at least 25 mm from the edges and ends of the specimen and far enough apart so that one penetration will not affect another.

3.2.2 Speed of Testing — The load shall be applied continuously throughout the test at a uniform rate of motion of the movable crosshead of the testing machine of 6 mm per minute.

3.2.3 Moisture Content — The moisture content of the test specimen shall also be determined.

3.3 Test Data and Report — The average diameter of the impression remaining on the specimen after removal of the ball shall be a measure of the hardness of the specimen and shall be included in the report. The actual load selected to imbed the ball and the moisture content of the specimen shall be reported.

4. MONNIN TEST METHOD (ALTERNATE TEST)

4.1 Test Specimen — Each specimen shall be nominally 2 cm in width, 15 cm in length and at least 25 mm thick. The specimen for test may be made by bonding together several layers of board to make the required thickness. A rubber cement or other suitable flexible adhesive shall be used. The finished specimen shall be trimmed after bonding so that edges are smooth. The dimensions of the specimen shall be measured to an accuracy of not less than ± 0.3 percent.

4.2 Procedure — A steel loading head having a right cylindrical loading surface with a radius of 30 mm and a length of 30 mm shall be used for determining hardness. The test specimen shall be placed on the flat bed of a testing machine with the long dimension of the specimen at right angles to the cylindrical axis of the loading head. The steel cylinder shall be pressed into the top face of the specimen at a load related to the type of particle board as indicated by the density as follows:

| <i>Load, kgf</i> | <i>Specified Gravity of Particle Board</i> |
|------------------|--|
| 200 | Above 0.90 |
| 100 | Greater than 0.40 and up to and including 0.90 |
| 50 | Greater than 0.25 and up to and including 0.40 |
| 25 | 0.25 and below |

The width of the indentation remaining on the test specimen after removal of the steel cylinder shall be measured to an accuracy of 1 percent at two points across the width of the specimen and the results averaged. Measurements may often be facilitated by coating the cylindrical face with carbon or by placing a carbon paper between the steel

IS : 2380 (Part XI) - 1977

ball and the specimen. Rubbing the test area with a chalk (of contrasting colour) sufficiently long to span the impression will also often facilitate measurement.

NOTE — This method of test gives a measure of the residual indentation remaining after removal of the penetrating tool rather than the actual deformation under load. For certain extremely dense boards, it may be necessary to apply loads greater than those specified. The actual load used shall be indicated in the report. Certain board surfaces may fail at the tool edges by an irregular breaking, making it impossible to obtain an accurate measurement of the width of impression. For such materials, the actual depth of the penetration below the surrounding surface shall be measured by means of a suitable gauge.

4.2.1 Number of Penetrations — Two penetrations shall be made on each of the two flat faces. The locations of the points of penetration shall be at least 25 mm from the ends of the specimen and far enough apart so that one penetration will not affect another.

4.2.2 Speed of Testing — The load shall be applied continuously throughout the test at uniform rate of motion of the movable crosshead of the testing machine of 6 mm per minute.

4.2.3 Moisture Content — The moisture content of the test specimen shall also be determined.

4.3 Test Data and Report — The hardness of the board shall be computed by the following formula:

$$d = R - \sqrt{R^2 - \frac{w^2}{4}}$$

where

d = depth of indentation in mm;

R = radius of loading cylinder in mm, and

w = average width of indentation in mm.

The reciprocal of the depth of indentation d shall be reported as the hardness of the specimen. The actual load selected to imbed the ball and the moisture content shall also be reported.

Indian Standard

METHODS OF TEST FOR WOOD PARTICLE
BOARDS AND BOARDS FROM OTHER
LIGNOCELLULOSIC MATERIALS

PART XII CENTRAL LOADING OF PLATE TEST

(First Revision)

1. SCOPE

1.1 This standard (Part XII) covers central loading of plate test.

2. TEST SPECIMEN

2.1 The test specimen shall be 35 cm square plate. This size shall be for the boards whose thickness shall be between 0.5 cm to 3 cm. The thickness of the specimen shall be the thickness of the board. Each specimen shall be conditioned as specified in 2 of IS : 2380 (Part I)-1977*. The side (a) and the thickness (h) of the specimen shall be measured to an accuracy up to 0.1 mm. The mass shall be determined to an accuracy of 0.01 g.

3. PROCEDURE

3.1 The specimen shall be simply supported on a square rig having smooth cylindrical edges on the top. The centre to centre distance between the

IS : 2380 (Part XII) - 1977

3.2 Moisture Content — The moisture content shall be determined by the method as specified in IS : 2380 (Part III)-1977*.

4. REPORT

4.1 The average maximum load and stiffness factor $\left(\frac{Pa^3}{dh^3} \right)$ shall be reported for a particular type and thickness of the board alongwith moisture content.

*Methods of test for wood particle boards and boards from other lignocellulosic materials: Part III Determination of moisture content and density (*first revision*).

Indian Standard

METHODS OF TEST FOR WOOD PARTICLE BOARDS AND BOARDS FROM OTHER LIGNOCELLULOSIC MATERIALS

PART XIII LONG TIME LOADING BENDING TEST

(First Revision)

1. SCOPE

1.1 This standard (Part XIII) covers long time loading under bending test.

2. TEST SPECIMEN

2.1 The specimen shall be rectangular and its thickness shall be the thickness of the board. The width shall be 5 cm for the boards having thickness 6 mm or less and 7.5 cm for boards having thickness more than 6 mm. The length shall be 24 times the thickness plus 5 cm. The test specimen shall be conditioned as specified in 2 of IS : 2380 (Part I)-1977*. The length, width and thickness of the specimen shall be measured to an accuracy of 0.1 mm and mass shall be determined to an accuracy of 0.01 g.

3. PROCEDURE

3.1 The specimen shall be simply supported on two horizontal parallel rollers having a radius of about 1 cm spaced at a distance centre to centre of 24 times the thickness of the specimen. At the centre of the span and along a line parallel to the end, a compressed wood roller of radius about 1 cm carrying a stirrup shall be placed. The total load of the roller and stirrup shall not be more than 250 g. The position assumed under this initial load after a period of half a minute shall be treated as zero condition.

An additional load equal to 30 percent of maximum load calculated according to relevant clauses in IS : 2380 (Part IV)-1977† on a similar

*Methods of test for wood particle boards and boards from other lignocellulosic materials: Part I Preparation and conditioning of test specimens (*first revision*).

†Methods of test for wood particle boards and boards from other lignocellulosic materials: Part IV Determination of static bending strength (modulus of rupture and modulus of elasticity in bending) (*first revision*).

IS : 2380 (Part XIII) - 1977

type of specimen, shall then be suspended from the stirrup directly or through sonic lever arrangement and the deflection attained in 24 hours (and at intermediate period if so required) shall be read to an accuracy of 0.1 mm. The load shall then be removed and after the lapse of a further period of 24 hours the residual deflection shall also be noted.

4. REPORT

4.1 The deflection after 24 hours under load and the residual deflection 24 hours after the removal of load shall be reported.

Indian Standard

METHODS OF TEST FOR WOOD PARTICLE BOARDS AND BOARDS FROM OTHER LIGNOCELLULOSIC MATERIALS

PART XIV SCREW AND NAIL WITHDRAWAL TEST

(First Revision)

1. SCOPE

1.1 This standard (Part XIV) covers screws and nails withdrawal test.

2. TEST SPECIMEN

2.1 The length and width of the test specimen shall be 150 mm and 75 mm respectively. The thickness shall not be less than 30 mm. If the thickness of the board is less than 30 mm, two or more thicknesses of the board may be bonded together with suitable adhesive or clamped.

2.1.1 Two wood screws No. 8 and 50 mm length shall be threaded into the specimen at right angle to the face up to half of their length in a prebore of 2.5 mm. The holes should be preferably at midwidth at about 5 cm from the ends of the specimen. If the screw holding capacity of the edge of the specimen is required, the screw shall be threaded in a similar way on the edge. Care shall be taken that sample may not split during driving of the screws in the specimen.

In the nail withdrawal resistance test, two nails of 50 mm long and 2.5 mm shank shall be driven in the specimen in the similar way as screw, but without any prebore. Nails shall be bright, galvanized, diamond pointed and shall have plane heads.

2.1.2 Each screw or nail shall be used only once.

3. PROCEDURE

3.1 The assembly for the screw or nail withdrawal test is shown in Fig. 1. The specimen holding fixture shall be attached to the lower platen of the testing machine. The specimen shall be inserted in the fixture with the head of the screw or nail up. The load applying fixture which is equipped with a slot for easy engagement of the head of the screw or nail shall be attached to the upper platen of the testing machine.

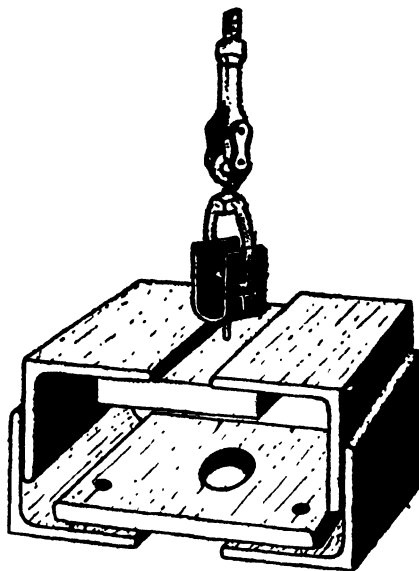


FIG. 1 TEST ASSEMBLY FOR MEASURING THE RESISTANCE OF SCREW AND NAILS TO DIRECT WITHDRAWAL

3.2 Rate of Loading—Load shall be applied to the specimen throughout the test by a uniform motion of the movable head of the testing machine at a rate of 1.5 mm per minute.

4. MOISTURE CONTENT

4.1 After the test, a section 50 mm long and of the full width of the specimen shall be cut from the body of the specimen for moisture content determination in accordance with 2 of IS : 2380 (Part III)-1977*.

5. TEST DATA AND REPORT

5.1 The maximum load required to withdraw the screw or nail shall be the measure of resistance of the material to direct withdrawal of screw or nail and shall be included in the report. The moisture content shall also be reported.

*Methods of test for wood particle boards and boards from other lignocellulosic materials: Part III Determination of moisture content and density (*first revision*).

Indian Standard
**METHODS OF TEST FOR WOOD PARTICLE
BOARDS AND BOARDS FROM OTHER
LIGNOCELLULOSIC MATERIALS**
PART XV LATERAL NAIL RESISTANCE
(First Revision)

1. SCOPE

1.1 This standard (Part XV) covers method of test of lateral nail resistance.

2. TEST SPECIMEN

2.1 Each specimen shall be 7.5 cm in width and of convenient length and shall have a nail 2.80 mm in diameter driven at right angles to the face of the board so that about an equal length of nail projects from each face. The nail shall be centered on the width and located 6, 12 or 18 mm from one end.

2.1.1 One-half of the specimens shall be selected and positioned in test so that the movement of the nail will be parallel and one-half so that the movement of the nail will be perpendicular to the long dimensions of the board for evaluation of directional properties.

2.1.2 The test may be conducted either in the dry or soaked condition. When the tests are made in the dry state, withdrawal shall be made immediately after the nails have been driven. Specimens to be tested in the soaked condition shall be prepared in accordance with **2.3** of IS : 2380 (Part I)-1977* and the nails shall be driven before the specimens are soaked.

3. PROCEDURE

3.1 Method of Loading — The end of the specimen opposite to the end with the nail shall be clamped in a position parallel to the movement of the testing machine head. Grips, which are suitable for tension tests parallel

*Methods of test for wood particle boards and boards from other lignocellulosic materials : Part I Preparation and conditioning of test specimens (*first revision*).

IS : 2380 (Part XV) - 1977

to the plane of the board are suitable. The nail is engaged by the stirrup which is in turn connected to one platen of the testing machine by a rod. A typical test assembly for measuring the resistance of a nail in the lateral direction is shown in Fig. 1. The stirrup and connections are detailed in Fig. 2.

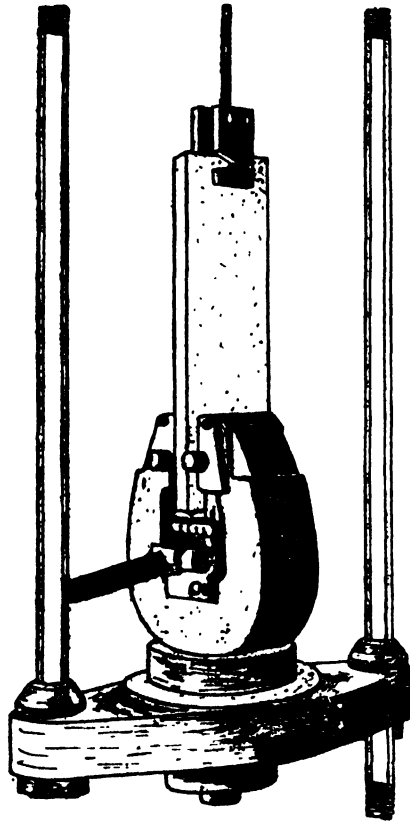
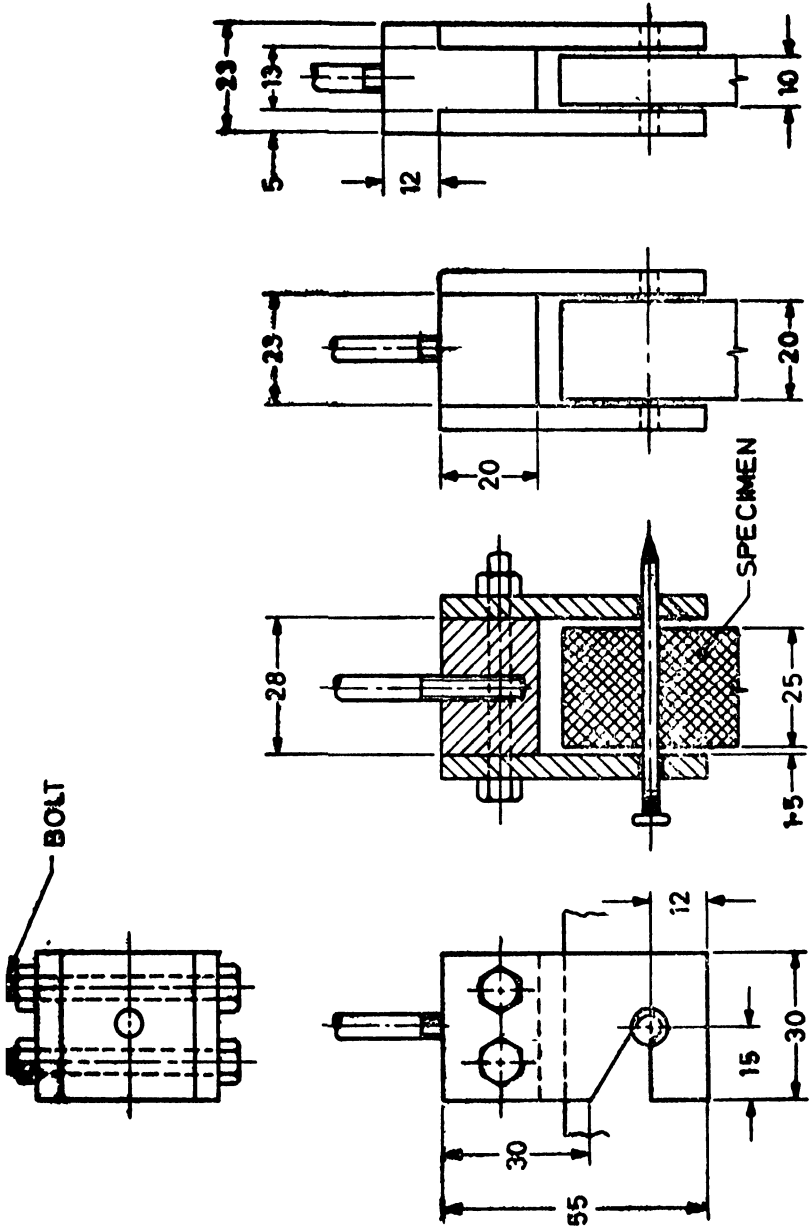


FIG. 1 TEST ASSEMBLY FOR MEASURING LATERAL RESISTANCE TO NAILS

3.2 Speed of Testing—The specimen shall be loaded continuously throughout the test by separation of the heads of the testing machine at a uniform rate of crosshead speed of 6 mm per minute.

3.3 Moisture Content—The moisture content of the test specimen shall be determined as described in IS : 2380 (Part III)-1977*.

*Methods of test for wood particle boards and boards from other lignocellulosic materials : Part III Determination of moisture content and density (*first revision*).



Note — Use same side plates with all thickness of specimen.
All dimensions in millimetres.

FIG. 2 DETAILS OF STIRRUPS AND CONNECTIONS FOR MEASURING THE LATERAL RESISTANCE TO NAILS

IS : 2380 (Part XV) - 1977

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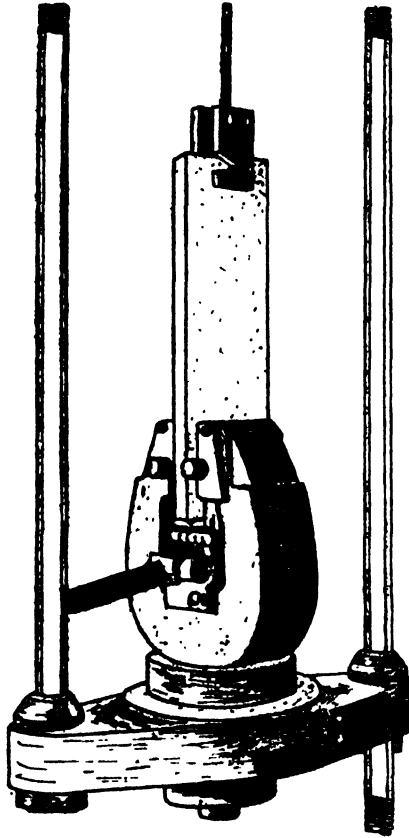
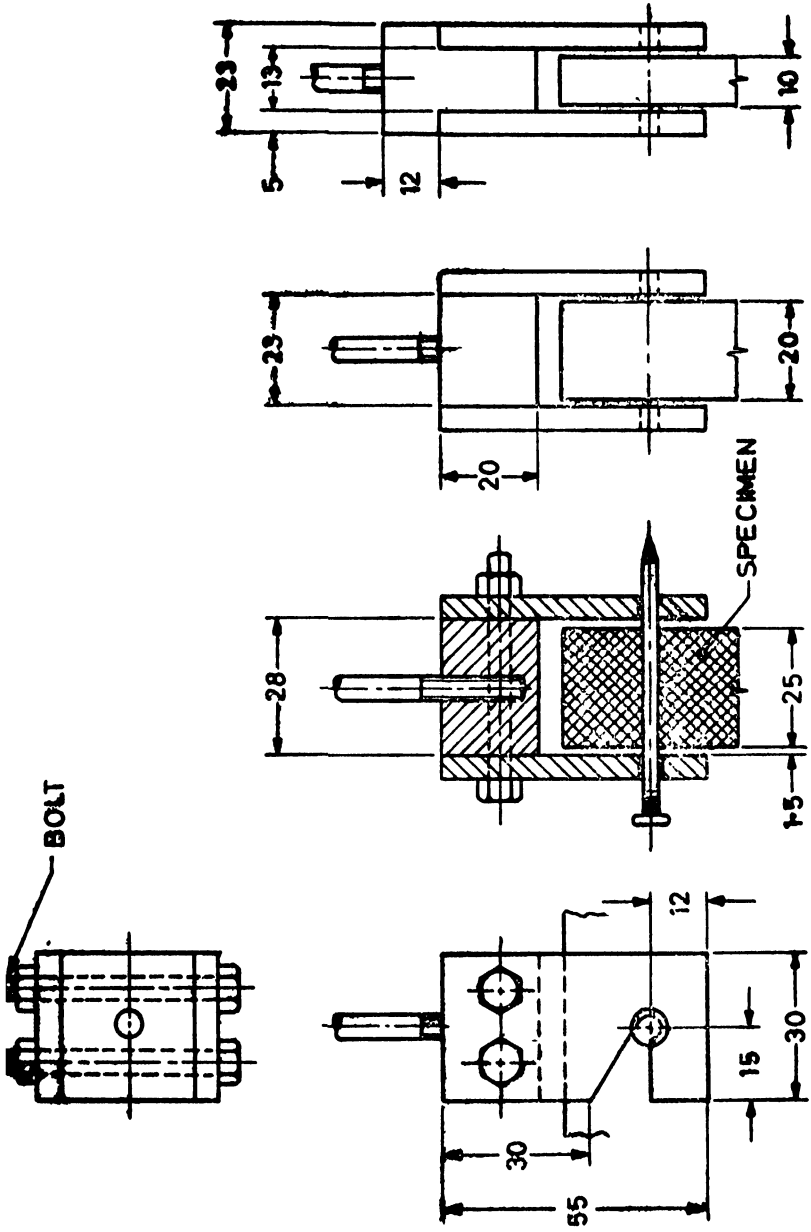


FIG. 1 TEST ASSEMBLY FOR MEASURING LATERAL RESISTANCE TO NAILS

3.2 Speed of Testing—The specimen shall be loaded continuously throughout the test by separation of the heads of the testing machine at a uniform rate of crosshead speed of 6 mm per minute.

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*Methods of test for wood particle boards and boards from other lignocellulosic materials : Part III Determination of moisture content and density (first revision).



Note — Use same side plates with all thickness of specimen.
All dimensions in millimetres.

FIG. 2 DETAILS OF STIRRUPS AND CONNECTIONS FOR MEASURING THE LATERAL RESISTANCE TO NAILS

4. TEST DATA AND REPORT

4.1 The load required to move the nail to the edge of the specimen shall be the measure of the lateral resistance. The maximum load and the nature of failure and the moisture content shall be included in the report.

NOTE — In some cases of the test, the nail may bend and pull out of the stirrup. If this happens, the maximum load will be apparent and not the true resistance of the board and will indicate that the resistance is some figure higher than the apparent value. When this happens, it shall be reported.

Values obtained from this test are dependent on the thickness of the specimen. Values, however, are not directly proportional to the thickness. For this reason, values obtained from tests of different boards can only be compared exactly, if the thicknesses are equal.

Indian Standard

METHODS OF TEST FOR WOOD PARTICLE BOARDS AND BOARDS FROM OTHER LIGNOCELLULOSIC MATERIALS

PART XVI DETERMINATION OF WATER ABSORPTION

(First Revision)

1. SCOPE

1.1 This standard (Part XVI) covers method of determination of water absorption of boards.

2. TEST SPECIMEN

2.1 Each test specimen shall be 30 × 30 cm and shall be prepared and conditioned as specified in 2.2.1 of IS : 2380 (Part I)-1977*. All the four edges shall be smoothly and squarely trimmed.

3. PROCEDURE

3.1 **Mass and Volume of Test Specimen** — After conditioning, the specimen shall be weighed to an accuracy of not less than ± 0.2 percent and the width, length and thickness shall be measured to an accuracy of not less than ± 0.3 percent. The volume of the specimen shall be computed from these measurements.

3.2 **Submersion in Water** — The specimen shall then be submerged horizontally under 25 mm fresh clean water maintained at a temperature of $27 \pm 2^\circ\text{C}$. The test specimen shall be separated by at least 15 mm from each other and from the bottom and sides of the container. After a 2-hour submersion, the specimen shall be suspended to drain for 10 minutes, at the end of which time the excess surface water shall be removed and the specimen immediately weighed. The specimen shall then be submerged for an additional period of 22 hours and the above weighing procedure repeated.

*Methods of test for wood particle boards and boards from other lignocellulosic materials: Part I Preparation and conditioning of test specimens (*first revision*).

IS : 2380 (Part XVI) - 1977

3.3 Moisture Content — After submersion, the specimen shall be dried in an oven at $103 \pm 2^{\circ}\text{C}$ as in 2.2 of IS : 2380 (Part III)-1977* and the moisture content (based on oven-dry mass) calculated from the masses after conditioning and after 2- and 24-hour submersions.

3.4 Density — The density of the specimen shall also be determined by the method specified in 3 of IS : 2380 (Part III)-1977*.

4. CALCULATION AND REPORT

4.1 The amount of water absorbed shall be calculated from the increase in mass of the specimen during the submersion, and the water absorption shall be expressed both as the percentage by volume and by mass based on the volume and the mass respectively, after conditioning. The specific gravity of water shall be assumed to be 1.00 for this purpose. The density of the specimen shall also be reported.

*Methods of test for wood particle boards and boards from other lignocellulosic materials: Part III Determination of moisture content and density (*first revision*).

Indian Standard

METHODS OF TEST FOR WOOD PARTICLE BOARDS AND BOARDS FROM OTHER LIGNOCELLULOSIC MATERIALS

PART XVII DETERMINATION OF SWELLING IN WATER

(First Revision)

1. SCOPE

1.1 This standard (Part XVII) covers method of determination of swelling in water of boards.

2. SWELLING DUE TO GENERAL ABSORPTION

2.1 **Test Specimen** — The test specimens shall be prepared and conditioned as specified in 2.2.1 of IS : 2380 (Part I)-1977*. Each test specimen shall be 200 × 100 mm and shall be of the thickness of the board.

2.2 **Procedure** — The thickness at the edge of each test specimen shall be measured to an accuracy of 0.01 mm at three places along one long edge approximately 50 mm, 100 mm and 150 mm from one end. The points at which the thicknesses are measured shall be clearly and indelibly marked. The same long edge of the test specimens shall be placed in the jig shown in Fig. 1 and the dial reading shall be recorded.

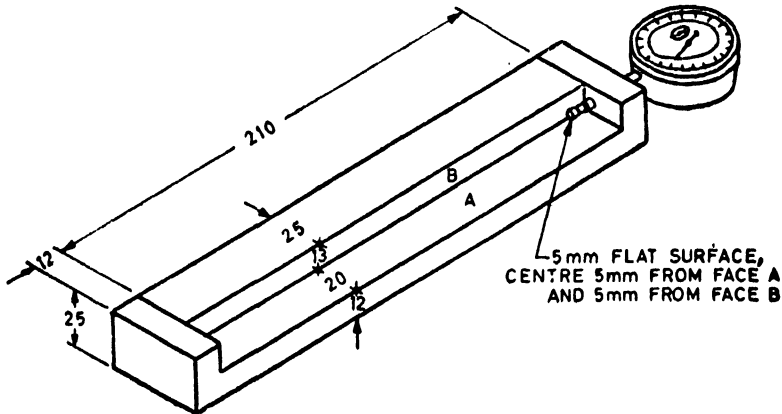
2.2.1 Each test specimen shall be immersed in fresh clean water having a temperature of $27 \pm 2^{\circ}\text{C}$, the water being renewed for each test. The short edges of the test specimens shall be vertical, with the measured edges lower most, and the test specimen shall be separated by at least 15 mm from each other and from the bottom and sides of the container. They shall be covered by approximately 25 mm of water.

2.2.2 At the end of 2 hours or such other period as may be specified, each test specimen shall be withdrawn from the water, wiped with a damp cloth and allowed to stand under normal room conditions for 1 hour with its bottom edge on a non-absorbent surface, such as a glass sheet. The thickness of each test specimen shall then be remeasured at the same

*Methods of test for wood particle boards and boards from other lignocellulosic materials: Part I Preparation and conditioning of test specimens (*first revision*).

IS : 2380 (Part XVII) - 1977

points as before and to the same degree of accuracy and the increases shall be recorded. The increased length of the measured edge shall be ascertained by use of the jig shown in Fig. 1.



All dimensions in millimetres.

FIG. 1 JIG FOR USE IN THE MEASUREMENT OF CHANGES
IN LENGTH

2.3 Report — The average of the three values obtained for the change in thickness expressed as a percentage of the original average thickness shall be reported as the swelling value. The increase in length of the measured edge shall be reported as a percentage of the nominal length of the test specimen.

3. SWELLING DUE TO SURFACE ABSORPTION

3.1 Test Specimen — Test specimens shall be prepared and conditioned as specified in 3 of IS: 2380 (Part I)-1977*. Each test specimen shall be 125 × 100 mm and shall be of the thickness of the board.

3.2 Procedure — The thickness of each test specimen shall be measured to an accuracy of ± 0.03 mm at four places, one in the centre of each side and approximately 20 mm from the edge. The points at which the thicknesses are measured shall be clearly and indelibly marked. The average of the four readings shall be recorded. The edges of each test specimen shall then be sealed by quickly dipping them in turn to a depth of 5 mm into a shallow bath of molten paraffin wax having a melting point of about 55°C, the temperature of the bath being about 90°C. The procedure shall be repeated until the pick-up of wax for each test specimen

*Methods of test for wood particle boards and boards from other lignocellulosic materials: Part I Preparation and conditioning of test specimens (first revision).

IS : 2380 (Part XVII) - 1977

is of the order of 5 g for each 10 mm thickness of the board. Each test specimen shall then be immersed in fresh clean water having a temperature of $27 \pm 2^{\circ}\text{C}$, the water being renewed for each test. The face being tested shall be immersed to a depth of approximately 3 mm. Care shall be taken not to wet the top surface of the test specimen. At the end of 2 hours or such other period as may be specified, each test specimen shall be withdrawn from water and the wet surface shall be wiped with a damp cloth. The test specimen shall then be laid, wet face down, for one hour on a non-absorbent surface, such as a glass sheet. The thickness of each test specimen shall then be remeasured at the same points as before and to the same degree of accuracy and the increases in thickness shall be recorded.

3.3 Report — The average of the four values of increase in thickness expressed as percentage of original average thickness shall be reported as surface swelling value.

Indian Standard

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BOARDS AND BOARDS FROM OTHER
LIGNOCELLULOSIC MATERIALS

PART XVIII DETERMINATION OF MASS AND
DIMENSIONAL CHANGES CAUSED BY MOISTURE
CHANGES

(First Revision)

1. SCOPE

1.1 This standard (Part XVIII) covers method of determination of mass and dimensional changes caused by moisture changes.

2. TEST SPECIMEN

2.1 Test specimens shall be prepared and precisely conditioned as specified in 2.2.1 of IS : 2380 (Part I)-1977* until they are substantially constant in mass and dimensions and shall be grouped in pairs. Metal shims may be cemented to the ends of the test specimens, if desired. Each test specimen shall be 200 × 10 mm and shall be of the thickness of the board.

3. PROCEDURE

3.1 Each test specimen shall be placed lengthwise in a jig, such as that illustrated in Fig. 1, that permits the test specimens to be held against a flat plate to eliminate the effect of any warping that may have occurred, and that has a dial gauge capable of recording changes in the length of the specimen to an accuracy of 0.01 mm. The dial reading shall be recorded. The thickness of each test specimen shall be measured to an accuracy of 0.01 mm at three marked points, one near each end and one in the middle of the length and the mean shall be recorded. The mass of each test specimen excluding any shims shall be recorded to an accuracy of 0.01 g.

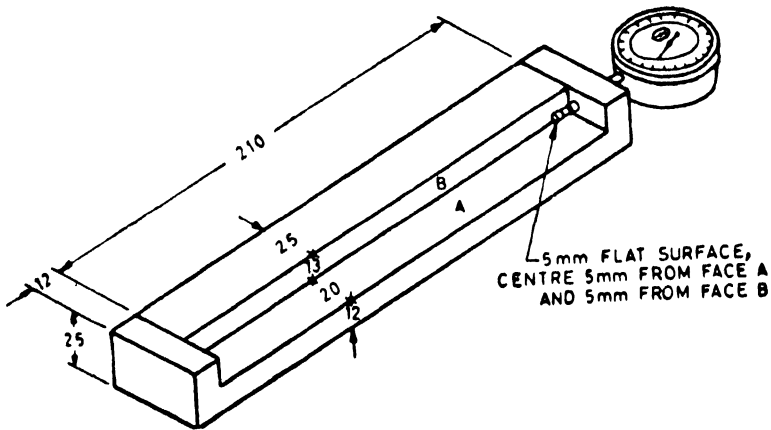
*Methods of test for wood particle boards and boards from other lignocellulosic materials: Part I Preparation and conditioning of test specimens (*first revision*).

IS : 2380 (Part XVIII) - 1977

3.1.1 One of each pair of test specimens shall then be placed in an atmosphere maintained at 90 ± 5 percent relative humidity at $27 \pm 2^\circ\text{C}$ and the other in an atmosphere maintained at 40 ± 5 percent relative humidity at $27 \pm 2^\circ\text{C}$. Upon their again reaching nearly constant mass and dimensions, the expansion or contraction, the change in the mean thickness and the change in mass of each test specimen shall be recorded. Finally, the test pieces shall be dried as specified in 2 of IS:2380 (Part III)-1977*, and re-weighed.

4. REPORT

4.1 The change in length corresponding to each change in condition (that is, from 65 percent to 40 percent relative humidity or from 65 percent to 90 percent relative humidity) shall be reported as a percentage of the nominal length. The corresponding changes in the mass or thickness as percentage of the mass or thickness after conditioning at 65 percent relative humidity shall also be reported. The equilibrium moisture contents at 40 and 90 percent relative humidity shall be reported.



All dimensions in millimetres.

FIG. 1 JIG FOR USE IN THE MEASUREMENT OF CHANGES IN LENGTH

*Methods of test for wood particle boards and boards from other lignocellulosic materials : Part III Determination of moisture content and density (first revision).

Indian Standard

METHODS OF TEST FOR WOOD PARTICLE
BOARDS AND BOARDS FROM OTHER
LIGNOCELLULOSIC MATERIALS

PART XIX DURABILITY CYCLIC TEST FOR
INTERIOR USE

(First Revision)

1. SCOPE

1.1 This standard (Part XIX) covers durability cyclic test for interior use.

2. GENERAL

2.1 This test is intended to evaluate boards intended for interior use.

3. TEST SPECIMEN

3.1 When mechanical tests are to be made on the board to determine the deteriorating effect of exposure cycling on mechanical properties, the size of the specimen shall conform to that required for the specific mechanical test to be made.

3.2 When this exposure cycling test is made only for the purpose of visually observing the damage, if any, resulting from the cyclic exposure the size of the test specimen shall be 30×30 cm or 15×15 cm with all four edges smoothly and squarely trimmed.

4. PROCEDURE

4.1 **Durability Cycles** — Each specimen shall be subjected to 16 complete cycles of wetting and drying. Each cycle shall consist of the following:

- a) Immersed vertically in water at $27 \pm 2^\circ\text{C}$ for 4 hours, and
- b) Heated in dry air at $38 \pm 2^\circ\text{C}$ for 20 hours.

After the completion of the 15 cycles of exposure, the material for test shall be further conditioned at a temperature of $27 \pm 2^\circ\text{C}$ and a

IS : 2380 (Part XIX) - 1977

5. INSPECTION OF MATERIAL DURING CYCLIC EXPOSURE

5.1 Frequent inspection of the material shall be made during the cycles for any signs of delamination or other disintegration. If there is any apparent damage to the material, it shall be described in the report and the cycle in which the damage occurred noted.

6. COMPARISON AND REPORT

6.1 After the wetting and drying tests have been completed, each specimen which has not disintegrated shall be tested in accordance with the appropriate methods of test. After these tests are completed the results shall be calculated and compared with the corresponding values obtained from tests made on material not subjected to the wetting and drying cycles.

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METHODS OF TEST FOR WOOD PARTICLE
BOARDS AND BOARDS FROM OTHER
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PART XX ACCELERATED WEATHERING CYCLIC TEST
FOR EXTERIOR USE

(*First Revision*)

1. SCOPE

1.1 This standard (Part XX) covers accelerated weathering cyclic test for exterior use.

2. GENERAL

2.1 This test is intended to estimate the weathering qualities of boards under severe exposure conditions. After the specimens are subjected to the cycles of accelerated weathering given in 4.1, the following tests shall be made according to the methods specified in this standard:

| <i>Test</i> | <i>Reference</i> |
|------------------|------------------------------|
| Static bending | IS : 2380 (Part IV)-1977* |
| Water absorption | IS : 2380 (Part XVI)-1977† |

3. TEST SPECIMENS

3.1 The test specimens shall be prepared as specified in the relevant tests listed above.

3.1.1 When this accelerated weathering test is made only for the purpose of visual observation of any defect resulting from cyclic exposure, the size of test specimen shall be 30 × 30 cm or 15 × 15 cm with all four edges smoothly and squarely trimmed.

*Methods of test for wood particle boards and boards from other lignocellulosic materials: Part IV Determination of static bending strength (modulus of rupture and modulus of elasticity in bending) (*first revision*).

†Methods of test for wood particle boards and boards from other lignocellulosic materials: Part XVI Determination of water absorption (*first revision*).

IS : 2380 (Part XIX) - 1977

5. INSPECTION OF MATERIAL DURING CYCLIC EXPOSURE

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Indian Standard

METHODS OF TEST FOR WOOD PARTICLE BOARDS AND BOARDS FROM OTHER LIGNOCELLULOSIC MATERIALS

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(First Revision)

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*Methods of test for wood particle boards and boards from other lignocellulosic materials: Part IV Determination of static bending strength (modulus of rupture and modulus of elasticity in bending) (*first revision*).

†Methods of test for wood particle boards and boards from other lignocellulosic materials: Part XVI Determination of water absorption (*first revision*).

4. PROCEDURE

4.1 Accelerated Weathering Cycle — Each specimen shall be subjected to six complete cycles of accelerated weathering. Each cycle shall consist of the following:

- a) Immersion in water at $49 \pm 2^\circ\text{C}$ for 1 hour,
- b) Spraying with steam and water vapour at $93 \pm 3^\circ\text{C}$ for 3 hours,
- c) Storing at ambient temperatures in a well ventilated room for 20 hours,
- d) Heating in dry air at $99 \pm 2^\circ\text{C}$ for 3 hours,
- e) Spraying again with steam and water vapour at $93 \pm 3^\circ\text{C}$ for 3 hours, and
- f) Heating again in dry air at $99 \pm 2^\circ\text{C}$ for 18 hours.

4.1.1 After the completion of the six cycles of exposure, the material for test shall be further conditioned at a temperature of $27 \pm 2^\circ\text{C}$ and a relative humidity of 65 ± 5 percent for at least 48 hours before being subjected to tests.

5. INSPECTION OF MATERIAL DURING CYCLIC EXPOSURE

5.1 Frequent inspections of the material shall be made during the weathering cycles for any signs of distortion or other damages. If there is any apparent damage to the material, it shall be included in the report, as well as the stage of the cycle in which damage became apparent.

6. COMPARISON AND REPORT

6.1 After the tests following the accelerated weathering treatment are completed, the results shall be calculated as specified in the appropriate test and compared with the corresponding values obtained from test made on material that did not have the accelerated weathering treatment and reported.

7. MEASUREMENT OF CUPPING AND TWISTING

7.1 Measurements of cupping and twisting shall also be made after completing the accelerated weathering cycles.

7.2 Procedure — Cupping may be determined by placing a straightedge across opposite edges of the specimen and measuring the maximum distance to the concave face. Twisting may be determined by placing the specimen with three corners touching a level surface and measuring the distance from the raised corner to the surface.

7.3 Report — Cupping or twisting shall be reported correct to 0.01 cm along with the size of the specimen.

IS : 2380 (Part XXI) - 1977

Indian Standard

METHODS OF TEST FOR WOOD PARTICLE BOARDS AND BOARDS FROM OTHER LIGNOCELLULOSIC MATERIALS

PART XXI PLANENESS TEST UNDER UNIFORM MOISTURE CONTENT

(First Revision)

1. SCOPE

1.1 This standard (Part XXI) covers planeness test under uniform moisture content. This may also be called as local planeness test.

2. TEST SPECIMEN

2.1 The whole board shall be used for measuring the local planeness.

3. PROCEDURE

3.1 The board shall be placed in a horizontal position and squares of 20 cm be made on the face of board by a soft pencil. A dial gauge suitably fixed on a plane surface so as to measure depression perpendicular to the plane surface shall be placed on each cross point of the squares. The depth of each cross point of the squares shall be measured with reference to the planeness of the surrounding surface. The ratio of the depth to the distance between corresponding corner points shall be calculated and recorded.

4. REPORT

4.1 Maximum ratio of the depth to the distance between corresponding corner points shall be reported. Where so much detail is not required the planeness shall be measured along a diagonal.

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