भारतीय मानक
*Indian Standard*

**IS 14276 : 2016**
**(Reaffirmed 2021)**

# सीमेंट बद्ध पार्टिकल बोर्ड — विशिष्टि

*( पहला पुनरीक्षण )*

# Cement Bonded Particle Boards — Specification

*( First Revision )*

ICS 79.060.20



भारतीय मानक ब्यूरो
BUREAU OF INDIAN STANDARDS
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**July 2016** **Price Group 4**

Wood and Other Lignocellulosic Products Sectional Committee, CED 20

FOREWORD

This Indian Standard (First Revision) was adopted by the Bureau of Indian Standards, after the draft finalized by the Wood and other Lignocellulosic Products Sectional Committee had been approved by the Civil Engineering Division Council.

Cement bonded particle board is made from admixture of wood particles and cement. The standard was first published in 1995 with an aim to provide necessary guidance to the manufacturers and users of the product.

This revision is undertaken to technically align the standard with ISO 8335 : 1987 'Cement-bonded particle boards — Boards of Portland' or equivalent cement reinforced with fibrous wood particles'. The optional requirements in ISO 8335 on dimensional stability, static point loading, frost resistance, fire resistance and impact resistance have not been specified in this standard. This standard additionally incorporates requirements of water absorption, swelling in water (for length and width) and modulus of rupture (MOR) and modulus of elasticity (MOE) in wet condition in view of likely exposure of the product to high moisture levels in use due to the atmospheric humidity conditions prevailing in the country. The general test conditions of temperature and humidity applicable also vary from that in ISO 8335.

In this standard the following important modifications have been incorporated:

a) Tolerances on dimensions have been modified;
b) Requirement on density has been modified; and
c) Requirement on *p*H has been deleted.

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

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

*Indian Standard*

# CEMENT BONDED PARTICLE BOARDS — SPECIFICATION

*( First Revision )*

## 1 SCOPE

**1.1** This standard covers the requirements of cement bonded wood particle boards.

**1.2** This standard does not cover wood particle boards bonded with synthetic resin adhesives.

**1.3** Requirements of prelaminated cement bonded particle boards are covered in IS 15786 : 2008 Prelaminated cement bonded particle board — Specification

## 2 REFERENCES

The standards listed in Annex A 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 the standard are encouraged to investigate the possibility of apply the most recent editions of the standard indicated in Annex A.

## 3 TERMINOLOGY

For the purpose of this standard, the definitions given in IS 707 and the following shall apply.

**3.1 Particle** — A distinct particle or fraction of wood or other lignocellulosic material produced mechanically for use as the aggregate for a particle board. This may be in the form of flake, granule, shaving splinter and sliver as stated below.

**3.2 Flake** — A specially made thin particle, with the grain of the wood essentially parallel to the surface of the flake, prepared with the cutting action of the knife in a plane parallel to the grain but at an angle to the axis of the fibre.

**3.3 Granule** — A particle in which the length, width and thickness are approximately equal, such as particle of saw dust.

**3.4 Shaving** — A thin slice or strip of wood pared off with a knife, planer or other cutting instrument, the knife action being approximately along the axis of the fibre, such as the shavings produced in planning the surface of wood.

**3.5 Splinter and Sliver** — A particle of nearly square or rectangular cross section with a length parallel to the grain of at least four times the thickness.

**3.6 Cement Bonded Particle Board** — A particle board made from a mixture of wood particles and Portland cement.

## 4 MATERIALS

**4.1** Species of wood which do not hinder the process of setting of cement shall be used. Suitable additives such as sodium silicate conforming to IS 381 and aluminium sulphate conforming to IS 260 shall be used to prevent inhibitive effect of setting of cement when other species are used.

**4.2** Cement conforming to IS 8112 or IS 12269 or IS 1489 (Part 1and Part 2) having equivalent compressive strength properties, shall be used.

## 5 MANUFACTURE

Wood particles for the manufacture of particle boards bonded with cement shall be produced by cutting wood into shavings, flakes. Splinters or slivers of sizes up to 15 mm in length, 3 mm in width and 0.3 mm in thickness on a suitable chipping machine. Particles up to 30 percent by dry weight shall be blended with requisite quantity of cement, other chemical additives and water. The mixture shall then be formed into a board. Boards thus formed shall be stacked in a stacking device and then compressed and clamped in a hydraulic press. Boards after compression shall be allowed to set in a curing chamber in the clamped condition. Boards shall be allowed to be cured for a minimum period of 12 days and then dried in a drying chamber. Subsequently boards shall be trimmed to required size.

## 6 FINISH

The particle boards shall be of uniform thickness and density throughout the length and width of the boards. All particle boards shall be flat and smooth on both sides.

## 7 DIMENSIONS AND TOLERANCES

**7.1** The sizes of cement bonded particle boards shall be as follows:

Length : 2 440 mm and 3 050 mm

Width : 1 200 mm

NOTE — Any other size as agreed to between the purchaser and the manufacturer may be manufactured.

### 7.2 Thickness

**7.2.1** The thickness of cement bonded particle boards shall be as given below:

6 ,8, 10, 12, 16, 20, 25, 30 and 40 mm

### 7.3 Tolerances

**7.3.1** The following tolerances for the dimensions shall be permitted:

a) Length and width : ± 5 mm
b) Thickness:
   1) Unsanded boards:
      i) 6 mm to 12 mm : ± 1.0 mm
      ii) above 12 mm and up to 20 mm : ± 1.5 mm
      iii) 20 mm or more : ± 2.0 mm
   2) Sanded boards : ± 0.3 mm
c) Straightness of edges : 1 mm/1 000 mm
d) Squareness of edges : 2 mm/1 000 mm

## 8 PHYSICAL CHARACTERISTICS

### 8.1 Density

The average density of the board when tested in accordance with **10.3** shall not be less than 1 000 kg/m$^3$.

### 8.2 Moisture Content

The average moisture content of the boards when determined in accordance with **10.4** shall not exceed the prescribed limits given in Table 1. The moisture content of individual test specimen shall not vary from the mean moisture content by more than ± 3 percent (absolute).

### 8.3 Water Absorption

The water absorption of the boards when determined in accordance with **10.5** shall not exceed the prescribed limits given in Sl No. (ii) of Table 1 for 2 and 24 h soaking.

### 8.4 Swelling in Water

The swelling in thickness, length and width, when determined in accordance with **10.6** shall not exceed the limits given in Table 1.

### 8.5 Workability

The boards shall not crack or split when drilled, sawed or nailed perpendicular to surface. For nailing perpendicular to surface a pre-bore of 0.8 times the diameter of the nail shaft shall be made.

## 9 SAMPLING AND INSPECTION

### 9.1 Scale of Sampling

**9.1.1** *Lot*

In any consignment, all the boards of the same dimensions and manufactured under similar conditions of production, shall be grouped together to constitute a lot.

**9.1.1.1** The conformity of a lot to the requirements of this standard shall be ascertained on the basis of tests on boards selected from it.

**9.1.2** The number of boards to be selected from a lot shall be in accordance with as prescribed in IS 7638.

**9.1.2.1** These boards shall be selected at random in accordance with **4.3** of IS 7638 (*see* IS 4905).

### 9.2 Test Specimens and Number of Tests

The length, width, thickness, edge straightness and squareness of the boards selected as in **9.1.2** shall comply with the requirement specified in **7**. The lot having been found satisfactory shall be further tested for physical characteristics as given in **8**. For this purpose, the boards examined according to **9.2.1** and found satisfactory shall be used.

**9.2.1** From each of the board selected following test specimens shall be cut out from portions 150 mm away from the edges for tests as specified under **10** and the preparation and conditioning of specimens shall be as specified in IS 2380 (Part 1):

a) *For determination of density* — Three test specimens from each sample, each of size 150 mm × 75 mm × full thickness of board. Specimens of other sizes may be used when deemed necessary.
b) *For determination of moisture content* — Three test specimens from each sample, each of size 150 mm × 75 mm × full thickness of board. Specimens of other sizes may be used when deemed necessary.
c) *For water absorption* — Three test specimens of size 300 mm × 300 mm in full thickness of board from each sample.
d) *For swelling in water* — Three test specimens of size 200 mm × 100 mm in full thickness of board from each sample.
e) *For modulus of rupture* — Three test specimens each for dry and wet condition from each sample conforming to dimensions as specified in IS 2380 (Part 4).

f) *For modulus of elasticity* — Three test specimens each for dry and wet condition from each sample conforming to dimensions as specified in IS 2380 (Part 4).

g) *For tensile strength perpendicular to surface* — Three test specimens each for dry and accelerated ageing test from each sample of size 50 mm × 50 mm in full thickness of material.

h) *For screw withdrawal strength* — Three test specimens from each sample of size 150 mm × 75 mm in full thickness of material.

j) *For p*H v*alue* — Three test specimens from each sample of size 150 mm × 75 mm in full thickness of material.

### 9.3 Criteria for Conformity

A lot shall be considered as conforming to the requirements of this specification, if the sample and test specimens pass the requirements prescribed in **10**.

**9.3.1** In case of failure, double the number of samples shall be taken from the lot for testing. The lot shall be considered to have passed, if all these samples conform to the requirements specified in **10**.

## 10 TESTING OF SAMPLES

**10.1** The samples and test specimens shall be tested as given in **10.2** to **10.11** and shall conform to the requirements prescribed in **7, 8** and Table 1.

### 10.2 Accuracy of Dimensions of Boards

The accuracy of dimensions of boards shall be measured as specified in IS 2380 (Part 2). All the samples selected in accordance with **9.2.1** shall be measured for straightness of edges, squareness of boards, length, width and thickness and shall comply with the requirement specified in **7.**

### 10.3 Test for Density

The average density of the board shall be determined for specimens prescribed in **9.2.1**(a) in accordance with IS 2380 (Part 3) and shall comply with the requirements specified in Sl No. (i) of Table 1.

### 10.4 Test for Moisture Content

The average moisture content of boards shall be determined for specimens prescribed in **9.2.1**(b) in accordance with IS 2380 (Part 3) and shall comply with the requirements specified in Sl No. (ii) of Table 1.

**Table 1 Requirements of Physical and Mechanical Properties for Cement Bonded Particle Boards**

(*Clauses* 8.2, 8.3, 8.4,10.1 and 10.3 to 10.10)

| Sl No. | Property | Requirement |
|---|---|---|
| (1) | (2) | (3) |
| i) | Density (*Min*) kg/m$^3$ | 1 000 |
| ii) | Moisture content, percent | 6 - 12 |
| iii) | Water absorption ( *Max* ), percent: | |
| | a) 2 h soaking | 13 |
| | b) 24 h soaking | 25 |
| iv) | Swelling in water ( *Max* ), percent (After 2 h soaking): | |
| | a) Thickness | 2.0 |
| | b) Length | 0.5 |
| | c) Width | 0.5 |
| v) | Modulus of rupture ( *Min* ), N/mm$^2$: | |
| | a) Dry condition | 9 (Average)<br>7.5 (Minimum individual) |
| | b) Wet condition[1)] | 5.5 (Average)<br>4.8 (Minimum individual) |
| vi) | Modulus of elasticity ( *Min* ), N/mm$^2$: | |
| | a) Dry condition | 3 000 (Average)<br>2 700 (Minimum individual) |
| | b) Wet condition[1)] | 2 200 (Average)<br>1 900 (Minimum individual) |
| vii) | Tensile strength perpendicular to surface ( *Min* ), N/mm$^2$ | |
| | a) Dry | 0.4 |
| | b) Accelerated ageing[2)] | 0.25 |
| viii) | Screw withdrawal strength ( *Min* ), N | |
| | a) Face | 1 250 |
| | b) Edge | 850 |

[1)]*MOR and MOE in wet condition* — Specimens are soaked in water at 27 ± 2ºC for a period of 24 h. Modulus of rupture shall be determined in wet state.

[2)]*Accelerated ageing* — Specimens are boiled in water for a period of 2 h. Afterwards they are dried at 27 ± 2ºC to a moisture content around 12 percent and then tensile strength perpendicular to surface shall be determined.

### 10.5 Test for Water Absorption

The average water absorption shall be determined for specimens prescribed in **9.2.1**(c) in accordance with IS 2380 (Part 16) and shall comply with the requirements specified in Sl No. (iii) of Table 1.

### 10.6 Test for Swelling in Water

The swelling in thickness, length and width shall be determined for specimens prescribed in **9.2.1**(d) in accordance with IS 2380 (Part 17) and shall comply with the requirements specified in Sl No. (iv) of Table 1.

### 10.7 Test for Modulus of Rupture

The average and minimum individual values of modulus of rupture in dry and wet condition ( *see* Table 1 ) shall be determined for specimens prescribed in **9.2.1**(e) in accordance with IS 2380 (Part 4) and shall comply with the requirements specified in Sl No. (v) of Table 1.

### 10.8 Test for Modulus of Elasticity

The average and minimum individual values of modulus of elasticity in dry and wet condition ( *see* Table 1 ) shall be determined for specimens prescribed in **9.2.1**(f) in accordance with IS 2380 (Part 4) and shall comply with the requirements specified in Sl No. (vi) of Table 1.

### 10.9 Test for Tensile Strength Perpendicular to Surface

The average tensile strength perpendicular to surface in dry and accelerated ageing test (*see* Table 1) shall be determined for specimens prescribed in **9.2.1**(g) in accordance with IS 2380 (Part 5) and shall comply with the requirements specified in Sl No. (vii) of Table 1.

### 10.10 Test for Screw Withdrawal Strength

The average screw withdrawal strength shall be determined for specimens prescribed in **9.2.1**(h) in accordance with IS 2380 (Part 14) and shall comply with the requirements specified in Sl No. (viii) of Table 1.

## 11 MARKING

**11.1** Each board shall be legibly and indelibly marked or stamped near any of its edges with the following:

a) Name of the manufacturer or trade-mark, if any;
b) Thickness; and
c) Date of manufacture.

### 11.2 BIS Certification Marking

The product may also be marked with the Standard Mark.

**11.2.1** The use of the Standard Mark is governed by the provisions of *Bureau of Indian Standards Act*, 1986 and the Rules and Regulations made thereunder. The details of conditions under which the licence for the use of standard Mark may be granted to manufacturers or producers may be obtained from the Bureau of Indian Standards.

# ANNEX A

( *Clause* 2.1 )

## LIST OF REFERRED INDIAN STANDARDS

| *IS No.* | *Title* |
|---|---|
| 260 : 2001 | Specification for aluminium sulphate, nonferric (*first revision*) |
| 381 : 1995 | Specification for sodium silicate (*first revision*) |
| 707 : 1976 | Glossary of terms applicable to timber technology and utilization of wood, bamboo and cane (*third revision*) |
| 1489 | Specification for Portland pozzolana cement: |
| (Part 1 ) : 1991 | Flyash based |
| (Part 2) : 1991 | Calcined clay based |
| 2380 | Methods of test for wood particle boards and boards from other lignocellulosic materials: |
| (Part 1) : 1977 | Preparation and conditioning of test specimens (*first revision*) |
| (Part 2) : 1977 | Accuracy of dimensions of boards (*first revision*) |
| (Part 3) : 1977 | Determination of moisture content and density (*first revision*) |
| (Part 4) : 1977 | Determination of static bending strength (*first revision*) |
| (Part 5) : 1977 | Determination of tensile strength perpendicular to surface (*first revision*) |
| (Part 14) : 1977 | Screw and nail withdrawal test (*first revision*) |
| (Part 16) : 1977 | Determination of water absorption (*first revision*) |
| (Part 17) : 1977 | Determination of swelling in water (*first revision*) |
| 4905 : 1968 | Methods for random sampling |
| 7638 : 1999 | Wood/lignocellulosic based panel products - Methods of sampling (*second revision*) |
| 8112 : 2013 | Ordinary Portland cement, 43 grade – Specification (*second revision*) |
| 12269 : 2013 | Ordinary Portland cement, 53 grade – Specification (*first revision*) |

# ANNEX B

(*Foreword*)

## COMMITTEE COMPOSITION

Wood and Other Lignocellulosic Products Sectional Committee, CED 20

| *Organization* | *Representative(s)* |
|---|---|
| Indian Plywood Industries Research & Training Institute, Bangalore | Shri K. S. Reddy (***Chairman***) |
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| Bamboo Society of India, Bangalore | Shri A. S. Sadashivaiah |
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