भारतीय मानक

सीमेंट बद्ध पार्टिकल बोर्ड — विशिष्टि

Indian Standard

CEMENT BONDED PARTICLE BOARDS — SPECIFICATION

ICS 79·060·20

BUREAU OF INDIAN STANDARDS
MANAK BHAVAN, 9 BAHADUR SHAH ZAFAR MARG
NEW DELHI 110002

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Price Group 4

FOREWORD

This Indian Standard was adopted by the Bureau of Indian Standards, after the draft finalized by the Wood Products Sectional Committee had been approved by the Civil Engineering Division Council.

Cement bonded particle board, which is now being manufactured in our country, is made from a mixture of wood particles and cement. This standard is now formulated to provide necessary guidance to the manufacturers and users of this product.

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

ISO 8335 : 1987 'Cement -- bonded particle boards — Boards of Portland or equivalent cement reinforced with fibrous wood particles', issued by International Organization for Standardization.

BS 5669 Part 4 : 1989 'Particle board : Part 4 Specification for cement bonded particle board', issued by British Standards Institute.

The committee responsible for the the preparation of this standard is given at 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

1 SCOPE

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

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

2 REFERENCES

2.1 The Indian Standards listed in Annex A are necessary adjuncts to this standard.

3 TERMINOLOGY

3.1 For the purpose of this standard, the following definitions shall apply and for definitions other than those given below, reference may be made to IS 707 : 1976.

3.2 Particle

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.

3.3 Flake

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.

3.4 Granule

Particle in which the length, width and thickness are approximately equal, such as particle of saw dust.

3.5 Shaving

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 planing the surface of wood.

3.6 Splinter and Sliver

Particle of nearly square or rectangular cross section with a length parallel to the grain of at least four times the thickness.

3.7 Cement Bonded Particle Board

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 : 1972 and aluminium sulphate conforming to IS 260 : 1969 shall be used to prevent inhibitive effect of setting of cement when other species are used.

4.2 Cement conforming to IS 8112 : 1989 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. Cured boards shall be allowed to mature for a period of 12 days and then dried in a drying chamber. Subsequently boards shall be trimmed to required size.

6 FINISH

6.1 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.

7 DIMENSIONS AND TOLERANCES

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

Length 3 050 mm and 2 440 mm

Width 1 220 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.

Length	± 5 mm
Width	± 5 mm
Thickness	
i) Unsanded boards	
6 mm to 12 mm	± 1 mm
12 mm to 20 mm	± 1·5 mm
20 mm and more	± 2 mm
ii) Sanded boards	
(For all thickness)	± 0·3 mm
Edge straightness	2 mm per 1 000 mm
Squareness	2 mm per 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 1 250 kg/m³.

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 percentage by more than ±3 percent.

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 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.

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

(*Clauses* 8.2, 8.3, 8.4, 10.1, 10.3, 10.4, 10.5, 10.6, 10.7, 10.8, 10.9, 10.10 *and* 10.11)

Sl No.	Property	Requirement
i)	Density (*Min*) kg/m³	1 250
ii)	Moisture content, percent	6 to 12
iii)	Water absorption (*Max*), percent	
	2 h soaking	13
	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/mm²	
	Dry condition	9
	*Wet condition	5·5
vi)	Modulus of elasticity (*Min*), N/mm²	3 000
vii)	Tensile strength perpendicular to surface (*Min*), N/mm²	
	a) Dry	0·4
	†b) Accelerated ageing	0·25
viii)	Screw withdrawal strength (*Min*), N	
	Face	1 250
	Edge	850
ix)	‡*p*H	11 to 13

**MOR in wet condition* — Specimens are soked in water at 27 ± 2°C for a period of 24 h. Modulus of rupture shall be determined in wet state.

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

‡*p*H — Specimens are immersed in water at 27 ± 2°C for a period of 72 h. After removing the specimens, *p*H value of the water shall be determined using a *p*H meter.

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 consitute 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 the following Table:

Lot Size	*No. of Boards*
N	*n*
Up to 50	2
51 to 100	3
101 to 200	4
201 to 300	5
301 to 500	7
501 and above	10

9.1.2.1 These boards shall be selected at random (*see* IS 4905 : 1968). In order to ensure randomness of selection, all the boards in the lot may be arranged in a serial order and every *r*th board may be selected till the required number is obtained, *r* being the integral part of N/n, where N is the lot size and n is the sample size.

9.2 Test Specimens and Number of Tests

The length, width, thickness and the diagonals of the boards selected as in **9.1.2** shall be measured before cutting the boards for taking test specimens. The straightness of edges shall also be measured. The lot having been found satisfactory shall be further tested for physical characteristics 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**. The method of preparation and conditioning of specimens shall be as specified in IS 2380 (Part 1) : 1977.

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) : 1977.

f) *For Modulus of Elasticity*

Three test specimens from each sample conforming to dimensions specified in IS 2380 (Part 4) : 1977.

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 pH Value*

Three test specimens from each sample of size 150 mm × 75 mm in full thickness of material. Other sizes may be used when deemed necessary.

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 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) : 1977. All the samples selected in accordance with **9.2.1** shall be measured for straightness of edges, squareness of boards, length, width and thickness.

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) : 1977 and shall comply with 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) : 1977 and shall comply with the requirements specified in Sl No. (ii) of Table 1.

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) : 1977 and shall comply with the requirement 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) : 1977 and shall comply with the requirement specified in Sl No. (iv) of Table 1.

10.7 Test for Modulus of Rupture

The average 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) : 1977 and shall comply with the requirements specified in Sl No. (v) of Table 1.

10.8 Test for Modulus of Elasticity

The average modulus of elasticity shall be determined for specimens prescribed in **9.2.1 (f)** in accordance with IS 2380 (Part 4) : 1977 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 prependicular 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) : 1977 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) : 1977 and shall comply with the requirements specified in Sl No. (viii) of Table 1.

10.11 Test for *p*H Value

The average *p*H shall be determined for specimens prescribed in **9.2.1** (j) in accordance with Table 1 and shall comply with the requirements specified in Sl No. (ix) 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

11.2.1 The product may also be marked with the Standard Mark.

11.2.2 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 : 1969	Aluminium sulphate, non-ferric (*first revision*)
381 : 1972	Sodium silicate (*first revision*)
707 : 1976	Glossary of terms applicable to timber technology and utilization (*second revision*)
2380	Methods of test for wood particle boards and boards from other lignocellulosic materials:
(Part 1) : 1977	Part 1 Preparation and conditioning of test specimens (*first revision*)
(Part 2) : 1977	Part 2 Accuracy of dimensions of boards (*first revision*)
(Part 3) : 1977	Part 3 Detetermination of moisture content and density (*first revision*)
(Part 4) : 1977	Part 4 Determination of static bending strength (*first revision*)
(Part 5) : 1977	Part 5 Determination of tensile strength perpendicular to surface (*first revision*)
(Part 14) : 1977	Part 14 Screw and nail withdrawal test (*first revision*)
(Part 16) : 1977	Part 16 Determination of water absorption (*first revision*)
(Part 17) : 1977	Part 17 Determination of swelling in water (*first revision*)
4905 : 1968	Methods for random sampling
8112 : 1989	43 grade ordinary portland cement (*first revision*)

ANNEX B

(*Foreword*)

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