

इंटरनेट

मानक

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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 12406 (2003): Medium Density Fibre Boards for General Purpose -Specification [CED 20: Wood and other Lignocellulosic products]



“ज्ञान से एक नये भारत का निर्माण”

Satyanarayan Gangaram Pitroda

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“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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भारतीय मानक
सामान्य प्रयोजनो के लिए मध्यम घनत्व के
रेशा बोर्ड — विशिष्टि
(पहला पुनरीक्षण)

Indian Standard

MEDIUM DENSITY FIBRE BOARDS FOR GENERAL
PURPOSE — SPECIFICATION

(*First Revision*)

ICS 79.060.20

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

**AMENDMENT NO. 1 SEPTEMBER 2006
TO
IS 12406 : 2003 MEDIUM DENSITY FIBREBOARDS
FOR GENERAL PURPOSES — SPECIFICATION**

(First Revision)

*(Page 4, clause 12, Title) — Substitute 'ADDITIONAL' for
'OPTIONAL'.*

(CED 20)

Reprography Unit, BIS, New Delhi, India

**AMENDMENT NO. 2 JANUARY 2007
TO
IS 12406 : 2003 MEDIUM DENSITY FIBRE BOARDS
FOR GENERAL PURPOSE — SPECIFICATION**

(First Revision)

(Page 2, clause 8.1) — Substitute 'MDF board' for 'plywood' wherever appearing in the clause.

(CED 20)

Reprography Unit, BIS, New Delhi, India

FOREWORD

This Indian Standard (First Revision) 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.

Medium density fibre board is a panel product manufactured from lignocellulosic fibres combined with synthetic resin or other suitable binder. The panels are manufactured to a specific gravity of 0.6 to 0.9 by the application of heat and pressure by a process in which the interfibre bond is substantially created by the added binder. Other materials may have been added during manufacturing to improve certain properties.

This standard was first published in 1988. This revision is being brought out to incorporate modifications found necessary in the present day context. Further, detailed requirements for physical and mechanical properties have been given for various thickness of boards. Medium density fibre boards are recommended for use in interior dry locations. Grade I boards may be used in Hazard Class 1¹⁾ and Hazard Class 2²⁾, whereas Grade II boards may be used in Hazard Class 1¹⁾ only.

In formulation of this standard, due weightage has been given to standards and practices prevailing in different countries and also to the climatic conditions and customs in the country. In this revision properties have been incorporated to facilitate the proper application of product, properties like modulus of elasticity and the values indicating minimum and average have been included.

A scheme of labelling environment friendly products to be known as ECO-Mark has been introduced at the instance of the Ministry of Environment and Forests (MEF), Government of India. The ECO-Mark shall be administered by the Bureau of Indian Standards (BIS) under the *BIS Act*, 1986 as per the Resolution No. 71 dated 21 February 1991 and Resolution No. 425 dated 20 October 1992 published in the Gazette of the Government of India. For a product to be eligible for ECO-Mark, it shall also carry the Standard Mark of the BIS besides meeting additional environment friendly requirements. For this purpose, the Standard Mark of BIS would be a single mark being a combination of the ISI Mark and the Eco logo. Requirements to be satisfied for a product to qualify for the BIS Standard Mark for Eco friendliness, will be optional. Manufacturing units will be free to opt for ISI Mark alone also.

The ECO criteria is based on the Gazette Notification No. 170 dated 16 May 1996 for wood substitutes as environment friendly products published in the Gazette of Government of India.

The composition of Committee responsible for the formulation of this standard is given at Annex C.

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.

¹⁾ Hazard Class 1 — Environment with relative humidity less than or equal to 70 percent so that equilibrium moisture content of MDF will not be more than 15 percent.

²⁾ Hazard Class 2 — Environment with relative humidity more than 70 percent so that equilibrium moisture content of MDF will not be more than 20 percent.

Indian Standard

MEDIUM DENSITY FIBRE BOARDS FOR GENERAL PURPOSE — SPECIFICATION

(*First Revision*)

1 SCOPE

1.1 This standard covers the requirements of medium density fibre boards for general purposes having density in the range of 600-900 kg/m³.

1.2 This standard does not cover veneered or laminated or prelaminated or other specially treated boards, moulded boards, etc.

2 REFERENCES

The standards listed in Annex A contain provisions, which through reference in this text, constitute provision of this standard. At the time of publication, the editions indicated were valid. All standards are subject to revision and parties to agreements based on this standard are encouraged to investigate the possibility of applying the most recent editions of the standards indicated in Annex A.

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.

3.2 **Additive** — Any material introduced prior to the final consolidation of a board to increase bulking or improve some property of the final board. Fillers and preservatives are included under this term.

3.3 **Defibration** — Under the influence of steam and heat, lignin is softened and the fibres can be separated from each other by a low energy output. Normally in medium density fibre board plant, the fibre separation takes place in defibrators where steamed chips are pushed through screws and ground between big grinding disc, one stationary and the other rotating.

3.4 **Fibre** — Wood fibre produced by fiberising steamed wood under pressure in a refiner and defibrator.

3.5 **Formation (Forming)** — The laying of the blended mass of glued fibres to form a mat for medium density fibre board.

3.6 **MDF** — MDF is the short term for medium density fibre board.

3.7 **Particles** — Distinct particles or fractions of wood or other lignocellulose material produced mechanically

as a first step towards defibration. The chips may be in the form of flakes, granules, shavings, splinter and sliver as stated below:

- a) *Flakes* — Specially made thin flat particles, 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.
- b) *Granule* — A particle in which the length, width and thickness are approximately equal, such as particle of saw-dust.
- c) *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 planing the surface of wood.
- d) *Splinter and Silver* — Particle of nearly square or rectangular cross-section with a length parallel to the grain of the wood of at least four times the thickness.

3.8 **Sizing Material** — Alum, wax, resin or other additive introduced to the agglomerate for MDF prior to forming, primarily to increase water resistance.

4 TYPES

Medium density fibre boards for general purpose shall be of one type only, that is, flat pressed single layer. It may, however, be of two Grades, Grade I and Grade II and may be designated as follows:

<i>Grade</i>	<i>Designation</i>
Solid board Grade I	SBG I
Solid board Grade II	SBG II

5 MATERIAL

5.1 Wood

Any species of wood or any other lignocellulosic material may be used for the manufacture of medium density fibre boards. However, the purchaser may at his own discretion, specify a particular species of wood or any particular lignocellulosic material for the manufacture of medium density fibre boards.

For ECO-Mark, only species of wood other than natural forests, such as wood from rubber, coconut, cashew, industrial and social forestry plantations, etc and shade trees from tea and coffee estates, wood residues or agricultural wastes shall be used for the manufacture of MDF board.

5.2 Adhesive

Any suitable type of synthetic resin adhesive may be used for the purpose of bonding to comply with physical and mechanical requirements given in Table 1.

5.3 Sizing Material

Paraffin wax dissolved in mineral spirit or alternatively emulsified with water, or melted shall be used as sizing material.

5.4 Preservative Treatment

A suitable preservative may be added to the fibre mix at the mixing stage of adhesive. The following preservatives are regarded as suitable and their percentage is given on the basis of oven dry weight of fibres:

- a) Sodium pentachlorophenate to the extent of 2 percent, and
- b) Trichlorophenol to the extent of 5 percent.

6 MANUFACTURE

Wood or any other lignocellulosic material shall be cut into small chips/particles on a suitable chipping machine. These chips shall be steamed and defibrated in suitable defibrating machine. These fibre thus produced shall be dried in flash dryers and blended with resin and wax. The blended fibres shall then be formed into mats by air felting and pressed into panels by passing into press under controlled heat, pressure and time conditions.

7 FINISH

Medium density fibre board shall be of uniform thickness and density throughout the length and width of the boards. All medium density fibre boards shall be flat. Both surfaces of the boards shall be sanded to a smooth finish. The boards shall be rectangular and shall have square edges. Edge straightness and squareness shall be measured according to the method given in Annex B.

8 DIMENSIONS AND TOLERANCES

8.1 The dimensions of plywood shall be as follows:

- Length : The length of plywood shall be 5.49, 4.89, 3.66, 3.05, 2.44, 1.83 and 1.22 m.

- Width : The width of plywood shall be 1.22 m.

- Thickness : The thickness of plywood shall be 6, 9, 12, 15, 18, 22, 25, 30, 35 and 40 mm.

NOTE — Any other dimension as agreed to between the purchaser and the manufacturer may be used.

8.2 Tolerances

Tolerances on the nominal dimensions of finished boards shall be as follows:

<i>Dimension</i>	<i>Tolerance</i>
Length	± 3 mm/m
Width	± 3 mm/m
Thickness	± 0.3 mm
Squareness	2 mm/m
Edge straightness	2 mm/m

9 PHYSICAL AND MECHANICAL REQUIREMENTS

Density, moisture content, water absorption, linear expansion, modulus of elasticity, modulus of rupture, internal bonding and screw withdrawal strength of MDF boards when tested in accordance with 10 and 11, shall meet the requirements specified in Table 1.

10 SAMPLING AND INSPECTION

10.1 Scale of Sampling

10.1.1 Lot

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

10.1.2 The conformity of a lot, to the requirements of this specification, shall be ascertained on the basis of tests on MDF boards selected from it.

10.1.3 The number of MDF boards to be selected from a lot shall be in accordance with the following:

<i>Lot Size</i>	<i>Number of Medium Density Fibre Boards to be Selected</i>
<i>N</i>	<i>n</i>
Up to 50	2
51-100	3
101-200	4
201-300	5
301-500	7
501 and above	10

10.1.4 These MDF boards shall be selected at random (see IS 4905). In order to ensure randomness of selection, all the MDF boards in the lot may be arranged in a serial order and every *r*th MDF 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.

10.2 Test Specimens and Number of Tests

The length, width, thickness and the diagonals of the MDF boards selected as in 10.1.3 shall be measured before cutting the MDF boards for taking test specimens. The straightness of edge shall also be measured.

10.2.1 From each of the MDF boards selected, following test specimens shall be cut out for portions 150 mm away from the edges for tests as specified under 11. The method of preparation and conditioning of specimens for tests listed in (c), (d), (e), (f) and (g) below 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. Other sizes of sample specimens 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. Smaller specimens may be used when deemed necessary.
- c) *For water absorption test* — Three test specimens from each sample, each of size 300 mm × 300 mm × full thickness of board.
- d) *For determination of linear expansion:*
 - 1) *Due to general absorption* — Three test specimens from each sample, each of size 200 mm × 100 mm × full thickness of board.
 - 2) *Due to surface absorption* — Three test specimens from each sample, each of size 200 mm × 100 mm × full thickness of board.
- e) *For determination of modulus of elasticity and modulus of rupture* — Three test specimens each for modulus of elasticity and modulus of rupture, from each sample to conform to dimensions as specified in 2 of IS 2380 (Part 4).
- f) *Internal bond* — Six specimens from each sample conforming to the dimensions specified in 3 of IS 2380 (Part 5). Out of these, three specimens shall be subjected to the test for internal bond as given in 11.9. The remaining three specimens shall be subjected to either cyclic or accelerated water resistance test as given in 11.9.1.
- g) *For screw withdrawal test* — Three test specimens from each sample conforming to the dimensions specified in 2 of IS 2380 (Part 14)

10.3 Criteria for Conformity

A lot shall be considered as conforming to the requirements of this specification, if all the samples and test specimens pass the conditions as prescribed in 11.

10.4 If any sample fails to conform to the requirements, further samples shall be taken from the lot, double in number, and the lot shall be considered to have passed, if these samples conform to the requirements prescribed.

11 TESTING OF SAMPLES

11.1 The samples drawn and the test specimens made therefrom in accordance with 10 shall be subjected to the tests as given in 11.3 to 11.10. The specimens shall meet the requirements specified in Table 1 (*see also 9 and 10.3*).

11.2 Preparation and Conditioning of Test Specimens

All the test specimens shall be prepared and conditioned before testing in accordance with the procedure given in IS 2380 (Part 1).

11.3 Accuracy of Dimensions of Boards

All the samples selected in accordance with 10.2.1 shall be measured for straightness of edges, squareness of boards, lengths, widths and thickness as given in IS 2380 (Part 2). The dimensions shall comply with the requirements specified in 8.

11.4 Test for Density

The average value of density as prescribed in 10.2.1(a), when tested in accordance with IS 2380 (Part 3) shall meet the requirements specified in Table 1 (*see 9*).

11.5 Test for Moisture Content

The average value of moisture content as prescribed in 10.2.1(b), when tested in accordance with IS 2380 (Part 3), shall meet the requirements specified in Table 1 (*see 9*).

11.6 Test for Water Absorption

The average value of water absorption as prescribed in 10.2.1(c), when tested in accordance with IS 2380 (Part 16) shall not exceed the limits specified in Table 1 (*see 9*).

11.7 Test for Linear Expansion (Swelling in Water)

11.7.1 Due to General Absorption

The average value of linear expansion as prescribed in 10.2.1(d), when tested in accordance with IS 2380

(Part 17) shall not exceed the limit specified in Table 1 (*see* 9).

11.7.2 Due to Surface Absorption

The average value of surface absorption as prescribed in 10.2.1(d), when tested in accordance with IS 2380 (Part 17) shall not exceed the limit specified in Table 1 (*see* 9).

11.8 Test for Modulus of Elasticity and Modulus of Rupture

The average and minimum individual value of modulus of elasticity and modulus of rupture as prescribed in 10.2.1(e), when tested in accordance with IS 2380 (Part 4) shall not be less than the value specified in Table 1 (*see* 9).

11.9 Test for Internal Bond

The average and minimum individual value of internal bond as prescribed in 10.2.1(f), when tested in accordance with IS 2380 (Part 5) shall not be less than the value specified in Table 1 (*see* 9).

11.9.1 The average and minimum individual value of internal bond as prescribed in 10.2.1(f), when subjected to (a) cyclic test or (b) accelerated water resistance test as given in Table 1 shall be not less than the values specified in Table 1 (*see* 9).

11.10 Test for Screw Withdrawal Strength

The average value of screw withdrawal strength as prescribed in 10.2.1(g), when tested in accordance with IS 2380 (Part 14) shall not be less than the value specified in Table 1 (*see* 9).

12 OPTIONAL REQUIREMENT FOR ECO-MARK

12.1 General Requirement

12.1.1 MDF shall conform to the requirement of quality and performance as specified in this standard.

12.1.2 The manufacturer shall produce to BIS

environmental consent clearance from State Pollution Control Board as per the provisions of the *Water (Prevention and Control of Pollution) Act*, 1974 and *Air (Prevention and Control of Pollution) Act*, 1981 and *Water (Prevention and Control of Pollution) Act*, 1981 and *Water (Prevention and Control or Pollution) Cess Act*, 1977 alongwith the authorization, if required under the *Environment (Protection) Act*, 1986, while applying for ECO-Mark appropriate with enforced rules and regulations of Forest Department.

12.2 Specific Requirement

MDF shall conform to the specific requirements given for ECO-Mark under relevant clauses of the standard.

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

13 MARKING

13.1 Each fibre board shall be legibly marked near any of its corners with the following:

- a) Name of the manufacturer;
- b) Grade of fibreboard (*see* 4 and Table 1);
- c) Nominal dimensions (length, width and thickness);
- d) Date of manufacture, and
- e) The criteria for which the MDF has been labelled as ECO-Mark.

13.2 BIS Certification Marking

13.2.1 Each fibre board may also be marked with Standard Mark.

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

Table 1 Physical and Mechanical Requirements of Medium Density Fibre Boards
(Clauses 5.2, 9, 11.1, 11.4, 11.5, 11.6, 11.7.1, 11.7.2, 11.8, 11.9, 11.9.1 and 11.10)

Sl No.	Properties	Grade II (SBG II)	Grade I (SBG I)
(1)	(2)	(3)	(4)
i)	Density (Kg/m ³)	600-900	600-900
ii)	Variation from mean density, percent	± 10	± 10
iii)	Moisture content, percent	5-10	5-10
iv)	Variation from mean moisture content percent (absolute)	± 3	± 3
v)	Water absorption percent, <i>Max</i>		
	a) After 2 h soaking	9	6
	b) After 24 h soaking:		
	Up to and including 6 mm thick	45	30
	7 to 12 mm thick	30	20
	13 to 19 mm thick	20	13
	20 mm thick and above	18	12
vi)	Linear expansion (swelling in water) percent, <i>Max</i>		
	a) Due to general absorption after 24 h soaking:		
	Thickness	7	4
	Length	0.4	0.3
	Width	0.4	0.3
	b) Due to surface absorption (in thickness) after 2 h soaking	5	4
vii)	Modulus of rupture, N/mm ²		
	a) Up to 20 mm thickness		
	Average	28	28
	Minimum individual	25	25
	b) Above 20 mm thickness .		
	Average	25	25
	Minimum individual	22	22
viii)	Modulus of elasticity, N/mm ²		
	a) Up to 20 mm thickness .		
	Average	2 800	2 800
	Minimum individual	2 500	2 500
	b) Above 20 mm thickness		
	Average	2 500	2 500
	Minimum individual	2 300	2 300
ix)	Internal bond, N/mm ²		
	a) Up to 20 mm thickness .		
	Average	0.8	0.9
	Minimum individual	0.7	0.8
	b) Above 20 mm thickness		
	Average	0.7	0.8
	Minimum individual	0.6	0.7
x)	Internal bond, N/mm ²		
	a) After cyclic test ¹⁾ .		
	Average	—	0.45
	Minimum individual	—	0.4
	b) After accelerated water resistance test ²⁾ :		
	Average	—	0.30
	Minimum individual	—	0.25
xi)	Screw withdrawal strength (<i>Min</i>), N		
	a) Face	1 500	1 500
	b) Edge (for thickness > 12 mm)	1 250	1 250

¹⁾ Cyclic test — Specimens are immersed in water at 27 ± 2°C for a period of 72 h, followed by drying in air at 27 ± 2°C for 24 h and then heating in dry air at 70°C for 72 h. Three such cycles are to be followed and then the specimens are tested for internal bond strength.

²⁾ Accelerated water resistance test — Specimens are immersed in water at 27 ± 2°C and water is brought to boiling and kept at boiling temperature for 2 hours. Specimens are then cooled in water to 27 ± 2°C and then tested for internal bond strength

ANNEX A

(Clause 2)

LIST OF REFERRED INDIAN STANDARDS

<i>IS No.</i>	<i>Title</i>	<i>IS No.</i>	<i>Title</i>
707 : 1976	Glossary of terms applicable of timber technology and utilization (<i>second revision</i>)	(Part 4) : 1977	Determination of static bending strength (<i>first revision</i>)
4905 : 1968	Methods for random sampling	(Part 5) : 1977	Determination of tensile strength perpendicular to surface (<i>first revision</i>)
2380	Methods of test for wood particle boards and boards from other lignocellulosic materials:	(Part 14) : 1977	Screw and nail withdrawal test (<i>first revision</i>)
(Part 1) : 1977	Preparation and conditioning of test specimens (<i>first revision</i>)	(Part 16) : 1977	Determination of water absorption (<i>first revision</i>)
(Part 2) : 1977	Accuracy of dimensions of boards (<i>first revision</i>)	(Part 17) : 1977	Determination of swelling in water (<i>first revision</i>)
(Part 3) : 1977	Determination of moisture content and density (<i>first revision</i>)		

ANNEX B

(Clause 7)

METHOD OF TEST FOR EDGE STRAIGHTNESS AND SQUARENESS

B-1 PROCEDURE FOR EDGE STRAIGHTNESS

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

straightedge and the edge shall be measured to the nearest millimetre and recorded.

B-2 PROCEDURE FOR SQUARENESS

The squareness of MDF board shall be checked with a 1 200 × 1 200 mm², by applying one arm of the square to the board. The maximum width of the gap shall be recorded.

ANNEX C**(Foreword)****COMMITTEE COMPOSITION****Wood Products Sectional Committee, CED 20**

Organization	Representative(s)
Indian Plywood Training and Research Institute, Bangalore	SHRI ARUN K. BANSAL (<i>Chairman</i>)
All India Agro-Board Association, Pune	SHRI V. S. RAJU
Andaman Chamber of Commerce and Industries, Kolkata	SHRI S. KUMAR
	SHRI HARISH KHAITAN (<i>Alternate</i>)
Assam Plywood Manufacturers Association, Tinsukia	SHRI S. L. YADAV
Builders Association of India, Chennai	REPRESENTATIVE
Building Materials & Technology Promotion Council, New Delhi	REPRESENTATIVE
Central Building Research Institute, Roorkee	DR Y. SINGH
	DR L. K. AGARWAL (<i>Alternate</i>)
Central Public Works Department, New Delhi	SHRI SURINDER KUMAR
	SHRI S. K. VERMA (<i>Alternate</i>)
Civil Aviation Department (Technical Centre), New Delhi	SHRI B. V. JOSHI
	SHRI N. M. WALECHA (<i>Alternate</i>)
Council of Architecture, New Delhi	REPRESENTATIVE
Directorate General of Supplies & Disposals, Hyderabad	SHRI M. GANGARAJU
Directorate of Standardization, New Delhi	SHRI K. L. ARORA
Engineer-in-Chief's Branch, New Delhi	SHRIMATI MEENAKSHI
	SHRIMATI AMITA RAJ (<i>Alternate</i>)
Federation of Indian Plywood & Panel Industry, New Delhi	SHRI JAYADEEP CHITLANGIA
	SHRI S. P. GOENKA (<i>Alternate</i>)
Forest Research Institute, Dehra Dun	DIRECTOR
Indian Academy of Wood Science, Dehra Dun	SHRI S. N. SANYAL
	SHRI K. S. SHUKLA (<i>Alternate</i>)
Indian Institute of Packaging, Mumbai	SHRI P. G. DESHMUKH
Indian Plywood Research & Training Institute, Bangalore	SHRI S. S. ZOOLAGUD
	SHRI K. SHYAMASUNDER (<i>Alternate</i>)
Institute of Wood Science & Technical, Bangalore	DR K. S. RAO
Kutty Flush Door & Furniture Co Pvt Limited, Chennai	SHRI D. R. ANANTHAKRISHNAN
Mangalam Timber Products Limited, Bangalore	SHRI K. SRIDHAR
	SHRI ANIL TALWAR (<i>Alternate</i>)
Ministry of Defence (R&D), New Delhi	SHRI RAVINDER KUMAR
Ministry of Defence (DGQA), Kanpur	SHRI RAM CHANDRA
	SHRI J. K. SINHA (<i>Alternate</i>)
Ministry of Railways (RDSO), Lucknow	DIRECTOR STANDARDS (CARRIAGE)
	ASSISTANT DIRECTOR (<i>Alternate</i>)
National Test House(ER), Kolkata	SHRI D. K. KANUNGO
	SHRI R. KAPUR (<i>Alternate</i>)
Novopan India Limited, Hyderabad	SHRI S. A. NAQUI
	SHRI A. V. V. RAGHAVACHARYA (<i>Alternate</i>)
Northern India Plywood Manufactures Association, Jalandhar	SHRI N. K. TIWARI
	SHRI ANIL GOEL (<i>Alternate</i>)
Nuchem Limited, New Delhi	SHRI SUDEV BARAR
	SHRI PRAVEEN KUMAR (<i>Alternate</i>)
Permali Wallace Limited, Bhopal	SHRI K. K. KEDASIA
	DR P. N. CHATURVEDI (<i>Alternate</i>)
The Indian Plywood Manufactures Co Limited, Mumbai	SHRI P. T. S. MENON

(Continued on page 8)

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Organization	Representative(s)
The South Indian Plywood Manufactures Association, Chennai	SHRI K. SANKARAKRISHNAN
The Western India Plywood Limited, Cannanore	SHRI P. K. MOHAMED
In personal capacity (E-59, Inderpuri, New Delhi 110012)	SHRI A. N. NAYER
BIS Directorate General	SHRI S. K. JAIN, Director and Head (Civ Engg) [Representing Director General (Ex-officio)]

Member Secretary
SHRI J. C. ARORA
Director (Civ Engg), BIS

Wood and Other Lignocellulosic Based Building Boards Subcommittee, CED 20 : 6

In personal capacity [No. 179(710), 24 th B-Cross, 3 rd Block, Jayanagar, Bangalore 560011 (Karnataka)]	DR H. N. JAGADEESH (<i>Convener</i>)
Bamboo Board Factory, Kerala	REPRESENTATIVE
M/s ECO Board Industries Ltd, Pune	SHRI B. V. RAO SHRI S. KRISHNA RAJ (<i>Alternate</i>)
Central Building Research Institute (CSIR), Roorkee	DR L. K. AGGARWAL SHRI B. SINGH (<i>Alternate</i>)
Central Public Works Department, New Delhi	SUPERINTENDING ENGINEER (S&S) EXECUTIVE ENGINEER (S&S) (<i>Alternate</i>)
Coir Industries Products Co-operative Society Ltd, Bangalore	SHRI MANOJ KUMAR SHRI VIJAY GHORPADE (<i>Alternate</i>)
Coir Board, Bangalore	SHRI M. SUDHAKARAN
Council of Architecture, New Delhi	REPRESENTATIVE
DGS&D, New Delhi	SHRI N. K. UPADHYAY
Engineer-in-Chief's Branch, New Delhi	SHRIMATI MEENAKSHI COL N. A. KUMAR (<i>Alternate</i>)
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