

IS : 3129 - 1985

Indian Standard

REAFFIRMED
(Reaffirmed 2020) 2010

SPECIFICATION FOR
LOW DENSITY PARTICLE BOARDS
(*First Revision*)

(Reaffirmed 2015)

UDC 691.116 : 674.816



© Copyright 1986

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

Indian Standard

SPECIFICATION FOR

LOW DENSITY PARTICLE BOARDS

(First Revision)

Wood Products Sectional Committee, BDC 20

Chairman

DR P. M. GANAPATHY

Representing

Indian Plywood Industries Research Institute,
Bangalore

Members

SHRI V. SIVANANDA (*Alternate*)

Dr P. M. Ganapathy)

DR ARJUN DAS

Central Building Research Institute (CSIR),
Roorkee

SHRI L. K. AGARWAL (*Alternate*)

SHRI P. R. CHANDRASEKHAR

CHIEF CONSERVATOR OF FORESTS

SHRI L. N. DOKANIA

Directorate General of Civil Aviation, New Delhi

Forest Department, Government of Assam, Guwahati

Federation of Indian Plywood and Panel Industry,
New Delhi

SHRI M. R. MOTHEYD (*Alternate*)

EDITOR

SHRI D. P. GHOSH

SHRI J. K. SINHA (*Alternate*)

INDUSTRIAL ADVISER

National Buildings Organization, New Delhi

Ministry of Defence (DGI)

Directorate General of Technical Development,
New Delhi

SHRI P. V. MEHTA (*Alternate*)

JOINT DIRECTOR STANDARDS

(CARRIAGE-I)

SHRI A. K. KADERKUTTY

SHRI U. B. KANCHAN

SHRI B. B. MEHTA (*Alternate*)

SHRI K. S. DAULY

LT-COL G. B. SINGH (RETIRED) (*Alternate*)

DR A. N. NAYER

DR A. PURUSHOTHAM

DR SATISH KUMAR (*Alternate*)

SHRI A. K. RAMACHANDRAN

Ministry of Railways (RDSO), Lucknow

The Western Indian Plywood Limited, Cannanore

Ministry of Defence (R&D)

Indian Plywood Manufacturing Co Ltd, Dandoli

In personal capacity (C-59, Inderpuri, New Delhi)

Indian Academy of Wood Science, Dharwad

South Indian Plywood Manufacturers' Association,
Trivandrum

SHRI JOSEPH K. KURIAN (*Alternate*)

SHRI P. R. RIGHSINGHANI

Engineer-in-Chief's Branch, Army Headquarters,
New Delhi

MAJ D. R. KOHLI (*Alternate*)

(Continued on page 2)

© Copyright 1986

INDIAN STANDARDS INSTITUTION

This publication is protected under the Indian Copyright Act (XIV of 1957) and reproduction in whole or in part by any means except with written permission of the publisher shall be deemed to be an infringement of copyright under the said Act.

IS : 3129 - 1985

(Continued from page 1)

<i>Members</i>	<i>Representing</i>
SRI S. K. SANGANERIA	Assam Plywood Manufacturers' Association, Guwahat
SRI S. N. SANYAL	Forest Research Institute and Colleges (Timber Mechanics Branch), Dehra Dun
SECRETARY	Indian Tea Association, Calcutta
SRI SHARAN SINGH	Directorate General of Supplies and Disposals, New Delhi
SUPERINTENDING SURVEYOR OF WORKS (NZ)	Central Public Works Department, New Delhi
SURVEYOR OF WORKS (NZ) (Alternate)	
SRI H. THOMSON	Sitapur Plywood Manufacturers Ltd, Sitapur
SRI G. RAMAN, Director (Civ Engg)	Director General, ISI (<i>Ex-officio Member</i>)

Secretary

SRI P. SATYANARAYANA
Assistant Director (Civ Engg), ISI

Wood-Based Building Boards Subcommittee, BDC 20 : 6

Convener

SRI S. S. MATHABU In personal capacity (*M-39C, Rajouri Garden, New
Delhi*)

Members

DR ARJUN DAS	Central Building Research Institute (CSIR), New Delhi
SRI V. K. JAIN (Alternate)	
SRI ARVIND JOLLY	Anil Hardboards Limited, Bombay
SRI V. D. SHARMA (Alternate)	
DEPUTY DIRECTOR STANDARDS (CARRIAGE-III)	Ministry of Railways (RDSO), Lucknow
ASSISTANT DIRECTOR STANDARDS (CARRIAGE-III) (Alternate)	
DIRECTOR	Indian Plywood Industries Research Institute, Bangalore
SRI V. SIVANANDA (Alternate)	
EDITOR	National Buildings Organization, New Delhi
SRI T. R. BHATIA (Alternate)	
SRI K. P. KAMALUDDIN	Western India Plywood Limited, Cannanore
SRI PURSHOTAM DAYAL (Alternate)	
SRI S. K. KAPOOR	Ministry of Defence (DGI)
SRI S. S. KAPUR	Lloyd Insulation (India) Pvt Ltd, New Delhi
SRI T. UDAYAKUMAR (Alternate)	
SRI A. K. MEHROTRA	Assam Hardboards Limited, Calcutta
SRI M. L. LAHOTI (Alternate)	
SRI P. V. MEHTA	Directorate General of Technical Development, New Delhi
SRI P. K. JAIN (Alternate)	
SRI S. A. NAQVI	Novopan India Limited, Secunderabad
SRI K. R. SHEEDHARAN (Alternate)	

(Continued on page 18)

Amend No. 1 to IS 3129 : 1985

(*Page 6, clause 8.1*) — Insert the following new clauses after 8.1 and renumber the subsequent clauses:

‘9 OPTIONAL REQUIREMENTS FOR ECO MARK

9.1 General Requirements

9.1.1 Low density particle board shall conform to the requirements of quality and performance as specified in this standard.

9.1.2 The manufacturer shall produce to BIS environmental consent clearance from the concerned State Pollution Control Board as per the provisions of the *Water (Prevention and Control of Pollution) Act, 1974* and *Air (Prevention and Control of Pollution) Act, 1981* and *Water (Prevention and Control of Pollution) Cess Act, 1977* along with the authorization, if required under the *Environment (Protection) Act, 1986*, while applying for ECO Mark appropriate with enforced rules and regulations of Forest Department.

9.2 Specific Requirements

The low density particle boards 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 the Bureau of Indian Standards while applying for ECO Mark.'

(*Page 8, renumbered clause 10.1*) — Insert the following matter at the end clause:

'e) The criteria for which the particle board has been labelled as ECO Mark.'

(CED 20)

AMENDMENT NO. 2 FEBRUARY 2001
TO
IS 3129:1985 SPECIFICATION FOR LOW DENSITY
PARTICLE BOARDS
(First Revision)

(*Page 4, clause 4.2*) — Substitute the following for the existing clause:

'4.2 Preservative Treatment — A suitable preservative may be added to the particle mix at the time of rinsing of adhesive. The following percentages of preservatives are regarded as suitable.

- a) Sodium pentachlorophenate — 1 percent on the basis of oven dry weight of particles, or**
- b) Trichlorophenol — 5 percent on the basis of resin adhesive mix.'**

(CED 20)

Reprography Unit, BIS, New Delhi, India

**AMENDMENT NO. 3 JUNE 2005
TO
IS 3129 : 1985 SPECIFICATION FOR
LOW DENSITY PARTICLE BOARDS**

(First Revision)

(Page 5, clause 5) — Substitute the following for the existing:

‘5 DIMENSIONS AND TOLERANCES

5.1 The dimensions of low density particle boards shall be as follows:

Length in mm : 3 600, 3 000, 2 700, 2 400, 2 100, 1 800, 1 500, 1 200, 1 000,
900, 600, 450 and 300

Width in mm : 1 800, 1 500, 1 200, 1 000, 900, 600, 450 and 300

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

5.1.1 Thickness

The thickness of low density particle boards shall be 12 mm, 15 mm, 20 mm, 25 mm, 30 mm, 35 mm, 40 mm, 45 mm and 50 mm.

5.2 Tolerances

The tolerances on the nominal sizes of finished boards shall be as follows:

<i>Dimensions</i>	<i>Tolerances</i>
Length	+ 6 mm – 0 mm
Width	+ 3 mm – 0 mm
Thickness	± 5 percent
Edge straightness	2 mm per 1 000 mm or 0.2 percent
Squareness	2 mm per 1 000 mm or 0.2 percent

(CED 20)

Reprography Unit, BIS, New Delhi, India

**AMENDMENT NO. 4 SEPTEMBER 2006
TO
IS 3129 : 1985 SPECIFICATION FOR LOW DENSITY
PARTICLE BOARDS**

(First Revision)

***[Page 8, clause 9, Title (see also Amendment No. 1)]* – Substitute
'ADDITIONAL' for 'OPTIONAL'.***

(CED 20)

Reprography Unit, BIS, New Delhi, India

IS : 3129 - 1985

Indian Standard

SPECIFICATION FOR LOW DENSITY PARTICLE BOARDS

(First Revision)

0. FOREWORD

0.1 This Indian Standard (First Revision) was adopted by the Indian Standards Institution on 28 October 1985, after the draft finalized by the Wood Products Sectional Committee had been approved by the Civil Engineering Division Council.

0.2 There are three categories of particle boards based on their density classification, namely, medium density particle boards having specific gravity of 0.5 to 0.9, covered in IS : 3087-1965*, high density particle board having specific gravity over 0.9 covered in IS : 3478-1966† and the low density particle boards covered in this standard having specific gravity not exceeding 0.4.

0.3 Low density particle boards find extensive use as ceiling tiles for auditoriums, computer centres, cinema halls and theaters as well as display boards in commercial establishments. These are also used as thermoacoustic insulation material for false ceiling and panelling, etc, in building industry. This standard was first published in 1965, to provide guidance to the manufacturers in ensuring the optimum requirements achieved in their product as well as to the users to select their requirements. As the practice for fire protection is gaining considerable importance in building industry, in this revision the optional requirements of fire resistance property of these boards and its method of tests have been incorporated. Besides this a table showing the optimum requirements of various physical properties is also provided.

0.4 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‡. The number of significant places retained in the rounded off value should be the same as that of the specified value in this standard.

*Specification for wood particle boards (medium density) for general purposes.

† Specification for high density wood particle boards.

‡ Rules for rounding off numerical values (revised).

IS : 3129 - 1985

1. SCOPE

1.1 This standard covers the essential requirements of low density particle boards having specific gravity not exceeding 0.4.

2. TERMINOLOGY

2.1 For the purpose of this standard, the definitions given in IS : 707-1976* and IS : 3087-1985† shall apply.

3. MATERIALS

3.1 Timber and Other Ligno-Cellulosic Material — Timber and other ligno-cellulosic material like bagasse, solapith, jute sticks, rice husk, pea-nut shells, etc, may be used for the manufacture of these boards. These shall be light weight materials of bulk density preferably not exceeding 400 kg/m³ and shall be free from extraneous matter and dust.

3.2 Adhesive — The adhesive used for bonding particles together shall be BWR or BWP type conforming to IS : 848-1974‡. The adhesive shall be either a phenol-formaldehyde or Urea-Formaldehyde type fortified with melamine.

4. MANUFACTURE

4.1 Low density particle boards shall be manufactured from low density wood or other ligno-cellulosic material by first milling or disintegrating the same into particles of pre-determined sizes, drying the same in a mechanical drier to pre-determined moisture content between 7 and 12 percent and grading the same according to size in a sifting machine. The graded particles of pre-determined size and thickness are then thoroughly mixed with adhesive specified in 3.2 in a pre-determined proportion between 6 to 10 percent and formed into a mat and pressed under platen type hot press at appropriate pressure to pre-determined thickness and density not exceeding 400 kg/m³.

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

- a) Sodium pentachlorophenate to the extent of 0.2 percent; and
- b) Pentachlorophenol to the extent of 0.2 percent. Alternatively, 2 percent of sodium pentachlorophenol or sodium pentachlorophenol in organic solution should be applied on the surface and edges.

*Glossary of terms applicable to timber technology and utilization (second revision).

†Specification for wood particle boards (medium density) for general purposes (first revision).

‡Specification for synthetic resin adhesives for plywood (phenolic and aminoplastic) (first revision).

IS : 3129 - 1985

4.3 Sizing Material — A suitable sizing material like paraffin wax or wax emulsion may be added to the particle mix to increase the water resistance of the board. The wax content usually does not exceed 1.5 percent of the oven dry weight of the particles.

4.4 Fire Retardants — Suitable fire retardant chemicals like mono or diammonium phosphate, tri-sodium phosphate, borax or borix acid shall be added to the particle mix at the manufacturing stage or alternatively the board shall be coated or painted on their surface and edges with fire retardant formulations; or both the treatment given at their respective stages, so that the board meets the requirements given in Table 1.

5. DIMENSIONS AND TOLERANCES

5.1 The sizes of insulation particle boards shall be as given below:

Length in mm — 3 650, 3 000, 2 700, 2 400, 2 100, 1 800, 1 500,
1 200, 1 000, 900, 600, 450 and 300

Width in mm — 1 800, 1 500, 1 200, 1 000, 900, 600, 450 and 300

5.2 Thickness — The thickness of insulation particle boards in mm shall be as given below:

50, 45, 40, 35, 30, 27, 25, 22, 19, 16 and 12.

5.3 Tolerances — The permissible tolerances on the nominal sizes of finished boards shall be as follows:

<i>Dimension</i>	<i>Nominal Size</i>	<i>Tolerance</i>
Length	for all lengths	± 8 mm
Width	for all widths	± 8 mm
Thickness	above 25 mm	± 1 mm
	up to and including 25 mm	± 0.8 mm

6. FINISH

6.1 The surface of the board may be plain, embossed with design or perforated. It may be treated or coated with fire-retardant composition and should be able to take a coat of oil distemper or plastic emulsion paint.

7. PHYSICAL CHARACTERISTICS

7.1 Density — The density of board as determined in accordance with 3 of IS : 2380 (Part 3)-1977* and its variation from board to board shall be as given in Table 1.

7.2 Moisture Content — The moisture content of the specimen, as determined in accordance with 2 of IS : 2380 (Part 3)-1977* shall be as given in Table 1.

*Methods of test for wood particle boards and boards from other lignocellulosic materials: Part 3 Determination of moisture content and density (first revision).

IS : 3129 - 1985

7.3 Transverse Strength — The modulus of rupture determined according to IS : 2380 (Part 4)-1977* shall be as given in Table 1.

7.4 Water Absorption — The specimen shall be soaked in water in accordance with 3.2 of IS : 2380 (Part 16)-1977* and shall be examined at the end of 2 hours and 24 hours. There shall be no splitting of edges and no signs of disintegration of board.

7.5 Swelling Due to Surface Absorption — The specimen shall be tested according to 3 of IS : 2380 (Part 17)-1977*. The swelling due to surface absorption shall be as given in Table 1.

7.6 Thermal Conductivity — The thermal conductivity of the specimen tested according to guarded hot plate method (two slabs) specified in IS : 3346-1980† maintaining temperature of the hot plate and cold plate as near to as 50°C and 25°C respectively shall be as given in Table 1.

7.7 Sound Absorption — The sound absorption coefficient when tested by standing wave method shall be as given in Table 1.

7.7.1 For other thicknesses, the sound absorption coefficient shall be as per the agreement between the purchaser and the supplier.

7.8 Fire Resistance — Under fire resistance property the ignitability and tendency of the material toward the spread of flame shall be tested.

7.8.1 Ignitability — The classification of the material when tested as per Appendix A, shall not be less than 'p' not easily ignitable (see Table 1).

7.8.2 Surface Spread of Flame — The classification of the material when tested as per Appendix B, shall not be lower than class 2 (see Table 1).

8. SAMPLING

8.1 Representative samples of the particle boards shall be taken and conformity of the material to this specification be determined according to the procedure prescribed in Appendix C.

*Methods of test for wood particle boards and boards from other lignocellulosic materials:

Part 4 Determination of static bending strength (modulus of rupture and modulus of elasticity in bending) (*first revision*).

Part 16 Determination of water absorption (*first revision*).

Part 17 Determination of swelling in water (*first revision*).

†Method for the determination of thermal conductivity of thermal insulation materials (two slab, guarded hot-plate method) (*first revision*).

TABLE 1 PHYSICAL REQUIREMENTS OF LOW DENSITY PARTICLE BOARDS

(Clauses 4.4, 7.1, 7.2, 7.3, 7.5, 7.6, 7.7, 7.8.1 and 7.8.2)

MAXIMUM DENSITY kg/m ³	MAXIMUM VARIATION IN DENSITY	MAXIMUM MOISTURE CONTENT	MINIMUM MODULUS OF RUP- TURE	MAXIMUM SWELLING DUE TO SURFACE ABSORP- TION*	MAXIMUM THERMAL CONDUCTI- VITY	MINIMUM SOUND ABSORPTION†		MINIMUM FIRE RESISTANCE	
						Frequency	Absorp- tion Co- efficient	Ignitabi- lity	Surface spread of flame
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
	Percent	Percent	N/mm ²	Percent	kcal. cm/m ² h°C	Hz			
						125	0.05		
						250	0.1	Not easily	Not lower
						500	0.2	Ignitable	than
								'P'	Class 2
						1 000	0.3		
						2 000	0.5		

*On two hours immersion.

†For boards of 12 mm thickness.

IS : 3129 - 1985

9. MARKING

9.1 Each low density particle board for insulation purposes shall be legibly marked or labelled on any of its edges with the following:

- a) Name of the manufacturer or trade-mark, if any;
- b) Description of the product — Low Density Particle Board;
- c) Thickness; and
- d) Date of manufacture.

9.1.1 Low density particle board for insulation purposes may also be marked with the ISI Certification Mark.

NOTE — The use of the ISI Certification Mark is governed by the provisions of the Indian Standards Institution (Certification Marks) Act and the Rules and Regulations made thereunder. The ISI Mark on products covered by an Indian Standard conveys the assurance that they have been produced to comply with the requirements of that standard under a well-defined system of inspection, testing and quality control which is devised and supervised by ISI and operated by the producer. ISI marked products are also continuously checked by ISI for conformity to that standard as a further safeguard. Details of conditions under which a licence for the use of the ISI Certification Mark may be granted to manufacturers or processors, may be obtained from the Indian Standards Institution.

A P P E N D I X A

(Clause 7.8.1)

IGNITABILITY TEST

A-0. GENERAL

A-0.1 This test identifies easily ignitable material of low heat contribution. Products subjected to this test may have faces which differ or may contain laminations arranged in different order in relation to the two faces. In those circumstances, full evaluation requires that both faces of the product shall be tested. The classification obtained as result of the test relates to the thickness of the specimen subjected to the test and may not be valid for other thickness unless varified by a test.

A-1. PREPARATION OF TEST SPECIMENS

A-1.1 Size of the Specimen — The specimen shall be 228×228 mm (± 0.5 mm) and of the thickness of the material which it represents. The test can be used either for individual materials or for a composite product. New specimens shall be used for each face tested.

IS : 3129 - 1985

A-1.2 Conditioning of Specimen — Before test the specimen shall be conditioned to equilibrium according to 2.2.1 of IS : 2380 (Part 1)-1977*.

A-2. APPARATUS

A-2.1 The apparatus shall be as shown in Fig. 1. It consists of a U-frame of 9 mm mild steel rod or tube fixed to a rigid steel base. The frame is provided with two laboratory clamps fixed at mid-height to hold the specimen centrally. Two supports of the same section of the frame are fitted vertically to the base so that the lower edge of the specimen rests on them in its testing position.

A-2.2 A copper tube with one end reduced to a 1.5 mm diameter orifice is pivoted on a fixed strap attached to the base and provided with an adjustable stop so that when set in its testing position the tube is inclined at an angle of approximately 45° to the vertical and the centre of the orifice is 3 mm (± 0.5 mm) from the centre of the face of the specimen.

A-3. TEST PROCEDURE

A-3.1 The test shall be carried out in a reasonably draught-free atmosphere. The conditioned specimen shall be held in a vertical position by the clamps and the gas orifice adjusted to its correct position by the adjustable stop. The gas orifice shall be moved away from its testing position and the gas shall be turned on and lit to provide a flame liberating 1 060 cal/min $\pm$ 2 percent. When using town gas having a calorific value of 4 360 kcal/m³ this represents a flow rate of 248 cm³/min.

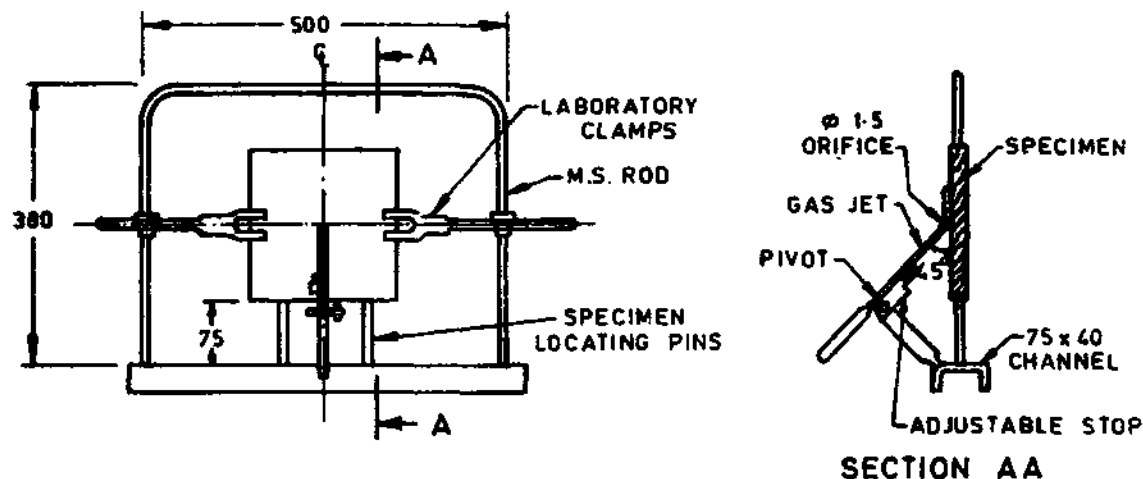
A-3.1.1 After ignition the gas jet shall be moved quickly to its testing position and a stop watch started simultaneously. After 10 seconds the jet shall be moved away and note made of the subsequent duration of flaming, if any, to the nearest second.

A-4. CLASSIFICATION OF MATERIAL

A-4.1 If any specimen flames for more than 10 seconds after the removal of the test flame or if burning of the specimen extends to the edge within this period the material shall be classified as 'easily ignitable' and its performance indicated by the letter 'X'.

A-4.2 If no specimen flames for more than 10 seconds after the removal of the test flame and burning does not extend to the edge within this period the material shall be classified 'not easily ignitable' and its performance indicated by the letter 'P'.

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



All dimensions in millimetres.

FIG. 1 APPARATUS FOR IGNITABILITY TEST

IS : 3129 - 1985

A-5. REPORT

A-5.1 The test report shall give a full description of the material, its construction and thickness, the face subjected to the test (if the two faces differ), and classification.

A P P E N D I X B

(Clause 7.8.2)

LARGE SCALE SURFACE SPREAD OF FLAME TEST AND METHOD OF CLASSIFICATION

B-0. GENERAL

B-0.1 This appendix specifies a large scale test for determining the tendency of materials to support the spread of flame across their surfaces. The test is intended for the classification of the exposed surfaces of walls and ceiling according to the rate and distance of spread of flame across them.

B-0.2 The test should be performed on the assembly of materials on which information is required. The performance in the test applies to the thickness of the specimen and the combination of materials subjected to the test and may not be valid for other assemblies unless verified by a further test.

B-1. SIZE OF THE SPECIMEN

B-1.1 A specimen shall be 230 × 900 mm, and of its normal thickness where this does not exceed 50 mm. Where, however, the thickness of the materials is greater, the materials should be reduced to 50 mm and the test applied to the face that will be exposed in practice. The performance under the test may be assumed to apply to the thicker specimen.

B-2. PREPARATION AND CONDITIONING OF SPECIMEN

B-2.1 Before test, paint the edges, together with a strip 40 mm wide from the edges on the unexposed face, with sodium silicate composition, the ingredients of which are specified in **B-3** after which condition the specimens as per 2.2.1 of IS : 2380 (Part 1)-1977*.

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

IS : 3129 - 1985

B-3. INGREDIENTS OF SODIUM SILICATE COMPOSITION

B-3.1 The sodium silicate composition shall conform to the following proportion by weight:

Kaolin	1.50
Sodium silicate	1.12
Water	1.00

B-3.1.1 The sodium silicate shall be a 'neutral' grade in the form of an aqueous syrup in which the ratio of soda to silicate is between $\text{Na}_2\text{O} : 3.2 \text{ SiO}_2$ and $\text{Na}_2\text{O} : 3.4 \text{ SiO}_2$ and which has a specific gravity between 1.41 and 1.43.

NOTE — This flame retardant composition is not suitable for use as a permanent paint for fire protection purposes.

B-4. APPARATUS

B-4.1 The apparatus shall consist of a vertically mounted radiation panel, approximately 900 mm square, provided with a refractory concrete surround projecting about 225 mm from the face of the panel. Any gaps between the surround and the panel should be tightly packed with a flexible non-combustible material.

B-4.2 On one side of the panel, at mid-height, a horizontal holder hinged on the side of the furnace or the surround. The holder consists of steel frame with asbestos insulation board and horizontal guides to locate the specimen holder described in B-5. When the holder is moved to the testing position the face of the specimen is flush with the inner face of the refractory surround and its front edge is shielded.

B-4.3 On the opposite side to the holder a frame may be fixed with radiometers of the type described in B-8 without a baseboard but with asbestos paper facings on both sides to act as a monitoring device. When the calibration of the radiating panel is undertaken the output of the monitoring radiometers, not less than five in number, is noted and used for control purposes for day-to-day operation of the apparatus.

B-4.4 The fuel is premixed in four venturi type injectors to which air is supplied under a pressure of $5\,000 \text{ N/m}^2$ and the mixture fed to the burner elements. Each element consists of a number tunnel type burners where combustion takes place in the burner so that in operation no pronounced flaming should occur on the face of the panel.

B-5. TEST PROCEDURE

B-5.1 Fix the specimen to a wooden framework faced with asbestos millboard, secure in such a way that the face of the specimen may burn without obstruction from the supports, for example, by screws from the

IS : 3129 - 1985

rear of the wooden framework. Mount the specimen with its long axis horizontal and its face vertical and bring, in not longer than five seconds, from a position at room temperature to its test position virtually at right angles to the furnace. A slight angular adjustment is allowable, in order to achieve the specified pattern of incident radiation, since this is the primary requirement.

B-5.2 Immediately after the specimen is exposed to the radiated heat apply a vertical luminous gas flame to its hotter end for one minute. This flame shall be 75 mm to 100 mm long and shall issue from a 9.5 mm diameter orifice. Locate the orifice not more than 6 mm from the surface of the specimen and at 6 mm above its lower edge. The room in which the test is made must be substantially free from draughts.

B-6. OBSERVATIONS DURING TESTING

B-6.1 As soon as the igniting flame is in contact with the specimen, record the time of spread of the flame front for measured distances along a line drawn parallel to the long axis, 75 mm from bottom edge of the specimen. Continue measurements for 10 mm, unless the flame front reaches the far end of the specimen in a shorter time.

B-6.2 Observe any associated phenomenon, such as transitory flaming and production of flaming droplets, and include all supplementary observations in the report. Specimens which become detached from the substrate or melt during the first minute of exposure causing lack of flame impingement on the hot end shall be regarded as unclassifiable.

B-7. CLASSIFICATION OF SURFACE SPREAD OF FLAME

B-7.1 Classify surfaces into one of the classes given in Table 2 and in Fig. 2 according to their observed behaviour under test. For a full evaluation of a material having faces which differ, classify each face separately.

B-7.1.1 The flame spread on any specimen of the samples shall not exceed the limit assigned for the class with the provision that for one specimen only in sample the flame spread may exceed this limit by the tolerance given in Table 2 and also (see Fig. 2).

TABLE 2 FLAME SPREAD CLASSIFICATION

CLASSIFICATION	FLAME SPREAD AT 1 1/2		FINAL FLAME SPREAD	
	Limit	Tolerance for One Specimen in Sample	Limit	Tolerance for One Specimen in Sample
	mm	mm	mm	mm
Class 1	165	25	165	25
Class 2	215	25	455	45
Class 3	265	25	710	75
Class 4	Exceeding class 3 limits			

IS : 3129 - 1985

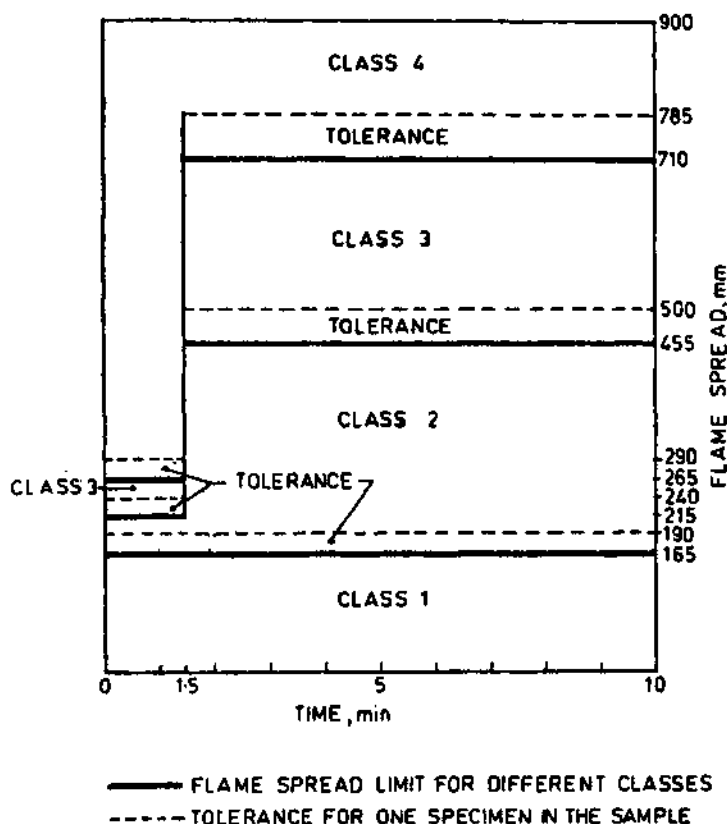


FIG. 2 CLASSIFICATION LIMITS FOR LARGE SCALE SPREAD OF FLAME TEST

B-8. SPECIFICATION FOR CALIBRATION OF APPARATUS (PANEL AND RADIOMETERS)

B-8.1 The panel to support the radiometers for measuring the intensity of radiant heat falling on a specimen consists of a base board 9 mm thick of asbestos having a density of 1 200 kg/m³ to 1 400 kg/m³. Recesses are formed at 75 mm intervals and 3 mm deep at positions shown in Fig. 3. Radiometers are made by silver soldering chromel/constantan thermocoupler, wire diameter not more than 0.71 mm, to one face of cleaned copper discs of 25 mm thickness is applied to the same face of the copper disc as the thermocouple junction using the sodium silicate composition.

IS : 3129 - 1985

When dry the assembly is fixed in the recess of the base board using the same adhesive. It is important to apply the sodium silicate composition sparingly as otherwise on heating it may bubble and cause malfunction of the radiometers.

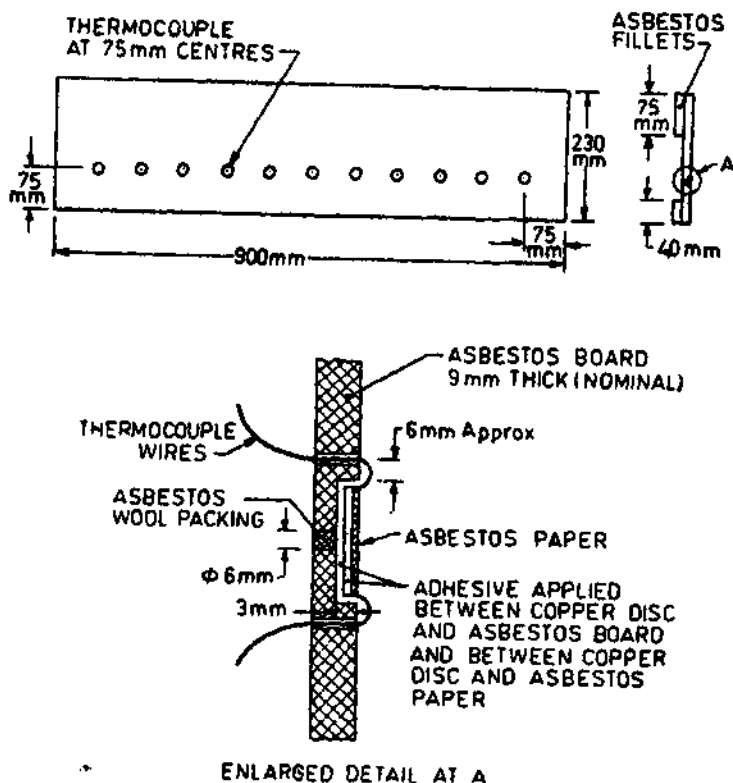


FIG. 3 DETAILS OF PANEL FOR CALIBRATION OF RADIATION FURNACE

B-8.2 The intensity of the radiated heat incident on the specimen shall vary with distance from the hotter end, so that when the calibrating panel is mounted in the place to be occupied by the specimen the e.m.f. output of the radiometers shall be as given in Table 3 within ± 1 m with reference to a cold junction temperature for radiometers of 0°C .

NOTE — The instruments used to measure e.m.f. should be of laboratory standard and calibrated and capable of making the measurements with the necessary accuracy.

IS : 3129 - 1985

TABLE 3 OUTPUT OF RADIOMETERS (LARGE SCALE TEST)
(Clause B-8.1)

Distance from bottom end of specimen (mm)	75	150	225	300	375	450	525	600	675	750	825
Radiation intensity (kW/m ²)	37.0	31.0	25.5	21.0	18.4	15.1	13.4	11.7	10.5	8.8	7.5
e.m.f. (mV)	31.5	28.5	26.0	23.5	21.5	19.5	18.0	16.5	15.0	13.5	12.0

B-9. TEST REPORT

B-9.1 In the test report a full description of the material, its construction and thickness, details of treatment if any, the method of fixing, the face subjected to the test, test results including any supplementary observations and the classification are to be given.

A P P E N D I X C (Clause 8.1)

SAMPLING OF PARTICLE BOARDS FOR INSULATION PURPOSES

C-1. SCALE OF SAMPLING

C-1.1 Lot -- In any consignment, all the boards manufactured under similar conditions of production, shall be grouped together to constitute a lot.

C-1.2 For ascertaining the conformity of the material to the requirements of this standard, samples shall be tested from each lot separately.

C-1.3 The number of boards to be selected from the lot shall depend upon the size of the lot and shall be according to Table 4.

TABLE 4 SCALE OF SAMPLING AND PERMISSIBLE NUMBER OF DEFECTIVES

(Clauses C-1.3, C-2.1 and C-2.2.1)

NUMBER OF BOARDS IN THE LOT (1)	SAMPLE SIZE (2)	PERMISSIBLE NUMBER OF DEFECTIVES (3)	SUB-SAMPLE SIZE (4)
Up to 50	8	0	2
51 to 100	13	1	2
101 to 150	20	2	3
151 to 300	32	3	5
301 to 500	50	5	7
501 and above	80	7	10

IS : 3129 - 1985

C-1.3.1 These boards shall be selected from the lot at random. In order to ensure the randomness of selection, procedures given in IS : 4905-1968* may be given.

C-2. NUMBER OF TESTS AND CRITERIA FOR CONFORMITY

C-2.1 Each of the boards selected according to col 1 and 2 of Table 2 be inspected for dimensions, workmanship and finish according to 5 or 6 of the specification. A board failing to satisfy one or more of these requirements shall be considered as defective. The lot shall be considered as satisfying these requirements if the number of defectives found in the sample is less than or equal to the corresponding permissive number of defectives given in col 3 of Table 4.

C-2.2 The lot having been found satisfactory according to C-2.1 shall be further tested for other requirements given in 7.

C-2.2.1 For this purpose the number of boards in col 4 of Table 4 shall be taken from those already tested according to C-2.1 and found satisfactory.

C-2.2.2 From each board selected according to C-2.2.1, the number of test specimens for different tests shall be as follows:

- a) Three specimens for each of density, moisture content and surface absorption tests,
- b) Three specimens for water resistance test,
- c) Three specimens for transverse strength test,
- d) Three specimens for thermal conductivity test,
- e) Three specimens for sound absorption test, and
- f) Three specimens for each of ignitability and surface spread of flame tests.

C-2.2.3 Unless otherwise specified, the sizes and the preparation of the specimens shall be done according to the test requirements prescribed in according to the test requirements prescribed in IS : 2380 (Part 1)-1977†. The size of the specimen for thermal conductivity test shall be 300 mm × 300 mm × t where t is the thickness of the board.

C-2.3 The lot shall be considered to have specified these requirements if the test results for each satisfy the corresponding specification requirements.

NOTE — Modulus of rupture shall be calculated by taking the average breaking of the individual values of three test specimens.

C-2.3.1 If any sample fails to conform to these requirements, double the number of samples shall be further taken from the lot and tested. The lot shall be considered to have passed if these samples conform to the corresponding specified requirements.

*Methods for random sampling.

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

IS : 3129 - 1985

(Continued from page 2)

<i>Members</i>	<i>Representing</i>
SHRI G. V. RAO	Ministry of Defence (R&D)
SHRI RAVINDRA KUMAR (<i>Alternate</i>)	
SHRI K. SANKRABHISHAN	Kutti Flush, Doors and Furniture Co (Pvt) Ltd, Madras
SHRI R. S. RAGHAVAN (<i>Alternate</i>)	
LT-COL G. B. SINGH (RETIRED)	Indian Plywood Manufacturing Co Ltd, Dandoli
SHRI K. S. SHUKLA	Forest Research Institute and Colleges, Dehra Dun
SHRI S. P. SINGH (<i>Alternate</i>)	
SHRI H. THOMSON	Sitapur Plywood Manufacturers Ltd, Sitapur
SHRI PURSHOTAM DAYAL (<i>Alternate</i>)	



INDIAN STANDARDS INSTITUTION

Headquarters:

Manak Bhavan, 9 Bahadur Shah Zafar Marg, NEW DELHI 110002

Telephones : 331 0131 331 1375

Telegrams : Manaksanstha
(Common to all Offices)

Regional Offices:

Telephone

*Western : Manakalaya, E9 MIDC, Marol Andheri (East) BOMBAY 400093 6 32 92 85

†Eastern : 1/14 C. I. T. Scheme VII M, V. I. P. Road, Manikola, CALCUTTA 700054 36 24 99

Northern : SCO 445-446, Sector 35-C CHANDIGARH 160038 { 2 18 43
3 16 41

Southern : C. I. T. Campus, MADRAS 600113 { 41 24 42
41 25 19
41 29 16

Branch Offices:

*Pushpak, Nurmohamed Shaikh Marg, Khanpur AHMADABAD 380001 { 2 63 48
2 63 49

*F Block, Unity Bldg, Narasimharaja Square, BANGALORE 560002 22 48 05

Gangotri Complex, 5th Floor, Bhadbhada Road, T. T. Nagar, BHOPAL 462003 6 67 18

Plot No. 82/83, Lewis Road, BHUBANESHWAR 751002 6 36 27

53/5 Ward No 29, R. G. Barua Road, 5th Byelane, GUWAHATI 781003 —

5-8-56C L. N. Gupta Marg, HYDERABAD 500001 22 10 83

R14 Yudhister Marg C Scheme, JAIPUR 302005 { 6 34 71
6 98 32

117/418 B Sarvodaya Nagar, KANPUR 208005 { 21 68 76
21 82 92

Patliputra Industrial Estate, PATNA 800013 6 23 05

Hantex Bldg (2nd Floor), Rly Station Road, TRIVANDRUM 695001 52 27

Inspection Office (With Sale Point):

Institution of Engineers (India) Building, 1332 Shivaji Nagar, PUNE 411005 5 24 35

*Sales Office in Bombay is at Novelty Chambers, Grant Road, BOMBAY 400007 69 45 28

†Sales Office in Calcutta is at 5 Chowringhee Approach, P.O. Princep Street, CALCUTTA 700072 27 66 00