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IS 3513-1 (1989): Resin treated compressed wood laminates (compregs) - Specification, Part 1: For electrical purposes [CED 20: Wood and other Lignocellulosic products]



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Bhartrhari—Nitiśatakam

“Knowledge is such a treasure which cannot be stolen”

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IS : 3513 (Part 1) - 1989

REAFFIRMED

2009

Indian Standard

**SPECIFICATION FOR
RESIN TREATED COMPRESSED WOOD
LAMINATES (COMPREGS)**

,PART 1 FOR ELECTRICAL PURPOSES

(First Revision)

First Reprint AUGUST 2001

UDC 674.812.2 : 678.632 : 621.315.619

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

October 1989

Price Group 4

AMENDMENT NO. 1 NOVEMBER 1998
TO
IS 3513 (PART 1) : 1989 SPECIFICATION FOR RESIN
TREATED COMPRESSED WOOD LAMINATES
(COMPREGS)
PART 1 FOR ELECTRICAL PURPOSES
(First Revision)

(Page 5, Table 3, Sl No. 1 and 2, col 2) — Insert 'along the grain direction' at the end.

(CED 20)

Reprography Unit, BIS, New Delhi, India

AMENDMENT NO. 2 JULY 2005
TO
IS 3513 (PART 1) : 1989 SPECIFICATION FOR
RESIN TREATED COMPRESSED WOOD LAMINATES
(COMPREGS)

PART 1 FOR ELECTRICAL PURPOSES

(First Revision)

(Page 3, clauses 7.1 and 7.1.1) — Substitute the following for the existing:

7.1 Boards

The dimensions of resin treated compressed wood laminate boards shall be as follows:

Length in mm	:	2 400, 2 100, 1 800, 1 500, 1 200, 900 and 600
Width in mm	:	1 200, 900, 600, 300 and 150

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

(Page 4, clause 7.1.2) — Renumber the clause and substitute the following for the existing:'

7.1.1 Thickness

Unless otherwise specified the thickness of resin treated compressed wood laminate boards shall be 3 mm, 4 mm, 5 mm, 6 mm, 8 mm, 12 mm, 16 mm, 20 mm, 25 mm, 32 mm, 40 mm, 50 mm, 60 mm and 70 mm.'

(Page 4, clause 7.1.3) — Renumber the clause and substitute the following for the existing:

Amend No. 2 to IS 3513 (Part 1) : 1989

'7.1.2 Tolerances

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

<i>Dimensions</i>	<i>Tolerance</i>
Length	+6 mm -0 mm
Width	+3 mm -0 mm
Thickness:	
i) Less than 6 mm	10 percent
ii) 6 mm and above	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. 3 FEBRUARY 2009
TO
IS 3513 (PART 1) : 1989 SPECIFICATION FOR RESIN
TREATED COMPRESSED WOOD LAMINATES
(COMPREGS)

PART 1 FOR ELECTRICAL PURPOSES

(First Revision)

(Page 2, clause 5.2) — Substitute the following for the existing:

'The synthetic resins used for impregnation and bonding of veneers shall be of phenol or cresol formaldehyde type and the resultant resin adhesive shall conform to the requirements specified in IS 848 : 2006.'

(Page 4, Table 1) — Substitute the following for the existing table:

Table 1 Physical Properties of Compregs (All Types)
(Clause 8.1)

Sl No.	Property	Requirement		Method of Test
		Types I, II, III and IV	Types V and VI	
i)	Specific gravity, <i>Min</i>	1.25	1.25	IS 1708 (Part 2) : 1986
ii)	Moisture content and volatile matter, percent, <i>Max</i>	4	4	IS 1708 (Part 1) : 1986
iii)	Water absorption at 27 ± 2°C, percent, <i>Max</i>	1.2	1.5	IS 3513 (Part 4) : 1966
iv)	Sporadic working temperature, <i>Max</i>	90°C	90°C	IS 3513 (Part 4) : 1966

[Page 5, Table 3, (see also Amendment No. 1)] — Substitute the following for the existing table:

Amend No. 3513 (Part 1) : 1989

**Table 3 Mechanical Properties
(Clause 8.3)**

Sl No.	Test	Unit	Requirement		Method of Test
			Type V	Type VI	
(1)	(2)	(3)	(4)	(5)	(6)
i)	Tensile strength, <i>Min</i> :				
	a) Along the grains	MPa	140	70	IS 1734 (Part 9) : 1983
b) Across the grains	MPa	-	50		
ii)	Static bending strength, <i>Min</i> :				
	a) Along the grains	MPa	185	90	IS 1998 : 1962
b) Across the grains	MPa	-	65		
iii)	Compressive strength, <i>Min</i> :				
	a) Parallel to laminae	MPa	160	110	IS 1708 (Parts 8 & 9) : 1986
b) Perpendicular to laminae	MPa	-	170		
iv)	Shear strength, <i>Min</i> :				
	a) Parallel to grains & laminae	MPa	12	15	IS 1708 (Part 11) : 1986
b) Perpendicular to grains & laminae	MPa	50	40		
v)	Hardness, Rockwell, <i>Min</i> , M scale		70	70	IS 1586 : 2000 ¹⁾
vi)	Impact strength, Izod, Un-notched, <i>Min</i> :				
	a) Perpendicular to laminae	kg/m ²	0.45	0.30	IS 1998 : 1962
b) Parallel to laminae	kg/m ²	0.25	0.20		

¹⁾ Rockwell hardness in M scale shall be determined using an indenter of diameter of 6.350 ± 0.0025 mm and with Minor load of 10 kg and Major load of 100 kg.

(Page 6, Annex A) — Substitute the following for the existing entries:

'IS 848 : 2006 Synthetic resin adhesives for plywood (phenolic and aminoplastic) — Specification (*second revision*)

IS 1586 : 2000 Method for Rockwell hardness test for metallic material (scales A-B-C-D-E-F-G-H-K 15N, 30N, 45N, 15T, 30T and 45T) (*third revision*)'

(CED 20)

Reprography Unit, BIS, New Delhi, India

FOREWORD

This Indian Standard (Part 1) (First Revision) was adopted by the Bureau of Indian Standards on 22 April 1989, after the draft finalized by the Wood Products Sectional Committee had been approved by the Civil Engineering Division Council.

Resin treated compressed wood laminates, also known as compregs, are laminates made from thin wood veneers and thermosetting phenol or cresol formaldehyde resins. They combine within themselves enhanced mechanical properties with the stabilizing and moisture-proof qualities of thermosetting resins; besides, they have good machining properties, electrical insulation, and resistance to corrosive agents and termite attack. Compregs are manufactured in different shapes, such as, sheets, rods and moulded shapes.

In the electrical industry, compregs are extensively used for lifting rods and guide plates in HV circuit-breakers; cleats and supports for HV tapplings in transformers; insulating stator brackets in turbo-generators; drums and finger boards for traction control gear; stay wire insulators, insulating studs, nuts, bolts, etc.

The grading of compregs is based upon the extent and nature of impregnation of the resin-forming chemicals, and also upon the compression and density as a result of pressure applied for curing and bending whereas the different types in each of the grades indicate the arrangement of the veneer, and therefore the relative orientation of wood fibre in various directions.

The dimensions of compreg boards and rounds have not been covered exhaustively as these vary widely depending upon end use. However, for general guidance, certain stock dimensions have been indicated.

This standard was first published in 1966. In the present revision, the requirements of various properties of compregs have been revised keeping in view the latest developments in the industry and the feedback from the users.

This standard is now published in four parts, namely,

Part 1 For electrical purposes

Part 2 For chemical purposes

Part 3 For general purposes

Part 4 Sampling and tests

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

SPECIFICATION FOR RESIN TREATED COMPRESSED WOOD LAMINATES (COMPREGS)

PART 1 FOR ELECTRICAL PURPOSES

(First Revision)

1 SCOPE

1.1 This standard (Part 1) covers the requirements of resin treated compressed wood laminates (compregs) for electrical purposes.

1.2 This standard does not cover the requirements for solid compressed wood.

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, definitions given in IS 707 : 1976 and the following shall apply.

3.2 Compreg

A wood-based laminated material made from thin wood veneers either impregnated under vacuum and/or pressure with synthetic resins or coated with synthetic resin or interlaid with synthetic impregnated paper and further bonded and densified under heat and pressure. The synthetic resins are usually of phenol or cresol/formaldehyde type.

3.3 High Density Compreg

Compreg with specific gravity between 1.25 and 1.35.

4 TYPES

4.1 Compreg for electrical purposes shall be a fully impregnated, high density material suitable for HV and LV electrical insulation requirements and for certain general mechanical purposes. This grade shall have six types, that is Type I to VI.

4.2 Types

4.2.1 The types of compreg shall be as follows, depending on grain orientation of individual veneers in a board:

a) *Type I* — In this type, the grain orientation of the constituent veneers shall be substantially tangential to the periphery of the board or the round. The joints in the adjacent layers of laminae shall be staggered. This type is suited for fabrication of large circular rings.

b) *Type II* — In this type, the grain orientation of the constituent veneers shall be more than 75 percent in the direction of the major mechanical stress. Every fourth veneer comprising this type shall have its grain direction at right angle to the grain direction of adjacent three veneers which will have their grains in the same direction.

The mechanical properties achieved in this type are generally comparable to Type V but the cross lamination gives improved resistance to splitting. This arrangement is specially suitable for tensile links where the end fixings are in the form of bolts or rivets located close to the end of the components.

c) *Type III* — In this type, the grain orientation of the constituent veneers shall be approximately equal in all radial directions. This type shall have each successive lamination angularly disposed in relation to the adjacent one.

This type is suited for fabrication of gears, chucks and wheels.

d) *Type IV* — In this type, the grain orientation of constituent veneers shall be oriented mainly at 45° to the load axis.

This arrangement is suitable for parts under high voltage stress with limited clearances.

- e) *Type V* — In this type, the grain orientation of the constituent veneers shall be in the direction of axis of load.

This type is suitable for parts subject to tensile stress and is thus suited for fabrication of sticks, flats, rods, turned parts and threading.

- f) *Type VI* — In this type, the grain orientation of the constituent veneers shall be more or less equal in each axis, at right angles to each other.

This type is of high compressive strength in the direction of its thickness and is also rigid. It is suited for sheet and block forms.

4.2.2 Typical sketches illustrating the directions of grains of the veneers in the assembly for various types are indicated in Fig 1.

5 MATERIALS

5.1 Timber

Any non-resinous species of timber can be used for the manufacture of veneers required for making compreg.

5.1.1 The veneers shall be either rotary cut or sliced and maximum variation in grains shall not exceed 1 in 10. They shall be smooth, free from knots, splits, dry rot or any other type of rot, and resin pockets. The veneers shall be of uniform thickness with tolerance of ± 5 percent, and dried to a suitable moisture content not exceeding 8 percent.

5.1.2 In selecting the species for the manufacture of compregs, it is recommended that, as far as possible, a single species of timber be used in a pack and where combination of different species is unavoidable, care shall be taken to prevent incompatibility of various species in the physical and mechanical properties.

5.2 Synthetic Resins

The synthetic resins used for impregnation and bonding of veneers shall be of thermosetting phenol or cresol formaldehyde type and shall generally conform to IS 848 : 1974.

5.3 Solvents

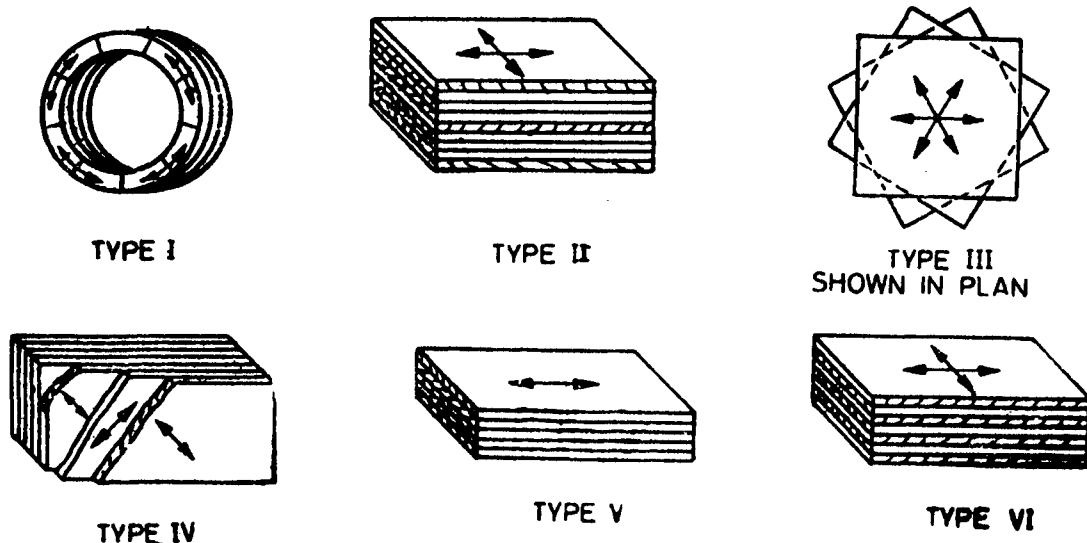
Denatured spirit conforming to IS 324 : 1959 or any suitable solvent conforming to its Indian Standard Specifications, shall be used for compreg of electrical grade.

5.4 Varnishes

Insulating oils and varnishes used for treating compreg boards and the machined components of compreg shall conform to IS 10026 (Part 3/ Sec 1 to 7) : 1983. Special high-viscosity insulating varnishes may also be used for electrical components if so required by the purchaser.

6 MANUFACTURE

6.1 Compreg of electrical grade shall be manufactured from suitable veneers by impregnating them with a thermosetting phenol or cresol formaldehyde resin dissolved in a suitable solvent like denatured spirit. Vacuum, with or without subsequent pressure, using a suitable impregnation



NOTE — Arrows show direction of grains in the laminae.

FIG. 1 TYPES OF COMPREG SHOWING ARRANGEMENT OF LAMINAE

schedule, shall be applied to ensure that the veneers are uniformly impregnated to such an extent that the resin content of the veneers is not less than 45 percent on an oven-dry basis.

6.1.1 The impregnated veneers shall be dried in a suitable drier or evaporating chamber at a suitable temperature to drive off the solvent and moisture, care being taken that the resin does not polymerize beyond the desired extent. The impregnated veneers shall then be inspected, and assembled into the required grain configuration and pressed in a hydraulic press at a suitable temperature and pressure. The press charge shall usually be cooled by cutting off steam and introducing a cooling medium.

6.2 Compreg for electrical purposes shall be manufactured in such a way that the following conditions are satisfied:

Synthetic Resin	Impregnation Method	Percent Resin Pickup on Oven Dry Basis	Curing Temperature	Curing and Bonding Pressure (Range) (MPa)
Natural phenol formaldehyde in alcohol solution	Vacuum impregnation with or without subsequent pressure	45, Min	135 to 150°C	7 to 15.5

6.3 The thickness of veneers for the manufacture of compregs shall be between 0.7 and 2.0 mm. The thickness of individual veneers shall not vary beyond ± 5 percent of the average thickness.

6.3.1 The veneers required to be edge jointed shall be so done on a tapeless splicer and no staples or tapes shall be used. The adhesive used for splicing should be compatible with phenol or cresol formaldehyde resins to be used later for impregnation and bonding.

6.3.2 Wherein an assembly different species are used, care shall be taken to see that they are not incompatible and that they are balanced around the central axis (see also 5.1.2).

6.3.3 In one pack, usually veneers of the same thickness shall be used except where adjustment is to be made for density but in case different thicknesses are used, these shall be balanced around the central axis.

6.3.4 The veneers of one pack shall be cut by the same method, that is, either rotary cut or sliced. If cut by different methods, these should be so assembled that these balance around the central axis.

6.4 The compreg boards after discharge from the press, shall be kept for a minimum period of one week to normalize internal stresses and then they shall be cut to the required sizes and finished.

6.5 The resins used shall have no fillers or extenders. A suitable modifying agent may be used to impart the required special properties to the board.

6.5.1 When the thickness of the board required exceeds the thickness the press can accommodate, it may be obtained by glueing two or more boards using similar and compatible resin used for impregnation and bonding with the prior approval of the purchaser.

6.6 A purchaser ordering for machined components shall provide the necessary drawings giving details as to the dimensions of the components and tolerances, and the components shall be supplied in accordance with the drawings.

6.7 The edges of all the boards and the surfaces of all the components shall be given a protective coat with suitable insulating varnish conforming to relevant Indian Standards [IS 10026 (Part 3/ Sec 1 to 7) : 1983].

7 DIMENSIONS AND TOLERANCES

7.1 Boards

The dimensions of platten finished compreg boards shall be quoted in the following order:

The first dimension shall represent the length, that is, the dimension parallel to the grain of faces, the second, the width, that is the dimensions at right angle to the grains of faces and the third, the thickness.

7.1.1 Size

The stock sizes for compreg boards shall generally be the following:

mm	×	mm
2 100	×	1 200
2 100	×	900
1 800	×	1 200
1 800	×	900
1 500	×	1 200
1 500	×	900
1 500	×	600
1 500	×	300
1 500	×	150
1 200	×	1 200
1 200	×	600
1 200	×	300

mm		mm
1 200	×	150
900	×	900
900	×	600
900	×	300
900	×	150
600	×	600
600	×	300
600	×	150

7.1.2 Thickness

The preferred thickness of compreg boards shall be 3, 4.5, 6, 8, 12, 16, 20, 25, 32, 40, 50, 60 and 70 mm.

7.1.3 Tolerances

The following tolerances on the nominal size of the finished compreg boards shall be permissible:

Dimension	Tolerance
a) Length	: + 6 mm - 0 mm
b) Width	: + 3 mm - 0 mm
c) Thickness less than 6 mm	: ± 10 percent
6 mm and above	: ± 5 percent

7.2 Rods

The sizes for round rods of compreg shall generally be the following:

Length	Diameter
mm	mm
1 500	8 to 50
1 200	3 to 50
900	50 to 80
600	6 to 40

7.2.1 Compreg rods of longer lengths and intermediate or greater diameters may be manufactured according to the requirements of the purchaser.

7.2.2 The tolerance on diameters of compreg rods shall be as follows:

Rods up to and including 40 mm dia	+ 0 mm - 0.20 mm
Rods 50 mm dia and above	+ 0 mm - 0.25 mm

7.3 The purchaser ordering compreg cut to special size and shapes, such as, round discs, rings and gear blanks to any required taper or finished parts, shall provide the necessary drawings specifying material, dimensions and tolerances, and the supplies shall be in accordance with the drawing of the purchaser.

7.3.1 Tolerances in finished components or blanks shall be according to the drawings of the purchaser.

8 PHYSICAL AND MECHANICAL PROPERTIES

8.1 The physical properties of compreg for electrical purposes for all types shall conform to Table 1 when tested by the methods specified therein.

8.2 Electrical Properties

The electrical properties of the electrical purpose compreg of all types shall conform to Table 2.

8.2.1 In case of electrical components, the following further test requirements shall be complied with:

- a) All components shall stand a minimum flashover voltage of 4 kV per cm length between cylindrical electrodes when tested according to IS 3513 (Part 4) : 1966.
- b) The varnished components for electrical grades shall have a minimum tracking time of 20 minutes when tested according to IS 3513 (Part 4) : 1966.

8.3 Mechanical Properties

The mechanical properties of compregs for electrical purposes of Type V and VI shall conform to Table 3 when tested by the methods specified therein.

Table 1 Physical Properties of Compregs (All Types)

(Clause 8.1)

Sl No.	Property	Requirement	Method of Test
i)	Specific gravity	1.25, <i>Min</i>	IS 1708 (Part 2) : 1986
ii)	Moisture content and volatile matter	4 percent, <i>Max</i>	IS 1708 (Part 1) : 1986
iii)	Water absorption at 27 ± 2°C	1.2 percent, <i>Max</i>	IS 3513 (Part 4) : 1966
iv)	Sporadic working temperature	90°C, <i>Max</i>	IS 3513 (Part 4) : 1966

Table 2 Electrical Properties of Compreg for Electrical Purpose (All Types)
(Clause 8.2)

Sl No.	Test	Requirement	Method of Test
i)	Insulation resistance after immersion in water at $27 \pm 2^\circ\text{C}$	10 Megohms, <i>Min</i>	IS 2259 : 1963
ii)	Volume and surface resistivity ohm-cm	2.5×10^9	IS 3396 : 1979
iii)	Flatwise electric strength in oil at $90 \pm 2^\circ\text{C}$	4 kV/mm for 6 mm thick specimen	IS 1998 : 1962
iv)	Edgewise electric strength in oil at 90°C	25 kV for 25 mm wide specimen	IS 1998 : 1962
v)	Power factor ($\tan \delta$)	0.019 at 50 cycles at 20°C (Typical, not mandatory)	IS 1998 : 1962
vi)	Comparative tracking index for varnished components	CTI 100	IS 2824 : 1975

Table 3 Mechanical Properties
(Clause 8.3)

Sl No.	Test	Requirement		Method of Test
		Type V	Type VI	
(1)	(2)	(3)	(4)	(5)
1	Minimum tensile strength (MPa)	175	90	IS 1734 (Part 9) : 1983
2	Minimum static bending strength (MPa)	195	95	IS 1998 : 1962
3	Minimum compressive strength (MPa) (Specimen 20 mm \times 20 mm \times 20 mm)			IS 1708 (Parts 8 and 9) : 1986
	a) Parallel to laminae	170	120	
	b) Perpendicular to laminae	95	185	
4	Minimum shear strength (MPa)			IS 1708 (Part 11) : 1986
	a) Parallel to grain and laminae	14	20	
	b) Perpendicular to grain and perpendicular to laminae (flatwise)	60	45	
5	Minimum hardness Rockwell M Scale	70	70	IS 1586 : 1988
6	Minimum impact strength (Izod) Unnotched sample (kg.m/m ²)			IS 1998 : 1962
	a) Perpendicular to laminae	0.50	0.35	
	b) Parallel to laminae	0.30	0.25	

9 WORMANSHIP AND FINISH

9.1 When supplied in board form, the face and the back of a board shall be free from checks, splits, blisters, discoloration, overlaps, gaps and open joints and the boards shall be free from warp.

9.2 Compreg boards may be either platten finished, or machine finished.

9.2.1 The machine finished boards shall be given a protective coat of varnish as required by the purchaser. Usually the edges of the boards shall be given a coat of protective varnish.

9.2.2 The machined components in case of electrical purpose compreg shall be given a coat of high viscosity varnish.

IS 3513 (Part 1) : 1989

10 SAMPLING

10.1 Sampling shall be as specified in IS 3513 (Part 4) : 1966.

11 TESTING

11.1 Test pieces cut from each of the boards selected shall be tested by the appropriate methods specified in appropriate tables and in IS 3513 (Part 4) : 1966.

11.2 Tests on Finished Machined Components

The manufacturer shall furnish a certificate to the purchaser that the finished component or part is made from compreg conforming to the requirements for the particular type as specified in this standard. If required by the purchaser, sample test pieces shall be tested from the same board, and test results thereon should be supplied.

11.3 Re-tests

If any piece fails to fulfil the test requirements specified under 11.1, a further set of duplicate samples on the basis prescribed under 11.1 shall be selected by the purchaser from the same batch for testing in the same manner. Test pieces prepared from these two further samples shall comply with the requirements, otherwise the batch shall be rejected.

12 MARKING

12.1 If compreg is supplied in board form, each board, and if supplied in component form, each component, or if components are small, each package of components, shall be legibly and indelibly marked or stamped with the following

particulars along with such other marks as the purchaser may stipulate at the time of placing a contract:

- a) Type and finish;
- b) Manufacturer's initials or recognized trade-mark;
- c) Year of manufacture; and
- d) Batch number.

13 PACKING AND DELIVERY

13.1 The boards or components shall be delivered in a clean and dry condition and shall be suitably packed.

14 INFORMATION TO BE SUPPLIED BY THE PURCHASER

14.1 The purchaser shall supply the following information to the supplier with his order:

- a) Number of boards or number of components;
- b) Type of material;
- c) Size and thickness;
- d) If components are required, full detailed drawings along with the tolerances and dimensions;
- e) Whether supply is to be platten finished or machine finished;
- f) Whether supply is to be oil finished or varnish finished; and
- g) Any other special requirement.

ANNEX A

(Clause 2.1)

LIST OF INDIAN STANDARDS REFERRED IN THE STANDARD

IS No.	Title	IS No.	Title
IS 324 : 1959	Specification for ordinary denatured spirit (<i>revised</i>)	IS 1708	Methods of testing of small clear specimens of timber (<i>second revision</i>)
IS 707 : 1976	Glossary of terms applicable to timber technology and utilization (<i>second revision</i>)	Part 1 : 1986	Determination of moisture content
IS 848 : 1974	Specification for synthetic resin adhesives for plywood (phenolic and aminoplastic) (<i>first revision</i>)	Part 2 : 1986	Determination of specific gravity
IS 1586 : 1988	Method for Rockwell hardness test for metallic material (Scales A-B-C-D-E-F-G-H-K) (<i>second revision</i>)	Part 8 : 1986	Determination of compressive strength parallel to grain
		Part 9 : 1986	Determination of compressive strength perpendicular to grain

IS 3513 (Part 1) : 1989

<i>IS No.</i>	<i>Title</i>	<i>IS No.</i>	<i>Title</i>
Part 11 : 1986	Determination of shear strength parallel to grain		solid insulating materials under moist conditions (<i>first revision</i>)
IS 1734	Methods of test for plywood (<i>second revision</i>)	IS 3396 : 1979	Methods of test for volume and surface resistivities of solid electrical insulating materials (<i>first revision</i>)
Part 9 : 1983	Determination of tensile strength		
IS 1998 : 1962	Methods of test for thermo-setting synthetic resin bonded laminated sheets	IS 3513 (Part 4) : 1966	Specification for high and medium density wood based laminates (compreg) : Part 4 Sampling and tests (<i>under revision</i>)
IS 2259 : 1963	Methods of test for determination of insulation resistance of solid insulating materials	IS 10026 (Part 3/Sec 1 to 7)	Specification for insulating varnishes containing solvents : Part 3 Specification for individual materials.
IS 2824 : 1975	Method for determining comparative tracking index of		

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Review of Indian Standards

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This Indian Standard has been developed from Doc : No. BDC 20 (4266)

Amendments Issued Since Publication

Amend No.	Date of Issue	Text Affected

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Southern : C.I.T. Campus, IV Cross Road, CHENNAI 600 113	{ 254 12 16, 254 14 42 254 25 19, 254 13 15
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Branches : AHMEDABAD. BANGALORE. BHOPAL. BHUBANESHWAR. COIMBATORE. FARIDABAD. GHAZIABAD. GUWAHATI. HYDERABAD. JAIPUR. KANPUR. LUCKNOW. NAGPUR. NALAGARH. PATNA. PUNE. RAJKOT. THIRUVANANTHAPURAM.	