

समुद्री उपयोग के लिए प्लाईवुड — विशिष्टि
(तीसरा पुनरीक्षण)

Marine Plywood — Specification
(Third Revision)

ICS 79.060.10

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FOREWORD

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

Plywood used in construction, repair and maintenance of marine and river craft is required to withstand rigorous conditions involving changes in temperature, humidity and alternate wetting and drying. In addition, they also need to withstand attack by marine organisms. Plywood used for general purposes is found to be unsuitable for such applications.

This standard on marine plywood was first published in 1957 and subsequently revised in 1976 and 2010. In this revision, the following major modifications have been incorporated:

- a) Material clause for timber has been modified;
- b) Dimension clause has been modified;
- c) Modulus of Rupture (MOR), Modulus of Elasticity (MOE) and tensile strength requirements have been modified;
- d) Requirements for formaldehyde content for oven dry board and the steady-state formaldehyde emission (optional) have been added; and
- e) Marking clause has been modified.

A scheme of labelling environment friendly products known as ECO-Mark has been instituted at the instance of the Ministry of Environment, Forests and Climate Change, Government of India. The ECO-Mark is administered by the Bureau of Indian Standards (BIS) under the *Bureau of Indian Standards Act, 2016* 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 (ISI Mark) of 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-Mark. 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, as revised/amended from time to time.

This standard contributes to the United Nations Sustainable Development Goal 9 'Industry innovation and infrastructure' Build resilient infrastructure promote inclusive and sustainable industrialization and foster innovation.

The composition of the Committee responsible for the formulation of the standard is given in [Annex E](#).

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 : 2022 'Rules for rounding off numerical values (*second revision*)'. 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***MARINE PLYWOOD — SPECIFICATION***(Third Revision)***1 SCOPE**

This standard covers the requirement for materials, manufacture and performance of marine plywood suitable for the construction, repair and maintenance of marine and river craft, pontoons and the like.

2 REFERENCES

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

3 TERMINOLOGY

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

4 MATERIALS**4.1 Timber**

4.1.1 Any species of timber may be used for manufacturer of plywood. It is recommended to use wood from sources other than natural forests includes, Tree Outside Forest (TOF), rubber, coconut, cashew, walnut, agroforestry, farm forestry, industrial and social forestry plantations, etc and shade trees from tea and coffee estates in plywood manufacturing. A list timber species is given in [Annex B](#) for guidance purpose. Imported timber may also be used in manufacturing of plywood.

4.1.2 In selecting the species for the manufacture of plywood, it is recommended that as far as possible a single species of timber shall be used and where combinations of different species are used, care shall be taken to prevent incompatibility of the two species.

4.2 Adhesive

The adhesives used for bonding the veneers shall be based on any suitable synthetic resin conforming to BWP Type of IS 848. Extender shall not be added to the adhesive by the plywood manufacturer. Fillers, if used, shall not exceed 10 percent by mass of solid content of the glue.

5 MANUFACTURE**5.1 Veneers**

The veneers shall be either rotary cut or sliced. The veneers shall be reasonably smooth to permit an even spread of glue. The veneers shall be conditioned to a moisture content in the range of 6 percent to 10 percent before bonding.

5.1.1 Defects in Veneers

The veneers to be used for the faces shall be free from sapwood. Core veneers may contain sound knots, whose maximum dimension in any one direction does not exceed 50 mm, and open defects (split and check), provided such defects do not impair the smooth finish of the surface required for painting or staining. Dead knots shall not be permissible. Overlaps or pleats shall not be allowed.

5.2 Assembly**5.2.1 Glueing**

The glue shall be evenly spread and the veneers shall be securely glued together without overlap. No unglued areas or starved joints shall be found on separation of veneers.

5.2.2 Thickness of Veneers

The thickness of veneers shall be uniform, within a tolerance of ± 5 percent. Corresponding veneers on either side of the central ply and those of face (top) and back (bottom) veneers shall be of species having similar physical and mechanical properties, such as, density, modulus of elasticity, shrinkage, etc to ensure balanced construction and shall also be cut by the same method, that is, either all rotary cut or all sliced.

In the case of 3 ply boards, the thickness of the centre veneer (core) shall be at least equal to that of one of the face (top) veneers, but shall not exceed the combined thickness of the two surface veneers.

5.2.3 Joint in Veneers

5.2.3.1 Veneers, which require to be jointed to form a ply, shall be spliced before assembly. All joints shall be cut square. Tapes, other than fusible tapes, shall not be used internally and when used for

making edge joints or repairing splits in face veneers they shall be removed subsequently. Fusible tapes shall be such that they are converted in the process of manufacture, to an adhesive that complies with the test requirements applicable to the adhesive used for the manufacture of the plywood.

5.2.3.2 Edge joints

Edge joints in veneers shall be made on a tapeless splicer or by fusible tape and staggered not less than 25 mm as between any veneer and the next one with the same grain direction on both the faces.

5.2.3.3 End joints

End joints shall be permitted in all veneers forming the core ply and in the veneers of face plies of panels provided the length of such panels is over 2 m. All such joints shall be accurately scarfed with an inclination not steeper than 1 in 10 and bonded with an adhesive complying with the requirements specified in [4.2](#).

5.2.3.4 Scarf joints

When sizes larger than available press size are required, boards to the required size shall be made with proper scarf joints through the thickness of the board, with the prior approval of the purchaser. The number and location of scarf joints shall be as agreed to between the purchaser and the manufacturer.

All scarf joints shall be bonded with the same adhesive used for the manufacture of the plywood and shall be made with an inclination not steeper than 1 in 10. The species of timber in corresponding plies of adjacent board scarfed together shall be the same.

5.2.4 Grain Direction

Unless otherwise specified by the purchaser and except in boards comprising an even number of plies, the direction of grain of the veneer in adjacent plies shall be at right angles to each other and that of the outer plies shall run parallel to the length of the sheet. In boards comprising an even number of plies, the grain of the centre pair shall follow the same direction. In adjacent plies in which the grains are required to be at right angles to each other, a deviation not exceeding 10° may be permitted. In all cases, the grain on both faces of the assembled boards shall run in the same direction. The grain of the veneer shall normally be parallel to the edges of rectangular boards, but for other grain direction, for example diagonal, it may be as agreed to between the purchaser and the supplier.

5.3 Treatment

The board shall be given treatment by pressure impregnation with fixed type either water soluble or oil-based preservatives and having retention of a minimum of 12 kg/m³ in case of ACC (acid-copper-chrome) or CCB (copper-chrome-boron) compositions as specified in IS 10013 (Part 1) and (Part 3) respectively or 100 kg/m³ in case of creosote or creosote-fuel oil composition as specified in Annex A of IS 5539, with adequate penetration.

5.4 Moisture Content

Finished plywood boards shall have moisture content not less than 5 percent and not more than 15 percent at any time of the year depending on the part of the country where the test is carried out (*see* IS 287).

6 DIMENSIONS

6.1 Any dimensions (length and width) and number of ply as agreed to between the manufacturer and the purchaser may be used, and shall be declared by the manufacturer. Prevailing dimensions (length × width) of plywood boards are as given below:

- a) 2 440 mm × 1 220 mm;
- b) 2 135 mm × 1 220 mm;
- c) 2 135 mm × 915 mm;
- d) 1 830 mm × 1 220 mm; and
- e) 1 830 mm × 915 mm

6.2 Thickness

The thickness of the plywood boards shall be 3 mm, 4 mm, 5 mm, 6 mm, 9 mm, 12 mm, 15 mm, 19 mm, 22 mm and 25 mm.

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

6.3 Squareness and Edge Straightness

Edge straightness and squareness shall be tested as per [Annex C](#).

6.4 Tolerances

Tolerance on the nominal sizes of finished boards shall be as given in [Table 1](#).

Table 1 Tolerances on Dimensions of Plywood for General Purposes*(Clause 6.4)*

SI No.	Dimension	Tolerance
(1)	(2)	(3)
i)	Length	+ 6 mm – 0 mm
ii)	Width	+ 3 mm – 0 mm
iii)	Thickness	
	a) less than 6 mm; and	± 10 percent
	b) 6 mm and above	± 5 percent
iv)	Squareness, <i>Max</i>	2 mm/1 000 mm or 0.2 percent
v)	Edge straightness, <i>Max</i>	2 mm/1 000 mm or 0.2 percent

7 WORKMANSHIP AND FINISH

7.1 The face (top) and back (bottom) of the finished boards shall be free from checks, splits, gaps (subject to provisions given in [7.4](#)), blisters, harmful discolouration, any kind of decay, pleats and overlaps, insect holes, dead or loose knots and live knots whose maximum dimensions in any direction exceed 25 mm. The plywood shall be free from warp.

7.2 Sound knots of diameter 25 mm and less shall be permitted provided the centre-to-centre distance between any two such knots is not less than 300 mm.

7.3 The face (top) shall be free from any patches, but on the back (bottom), patches at distances of not less than 600 mm apart shall be permissible. The maximum dimension of any one patch shall be not more than 40 mm.

7.4 Splits, gaps and open joints shall not be permitted in core. These may be permitted in face (top) provided the gap or opening does not exceed a width of 0.5 mm. If exceeding 0.5 mm, this may be rectified by well fitted veneer inserts of a minimum width of 5.0 mm provided the grain of the veneer does not exceed in deviation by more than 10 percent from the grain direction of the surrounding veneer.

7.5 The finish shall be reasonably smooth, and sanding shall be given to both the sides if so required by the purchaser.

7.6 The minimum width of the veneers used in face (top) and back (bottom) of the boards shall be not less than 75 mm except at the edges, where it may

be less. The edge of the board shall be trimmed square.

8 SAMPLING AND CRITERIA FOR CONFORMITY

The method of drawing representative samples and the criteria for conformity shall be as prescribed in IS 7638.

9 PHYSICAL AND MECHANICAL REQUIREMENTS

9.1 The plywood shall conform to the requirements given in [9.3](#) to [9.11](#).

9.2 Unless otherwise specified in this standard, six test specimens, cut from each of the plywood selected as in [8](#) for tests specified in [9.3](#) to [9.9](#). For formaldehyde content and steady-state formaldehyde emission test, specimens shall be taken as per IS 13745 and IS/ISO 12460 (Part 1) respectively.

9.3 Moisture Content

The moisture content of test pieces cut from each board selected as under [9.2](#) shall not exceed 15 percent nor be less than 5 percent when determined by the method described in IS 1734 (Part 1).

9.4 Glue Adhesion in Dry State**9.4.1 Glue Shear Strength**

When tested for glue adhesion by the method described in IS 1734 (Part 4), the average failing

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load shall be not less than 1 350 N and no individual value shall be less than 1 100 N.

9.4.2 Adhesion of Plies

The adhesion of plies shall be tested by forcibly separating the layers. The veneers shall offer appreciable resistance to separation and the fractured samples shall show some adherent fibres distributed more or less uniformly. Adhesion may also be tested by knife test method described in IS 1734 (Part 5).

NOTE — In case, a definite result is not obtainable by the method described in IS 1734 (Part 4), the result of knife test described in IS 1734 (Part 5) shall be considered as decisive. In case of even number of plies, where the grains of central plies follow the same direction then the result as obtained from knife test shall be considered as final.

9.5 Water Resistance Test

The specimens shall be subjected to any one of the tests specified in [9.5.1](#) and [9.5.2](#). The test specimen for carrying out test as per [9.5.1.1](#), shall be as specified in IS 1734 (Part 5). Six test pieces each of approximately 250 mm × 100 mm size, shall be cut from any position in the board such that the grain of the face veneer is parallel to the length of the piece for carrying out test as per [9.5.1.2](#).

9.5.1 The specimens shall be kept submerged in a pan of boiling water for a period of 72 h. The period of 72 h of boiling may be a continuous period or an aggregate of smaller periods of boiling, if the test piece is left in cold water between these smaller periods. These test pieces shall then be removed from the boiling water and cooled down to room temperature by plunging them in cold water. These test specimens, while still in wet condition, shall be subjected to tests described under [9.5.1.1](#) and [9.5.1.2](#).

9.5.1.1 Glue shear strength

When tested for glue shear strength by the method described in IS 1734 (Part 4), the average failing load shall be not less than 1 000 N and no individual value shall be less than 800 N.

9.5.1.2 Adhesion of plies

The adhesion of plies shall be tested by forcibly separating the layers. The veneers shall offer appreciable resistance to separation and the fractured sample shall show some adherent fibres distributed more or less uniformly. Adhesion may also be tested by knife test method described in IS 1734 (Part 5).

NOTE — In case a definite result is not obtainable by the method described in IS 1734 (Part 4), the result of knife test

described in IS 1734 (Part 5) shall be considered as decisive. In case of even number of plies where the grains of central plies follow the same direction the result as obtained from knife test shall be considered as final.

9.5.2 The specimens shall be subjected to constant steam pressure for a definite duration inside a vacuum steam pressure test apparatus as described in [Annex D](#) and thereafter subjected to tests as per [9.5.1.1](#) and [9.5.1.2](#).

9.6 Tensile Strength

The tensile strength when determined by the method described in IS 1734 (Part 9) shall comply with the following values:

- a) Tensile strength shall be not less than 36.0 N/mm² in the direction parallel to grain direction of the face veneers;
- b) Tensile strength shall be not less than 29.0 N/mm² in the direction of right angles to the grain direction of the face veneers; and
- c) Sum of the tensile strength in both directions shall be not less than 84.5 N/mm².

If the plywood contains scarf joints, half the specimen subjected to testing shall contain the joint.

9.7 Mycological Test

The test for resistance to micro-organism shall be carried out by the method described in IS 1734 (Part 7). When tested, the test piece shall show no appreciable signs of separation at the edges of the veneers and shall comply with the requirements as specified in [9.5](#).

9.8 Static Bending Strength

Three test specimens taken in each direction from the sample of plywood, when tested in accordance with IS 1734 (Part 11) shall have an average and a minimum individual value of modulus of elasticity and modulus of rupture not less than the values specified in [Table 2](#).

9.9 Wet Bending Strength

Three test specimens taken in accordance with IS 1734 (Part 11) and from each direction of a sample of plywood, shall be subjected to cyclic test for 3 cycles, each cycle consisting of 4 h boiling in water and 16 h drying in an oven at 65 °C ± 2 °C or of 72 h of boiling. The samples shall be then kept in water at 27 °C ± 2 °C for 1 h and thereafter tested as per IS 1734 (Part 11). The duration of boiling/drying in oven may be split into shorter intervals by keeping the samples at 27 °C ± 2 °C in

water (in case of boiling) or in air (in case of drying). The sample shall have an average and minimum individual modulus of elasticity and modulus of rupture not less than the values specified in [Table 3](#).

Table 2 Minimum Values for MOE and MOR

([Clause 9.8](#))

Sl No.	Requirement	Along the Face Grain	Across the Face Grain
(1)	(2)	(3)	(4)
i)	Modulus of Elasticity (MOE), N/mm ² :		
	a) Average; and	6 400	4 600
	b) Minimum individual	5 700	4 100
ii)	Modulus of Rupture (MOR), N/mm ² :		
	a) Average; and	43	35
	b) Minimum individual	38	31

Table 3 Minimum Values for MOE and MOR (Wet Bending Strength)

([Clause 9.9](#))

Sl No.	Requirement	Along the Face Grain	Across the Face Grain
(1)	(2)	(3)	(4)
i)	Modulus of Elasticity (MOE), N/mm ² :		
	a) Average; and	3 200	2 300
	b) Minimum individual	2 900	2 100
ii)	Modulus of Rupture (MOR), N/mm ² :		
	a) Average; and	21	17
	b) Minimum individual	19	15

9.10 Retention of Preservative

When tested as per IS 2753 (Part 1 and Part 2) the plywood shall have a retention of preservative as specified in [5.3](#).

9.11 Formaldehyde Content Test

Test of free formaldehyde content in the sample shall be done by perforator method as per IS 13745 and test results of drawn sample shall meet the requirements of formaldehyde content as follows:

- a) Formaldehyde Class, E_1 \leq 8 mg/100 g of oven dry sample; and
- b) Formaldehyde Class, E_2 $>$ 8 mg/100 g of oven dry sample and \leq 30 mg/100 g of oven dry sample.

9.12 Steady-State Formaldehyde Emission Test (Optional Test)

Manufacturer will offer a stack of plywood made under a batch (not less than 50 pieces) bearing the batch number and date of manufacture, along with details of plywood that is grade, size and thickness, adhesive used and any other (the manufacture wish to inform). After sampling, the sample shall be immediately covered in airtight polythene with date of sampling on the plywood.

Sample must be taken for test within 24 h of opening the airtight cover and within one month from the date of sampling and test shall be done by the test method as given in IS/ISO 12460 (Part 1). The test results of drawn sample shall meet the requirements of formaldehyde emission value as follows:

- a) Formaldehyde Class, E_1 \leq 0.124 mg/m³; and
- b) Formaldehyde Class, E_2 $>$ 0.124 mg/m³.

10 ADDITIONAL REQUIREMENTS FOR ECO-MARK

10.1 General Requirements

10.1.1 The plywood shall conform to the requirements of quality specified in this standard.

10.1.2 The manufacturer shall produce to Bureau of Indian Standards, the 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 or 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.

10.2 Specific Requirements

The plywood 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.

11 MARKING

11.1 Each plywood board shall be legibly and indelibly marked or stamped with the following:

- a) Manufacturer's name and his initials or his recognized trade-mark, if any;
- b) In words 'MARINE PLYWOOD';
- c) Formaldehyde Class;
- d) Nominal length, width and thickness of plywood;
- e) Month and year of manufacture;
- f) Batch No.; and
- g) Criteria for which the plywood has been labelled as ECO-Mark (if applicable).

11.2 Following additional information may be marked on each plywood:

- a) Number of plies; and
- b) Trade name of timber species used in manufacturing of plywood (*see* IS 1150).

11.3 BIS Certification Marking

The product(s) conforming to the requirements of this standard may be certified as per the conformity assessment schemes under the provisions of the *Bureau of Indian Standards Act, 2016* and the Rules and Regulations framed there under, and the products may be marked with the Standard Mark.

12 DELIVERY

Unless otherwise specified, the plywood boards shall be delivered in a clean condition and shall be suitably packed according to normal trade. For ECO-Mark, the material used for packaging of the plywood shall be recyclable, reusable or biodegradable.

ANNEX A

(Clause 2)

LIST OF REFERRED STANDARDS

<i>IS No.</i>	<i>Title</i>	<i>IS No.</i>	<i>Title</i>
IS 287 : 1993	Permissible moisture content of timber used for different purposes — Recommendations (<i>third revision</i>)	IS 2753	Methods for estimation of preservatives in treated timber and in treating solutions:
IS 707 : 2011	Timber technology and utilization of wood, bamboo and cane — Glossary of terms (<i>third revision</i>)	(Part 1) : 1991	Determination of copper, arsenic, chromium, zinc, boron, creosote and fuel oil (<i>first revision</i>)
		(Part 2) : 2014	Determination of copper (in copper organic preservative salt) (<i>second revision</i>)
IS 848 : 2006	Synthetic resin adhesives for plywood (phenolic and aminoplastic) — Specification (<i>second revision</i>)	IS 5539 : 1969	Specification for preservative treated plywood
IS 1150 : 2000	Trade names and abbreviated symbols for timber species (<i>third revision</i>)	IS 7638 : 1999	Wood/lignocellulosic based panel products — Methods of sampling (<i>second revision</i>)
IS 1734	Methods of test for plywood:	IS 10013	Specification for water soluble type wood preservative:
(Part 1) : 1983	Determination of density and moisture content (<i>second revision</i>)	(Part 1) : 1981	Acid-copper-chrome (ACC) wood preservative
(Part 4) : 1983	Determination of glue shear strength (<i>second revision</i>)	(Part 3) : 1981	Copper-chrome-boron (CCB) wood preservative
(Part 5) : 1983	Test of adhesion of piles (<i>second revision</i>)	IS/ISO 12460-1 : 2007	Wood based panels — Determination of formaldehyde release: Part 1 Formaldehyde emission by the 1-cubic-metre chamber method
(Part 7) : 1983	Mycological test (<i>second revision</i>)		
(Part 9) : 1983	Determination of tensile strength (<i>second revision</i>)	IS 13745 : 2020	Method for determination of formaldehyde content in wood-based panels by extraction method called perforator method (<i>first revision</i>)
(Part 11) : 1983	Determination of static bending strength (<i>second revision</i>)		

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ANNEX B

(Clause 4.1.1)

LIST OF PREVALENT TREE OUTSIDE FOREST (TOF) SPECIES FOR PLYWOOD

<i>Sl No.</i>	<i>Botanical Name</i>	<i>Trade Name</i>	<i>Abbreviation</i>
(1)	(2)	(3)	(4)
i)	<i>Acrocarpus fraxinifolius</i>	Mundani	MUN
ii)	<i>Ailanthus spp.</i>	Maharukh	MAH
iii)	<i>Albizia chinensis Merr.</i>	Siris	SIR
iv)	<i>Alstonia scholaris</i>	Chatian	CHT
v)	<i>Anacardium occidentale</i>	Cashew	CAH
vi)	<i>Bischofia javanica</i>	Uriam	URI
vii)	<i>Chukrasia tabularis</i>	Chickrassy	CHI
viii)	<i>Delonix spp.</i>	Gulmohur	GUM
ix)	<i>Duabanga grandiflora</i>	Lampati	LAP
x)	<i>Eucalyptus</i>	Eucalyptus	EUC
xi)	<i>Grevillea robusta</i>	Silver oak	SOA
xii)	<i>Hevea brasiliensis</i>	Rubber wood	RUB
xiii)	<i>Khaya spp.</i>	Lambu	LAB
xiv)	<i>Leucaena leucocephala</i>	Subabul	SUB
xv)	<i>Macaranga spp.</i>	Vatta	MCR
xvi)	<i>Maesopsi seminii</i>	Umbrella tree	UMB
xvii)	<i>Melia azedarach Linn.</i>	Bakain	PLI
xviii)	<i>Melia composita/dubia</i>	Malabar neem	MNE
xix)	<i>Neolamarckea cadamba</i>	Kadam	KAD
xx)	<i>Pinus spp.</i>	Pine	PNE
xxi)	<i>Populus spp.</i>	Poplar	POP
xxii)	<i>Samanea saman</i>	Saman	SAM
xxiii)	<i>Toona ciliata</i>	Toon	TOO
xxiv)	<i>Swietenia spp.</i>	Mahogany	MAG

ANNEX C

(Clause 6.3)

METHOD OF TEST FOR EDGE STRAIGHTNESS AND SQUARENESS

C-1 PROCEDURE FOR EDGE STRAIGHTNESS

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

be measured to the nearest milimetre and recorded.

C-2 PROCEDURE FOR SQUARENESS

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

ANNEX D

(Clause 9.5.2)

ALTERNATE METHOD FOR WATER RESISTANCE TEST

D-1 Pure water shall be filled in boiler of the vacuum steam pressure test (VPT) apparatus as shown in Fig. 1 to the marking of minimum water level on glass water level indicator and the boiler shall be switched on with the valve connecting the boiler and main chamber in closed condition. The test specimen(s) shall be placed in the working (main) chamber and shall be closed air tight with cover. The vacuum pump shall then be switched on and vacuum inlet valve shall be kept in open condition. The steam release valve shall be kept in closed condition. After the required vacuum of 110^{+10}_{-0} kPa has been created inside the main

chamber, the vacuum pump shall be switched off, the vacuum inlet valve closed and boiler valve connected to main chamber opened. The time shall be noted the moment the steam pressure in the main chamber reaches 220^{+10}_{-0} kPa and same pressure shall be maintained for 6 h. The system and boiler then shall be switched off. The steam release valve and vacuum release valve shall slowly be opened until the steam in the chamber is completely evacuated. The samples shall then be kept in water for 1 h at $27 \text{ }^{\circ}\text{C} \pm 2 \text{ }^{\circ}\text{C}$. The samples shall thereafter be tested as per 9.5.1.1 and 9.5.1.2.

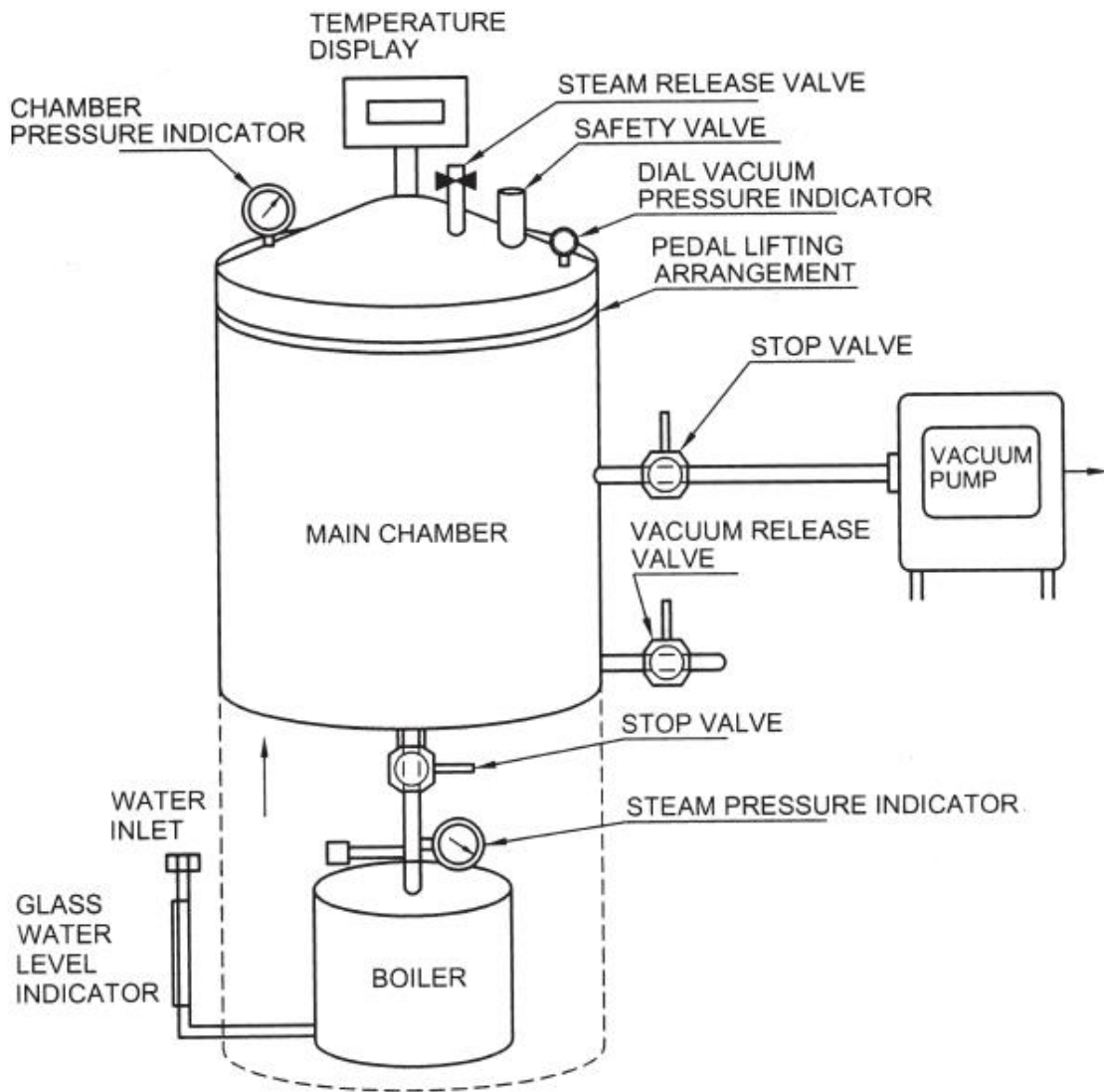


FIG. 1 TYPICAL SKETCH OF VACUUM STEAM PRESSURE TEST (VPT) APPARATUS

ANNEX E

(Foreword)

COMMITTEE COMPOSITION

Wood and Other Lignocellulosic Products Sectional Committee, CED 20

<i>Organization</i>	<i>Representative(s)</i>
Institute of Wood Science & Technology, Bengaluru	DR M. P. SINGH (Chairperson)
Balaji Action Buildwell, New Delhi	SHRI RAJESHWAR NAIR SHRI VIVEK JAIN (<i>Alternate</i>)
Bamboo Society of India, Bengaluru	SHRI PUNATI SRIDHAR DR S. R. SHUKLA (<i>Alternate I</i>) DR JAGADISH VENGALA (<i>Alternate II</i>)
Central Building Research Institute, Roorkee	SHRIMATI HEMALATA DR JEESHAN KHAN (<i>Alternate I</i>) SHRI PRASANTA KAR (<i>Alternate II</i>)
Central Institute of Coir Technology, Bengaluru	DR O. L. SHANMUGASUNDARAM SHRIMATI SUMY SEBASTIAN (<i>Alternate</i>)
Central Public Works Department, New Delhi	CHIEF ENGINEER (CSQ) SUPERINTENDENT ENGINEER (TAS) (<i>Alternate</i>)
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