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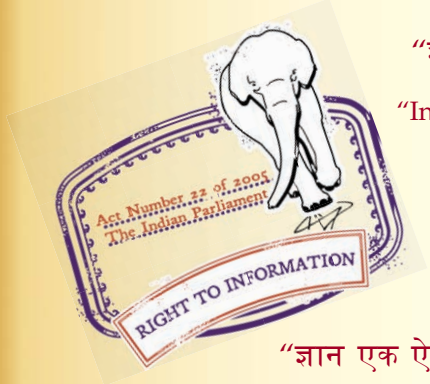
IS 5539 (1969): Specification for preservative treated plywood [CED 20: Wood and other Lignocellulosic products]



"ज्ञान से एक नये भारत का निर्माण"
Satyanarayan Gangaram Pitroda
"Invent a New India Using Knowledge"

"ज्ञान एक ऐसा खजाना है जो कभी चुराया नहीं जा सकता है"
Bhartṛhari—Nītiśatakam
"Knowledge is such a treasure which cannot be stolen"

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IS : 5539 - 1969
(Reaffirmed 2009)

Indian Standard

SPECIFICATION FOR PRESERVATIVE TREATED PLYWOOD

Second Reprint JANUARY 1992

UDC 674 243 048

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

Gr 4 *July* 1970

Indian Standard

SPECIFICATION FOR PRESERVATIVE TREATED PLYWOOD

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116-B, 4th Main Road, Jayamahal Extension, Bangalore-6

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BUREAU OF INDIAN STANDARDS
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AMENDMENT NO. 1 JANUARY 1992
TO
IS 5539 : 1969 SPECIFICATION FOR PRESERVATIVE TREATED PLYWOOD

[*Page* 9, *Appendix* A, *Sl No.* (vii), *col* 6] — Substitute '7.5' *for* '75.0' against Type 4 (copper-chrome-arsenic composition or acid-copper-chrome composition).

(CED 20)

Reprography Unit, BIS, New Delhi, India

AMENDMENT NO. 2 FEBRUARY 2001
TO
IS 5539 : 1969 SPECIFICATION FOR PRESERVATIVE TREATED PLYWOOD

[*Page* 4, *clause* 3.1(b)] — Substitute 'trichlorophenol' *for* 'pentachlorophenol'.

(CED 20)

Reprography Unit, BIS, New Delhi, India

AMENDMENT NO. 3 JULY 2002
TO
IS 5539 : 1969 SPECIFICATION FOR PRESERVATIVE TREATED PLYWOOD

[*Page* 4, *clause* 3.1(b)] — Substitute 'Lindane' *for* 'benzene hexachloride and pp'-dichlorodiphenyl - trichloroethane (DDT)'.

(CED 20)

Reprography Unit, BIS, New Delhi, India

AMENDMENT NO. 4 FEBRUARY 2005
TO
IS 5539 : 1969 SPECIFICATION FOR PRESERVATIVE TREATED PLYWOOD

(*Page* 4, *clause* **5.1.3**) — Substitute 'Annex A' *for* 'Appendix A'.

(*Page* 5, *clauses* **5.1.4** *and* **5.2.1**) — Substitute 'Annex B' *for* 'Appendix B'

(*Page* 7, *clause* **7.1**) — Add the following new clauses after **7.1**:

8 DIMENSIONS AND TOLERANCES

8.1 The dimensions of plywood boards shall be as given below:

2 400 mm × 1 200 mm	2 100 mm × 900 mm
2 100 mm × 1 200 mm	1 800 mm × 900 mm
1 800 mm × 1 200 mm	

8.2 Thickness

The thickness shall be 3 mm, 4 mm, 5 mm, 6 mm, 8 mm, 9 mm, 12 mm, 15 mm, 19 mm, 22 mm and 25 mm.

NOTE — Any other dimensions (length, width and thickness) as agreed to between the manufacturer and the purchaser may also be used

8.3 Tolerances

Tolerances on the nominal sizes of finished boards shall be as given below:

Dimension	*Tolerance*
Length	$^{+6}_{-0}$ mm
Width	$^{+3}_{-0}$ 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

NOTE — Edge straightness and squareness shall be tested as per Annex C.

9 STATIC BENDING STRENGTH

Three test specimens taken in each direction from the sample of plywood, when tested in accordance with IS 1734 (Part 11) : 1983[3] shall have an average and a minimum individual Modulus of Elasticity and Modulus of Rupture not less than the values specified in Table 1.

Table 1 Average and Minimum Individual Values of Modulus of Elasticity (MOE) and Modulus of Rupture (MOR)
(*Clause* 9)

Direction	MOE (N/mm^2)		MOR (N/mm^2)	
	Average	Min. Ind.	Average	Min. Ind.
(1)	(2)	(3)	(4)	(5)
Along (Direction parallel to the grain direction of the face veneer)	5 000	4 500	40	36
Across (Direction perpendicular to the grain direction of the face veneer)	2 500	2 200	20	18

(*Page* 7, *footnote*) — Insert the following new footnote:

'[3]Method of test for plywood Part 11 Determination of static bending strength (*second revision*).'

(*Pages* 7 *and* 8, *clauses* **8**, **9**, **10** *and* **11**) — Renumber clause **8**, **9**, **10** and **11** as **10**, **11**, **12** and **13** and the sub-clauses, wherever they exist, accordingly.

(*Page* 8, *clause* **10.1**) — Substitute 'Annex A' *for* 'Appendix A'

[*Page* 8, *clause* **11.1**(c)] — Substitute 'Annex A' *for* 'Appendix A'.

(*Page* 9, *Appendix A and the clause references thereunder*) — Rename Appendix A as Annex A and substitute the clause references with '*Clauses* **5.1.3**, 5.1 4, **12.1** *and* **13.1**(c)'

(*Page* 11, *Appendix* B *and Table* 1) — Rename **APPENDIX B** as **ANNEX B** and Table 1 as Table 2.

(*Page* 11, *clause* **B-1.1**, *fourth line*) — Substitute 'Table 2' *for* 'Table 1'

(*Page* 13, *clause* **B-3.1**, *second line*) — Substitute 'Table 2' *for* 'Table 1'.

(*Page* 13, *clause* **B-3.1.1**) — Insert the following Annex C after Annex B:

ANNEX C

(*Clause* **8.3**)

METHOD OF TEST FOR EDGE STRAIGHTNESS AND SQUARENESS

C-1 PROCEDURE FOR EDGE STRAIGHTNESS

C-1.1 The straightness of the edges and ends of plywood shall be verified against a straight edge not less than the full length of the plywood. If the edge on the end of the plywood is convex, it shall be held against the straight edge in such a way as to give approximately equal gap at each end. The largest gap between the straight edge and the edge shall be measured to the nearest millimetre and recorded

C-2 PROCEDURE FOR SQUARENESS

C-2.1 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.

(CED 20)

Reprography Unit, BIS, New Delhi, India

Indian Standard

SPECIFICATION FOR PRESERVATIVE TREATED PLYWOOD

0. FOREWORD

0.1 This Indian Standard was adopted by the Indian Standards Institution on 22 December 1969, after the draft finalized by the Wood Products Sectional Committee had been approved by the Civil Engineering Division Council.

0.2 The various standards on plywood include provisions of treatment but these treatments are made mainly to give temporary protection to plywood in storage. Plywoods so treated are not proof against decay, marine borer and insect attack in service under all conditions. This standard specifies the methods of preservative treatment against these risks, suitable for plywood made with an adhesive complying with the requirements BWR type of adhesives.

0.3 In general, plywood can be given preservative treatment by the same methods as are used for solid wood. The degree of severity of any particular hazard varies and should be taken into account in deciding the type of preservation required of plywood so that it shall be economic as well as effective for its purpose. As a guiding principle, where maximum protection is required the plywood should be completely penetrated by the preservative so that no untreated wood is left exposed when the sheet is cut or drilled in use.

0.4 This standard does not cover plywood treated with fire retardants. Where fire risk is to be covered, plywood shall be treated with fire retarding chemicals conforming to IS : 5509-1969*. Sometimes certain service conditions may require plywood to be treated both with preservative and fire retardants, in which case reference shall be made to both the standards and the plywood shall conform to the requirements laid down in both these standards. The two treatments may be given either simultaneously or separately.

0.5 This standard contains clause **10.1** which requires the purchaser to specify whether plywood is to be treated with fire retardants only or with fire retardants and preservatives.

*Specification for fire retardant plywood.

0.6 Methods have been claimed for introducing the preservative chemicals or solutions in the plywood at the veneer stage. Most of the preservatives are likely to interfere in the gluing of veneers. If treatment is given at the veneering stage, care should, therefore, be taken that the glue strength is not interfered with by the preservatives either at the time of gluing or in long storage and use.

0.7 The presence of many of the preservatives on the surface of the plywood may interfere with subsequent gluing operations and the user should seek the advice of the plywood manufacturer. Similarly for painting purpose, the manufacturer of plywood should be consulted regarding the appearance and paintability of the finished treated plywood. Some of the preservatives may be toxic and advice of the manufacturer may be sought in handling such preservative treated plywood.

0.8 In the formulation of this standard due weightage has been given to international co-ordination among the standards and practices prevailing in different countries in addition to relating it to the practices in the field in this country.

0.9 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.

1. SCOPE

1.1 This standard covers the treatment of plywood for protection against fungi, termites and other insects and marine borers and requirements of preservative treated plywood.

2. TERMINOLOGY

2.1 For the purpose of this standard, definitions given in IS : 707-1968† and IS : 401-1967‡ shall apply.

3. TYPES OF PRESERVATIVES

3.1 The preservative used shall be of the following four types each consisting of one or more of the chemicals mentioned:

a) *Type 1 (Oil Type)* — Coal tar creosote with or without admixture with various grades of petroleum or other suitable oils having high boiling point.

*Rules for rounding off numerical values (*revised*).
†Glossary of terms applicable to timber and timber products (*first revision*).
‡Code of practice for preservation of timber (*second revision*).

b) *Type 2 (Organic Solvent Type)* — Copper naphthenate, zinc naphthenate, pentachlorophenol, benzene hexachloride and pp'-dichlorodiphenyl-trichloroethane (DDT).

c) *Type 3 (Water Soluble Non-fixing Type)* — Zinc chloride, boric acid, borax, sodium fluoride and sodium pentachlorophenate.

d) *Type 4 (Water Soluble 'Fixed' Type)* — Copper-chrome-arsenic composition, acid-copper-chrome composition, chromated zinc chloride and copper-chrome-boric composition.

NOTE — IS : 401-1967* gives the description of preservatives of the above four types.

4. PREPARATION OF PLYWOOD FOR TREATMENT

4.1 Plywood for preservative treatment shall be clean, free of oil or dirt patches on the surface and at a moisture content not exceeding 16 percent. If it is possible, particularly for method of treatment as in **5.2.3**, plywood which requires cutting to size, boarding, etc, should be so finished before treatment.

4.1.1 In case of veneered decorative plywood, care shall be taken that the colour of the preservative does not spoil or stain the decorative surface.

4.1.2 The plywood for treatment shall have been bonded with water resistant glue of the BWR type conforming to IS : 848-1957†.

4.1.3 For treatment of veneers by method as in **5.2.3**, the moisture content of the veneers before treatment shall be taken into account to determine the length of period of soaking.

5. TREATMENT

5.1 Choice of Treatment

5.1.1 The choice of treatment is governed by the timber species in the plywood, its sapwood content and the use of plywood after treatment.

5.1.2 Sapwood of all species of timber and heartwood of non-durable species require treatment. Heartwoods of durable species require treatment, if the plywood is to be placed in the ground or are required to give long life under severe service conditions like boats, pontoons, military equipment, etc, which are likely to be left in camouflage, forest or termite infestation danger conditions.

5.1.3 The recommended practice with regard to the choice of preservative treatment process, the amount of absorption and the penetration of the preservative is given in Appendix A.

*Code of practice for preservation of timber (*second revision*).

†Specification for synthetic resin adhesives for plywood (phenolic and aminoplastic).

5.1.4 Information with regard to durability and degree of treatability of different species of timbers is given in Appendix A of IS : 401-1967*. The natural durability and degree of treatability of different species of timbers used for manufacture of plywood are given in Appendix B.

5.2 Modes of Treatment — The types of treatment shall be any one of the methods described in **5.2.1** to **5.2.3**.

5.2.1 *Treatment of Plywood by Pressure Impregnation After Manufacture* — The partial permeability of the veneer and glue lines and penetration from the ends of the veneers make it possible to impregnate plywood by pressure or vacuum-cum-pressure treatment after manufacture of plywood. The plywood shall be of the BWR type (*see* IS : 303-1960†) to stand pressure impregnation. The degree of penetration depends on the permeability of timber used in the veneers. The treatability of the heartwood of various timbers has been listed in Table 3 of IS : 401-1967* and may be referred to. The natural durability and treatability of timbers used in plywood are given in Appendix B. The pressure and temperature shall be such as not to damage the structure of the wood.

5.2.1.1 The use of full-cell process is recommended for treatment of plywood by pressure impregnation. The plywood charge is introduced into the pressure cylinder. The plywood shall preferably be stacked vertical and if stacked horizontally suitable spacers or grills shall be inserted in between each sheet to permit free flow of solution all-round. With the pressure cylinder closed a vacuum of not less than 56 cm of mercury shall be applied and kept for 20 minutes to half-an-hour. At the end of the vacuum period, the preservative solution shall be introduced into the cylinder without breaking the vacuum and when the cylinder is filled with the preservative, it shall be subjected to a pressure of 2 to 12·5 kg/cm^2 depending on the species of timber and thickness of plywood. The pressure shall be maintained until the desired absorption is obtained, followed with breaking of pressure and application of vacuum again for 10 to 15 minutes to free the plywood from dripping preservative. The specified absorption and retention of preservative may be obtained by proper selection of the concentration of the preservative solution and the extent and duration of pressure.

5.2.1.2 The pressure impregnation process usually gives protection to the whole body of the plywood in thicknesses up to 19 mm. It is still advisable that surfaces left exposed when using pressure treated plywood by either drilling or cutting be liberally treated with a brush type of preservative compatible with the initial treatment.

5.2.2 *Treatment by Soaking or Surface Application of Preservative After Manufacture* — The treatments to be given are specified in **5.2.2.1** to **5.2.2.3**.

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*Code of practice for preservation of timber (*second revision*).

†Specification for plywood for general purposes (*revised*).

5.2.2.1 The penetration of preservatives applied by this method is limited and it is important that any drilling or cutting of plywood is carried out before treatment. If, however, this is impossible, any untreated surface exposed by drilling or cutting during use should be liberally brush treated with the preservative.

5.2.2.2 Surface application may be done either by brush, spray or dipping in the preservative solution for a short period. It is preferable to apply at least two coats of preservatives; the second and subsequent coats shall be applied when the first has partially dried or soaked into the plywood and the surface is still wet. The edges of plywood shall also be liberally treated.

5.2.2.3 Soaking treatment shall be carried out by submerging the plywood in solution for a sufficiently long period until the required absorption of the preservative is obtained. This method may be modified by adopting hot and cold dipping. Hot and cold dipping may be done in either of the two ways mentioned below:

a) By dipping the plywood in a hot solution of the preservative at a temperature of 80° to 90°C, maintaining at this temperature for a suitable period and allowing to cool until the required absorption of the preservative is obtained or alternatively, the plywood may be removed from the hot solution and dipped into another vessal of cold solution of the same preservative. Suitable loading and unloading arrangements shall be provided. The hot and cold process has also the effect of sterilization of plywood against insects that may be present.

b) By dipping the sheets of plywood as they come out of the hot press into the cold solution of the preservative and leaving it there till the required absorption is achieved.

5.2.3 *Treatment of Dry or Wet Veneers Before Assembly* — If timbers used in the manufacture of plywood are very refractory to treatment (*see* IS : 401-1967*) the plywood is difficult to treat after manufacture. However, the veneers, because they are thin, can be completely or nearly penetrated. Thoroughly impregnated plywood of any species can be obtained by treating the veneers before assembly. The method of treatment may be soaking with or without pressure for dry veneers and by diffusion for wet veneers. Normally, soaking of dry veneers in the preservative solution for a period of 15 to 30 minutes with arrangement that the solution approaches freely on all the surfaces of veneers is adequate in veneer thicknesses up to 1·6 mm for refractory timbers and up to 3 mm in others. For veneers of refractory timbers in thicknesses over 1 6 mm full penetration is difficult to attain by soaking alone. The method of diffusion is to soak the veneers in the preservatives for a period of 10 to 15 minutes and solid stack them for a

*Code of practice for preservation of timber (*second revision*).

period of 1 to 2 hours to allow the diffusion of the preservatives into the interior of the veneer.

5.2.3.1 It is necessary to ensure that the adhesive used in the subsequent bonding of veneers is compatible with the preservative treatment.

5.2.3.2 This method gives plywood with preservative dispersed uniformly in the thickness of plywood and no further treatment of cut and drilled surfaces is required before use.

6. CONDITIONING

6.1 Plywood when treated as in **5.2.1** to **5.2.3** shall, after treatment, be conditioned to a moisture content not more than 14 percent for interior uses and not more than 18 percent for exterior uses. For certain applications, a higher moisture content may be agreed to between the supplier and the purchaser. If treated plywood is required to be painted subsequently, the moisture content shall be not less than 6 percent and not more than 14 percent.

6.2 After treatment of veneers as in **5.2.3**, the veneers shall be suitably dried to a moisture content suitable for the gluing conditions which is usually not exceeding 10 percent.

7. BONDING

7.1 The glue adhesion of preservative treated plywood shall meet the requirements of type BWR according to IS:303-1960*.

8. WORKMANSHIP AND FINISH

8.1 The finished plywood shall be reasonably clean to handle and free of dirt and stain other than any uniform colour of the preservative.

9. SAMPLING AND TESTING

9.1 For the purpose of test, samples shall be taken out of a batch as given in IS:303-1960*.

9.2 The net absorption of the preservative in the plywood shall be determined with the chemical analysis of the treated plywood according to the methods specified in IS:2753 (Part I)-1964† and IS:2753 (Part II)-1966‡.

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*Specification for plywood for general purposes (*revised*).

†Methods for estimation of preservatives in treated timber and in treating solutions: Part I Determination of copper, arsenic, chromium, zinc, boron, creosote and fuel oil.

‡Methods for estimation of preservatives in treated timber and in treating solutions: Part II Determination of copper (in copper naphthenate) and pentachlorophenol.

9.2.1 The net retention of preservatives may be compared with the figure obtained from service tank reading or weight of the charge before and after treatment. For this purpose, the manufacturer may be required to maintain an absorption log book and furnish a certificate as to the net absorption.

9.2.2 The extent of penetration of the preservative may be done by taking out pieces from the treated plywood at random and at least 15 cm away from the edges and further by boring or cutting or determining the extent of penetration of preservative as specified in one of the methods given in Appendix C of IS : 401-1967*.

10. REQUIREMENTS FOR ABSORPTION OF PRESERVATIVE

10.1 The net absorption of the preservative shall be as specified by the purchaser depending on the situations of use (*see* Appendix A)

11. MARKING

11.1 Each plywood sheet shall be marked legibly and indelibly near the edge with the following:

a) Manufacturer's name, his initials or recognized trade-mark, if any;

b) The year of manufacture;

c) IS number and treatment mark as in Appendix A, and

d) The type of plywood (conforming to IS : 303-1960†, IS : 710-1957‡ and IS : 1328-1958§).

11.1.1 Each sheet 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. Presence of this 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 during production. This system, which is devised and supervised by ISI and operated by the producer, has the further safeguard that the products as actually marketed are continuously checked by ISI for conformity to the standard. 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

*Code of practice for preservation of timber (*second revision*).
†Specification for plywood for general purposes (*revised*).
‡Specification for marine plywood.
§Specification for veneered decorative plywood.

APPENDIX A

[*Clauses* 5.1.3, 5.1.4, 10.1 *and* 11.1 (c)]

RECOMMENDED PRACTICE FOR PRESERVATIVE TREATMENT OF PLYWOOD FOR VARIOUS SERVICE CONDITIONS

Sl No	Service Conditions for Treated Plywood	Timber Used in Plywood According to the Relevant Indian Standard on Plywood Required to be Treated	Type of Preservative Recommended as in Clause 3	Mode of Treatment Recommended as in Clause 5	Minimum Retention, kg/m³
(1)	(2)	(3)	(4)	(5)	(6)
i)	Plywood in direct contact with water or ground and required to be painted as for pontoons, boats, rafts, tugs, fence posts, box columns, etc (IS : 710-1957*)	All	Type 4 (copper-chrome-arsenic composition or acid-copper-chrome composition)	Pressure process (**5.2.1**) Veneer treatment (**5.2.3**)	12·0 12·0
ii)	Plywood in direct contact with water or ground and required to be painted as for pontoons, boats, rafts, tugs, fence posts, box columns, etc (IS : 710-1957*) but plywood not requiring light painting or only black coal tar base (IS : 710-1957*)	All	a) Type 4 (copper-chrome-arsenic composition or acid-copper-chrome composition) b) Type 1 [creosote or creosote fuel oil mixture (50 : 50)]	Pressure process (**5.2.1**) Pressure process (**5.2.1**)	12·0 100·0
iii)	Marine structures exposed to marine borer danger (IS : 710-1957*)	All	Type 1 [creosote or creosote fuel oil mixture (50 : 50)]	Pressure process (**5.2.1**)	200·0
iv)	Concrete shuttering plywood (IS : 4990-1969†)	All	Type 4 (copper-chrome-arsenic composition or acid-copper-chrome composition)	Pressure process (**5.2.1**) Veneer treatment (**5.2.3**)	12·0 12·0
v)	Plywood for outer cladding of houses, roofing, bunkers and shelters, and in other conditions exposed to rain, sun and outer weather but requiring painting (IS : 303-1960‡ BWR Grade)	All	Type 4 (copper-chrome-arsenic composition or acid-copper-chrome composition)	Veneer treatment (**5.2.3**)	12·0
vi)	Plywood for outer cladding of houses, roofing, bunkers and shelters, and in other conditions exposed to rain, sun and outer weather but requiring painting, but paint and colour not important (IS : 303-1960‡ BWR Grade)	All	Type 1 [creosote or creosote fuel oil mixture (50 : 50)]	Pressure process (**5.2.1**)	100·0
vii)	Plywood for bus flooring or rail coach flooring (IS 303-1960‡ BWR Grade)	All	Type 4 (copper-chrome-arsenic composition or acid-copper-chrome composition) or Type 1 [creosote or creosote fuel oil mixture (50 : 50)]	Pressure process (**5.2.1**)	75·0 75·0
viii)	Plywood not in direct contact with ground or water but exposed and given paint or varnish regularly as in plywood for rail coach ceilings, partitioning and other interior use, bus interior, ammunition boxes, exterior doors, etc (IS : 303-1960‡ BWR Grade)	All timbers except when only heartwood of durable timber is used	Type 4 (copper-chrome-arsenic composition or acid-copper-chrome composition) or Type 2	Pressure or soaking (**5.2.1** and **5.2.2**)	5·5 4·5
ix)	Decorative panelling on rail coaches and shipbuilding (IS : 303-1960‡ BWR Grade)	do	Type 2 or Type 3 not colour imparting	Pressure process or soaking (**5.2.1** or **5.2.2**)	4·0
x)	Plywood for internal uses in dry localities, such as inner partitions, panelling, wall boarding, ceiling and furniture (IS : 303-1960‡ and IS : 1328-1958§)	do	Type 2 or Type 3 or Type 4	Pressure process or soaking (**5.2.1** or **5.2.2**)	4·0

*Specification for marine plywood.
†Specification for plywood for concrete shuttering work.
‡Specification for plywood for general purposes (*revised*).
§Specification for veneered decorative plywood.

APPENDIX B

(*Clauses* 5.1.4 *and* 5.2.1)

NATURAL DURABILITY AND DEGREE OF TREATABILITY OF DIFFERENT SPECIES OF TIMBER USED FOR MANUFACTURE OF PLYWOOD

B-1. SPECIES OF TIMBER

B-1.1 All the species of timber, used for manufacture of plywood according to the relevant Indian Standards on plywood giving the natural durability of their heartwood and degree of treatability with preservative liquids or solutions, are listed in Table 1. Column 3 of Table 1 indicates the relevant (*see* foot-note) designations:

TABLE 1 DURABILITY AND TREATABILITY OF TIMBER FOR PLYWOOD

Sl No.	Botanical Name	Relevant Indian Standard on Plywood/ Class of Plywood	Class of Durability as in B-2.2	Treatability as in B-3.1
(1)	(2)	(3)	(4)	(5)
1.	*Acer* sp.	A (Class I), B and C	III	e
2.	*Acrocarpus fraxinifolius*	A (Class I)	III	c
3.	*Adina cordifolia*	A (Class I)	III	c
4.	*Albizzia* sp.	A (Class I)	I	e
5.	*Amoora* sp	A (Class I)	I	b
6.	*Artocarpus chaplasha*	A (Class I), B	II	d
7.	*Artocarpus hirsutus*	A (Class I), C	III	d
8.	*Betula* sp.	A (Class I), C	II	e
9.	*Calophyllum* sp.	A (Class I)	II	e
10	*Carapa moluccensis*	A (Class I)	I	c
11.	*Cedrela toona*	A (Class I)	III	c
12.	*Chukrasia tabularis*	A (Class I), B and C	III	c
13.	*Cinnamomum ceicodaphne*	A (Class I)	III	b
14.	*Dalbergia latifolia*	A (Class I), C	I	e
15.	*Dalbergia sissoo*	A (Class I), B and C	I	e
16.	*Dichopsis elliptica* (Syn. *of Palaquium ellipticum*)	A (Class I), C, D and E	II	e
17.	*Dillenia* sp.	A (Class I)	III	d
18.	*Diospyros* sp.	A (Class I)	II	b
19.	*Dipterocarpus macrocarpus*	A (Class I), C	III	b
20.	*Dipterocarpus* sp.	A (Class I)	II	b
21.	*Dysoxylum malabaricum*	A (Class I), B and C	I	d
22.	*Eugenia jambolana*	A (Class I)	II	e
23.	*Gmelina arborea*	A (Class I)	I	—
24.	*Holoptelia integrifolia*	A (Class I), B	III	b
25.	*Juglans regia*	A (Class I), B and C	III	d
26.	*Lagerstroemia hypoleuca*	A (Class I)	I	e
27.	*Lannea grandis*	A (Class I)	III	e
28.	*Machilus macrantha*	A (Class I)	I	b

(*Continued*)

TABLE 1 DURABILITY AND TREATABILITY OF TIMBER FOR PLYWOOD — *Contd*

Sl No.	Botanical Name	Relevant Indian Standard on Plywood/ Class of Plywood	Class of Durability as in B-2.2	Treatability as in B-3.1
(1)	(2)	(3)	(4)	(5)
29.	*Mangifera indica*	A (Class I), B and C	III	a
30.	*Michelia champaca*	A (Class I), B and C	III	c
31.	*Phoebe* sp.	A (Class I), C	III	c
32.	*Polyalthia fragrans*	A (Class I)	III	b
33.	*Pterospermum acerifolium*	A (Class I)	II	e
34.	*Shorea assamica*	A (Class I)	III	c
35.	*Swietenia* sp.	A (Class I)	II	e
36.	*Tectona grandis*	A (Class I)	I	c
37.	*Terminalia myriocarpa*	A (Class I)	III	a
38.	*Terminalia tomentosa*	A (Class I), B	II	b
39.	*Vateria indica*	A (Class I), C	III	e
40.	*Zanthoxylum rhetsa*	A (Class I), C	II	d
41.	*Alnus nepalensis*	A (Class II)	II	d
42.	*Artocarpus integrifolia*	A (Class II)	II	d
43.	*Canarium* sp.	A (Class II), E	III	b
44.	*Carallia integerrima*	A (Class II)	III	b
45.	*Cullenia excelsa*	A (Class II)	III	b
46.	*Hardwickia pinnata*	A (Class II)	II	e
47.	*Planchonia andamanica*	A (Class II)	II	e
48.	*Schima wallichii*	A (Class II)	—	—
49.	*Terminalia arjuna*	A (Class II)	II	b
50.	*Terminalia bellirica*	A (Class II)	III	b
51.	*Terminalia paniculata* Roth	A (Class II), B	II	c
52.	*Termanalia tialata*	A (Class II)	III	c
53.	*Ailanthus* sp	A (Class III)	III	b
54.	*Alstonia scholaris*	A (Class III)	III	b
55.	*Anthocephalus cadamba*	A (Class III)	III	a
56.	*Bombax insigne*	A (Class III)	III	a
57.	*Boswellia serrata*	A (Class III)	III	e
58.	*Duabanga sonneratioides*	A (Class III)	III	c
59.	*Garuga pinnata*	A (Class III)	III	e
60.	*Grevillea robusta*	A (Class III), B	III	e
61.	*Kydia calycina*	A (Class III)	III	b
62.	*Litsaea polyantha*	A (Class III)	III	b
63.	*Lophopetalum wightianum*	A (Class III)	III	—
64.	*Salmalia malabarica*	A (Class III)	III	a
65.	*Spondias* sp.	A (Class III)	III	—
66.	*Sterculia alata*	A (Class III)	III	a
67.	*Sterculia foetida*	A (Class III)	III	a
68.	*Sterculia villosa*	A (Class III)	III	a
69.	*Teterameles nudiflora*	A (Class III)	III	a
70.	*Trewia nudiflora*	A (Class III)	III	a

A stands for IS : 303 - 1960 Specification for plywood for general purposes (*revised*)
B stands for IS : 710 - 1957 Specification for marine plywood.
C stands for IS : 1328 - 1958 Specification for veneered decorative plywood.
D stands for IS : 4859 - 1968 Specification for high strength aircraft plywood.
E stands for IS : 4990 - 1969 Specification for plywood for concrete shuttering work.

B-2. CLASSIFICATION FOR DURABILITY

B-2.1 This is based on the open graveyard tests done at the Forest Research Institute, Dehra Dun or elsewhere in the country with test specimens of size 60 × 5 × 5 cm of heartwood of the timbers and exposed to fungus, termites, and other insect and rot dangers.

B-2.2 The timbers are classified for durability according to the average life of these test specimens as follows:

Class I Timbers having average life of 120 months and over,

Class II Timbers having average life of 60 to 119 months, and

Class III Timbers having average life of 59 months and below.

B-3. CLASSIFICATION FOR TREATABILITY

B-3.1 The treatability of the heartwood of different species is indicated in five grades in col 5 of Table 1 each grade being defined as indicated below:

a) Heartwood easily treatable;

b) Heartwood treatable, but complete penetration not always obtained;

c) Heartwood only partially treatable;

d) Heartwood refractory to treatment; and

e) Heartwood very refractory to treatment, penetration of preservative being practically nil even from the ends.

B-3.1.1 These grades are based on experiments carried out on the pressure and non-pressure treatments of various timbers with creosote-crude oil mixtures and with water-soluble preservatives under conditions of treatment which are normally used for these processes. The grades should, therefore, be taken to represent approximately the degree of resistance offered by the heartwood of the species to the penetration of preservative solutions under 10·50 kg/cm² hydraulic pressure. In the case of treatment with creosote crude oil mixture, the liquid is usually heated to 80° to 90°C but with aqueous solutions, the treatment is generally carried out in the cold to avoid precipitation of the salts.

(*Continued from page* 1)

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