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IS 5509 (2000): Fire Retardant Plywood -Specification [CED
20: Wood and other Lignocellulosic products]



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भारतीय मानक
अग्निरोधी प्लाईवुड — विशिष्टि
(दूसरा पुनरीक्षण)

Indian Standard
FIRE RETARDANT PLYWOOD — SPECIFICATION
(*Second Revision*)

ICS 13.220.50, 79.060.10

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

FOREWORD

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

Plywood is similar to solid wood of comparable density and thickness in its behaviour towards fire. Fire retardant characteristics is a very important property to prevent propagation of fire at the initial stages. Being an organic material, plywood cannot be made completely fireproof. However, its resistance to ignition, surface spread of flame, flame penetration, etc, can be improved by suitable treatments. For certain uses, for example, in ship building and railway coach construction, plywood treated against fire is required.

Methods have been claimed for introducing fire resistant chemicals in the plywood at the veneer stage. Such chemicals 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 fire resistant chemical used either at the time of gluing or during long storage and use. However, the extensively used method of treating plywood against fire risk is to impregnate the same after manufacture, with fire retardant chemicals and hence this standard lays down only impregnation methods of fire retardant treatment and the requirements of such plywood.

The presence of fire retardant chemicals on the surface of plywood may interfere with subsequent gluing operations. Similarly, some of the fire retardant chemicals treatment may require special paints for painting of finished plywood. The user should seek the advice of the plywood manufacturer in these cases.

This standard was first published in 1969 and subsequently revised in 1980. This revision is based on the experience gained in the manufacture and use of the fire retardant plywood over these years and the modifications incorporated in this version mainly relate to the fire retardant requirements, selection of specimen. According to 6.2.1 of this standard the purchaser should specify whether plywood is to be treated with fire retardants only or with fire retardants and preservatives.

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.

A scheme of labelling environment friendly products to be known as ECO-Mark has been introduced at the instance of the Ministry of Environment and Forests (MEF), Government of India. The ECO-Mark shall be administered by the Bureau of Indian Standards (BIS) under the *Bureau of Indian Standards Act, 1986* as per the Resolution No. 71 dated 21 February 1991 and Resolution no. 425 dated 28 October 1992 published in the Gazette of the Government of India. For a product to be eligible for ECO-Mark, it shall also carry the Standard Mark of the BIS besides meeting additional environment friendly requirements. For this purpose, the Standard Mark of BIS would be a single mark being a combination of the ISI mark and the ECO logo. Requirements to be satisfied for a product to qualify for the BIS Standard Mark for ECO friendliness, will be optional; manufacturing units will be free to opt for ISI Mark alone also.

The criteria pertaining to ECO-Mark is based on the Gazette Notification No. 170 dated May 18, 1996 for Wood Substitutes as Environment Friendly Products published in the Gazette of India.

The Committee responsible for the preparation of this standard is given at Annex A.

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

FIRE RETARDANT PLYWOOD — SPECIFICATION

(*Second Revision*)

1 SCOPE

This standard covers the fire retardant chemicals, method of treatment, retentions and requirements of fire retardant plywood.

2 NORMATIVE REFERENCES

The following Indian Standards, 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 agreement based on this standard are encouraged to investigate the possibility of applying the most recent editions of the standards indicated below:

<i>IS No.</i>	<i>Title</i>
303 : 1989	Specification for plywood for general purposes (<i>third revision</i>)
401 : 1982	Code of practice for preservation of timber (<i>third revision</i>)
707 : 1976	Glossary of terms applicable to timber technology and utilization (<i>second revision</i>)
1734	Method of test for plywood
(Part 1) : 1983	Determination of density and moisture content (<i>second revision</i>)
(Part 3) : 1983	Determination of fire resistance (<i>second revision</i>)
7638 : 1999	Wood/Lignocellulosic based panel products — Method of Sampling (<i>second revision</i>)
12049 : 1987	Dimensions and tolerances relating to wood based panel materials
12120 : 1987	Code of practice for preservation of plywood and other panel products

3 TERMINOLOGY

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

3.2 Flame Retardant

A substance when suitably applied to the plywood reduces the rate at which the flame will spread across the surface of plywood or penetrate it.

3.3 Preservative

A substance when suitably applied to the plywood makes it resistant to attack by fungi, termite and other insects or marine borers.

4 FLAME RETARDANTS

4.1 Flame retardant chemicals used for treatment of plywood shall generally be the following:

- Type 1 Ammonium phosphates
- Type 2 Ammonium sulphate
- Type 3 Boron compounds
- Type 4 Combination of ammonium phosphate and boron compounds
- Type 5 Combination of ammonium sulphate and ammonium phosphate

4.2 Where flame retardant and preservative treatment are required together, the types of preservative chemicals and their retention shall be as given in IS 12120.

NOTE — Flame retardants commonly used are not fixed in the plywood, they are leachable and therefore, plywood treated as such is not meant to be used under conditions which encourage leaching or migration of the flame retardant chemicals.

4.3 In all the cases the treatment shall be such that the treated plywood meets the requirements of fire retardant plywood laid down in this standard.

5 PREPARATION OF PLYWOOD FOR TREATMENT

5.1 The plywood to be given fire retardant treatment shall conform to BWR grade of IS 303 to be able to stand pressure impregnation. Plywood for treatment shall be clean, free from oil or dirt patches on the surface and at a moisture content not exceeding 15 percent. In case of veneered decorative plywood care shall be taken that the colour of the solution does not spoil the decorative surface.

For ECO-Mark, the plywood shall conform to the requirements of ECO-Mark specified in IS 303.

6 FIRE RETARDANT TREATMENT

6.1 Type of Treatment

In order to comply with the requirements of this standard

the types of treatment shall be either according to 6.1.1 or 6.1.2.

6.1.1 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-pressure treatment after manufacture of plywood. 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 IS 401 and may be referred to. The pressure and temperature shall be such as not to damage the structure of the wood.

6.1.1.1 The pressure treatment shall be done by the full cell process. The plywood shall preferably be kept vertical in the pressure cylinder, and if stacked horizontally suitable spacers or grills shall be inserted between each sheet to permit free flow of solution all round. A vacuum of not less than 560 mm Hg shall be applied and kept for 20 min to half-an-hour. The flame retardant solution shall be introduced into the pressure cylinder when the vacuum is on and the filling subjected to a pressure of 2 to 12 kg/cm² depending on the species of timber and thickness of the board treated. The specified absorption and retention of flame retardant solution may be obtained by proper selection of the concentration of a suitable flame retardant solution. The pressure shall be maintained till required absorption is obtained and followed with the breaking of pressure, application of vacuum again for 10 to 15 min to free the plywood from dripping solution.

6.1.2 Soaking Treatment

This may be carried out by submerging plywood in solution for sufficiently long period until the required absorption of the solution is obtained.

6.1.2.1 This method may also be modified by adopting hot and cold dipping. The plywood shall first be dipped in hot solution at a temperature of 80 to 90 °C, maintaining this temperature for a suitably long period and then dipped in cold solution of the chemical until the required absorption of the solution is obtained.

6.2 Choice of Treatment

6.2.1 The choice of treatment may be left to the manufacturer of plywood as long as the fire resistant requirements prescribed in 12.3 are met. The purchaser should, however, specify whether plywood is to be treated with fire retardants only or with fire retardants and preservatives.

6.2.2 The recommended retention of fire retardant

chemicals for different hazards like interior or exterior use not subject to leaching by rain and water is of the order of 50 kg/m³.

7 CONDITIONING AFTER TREATMENT

Plywood after treatment shall be conditioned to suitable equilibrium moisture content of not more than 20 percent.

8 DIMENSIONS AND TOLERANCES

Dimensions and tolerances of fire retardant plywood shall conform to IS 12049. The tolerance for thickness shall conform to IS 303.

9 WORKMANSHIP AND FINISH

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

10 SAMPLING

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

11 TEST SPECIMEN AND NUMBER OF TESTS

From each of the fire retardant plywood selected as in 10, following test specimens shall be cut from portions 150 mm away from the edges for tests specified in 12.

- a) *For Flammability* — Six test specimens 125 mm × 125 mm in full thickness of material from each sample.
- b) *For Flame Penetration* — Three test specimens 125 mm × 125 mm in full thickness of material from each sample.
- c) *For Rate of Burning* — Three test specimens 100 mm × 12.5 mm in full thickness of material from each sample.

12 TEST REQUIREMENTS

12.1 Test specimens prepared as per 11 shall be subjected to tests specified under 12.2 to 12.4.

12.2 Moisture Content

The moisture content of fire retardant plywood when tested in accordance with IS 1734 (Part 1) shall not exceed 20 percent.

12.3 Fire Retardant Requirements

12.3.1 Flammability

When tested in accordance with 3 of IS 1734 (Part 3) for flammability, the time taken for the second

ignition shall not be less than 30 min.

NOTE — Continuous flame on the second specimen for one minute shall be considered as second ignition.

12.3.2 Flame Penetration

When tested in accordance with 4 of IS 1734 (Part 3), the time taken for flame penetration shall not be less than 15 min for every 6 mm thickness.

NOTE — For thickness t mm of plywood the minimum time for flame penetration of plywood will be $\frac{1.5}{6}t$ minutes.

12.3.3 Rate of Burning

When tested in accordance with 5 of IS 1734 (Part 3), the time taken to lose weight from 30 percent to 70 percent shall not be less than 20 min.

12.4 Other Tests

The plywood when tested for glue shear strength in dry state, mycological test, water resistance test and for any other mechanical property as agreed to between the purchaser and supplier, shall meet the requirements of BWR grade of IS 303.

13 OPTIONAL REQUIREMENTS FOR ECO-MARK

13.1 General Requirements

13.1.1 The plywood shall conform to the requirements of quality and performance as specified in this standard as well as the requirements of ECO-Mark as specified in IS 303.

13.1.2 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* alongwith the authorization, if required under the *Environment (Protection) Act 1986*, while applying for ECO-Mark appropriate with enforced rules and regulations of Forest Department.

13.2 Specific Requirements

The Plywood shall conform to the specific requirements given for ECO-Mark under relevant clause 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.

14 MARKING

14.1 Each board shall be legibly and indelibly marked near the edge with the following:

- Manufacturer's name, his initials or his recognized trade mark, if any;
- Year of manufacture;
- Type of treatment; and
- Criteria for which the plywood has been labelled as ECO-Mark.

14.2 BIS Certification Marking

14.2.1 Each board may also be marked with the Standard Mark.

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

♦

ANNEX A
(Foreword)

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The South Indian Plywood Manufacturers' Association, Kannur

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Review of Indian Standards

Amendments are issued to standards as the need arises on the basis of comments. Standards are also reviewed periodically; a standard along with amendments is reaffirmed when such review indicates that no changes are needed; if the review indicates that changes are needed, it is taken up for revision. Users of Indian Standards should ascertain that they are in possession of the latest amendments or edition by referring to the latest issue of 'BIS Handbook' and 'Standards : Monthly Additions'.

This Indian Standard has been developed from Doc : No. CED 20 (5497).

Amendments Issued Since Publication

Amend No.	Date of Issue	Text Affected

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AMENDMENT NO. 1 FEBRUARY 2005
TO
IS 5509 : 2000 FIRE RETARDANT PLYWOOD —
SPECIFICATION

(Second Revision)

(Page 2, clause 8) — Substitute the following for the existing:

8 DIMENSIONS AND TOLERANCES

8.1 The dimensions of plywood boards shall be as follows:

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

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

<i>Dimension</i>	<i>Tolerance</i>
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
Squareness	or 0.2 percent
	2 mm per 1 000 mm
	or 0.2 percent

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

(*Page 3, clause 14*) — Insert the following Annex after **14.2.2**:

ANNEX A
(Clause 8.3)

METHOD OF TEST FOR EDGE STRAIGHTNESS AND SQUARENESS

A-1 PROCEDURE FOR EDGE STRAIGHTNESS

A-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.

A-2 PROCEDURE FOR SQUARENESS

A-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.

(*Page 4, Annex A*) — Rename 'Annex A' as 'Annex B'.

(CED 20)

AMENDMENT NO. 2 SEPTEMBER 2006
TO
IS 5509 : 2000 FIRE RETARDANT PLYWOOD —
SPECIFICATION

(Second Revision)

(Page 3, clause 13, Title) — Substitute 'ADDITIONAL' for
'OPTIONAL'.

(CED 20)