

भारतीय मानक
Indian Standard

IS 5509 : 2021

अग्निरोधी प्लाइवुड — विशिष्टि
(तीसरा पुनरीक्षण)

**Fire Retardant Plywood —
Specification**
(*Third Revision*)

ICS 79.060.10

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Price Group 4

Wood and Other Lignocellulosic Products Sectional Committee, CED 20

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 is similar to solid wood of comparable density and thickness in its behaviour towards fire. Fire retardant characteristic 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.

The extensively used method of treating plywood against fire risk is to treat the same after manufacture, with fire retardant chemicals. Also, fire resistant chemicals can be introduced in the plywood at the veneer stage. Such chemicals, however, 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.

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 and 2000. This revision is based on the experience gained in the manufacture and use of the fire retardant plywood over these years and use of this standard since the last revision. In this revision, the following major modifications have been incorporated:

- a) Flame-retardant chemicals other than those specified in this standard that meet fire-retardance requirements have been permitted to be used, and the same shall have to be declared.
- b) Preparation of treatment has been revised.
- c) Soaking treatment for wood veneer for fire retardance has been added.
- d) Clause of recommended retention of fire retardant chemicals for different hazards has been deleted.
- e) Clause on other tests has been modified.
- f) Marking clause has been revised.
- g) Requirements have been prescribed in more user-friendly way and cross-references to other Indian Standards have been updated.

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, Forest 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*. For a product to be eligible for ECO-Mark, it shall also carry the Standard Mark of the BIS besides meeting additional environment friendliness requirements. For this purpose, the Standard Mark of BIS would be a single mark being a combination of the BIS Standard Mark (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; and 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 formulation of this standard is given at Annex B.

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

(Third Revision)

1 SCOPE

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

2 REFERENCES

The standards listed below 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 editions of the standards indicated in below:

IS No.	Title
303 : 1989	Specification for plywood for general purposes (<i>third revision</i>)
401 : 2001	Code of practice for preservation of timber (<i>fourth revision</i>)
707 : 2011	Glossary of terms applicable to timber technology and utilization (<i>third 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>)
12120 : 1987	Code of practice for preservation of plywood and other panel products

3 TERMINOLOGY

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

3.1 Flame Retardants — The substances when suitably applied to the plywood reduce the rate at which the flame will spread across the surface of plywood or penetrate it.

3.2 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 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

Type 6 : Chemicals other than those given in Types 1 to 5, which meet fire retardance requirements.

NOTE — In case of Type 6, name of the chemical compound shall be declared by the manufacturer.

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 FOR TREATMENT

5.1 Fire retardant treatment is given on plywood. However, it can also be given at veneer stage followed by treatment after manufacture of plywood therefrom.

5.2 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.

5.3 In case of fire retardant treatment is given at veneer stage and finally after the manufacture of plywood, the plywood so made shall conform to BWR grade of IS 303.

IS 5509 : 2021

6 FIRE RETARDANT TREATMENT

6.1 Method of Treatment

Plywood can be given fire retardant treatment either by pressure impregnation after manufacture or by soaking of plywood/veneer. In case of fire retardant treatment at veneer stage, the same shall be done by soaking method.

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-cum-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 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 of Hg shall be applied and kept for 20 min to 30 min. The flame retardant solution shall be introduced into the pressure cylinder when the vacuum is on and the filling subjected to a pressure of 0.2 N/mm² to 1.2 N/mm² 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, and 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/veneer in solution for sufficiently long period until the required absorption of the solution is obtained.

6.1.2.1 One way of doing is 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 dipping in cold solution of the chemical until the required absorption of the solution is obtained.

6.1.2.2 Other way of doing is soaking the wood veneer in solution before making plywood followed by another soaking treatment after making plywood.

6.2 Choice of Treatment

The choice of fire retardant treatment may be left to the manufacturer of plywood as long as the fire resistant requirements prescribed in **12.1** are met.

7 CONDITIONING AFTER TREATMENT

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

8 DIMENSIONS AND TOLERANCE

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 in Table 1.

Table 1 Tolerances on Nominal Sizes of Fire Retardant Plywood
 (Clause 8.3)

Sl No.	Dimension	Tolerance
(1)	(2)	(3)
i)	Length	+6 mm -0
ii)	Width	+3 mm -0
iii)	Thickness:	
	a) Less than 6 mm	± 10 percent
	b) 6 mm and above	± 5 percent
iv)	Edge straightness, Max	2 mm/1 000 mm or 0.2 percent
v)	Squareness, Max	2 mm /1 000 mm or 0.2 percent

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

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 AND CRITERIA FOR CONFORMITY

The method of drawing representative sample 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 specimen 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 Fire retardant plywood shall comply with the requirements given in Table 2 and those specified under 12.2.

Table 2 Requirements for Fire Retardant Plywood
 (Clause 12.1)

SI No.	Characteristic	Requirement	Method of Test, Ref to
(1)	(2)	(3)	(4)
i)	Moisture content, percent, <i>Max</i>	20	IS 1734 (Part 1)
ii)	Flammability (see Note 1), minutes, <i>Min</i>	30	IS 1734 (Part 3)
iii)	Flame penetration (see Note 2), minutes, <i>Min</i>	15	IS 1734 (Part 3)
iv)	Rate of burning (see Note 3), minutes, <i>Min</i>	20	IS 1734 (Part 3)

NOTES

1 Flammability is measured as the time taken for second ignition. Continuous flame on the second specimen for 1 min shall be considered as second ignition.

2 The requirement of 15 min is applicable for plywood of upto 6 mm. For the thickness, *t* above 6 mm, the minimum time for flame penetration of plywood will be $15 \times \left(\frac{t}{6}\right)$ min.

3 Time taken to lose weight from 30 percent to 70 percent.

12.2 Other Tests

For other properties as specified in IS 303, the fire retardant plywood for other properties shall meet the

requirements of BWR grade of IS 303, in accordance with the methods specified therein.

13 ADDITIONAL 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* 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.

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 or stamped with the following particulars:

- a) Manufacturer's name and his initials or his recognized trade-mark, if any;
- b) In words 'Fire Retardant Plywood';
- c) Year of manufacture;
- d) Type and method of treatment;
- e) Batch number; and
- f) Criteria for which the plywood has been labelled as ECO-Mark.

14.2 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 thereunder, and the products may be marked with the Standard Mark.

IS 5509 : 2021

ANNEX A

(*Table 1*)

METHOD OF TEST FOR EDGE STRAIGHTNESS AND SQUARENESS

A-1 PROCEDURE FOR EDGE STRAIGHTNESS

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 straightness 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

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 square to the plywood. The maximum width of the gap shall be recorded.

ANNEX B

(Foreword)

COMMITTEE COMPOSITION

Wood and Other Lignocellulosic Products Sectional Committee, CED 20

<i>Organization</i>	<i>Representative(s)</i>
Indian Plywood Industries Research & Training Institute, Bengaluru	SHRI M. P. SINGH (Chairman)
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IS 5509 : 2021

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