

इंटरनेट

मानक

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Mazdoor Kisan Shakti Sangathan

“The Right to Information, The Right to Live”

“पुराने को छोड़ नये के तरफ”

Jawaharlal Nehru

“Step Out From the Old to the New”

IS 14616 (1999): Laminated veneer lumber - Specification  
[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”

Bhartrhari—Nitiśatakam

“Knowledge is such a treasure which cannot be stolen”



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**IS 14616 : 1999**  
REAFFIRMED 2009

**भारतीय मानक  
परतणत विनियर लम्बर — विशिष्टि**

*Indian Standard*

**LAMINATED VENEER LUMBER —  
SPECIFICATION**

ICS 83.140.20.79.060.10

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

*January 1999*

Price Group 4

**AMENDMENT NO. 1 JUNE 2005  
TO  
IS 14616 : 1999 LAMINATED VENEER LUMBER —  
SPECIFICATION**

( Page 2, clause 8.2.3 ) — Substitute the following for the existing:

'Six specimens each shall be tested for modulus of rupture and modulus of elasticity, compressive strength parallel to grain and perpendicular to grain (both parallel and perpendicular to laminate), horizontal shear strength (both parallel and perpendicular to grain), tensile strength parallel to grain and nail and screw holding power in accordance with the methods given in IS 1659 (Annex J), IS 1708 (Part 8), IS 1708 (Part 11), IS 1734 (Part 9) and IS 1708 (Part 15), respectively and the average values for each test shall conform to the requirements given under SI No. (i) to (vii) of Table 1. The placement of forces for compressive strength shall be as given in Fig. 1.'

( Page 3, clause 10 ) — Insert the following figure after the clause:

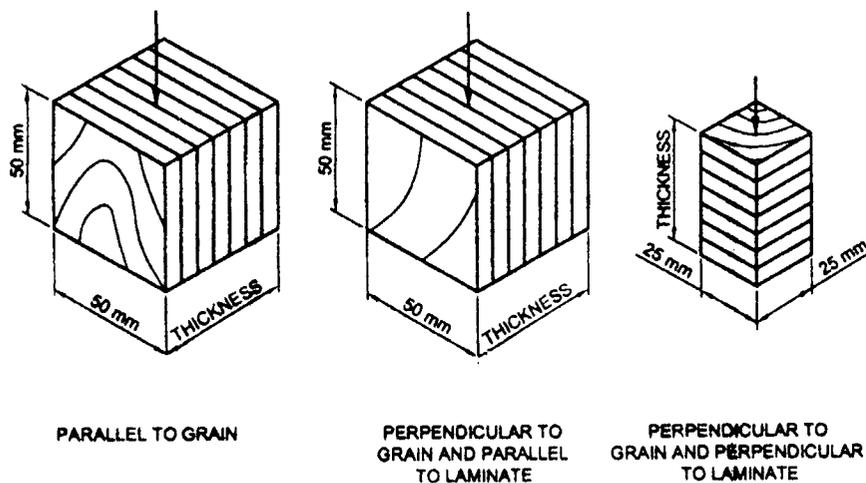


FIG. 1 PLACEMENT OF FORCES FOR COMPRESSIVE STRENGTH

**Amend No. 1 to IS 14616 : 1999**

( Page 4, Annex A ) — Insert the following at appropriate place:

IS 1659 : 2004	Block boards — Specification ( <i>fourth revision</i> )
IS 1734 (Part 9) : 1983	Methods of test for plywood : Part 9 Determination of tensile strength ( <i>second revision</i> )

(CED 20)

**AMENDMENT NO. 2 DECEMBER 2008**  
**TO**  
**IS 14616 : 1999 LAMINATED VENEER LUMBER —**  
**SPECIFICATION**

(*Second cover page, Foreword*) — Insert the following after the eighth para as a new para:

'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 (MoEF), Government of India. The Eco-Mark shall be administered by the Bureau of Indian Standards (BIS) under the *BIS 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 Eco-Mark criteria is based on the Gazette Notification No. 170 dated 18 May 1996 for Wood Substitutes as Environment Friendly Products published in the Gazette of the Government of India.'

(*Page 3, clause 8.2.4*) — Insert the following new clause at the end and renumber the subsequent clauses:

**9 ADDITIONAL REQUIREMENTS FOR ECO-MARK**

**9.1 General Requirements**

**9.1.1** The laminated veneer lumber shall conform to the requirements of quality specified in this standard.

**9.1.2** The manufacturer shall produce to BIS environmental consent clearance from the concerned State Pollution Control Board as per the provisions of *Water (Prevention and Control of Pollution) Act*, 1974 and *Air (Prevention and Control of Pollution) Act*, 1981 and *Water (Prevention and Control of Pollution) 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.

**Amend No. 2 to IS 14616 : 1999**

**9.2 Specific Requirements**

The laminated veneer lumber 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.

[Page 3, clause 9.1 (renumbered 10.1)] — Insert the following matter at the end:

'd) The criteria for which the laminated veneer lumber has been labelled as Eco-Mark.'

(CED 20)

**AMENDMENT NO. 4 NOVEMBER 2011**

**TO**

**IS 14616 : 1999 LAMINATED VENEER  
LUMBER — SPECIFICATION**

(Page 2, clause 8.1) — Substitute the following for the existing:

**‘8.1 Scale of Sampling and Criteria for Conformity**

The scale of sampling and criteria for conformity shall be as prescribed in IS 7638.’

(Page 4, Annex A) — Insert reference of the following in the list of standards at appropriate place:

<i>IS No.</i>	<i>Title</i>
IS 7638 : 1999	Wood/lignocellulosic based panel products — Methods of sampling ( <i>second revision</i> )

[Page 2, clause 8.2.2(b)] — Substitute the following for the existing:

‘After subjecting to six cycles, each cycle consisting of 8 h boiling in water and 16 h drying in an oven at  $65 \pm 5^\circ\text{C}$ , and’

(CED 20)

## FOREWORD

This Indian Standard 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.

To conserve our natural forest cover and the ecology and environment, the government, amongst several other measures, has suggested a search for possible wood substitutes that may be produced without affecting our natural forest system and the environment. Wood is a ligno-cellulosic material. Amongst alternative materials that have been identified for adoption, reconstituted ligno-cellulosic products that can be manufactured from plantation wood grown outside the natural forest system or even from ligno-cellulosic agro-residues have also been recommended for use as environmentally friendly materials.

Wooden components used in construction, furniture, packaging and other industrial and domestic requirements fall into two categories:

- a) Panels for sheathing and diaphragms, siding, casing, partitions, panelling, shelving, topping, decking, etc.
- b) Load bearing members like beams, posts, stringers, structural frame work in construction, joinery, furniture, etc.

The use of reconstituted ligno-cellulosic products like plywood, particle board, fibre hardboard and medium density fibreboard as substitutes of wood as panel material is already well established in the country. Till now, however, substitution of wood for load bearing components like beams, posts, stringers and structural frame work in construction, joinery, furniture, etc, with reconstituted ligno-cellulosic products has not been seriously considered in our country. Primarily, the high anisotropic (along the grain) strength of solid wood has a significant and critical role to play in these applications.

In some advanced countries, certain reconstituted ligno-cellulosic products with the fibre oriented along a specific direction have been developed and are gradually being adopted for such load bearing applications as completely appropriate wood substitutes, having high anisotropic (along the oriented direction) strength like natural wood. Such reconstituted ligno-cellulosic products are:

- a) Laminated Veneer Lumber (LVL).
- b) Parallel Strand Lumber (PSL) along with its variant 'Scrimber'.
- c) Parallel-Fibre Oriented Strand Board (OSB).

Since direct use of solid timber from plantations is beset with problems of inherent growth stressed brittle heart, tension wood, excessive warping and small girths, and use of conventional timbers from the natural forests has been banned there is an acute paucity of timber in the country. The above mentioned new structural composites (including LVL), reconstituted from plantation grown wood, are eco-friendly products. They effectively overcome all the problems associated with direct use of plantation timber.

Being based on lamination technology, these products eliminate the adverse effects of growth stresses such as excessive waypine. Through a re-distribution of natural defects such as knots, cross grain, etc, they can be engineered to give more uniform strength properties, greater reliability and lower factors of safety than are possible with natural solid wood.

Commercial manufacture of these products need to be initiated and promoted in the country on an urgent basis and since some of them have already been developed and investigated recently by national research institutes, like Forest Research Institute, Dehra Dun and Indian Plywood Industries Research and Training Institute, Bangalore as well as by the R&D Divisions of wood products manufacturers in the country, there is a need to formulate Indian Standards for these products for the technical guidance of manufacturers and new entrepreneurs.

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

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***LAMINATED VENEER LUMBER —  
SPECIFICATION****1 SCOPE**

**1.1** This standard covers Laminated Veneer Lumber (LVL) of density range 0.6 to 0.75 in which most natural structural wood fall.

**1.2** Its applications include all the end uses to which structural wood has been traditionally used, such as, beams, rafters, stringers, joists, posts and framework construction, stiles, rails and frames of doors and windows, vehicle bodies, railways coaches, containers, framework of furniture, cabinets, shelving, etc.

**2 REFERENCES**

The Indian Standards listed in Annex A contain provisions which through reference in this text, constitute provision 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 Annex A.

**3 TERMINOLOGY**

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

**3.2 Laminated Veneer Lumber (LVL)**

A structural composite made by laminating veneers, 1.5 to 4.2 mm thick, with suitable adhesive and with the grain of veneers in successive layers aligned along the longitudinal (length) dimension of the composite.

**4 MATERIALS****4.1 Veneers**

**4.1.1** Veneers of the required thickness shall be obtained from timber logs grown in plantations outside the natural forest system, such as rubber wood, silver oak, eucalyptus, poplars, acacias, etc.

**4.1.2** Veneers shall be free from knot holes, decayed knots except pin knots, unfilled splits wider than 3 mm, concentrated borer holes, shakes, objectionable decay or termite attack, except that for the face veneers none of these defects nor cross grain exceeding 1 in 10 shall be permitted. The nominal thickness of all the veneers used shall be identical and uniform within a tolerance of  $\pm 5$  percent.

**4.2 Adhesives**

**4.2.1** Only BWP grade adhesive conforming to IS 848 shall be used for making LVL.

**4.3 Preservatives**

**4.3.1** Veneers used for LVL shall be given suitable preservative treatment before lamination, with a preservative that is compatible with the adhesive to be used.

**4.3.2** Only fixed type of water soluble preservatives, CCA or CCB, or non-leachable, solvent soluble preservatives as per IS 401 shall be used for treating the veneers.

**4.3.3** Retentions of preservatives shall be as per IS 401 depending upon the proposed end use.

**5 MANUFACTURE**

**5.1** The veneers shall be reasonably smooth to permit an even spread of glue. After preservative treatment they shall be dried and conditioned to moisture content not exceeding 10 percent before bonding.

**5.2** LVL may be directly manufactured in the nominal size of the components ultimately desired (allowing margin for final dressing and sanding) or in planks of larger lengths and widths from which the desired size of components may be obtained by ripping.

**5.3** Glue shall be evenly spread over the veneers, not leaving any unglued or glue-starved areas. The glued

## IS 14616 : 1999

veneers shall be assembled with the grain direction in all the layers aligned longitudinally. No overlap of veneer ends or edges shall be permitted during assembly. The requisite number of veneer layers may be assembled to obtain the required finish. The assembly shall be hot pressed under controlled conditions of temperature, pressure and pressing time which depends upon the thickness of the composite. The stack under press shall then be cooled down to near room temperature by suitable cooling schedule in order to stabilize it.

**5.4** The pressed components or blanks, if required to be stored, shall be stacked flat with sufficient load on its top. Blanks may be ripped and cross cut to the required sizes.

NOTE — Unlike solid timber, LVL components generally need minimum of dressing, planning and sanding to correct warping, remove surface and end cracks or surface roughness.

## 6 DIMENSIONS

**6.1** Dimensions of LVL composite supplied shall be inclusive of margin required for dressing and finishing over and above the size of finished component desired, unless finished components (ready for painting) are ordered.

**6.2** The margin for dressing and finishing shall not exceed 3 mm in the width and thickness and 12 mm in the length.

## 7 WORKMANSHIP AND FINISH

The following defects shall be permissible in the manufactured LVL:

<i>Defects</i>	<i>Permissible Limits</i>
Jointing gaps	Not more than 3 mm wide, provided they are well staggered in their spacing and position between the successive plies.
Slope of grain	Not exceeding 1 in 10 in the face layers.
Tight knot	Three numbers up to 25 mm diameter in one square metre provided they are spaced 300 mm or more apart.
Warp	Not exceeding 1.5 mm per metre length.

## 8 SAMPLING AND TESTING

### 8.1 Test Samples

For purposes of tests, samples shall be drawn at random from a batch as given below:

<i>Size of Batch (No. of Pieces of Any Size)</i>	<i>No. of Pieces to be Selected at Random</i>
Less than 50	2
51 to 100	4
101 to 200	5
201 to 250	6
251 to 500	7

**8.1.1** The pieces selected as samples for test shall contain joints in case the pieces in the batch represented contain joints.

### 8.2 Tests

#### 8.2.1 Moisture Content

The average moisture content of three test specimens, when determined in accordance with IS 1734 (Part 1), shall be between 5 to 15 percent.

#### 8.2.2 Adhesion of Plies

Adhesion of plies shall be tested by knife test described in IS 1734 (Part 5) on three specimens each under the following conditions:

- In the dry state,
- After boiling in water for 72 h followed by cooling in water at room temperature, and
- After subjecting to attack by micro-organism as per Annex B.

Under each condition the fractured specimens shall show some adherent fibres distributed more or less uniformly. Also the test should offer appreciable resistance to the separation of layers.

#### 8.2.3 Strength Tests

Six specimens each shall be tested for modulus of rupture and modulus of elasticity, compressive strength parallel to grain, compressive strength perpendicular to grain (both parallel and perpendicular to laminae), horizontal shear strength (both parallel and perpendicular to grain), tensile strength parallel to grain

and nail and screw holding power in accordance with the methods given in IS 1708 (Parts 6, 8, 9, 11, 12 and 15) respectively and the average values for each test shall conform to the requirements given under SI No (i) to (vii) of Table 1.

**Table 1 Requirements of LVL**  
(Clauses 8.2.3 and 8.2.4)

SI No.	Properties	Requirement
i)	Modulus of rupture (N/mm <sup>2</sup> ), <i>Min</i>	50
ii)	Modulus of elasticity (N/mm <sup>2</sup> ), <i>Min</i>	7 500
iii)	Compressive strength parallel to grain (N/mm <sup>2</sup> ), <i>Min</i>	35
iv)	Compressive strength perpendicular to grain:	
	a) Parallel to laminae (N/mm <sup>2</sup> ), <i>Min</i>	35
	b) Perpendicular to laminae (N/mm <sup>2</sup> ), <i>Min</i>	50
v)	Horizontal shear:	
	a) Parallel to grain (N/mm <sup>2</sup> ), <i>Min</i>	6
	b) Perpendicular to grain (N/mm <sup>2</sup> ), <i>Min</i>	8
vi)	Tensile strength parallel to grain (N/mm <sup>2</sup> ), <i>Min</i>	55
vii)	Screw holding power:	
	a) Edge (N), <i>Min</i>	2 300
	b) Face (N), <i>Min</i>	2 700
viii)	Thickness swelling in 2 h water soaking (percent), <i>Max</i>	3

#### 8.2.4 Swelling in Water

The average swelling in thickness of three specimens due to general absorption when determined in accordance with IS 2380 (Part 17) shall comply with the requirements given under SI No. (viii) of Table 1.

## 9 MARKING

9.1 Each LVL piece shall be legibly and indelibly marked or stamped on the face near one corner with the following:

- Name of the manufacturer or trade-mark,
- Thickness, and
- Year of manufacture.

#### 9.2 BIS Certification Marking

The LVL may also be marked with the Standard Mark.

9.2.1 The use of Standard Mark is governed by the provisions of *Bureau of Indian Standards Act, 1986* and the Rules and Regulations made thereunder. The details of conditions under which the licence for the use of Standard Mark may be granted to manufacturers or producers may be obtained from the Bureau of Indian Standards.

## 10 DELIVERY

Unless otherwise specified, the LVL shall be delivered in good condition and shall be suitably packed according to normal trade practices.

## ANNEX A

( Clause 2 )

## LIST OF REFERRED INDIAN STANDARDS

<i>IS No.</i>	<i>Title</i>	<i>IS No.</i>	<i>Title</i>
401 : 1982	Code of practice for preservation of timber ( <i>third revision</i> )	(Part 11) : 1986	Determination of shear strength parallel to grain ( <i>second revision</i> )
707 : 1976	Glossary of terms applicable to timber technology and utilization ( <i>second revision</i> )	(Part 12) : 1986	Determination of tensile strength parallel to grain ( <i>second revision</i> )
848 : 1974	Specification for synthetic resin adhesives for plywood (phenolic and aminoplastic) ( <i>first revision</i> )	(Part 15) : 1986	Determination of nail and screw holding power ( <i>second revision</i> )
1708 (Part 6) : 1986	Method of testing of small clear specimens of timber : Determination of static bending strength under two-point loading ( <i>second revision</i> )	1734 (Part 1) : 1983	Methods of test for plywood: Determination of density and moisture content ( <i>second revision</i> )
(Part 8) : 1986	Determination of compressive strength parallel to grain ( <i>second revision</i> )	(Part 5) : 1983	Test for adhesion of plies ( <i>second revision</i> )
(Part 9) : 1986	Determination of compressive strength perpendicular to grain ( <i>second revision</i> )	2380 (Part 17) : 1977	Methods of test for wood particle boards and boards from other lignocellulosic materials: Part 17 Determination of swelling in water ( <i>first revision</i> )

## ANNEX B

[Clause 8.2.2 (c)]

### B-1 OBJECT

This test is intended to evaluate the resistance of glue line to attack by micro-organism.

### B-2 PROCEDURE

**B-2.1** A flat rectangular dish of enamelled iron, glass or porcelain (such as a photographic developing dish), of a minimum depth of 50 mm, shall be filled to a depth of about 25 mm with a layer of saw dust obtained from the sapwood of a perishable timber, like semul (*Bombax ceiba*) in its natural condition. The saw dust shall have previously been moistened with water containing 15 g of sucrose (normally sugar may be used; but if unavailable, 30 g commercial malt extract may be substituted) to a litre of water so that it is saturated with moisture, but not so wet that free water is squeezed out of it by hand pressure. To attain this

condition with dry saw dust, it is usually necessary to add three times its mass of water.

**B-2.2** The saw dust shall then be charged with spores of commonly occurring wood destroying fungi and loosely compacted. The test specimens shall be pressed down into it so that their upper surfaces are level with the top of the saw dust layer.

**B-2.3** The dish shall then be covered with a sheet of glass and the edges of the dish sealed against the glass with modelling clay or a similar suitable material so that the atmosphere around the test specimens shall remain saturated with water vapour.

**B-2.4** The dish and the contents shall be maintained at a temperature of  $27 \pm 2^\circ\text{C}$  for a period of three weeks, after which the test pieces shall be removed, washed in water at room temperature.

**ANNEX C**  
*(Foreword)*  
**COMMITTEE COMPOSITION**

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*Chairman*

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