IS 15932-1 (2012): Selection and Use of various types of Lignocellulosic Panel Products - Code of Practice, Part 1: Medium Density Particle Boards [CED 20: Wood and other Lignocellulosic products]

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विभिन्न प्रकार के लिग्नोसैल्युलोसिक पैनल के चयन और प्रयोग — रीति संहिता

भाग 1 मध्यम धनत्व के पार्टिकल बोर्डस

Indian Standard

SELECTION AND USE OF VARIOUS TYPES OF LIGNOCELLULOSIC PANEL PRODUCTS — CODE OF PRACTICE

PART 1 MEDIUM DENSITY PARTICLE BOARDS

ICS 79.060.20

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

August 2012 **Price Group 4**

Wood and Other Lignocellulosic Products Sectional Committee, CED 20

FOREWORD

This Indian Standard (Part 1) 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.

Particle boards are classified into three types based on their density as low density, medium density and high density particle boards. All the three types of particle boards have specific application and usage. While low density particle boards are used as ceiling tiles and display boards, high density particle boards are used for specialized tools, in aircraft, automobile and general engineering industries; their usage however is only to a limited extent. The most common type of particle boards being used is the medium density boards which find extensive use in partitioning, in manufacture of doors, in manufacture of furniture, etc.

Over the past few years medium density particle boards have become one of the major products of growing importance to furniture industry. In view of its construction and properties being different from that of wood, especially with regard to carpentry work, the need to formulate a comprehensive Code for proper guidance to industry and consumer in the selection and use of medium density particle board was felt.

This Code of practice is a guideline for use of medium density particle boards only. The Code may be read in conjunction with IS 3087 : 2005 'Specification for particle boards of wood and other lignocellulosic materials (medium density) for general purposes (*second revision*)'; IS 3097 : 2006 'Specification for veneered particle boards (*second revision*)' and IS 12823 : 1990 'Specification for prelaminated particle boards'. This standard is published in three parts. The other parts in the series are:

Part 2 Hardboards *(under preparation)*

Part 3 Fibreboards *(under preparation)*

In the formulation of this standard, due weightage has been given to standards and practices prevailing in the country.

The composition of the Committee responsible for the formulation of this standard is given in Annex A.

Indian Standard

SELECTION AND USE OF VARIOUS TYPES OF LIGNOCELLULOSIC PANEL PRODUCTS — CODE OF PRACTICE

PART 1 MEDIUM DENSITY PARTICLE BOARDS

1 SCOPE

This standard (Part 1) covers guidelines for use and application of medium density particle boards widely used in building interiors, cabinets, joinery, mass produced furniture/wardrobes, kitchen cabinets, shelving and storage units, partitions, door infill, work stations, floor decking, temporary constructions and mock ups. Particle boards are amenable to be used in combination with wood, aluminium and steel external frame work.

2 REFERENCES

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

IS No.	*Title*
3087 : 2005	Particle boards of wood and other lignocellulosic materials (medium density) for general purposes — Specification (*second revision*)
3097 : 2006	Veneered particle boards — Specification (*second revision*)
12823 : 1990	Prelaminated particle boards from wood and other lignocellulosic material — Specification

3 GRADE AND GRADE SELECTION

3.1 Grades

The medium density particle boards shall be selected from the following grades/types:

Sl No.	*Type of Board*	*Grade/Type*	*Designation*	*IS No.*
i)	Medium density particle board for general purposes	Flat pressed, single layer	FPS	IS 3087
		Extrusion pressed, solid	XPS	
		Extrusion pressed, tubular	XPT	
		Flat pressed, multilayer:		
		a) Grade I	FPT 1	
		b) Grade II	FPT 2	
ii)	Prelaminated particle boards	Grade I:		IS 12823
		a) Type I	PLB 11	
		b) Type II	PLB 12	
		c) Type III	PLB 13	
		d) Type IV	PLB 14	
		Grade II:		
		a) Type I	PLB 21	
		b) Type II	PLB 22	
		c) Type III	PLB 23	
		d) Type IV	PLB 24	
iii)	Veneered particle boards	Grade I:		IS 3097
		a) Type 1	SOGP-I	
		b) Type 2	SOD-I	
		c) Type 3	TUGP-I	
		d) Type 4	TUD-I	
		Grade II:		
		a) Type 1	SOGP-II	
		b) Type 2	SOD-II	
		c) Type 3	TUGP-II	
		d) Type 4	TUD-II	

3.2 Grade Selection

All the above grades of particle boards with the exception of tubular veneered particle boards, are suitable for use in interior dry locations or in air conditioned environments. For hazard Class 1 environments only Grade I prelaminated or Grade I veneered particle boards shall be used (phenolic resin bonded).

Particle boards of different grades presently manufactured in the country are not suitable for exposed/out door conditions or for interiors with high moisture and wet conditions.

NOTE — Hazard Class 1 environment have relative humidity less than or equal to 70 percent.

4 STRUCTURAL CONSIDERATIONS

4.1 Particle board like other board has relatively low bending strength (modulus of rupture, MOR) and low stiffness (modulus of elasticity, MOE) as compared to wood or plywood. It also possesses high inplane rigidity which makes it ideal for box like constructions (cabinets). Combining particle board with wood or metal framework can overcome the limitations in bending strength and stiffness of the material.

4.2 Fastener like wood screws and nails are generally not suitable for making joints in particle boards as they have a tendency to split the board when screwed or nailed edgewise. A wide variety of fasteners like particle board screws and connectors to improve the jointing efficiency in particle boards are available (*see also* **6**).

4.3 Where stiffness is the main consideration as in shelving, storage units and floor decking, the load bearing capacity for a given thickness of particle board for uniformily distributed loading condition depends upon the MOE of the material and is given by:

$$W=\frac{32\,bt^3d}{5\,L^3}E$$

where

W = total load (uniformly distributed), in kg;

b = width of shelf, in mm;

t = thickness of board, in mm;

d = deflection at the centre, in mm;

L = distance between two supports (span), in mm; and

E = modulus of elasticity, in N/mm^2.

The deflection in shelves may be restricted to between span/200 to span/240.

Due to creeping behaviour of particle boards under varying humidity condition and sustained load effect, the load bearing capacity may be reduced by 20 percent.

For continuously supported conditions (supported on two or more supports), the load bearing capacity of the boards may be increased by twice the value arrived at by the above formula.

5 JOINTING/FASTENING TECHNIQUES

5.1 The principal use of medium density particle board is in the manufacture of factory produced cabinets and furniture. Besides, medium density particle board is also used as infill panels where plain or prelaminated/ veneered particle boards are inserted in wood or metal frames. Medium density particle board is also used as a cladding material in building interiors where boards are directly screwed to wood or metal framework.

5.2 In cabinet construction/panel furniture/storage units, particle boards have to be joined at right angles forming 'L' or 'T' joints. The joints have to be suitably detailed depending on the appearance.

Common corner joints ('L' joints) suitable for particle board are butt, mitre, lap and bare faced housing as shown in Fig. 1. These joints have to be further strengthened with the help of connectors, dowels or loose tongue in combination with adhesives. Special knock downs are also available for making butt joints especially in mass productions and do-it-yourself furniture and cabinets. T-joints are also detailed on similar lines as shown in Fig. 2.

5.3 Specially made screws, dowels, loose tongue and special hardware and adhesives are additionally used to strengthen joints. Manufacturer's instructions should be followed in use of these hardwares.

5.4 Joints usually used in wood work such as mortise and tenon, dovetail and box, are not suitable for working with particle board and other panel materials due to splitting tendency and low tensile strength of these material. These types of joints should be avoided.

5.5 End to end joints in particle boards can be used to increase the width or length. Tongue and groove, loose tongue and dowels are suitable for making end joints as shown in Fig. 3.

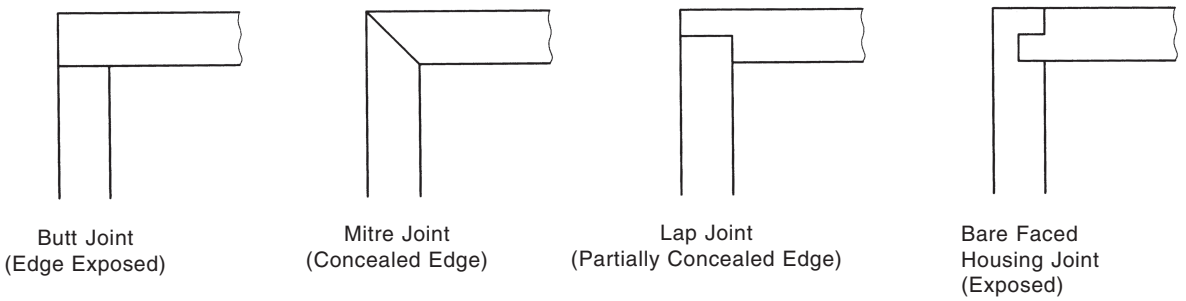


FIG. 1 L-JOINTS

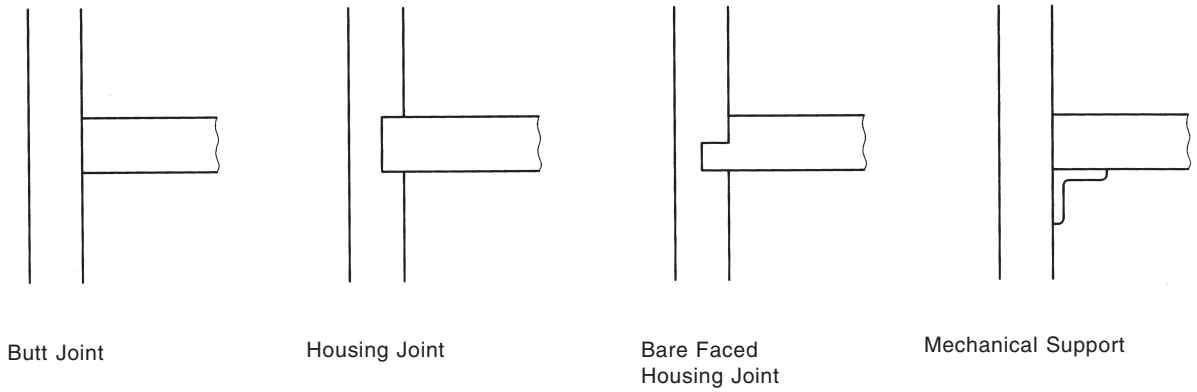


FIG. 2 T-JOINTS

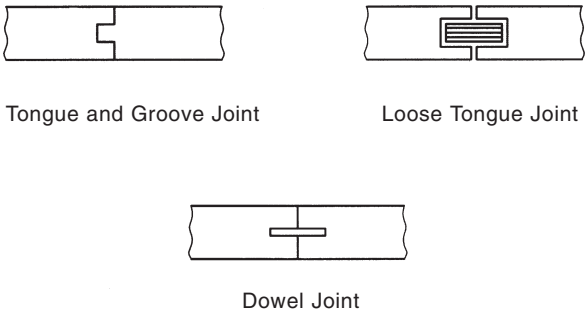


FIG. 3 END JOINTS

6 FASTENERS FOR PARTICLE BOARD

6.1 Particle boards have different structure as compared to wood. Layered or graded construction used in the manufacture of boards make them vulnerable to splitting when screwed or nailed. It is always safe to screw through the face of the board and specially made hardwares are designed to follow this rule.

6.2 Wood screws do not provide required withdrawal strength for making strong joints in particle boards. As an alternative, fully threaded self tapping or twin threaded screws provide better holding in joints. These types of screws facilitate easy screwing without splitting the board. These types of screws can be used in strengthening 'T' and 'L' joints.

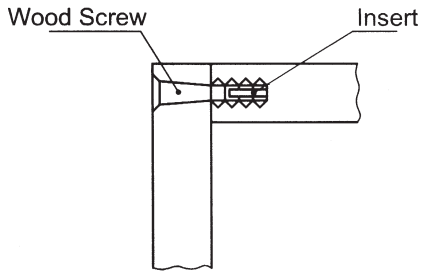
6.3 As a general rule suitable shank diameter (size) of the screw equivalent to one-fifth of the thickness of the board to be joined can be selected. Length of the screws can be two and a half to three times the thickness of the board in 'L' and 'T' joints.

6.4 Pilot holes are required for any type of screws, through the face into the edge of the board. As a rule pilot hole diameter could be 80 percent of the shank diameter of the screw. Normally screw heads can either be countersunk or concealed with specially made decorative covers.

6.5 Strong joints can be achieved by inserting threaded nylon plugs/inserts into pre-drilled holes in the edge of the board and ordinary wood screws can be driven to make straight strong corner or 'T' joints as shown in Fig. 4.

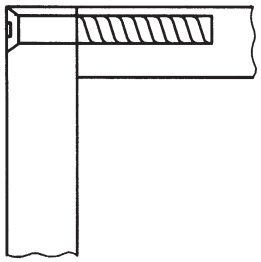
6.6 Specially made screw connectors, coarse threaded are also used in the manufacture of do-it-yourself furniture. These type of screws are driven into pilot holes with ordinary screwdrivers as shown in Fig. 5.

6.7 Hard wood dowels, 6 to10 mm in diameter also provide good means of making 'L' and 'T' joints. Generally grooved hardwood dowels are used for this



Nylon Insert and
Wood Screw Joint

FIG. 4 NYLON INSERT AND WOOD SCREW JOINT



Screw Connection

FIG. 5 SCREW CONNECTOR

purpose. As a general rule the diameter of the dowels may be half the thickness of the board to be joined and length of the dowel may be five times thickness of the board.

6.8 Nails shall only be used for nailing particle board through the face into the wooden framework for temporary use. Nails shall never be used for making 'L' and 'T' joints in particle boards.

7 ADHESIVES

Woodworking adhesives based on polyvinyl acetate (PVA) are suitable for use in strengthening the joints, in lipping and in laminating with high pressure laminates. The use of new generation adhesives for use with particle boards may also be considered.

8 STACKING AND HANDLING

Particle boards are hygroscopic in nature and will thus respond to variations in atmospheric temperature and relative humidity. A change in moisture content affects the dimensions and likely loss in the flatness. Improper handling causes physical damages to the boards. Many of the problems can be avoided by taking precautions in handling and storage of particle boards. The following precautions are needed in handling and storing of particle boards:

a) Particle boards should be kept off the floor. A pallet shall be placed on ground as base on the floor.

b) The frame planks and wooden beams in pallet should be of uniform thickness.

c) A pallet should be used between each metre height of stack.

d) When loose wooden beams are used instead of pallet, then the beams should be laid at equal distance and the position of each beam should fall in one vertical line.

e) A stack of particle boards shall be covered with a weight on the top board. The weight on top should not warp or bend the boards.

f) Boards should not be stored near open windows or near open door during monsoon or the windows should be kept closed.

g) Boards should be stored in a clear, covered and dry place with proper ventilation.

9 WORKING OF MEDIUM DENSITY PARTICLE BOARDS

9.1 Medium density particle boards have no definite directional characteristics. Therefore, unlike wood, particle boards can neither be ripped nor be cross cut when sawed, regardless of direction. Particle boards must be sawed by a combination of the two cutting methods.

9.2 The conventional hand saw does not work well in particle boards because of thermosetting resin used and silica content in the raw material. Thermosetting resins are somewhat abrasive and dull the steel saws rapidly. It is therefore recommended to use tungsten tipped carbide saw blades.

Chip load in the range of 0.08 to 0.13 mm per tooth is recommended. Low chip loads result in a fine cut edge. Chip load is the amount of material removed per tooth and is related to the number of teeth on the blade, the running speed and the material feed rate.

In order to get a side finish suitable for edge-bonding, use of a scoring saw is a must. Such equipment is otherwise required to avoid chip-offs.

9.3 The following guidelines shall be followed while cutting:

a) Cutting speed should be a minimum of 4 500 rpm.

b) Use of a strudy machine with scoring blade facility gives an edge surface suitable for edge bonding and edges without any chip-offs.

c) Use of fine tungsten carbide tipped blade is recommended.

d) The height of blade above the board surface shall be maintained between 12 mm to 25 mm.

e) Support to the work shall be extended up to

the position of the blade in order to obtain a vibration free cut and to avoid chip-offs.

f) Boards shall be cut using sharp blades only.

g) When using hand saws, the following shall be ensured:

1) Use of a thinner saw,

2) Use of fine tooth cross cut saw having a tooth angle towards the operator, and

3) Material should not be cut at a right angle position. The blade shall be at a minimum angle position or should have a cutting angle of less than 40°.

NOTE — A sharp saw tooth is to be maintained.

10 EDGE PROFILING AND FINISHING

10.1 Edges of particle boards can be profiled using tungsten carbide tipped cutters fitted to spindle moulding machine.

10.2 PVC edge bands specially made for particle boards are widely used for factory produced items. These are in wide range of colours and profiles that match with the lamination. Special edge bending machines are used to fix the bands using hot melt adhesives. Veneer bands are also available for finishing the edge of particle board.

10.3 For wood lipping, plastic laminates can also be used to finish the edges using PVA and rubber based adhesives. In plain particle board the edges can be painted or lacquered, after sealing the edges with sealants.

11 FINISHING

11.1 Plain particle board being absorbent in nature should be sealed with a proprietary sealants and fillers. The surface may be finished with pigmented finishes based on alkydes, melamine and polyurethanes. They can also be finished after sealing, staining with lacquers based on nitrocellulose, polyurethanes and melamines.

11.2 Plain particle board cabinets and table tops can also be finished with high pressure laminates using PVA or rubber based adhesives.

11.3 Veneered particle board may be finished using the same methods used for finishing wood. Clear/ pigmented finishes, lacquers, varnishes or paints are suitable for finishing veneered particle board.

11.4 The manufacturer's instructions should be followed for preparation of the surface (with proper use of abrasive paper) and sealing the surface with sealers and primers.

12 FITTINGS FOR JOINERY

12.1 Numerous types of hardware are now available for use with panel materials. Surface mounted hinges are recommended for fixing particle board shutters in manufactured items like cabinets, storage units and wardrobes.

12.2 Slides, drawer glides and shelve supports are specially available for panel materials to facilitate easy fixing and avoid damage during fabrication.

12.3 Fittings like ex-centre wheel, corner blocks, mini fix are ideal for making corner joints in knock down and assembled furniture.

12.4 Fabricators should follow instructions given by the manufacturers of the special hardware. They should check the strength and wear and tear of such hardware under prolong use.

13 APPLICATIONS

13.1 Particle board plain, veneered or prelaminated, are ideal for making cabinets, furniture units, partitions, door panel inserts and wardrobes. Veneered particle board with phenolic resin bonded core can be used for semi-structural applications like floor decking in air-conditioned rooms. Perforated particle boards are suitable to be used in suspended type false ceilings.

13.2 Generally, particle boards in thickness 20 to 25 mm are suitable for cabinets, built-in furniture, partitions and floorings. Boards in the range of 9 to 12 mm are used as panel inserts, in ceiling, wall panelling and for backing of cabinets. The relevant Indian Standards on various types of door shutters should be referred for use of particle board as panel inserts.

13.3 Particle boards, plain, prelaminated and veneered; are also suitable for making partitions, cabins and workstations. Boards of 12 to 15 mm thickness, supported by wood or metal framework should be adequate for this purpose.

13.4 Particle boards are also useful for making mock ups, settings, exhibition structures and other temporary applications.

ANNEX A
(*Foreword*)

COMMITTEE COMPOSITION

Wood and Other Lignocellulosic Products Sectional Committee, CED 20

Organization	*Representative(s)*
Indian Plywood Industries Research & Training Institute, Bangalore	Dr C. N. Pandey (***Chairman***)
Bamboo Society of India, Bangalore	Shri N. S. Adkoli Shri A. S. Sadashivaiah (*Alternate*)
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Scientist 'E' (CED), BIS

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The Western India Plywood Limited, Kannur	Shri K. P. Kamaluddin Shri C. A. Gafoor (*Alternate*)
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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 Catalogue' and 'Standards : Monthly Additions'.

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