
लकड़ी के सपाट दरवाजे के शटर
(ठोस कोर प्रकार) — विशिष्टि

भाग 1 प्लाईवुड सतहयुक्त पल्ले
(सातवाँ पुनरीक्षण)

Wooden Flush Door Shutters
(Solid Core Type) — Specification

Part 1 Plywood Face Panels
(Seventh Revision)

ICS 91.060.50

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FOREWORD

This Indian Standard (Part 1) (Seventh Revision) was adopted by the Bureau of Indian Standards, after the draft finalized by the Doors, Windows and Shutters Sectional Committee had been approved by the Civil Engineering Division Council.

This standard was first published in 1962 and subsequently revised in 1966, 1973, 1980, 1983, 1991 and 1999. During this period, the standard has undergone modifications relating to grades of doors, species of timbers, inclusion of tests, etc.

In this revision, considering the rapid changes in lifestyle as well as material availabilities and acceptance of ecofriendly options in door constructions during the last two decades, a number of improvements have been made.

In this revision, the following major modifications have been incorporated:

- a) Wooden flush door shutters (solid core type) have been categorized in two grades that is BWP (Boiling Water Proof) Grade and MR (Moisture Resistance) Grade.
- b) Particle board with block board and medium density fibre board with block board type core have been deleted.
- c) Thickness criterion for flush door shutter designations 8 DS 20 and 8 DS 21 have been revised.
- d) Raw materials, requirements have been modified as per new grades of wooden flush door shutters (solid core type).
- e) Under raw materials, particle board, medium density fibre board, stiles and rails, requirements have been modified.
- f) Laminated veneer lumber (LVL) and veneer laminated lumber (VLL) have been incorporated as raw materials for use as stiles and rails.
- g) End immersion and glue adhesion test requirements have been modified as per grades of wooden flush door shutters (solid core type).
- h) All the amendments issued to the previous version of the standard have been absorbed, and the text of the standard has been suitably modified to make it more user friendly.

A scheme of labelling environment friendly products known as ECO-Mark has been instituted at the instance of the Ministry of Environment, Forests 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* as per the Resolution No. 71 dated 21 February 1991 and Resolution No. 425 dated 20 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 (ISI mark) of 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 16 May 1996 for wood substitutes as environment friendly products published in the Gazette of Government of India, as revised/amended from time to time.

The composition of the Committee responsible for the formulation 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 : 2022 'Rules for rounding of numerical values (*second revision*)'. 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***WOODEN FLUSH DOOR SHUTTERS
(SOLID CORE TYPE) — SPECIFICATION****PART 1 PLYWOOD FACE PANELS***(Seventh Revision)***1 SCOPE**

This standard (Part 1) specifies the requirements for wooden flush door shutters (solid core type) with face panels of plywood or of cross-band and face veneers.

2 REFERENCES

The 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

For the purpose of this standard, the definitions given in IS 10428, IS 707 and the following shall apply.

3.1 Type Tests — Tests carried out to prove conformity with the specification, which are intended for product/type approval of a given construction or a prototype of door shutters.

3.2 Acceptance Tests — Tests carried out on sample taken from a lot passing type tests for the purpose of acceptance of the lot on a batch to batch basis.

4 GRADE, TYPE AND CONSTRUCTION

4.1 Flush door shutters shall be classified in two grades as follows:

- a) *BWP (Boiling Water Proof) Grade* — Such flush door shutters recommended for use at humid and dry locations.
- b) *MR (Moisture Resistance) Grade* — Such flush door shutters recommended for use at dry locations only.

4.2 Each of the grades specified in **4.1** shall be further classified into two types that is decorative type and non-decorative type for different core construction as given in Table 1.

Table 1 Nature of Construction of Wooden Flush Door Shutters (Solid Core Type)

[Clauses 4.2 and 14.1 (c)]

Sl No.	Core	Type	Abbreviation
(1)	(2)	(3)	(4)
i)	Blockboard	Decorative	BD
		Non-decorative	BN
ii)	Particle board	Decorative	PD
		Non-decorative	PN
iii)	Medium density fibre board	Decorative	MD
		Non-decorative	MN

5 SIZES

Sizes and thickness of the door shutters shall conform to the modular sizes specified in Table 2 (*see* Fig. 1). Sizes other than modular sizes, as agreed to between the manufacturer and the purchaser, may also be permitted; provided, the thickness of shutters in such cases shall be equal to that specified against the nearest higher modular size given in Table 2.

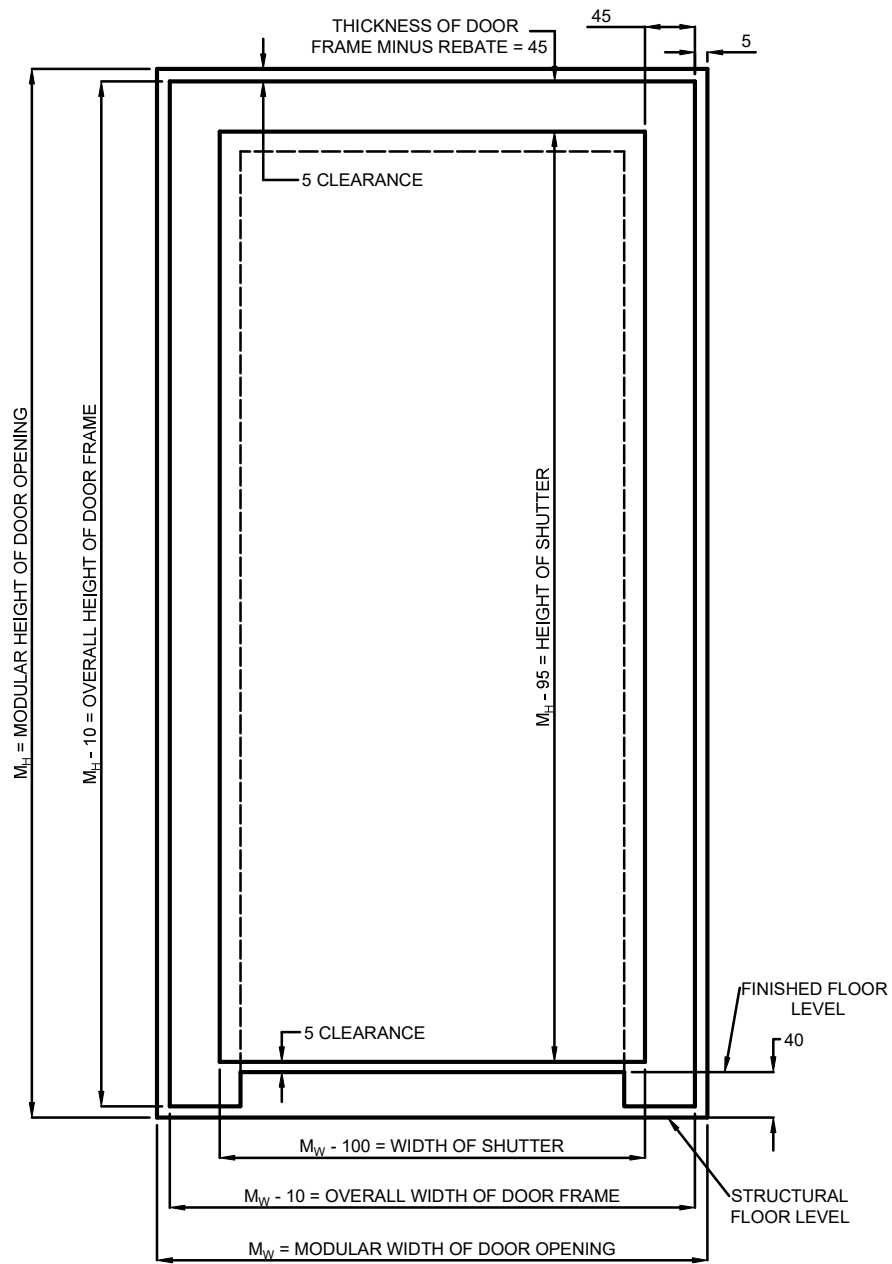
However, for sizes greater than 12 DT 21, the thickness of such shutters shall be greater than 35 mm and shall be as agreed to between the manufacturer and the purchaser.

6 MATERIAL**6.1 Timber**

6.1.1 Any species of timber may be used for the core of flush door shutters. However, a list of species is given in Group 1 of Annex B for guidance.

6.1.2 For stiles, rails and lipping, list of species for guidance purpose is given in Group 2A and Group 2B of Annex B.

NOTE — The suitability of timber for stiles, rails and lipping is normally based on the screw holding properties of timber. The classification as given in Group 2 is based on both the density of the species and the data relating to the screw holding properties as available for some of the species.



All dimensions in millimetres

FIG. 1 SKETCH ILLUSTRATING DIMENSIONS OF SHUTTER

Table 2 Dimensions of Flush Door Shutters

[Clauses 5 and 14.1 (e)]

Sl No.	Designation of Door Shutters	Width mm	Height mm	Thickness mm
(1)	(2)	(3)	(4)	(5)
i)	8 DS 20	700	1 905 (1 945)	} 25 or 30
ii)	8 DS 21	700	2 005 (2 045)	
iii)	9 DS 20	800	1 905 (1 945)	} 30
iv)	9 DS 21	800	2 005 (2 045)	
v)	10 DS 20	900	1 905 (1 945)	} 35
vi)	10 DS 21	900	2 005 (2 045)	
vii)	12 DT 20	1 100*	1 905 (1 945)	} 35
viii)	12 DT 21	1 100*	2 005 (2 045)	

NOTES

1 D = Door, S = Single Shutter, and T = Double Leaf Shutter.

2 The designation indicates the size of door opening, the first number referring to width in modules of 100 mm and the last number the height in modules of 100 mm.

3 Standard sizes of door frames are covered in IS 4021 and 4351.

4 In arriving at the standard widths and heights of flush door shutters, allowance have been made as given in Fig. 1. In case, the modular height of door opening is taken from finished floor level, the height of the flush door shall be the one given in the bracket. In case of double leaf shutters, the rebate shall be as given in 7.7.

*Combined width of two shutters in closed position

6.1.3 The moisture content in timbers used in manufacture of flush door shutters shall be not more than 12 percent when tested according to IS 1708 (Part 1).

6.1.4 Timber shall be free from decay and insect attack. Knots and knot holes less than half the width of cross section of the members in which they occur may be permitted. Pitch pockets, pitch streaks and harmless pin holes shall be permissible except in the exposed edges of the core members where they shall be cut out and filled in with carefully fitted glued pieces of wood of similar species and character with their grain running in the same direction.

6.1.5 Species of timber marked with an asterisk in Annex B and sapwood of all other timbers shall be preservative treated before assembly as specified in **6.1.5.1**.

6.1.5.1 For preservative treatment, the timber shall be soaked in a 1.25 percent solution of boric acid or 1.9 percent solution of borax at a temperature of 85 to 90 °C for a period of 10 to 40 min depending upon the species and thickness, or the timber may be dipped in a 2 to 3 percent solution of boric acid or 3 percent

solution of borax for 2 min and then block stacked for at least 2 h. Alternatively, it may be soaked at ambient temperature in a 2 percent solution of sodium pentachlorophenate in water for a period of 2 min and then stacked for at least half an hour before drying. The timber should be dried to a suitable moisture content before bonding. Qualitative test shall be conducted according to IS 401 for determining the presence of preservative used.

6.2 Plywood

6.2.1 Plywood used in flush door shutters shall conform to IS 710 for BWP grade flush door shutter and MR grade of IS 303 for MR grade flush door shutter.

6.2.2 Decorative plywood used in flush door shutters shall conform to Type 1, BWR grade for BWP grade flush door shutter and Type 1, MR grade for MR grade flush door shutter of IS 1328.

6.3 Cross-Bands

Cross-band used in flush door shutters shall conform to the requirements specified in IS 710 for BWP grade flush door shutter and IS 303 for MR grade flush door shutter.

6.4 Face Veneers

6.4.1 Commercial face veneers used in flush door shutters shall conform to the requirements specified for veneers in IS 710.

6.4.2 Decorative face veneers used in flush door shutters shall conform to the requirements of Type 1 decorative veneers specified in IS 1328.

6.5 Cross-band and face veneers made from species of timber marked with an asterisk in Annex B and sapwood of all other timbers used shall be preservative treated before assembly as specified in **6.1.5.1**. Preservative treated plywood shall be used as specified in their respective Indian Standards (*see 6.2.1 and 6.2.2*).

6.6 Adhesives

6.6.1 Adhesives used for bonding plywood or cross-band and face veneers to core shall be conforming to BWP grade and MR grade as specified in IS 848 for BWP grade flush door shutter and MR grade flush door shutter respectively.

6.6.2 Only synthetic resin adhesive shall be used for bonding core members to one another, including, core frame, and for lipping, glazing frame, venetian frame and other exposed parts where such bonding is required.

6.7 Particle Board

Particle board used for the core of the flush doors shall be either flat-pressed type, solid extruded type or tubular extruded type. The swelling in thickness due to general absorption of the particle boards when tested in accordance with IS 2380 (Part 17) shall not be more than 5 percent.

6.8 Medium Density Fibre (MDF) Board

Medium density fibre board used for the core of flush doors shall be flat pressed single layer type. The swelling in thickness due to general absorption of the MDF, when tested in accordance with IS 2380 (Part 17) shall not exceed 5 percent.

6.9 Alternative Materials

Laminated veneer lumber (LVL) conforming to IS 14616, veneer laminated lumber (VLL) conforming to IS 16171, medium density fibre board (MDF) conforming to Grade 1 of IS 12406, high density fibre board (HDF), plywood conforming to IS 710 and IS 303 for BWP grade flush door shutter and MR grade flush door shutter respectively, may also be used for stiles and rails.

7 CONSTRUCTION

7.1 Blockboard Core (*see Fig. 2*)

7.1.1 The blockboard core shall conform to the requirements specified in **7.1.2**. A frame constructed

of stiles and rails shall be provided for holding the core. The width of the frame including lipping, where provided, shall not be less than 40 mm and not more than 75 mm.

7.1.2 The wooden strips for core shall be cut out from the timbers and seasoned to a moisture content not exceeding 12 percent. The width of each strip of wood shall not exceed 30 mm. These strips may consist of piece of small lengths placed end to end with the end joints staggered. In any one blockboard, the core strips shall be of one species of timber only. The strips of wood may be laid separately or spot glued or otherwise jointed to form a core which is glued between two or more outer veneers with the direction of the grain of core blocks running at right angles to that of the adjacent veneer.

7.2 Particle Board or Medium Density Fibre (MDF) Board Core (*see Fig. 3*)

The core shall be either particle board or MDF board as specified in **6.7** and **6.8** respectively.

7.3 Stiles and Rails

7.3.1 Stiles and rails of shutters shall be of timber or LVL or VLL (*see 6.9*). The frame for holding the core, including lipping where it occurs, shall be not less than 40 mm and not more than 75 mm in width. Second stile and rail of alternative material (other than LVL and VLL) (*see 6.9*) may also be used, in such case the outer stile and rail shall be of timber or LVL or VLL and shall be minimum 30 mm width after trimming and sizing. Butt (end) joints shall not be permitted for making-up the length of the frame.

7.3.2 Maximum one finger joint or one scarf joint shall be allowed for timber stiles only with following details:

- Joint shall be located between 300 to 500 mm from center liner of door;
- In case of scarf joint it shall be diagonally cut at an angle of maximum 30 degree of horizontal; and
- The joints to both the stiles shall be located diagonally opposite to each other.

7.3.3 The rails shall be made without any joints.

7.4 Levelling

Leveling, not necessarily by planing of surfaces, shall be carried out during each stage of construction, that is, fabrication of core and bonding of plywood or cross-bands and face veneers. The thickness of core shall be checked for uniformity before bonding the plywood or cross bands and face veneers as the case may be.

NOTE — In a blockboard construction the impressions of the core strips on the outside face may be minimized to a large extent by following the provisions of **7.4** but cannot be eliminated altogether because of the nature of construction.

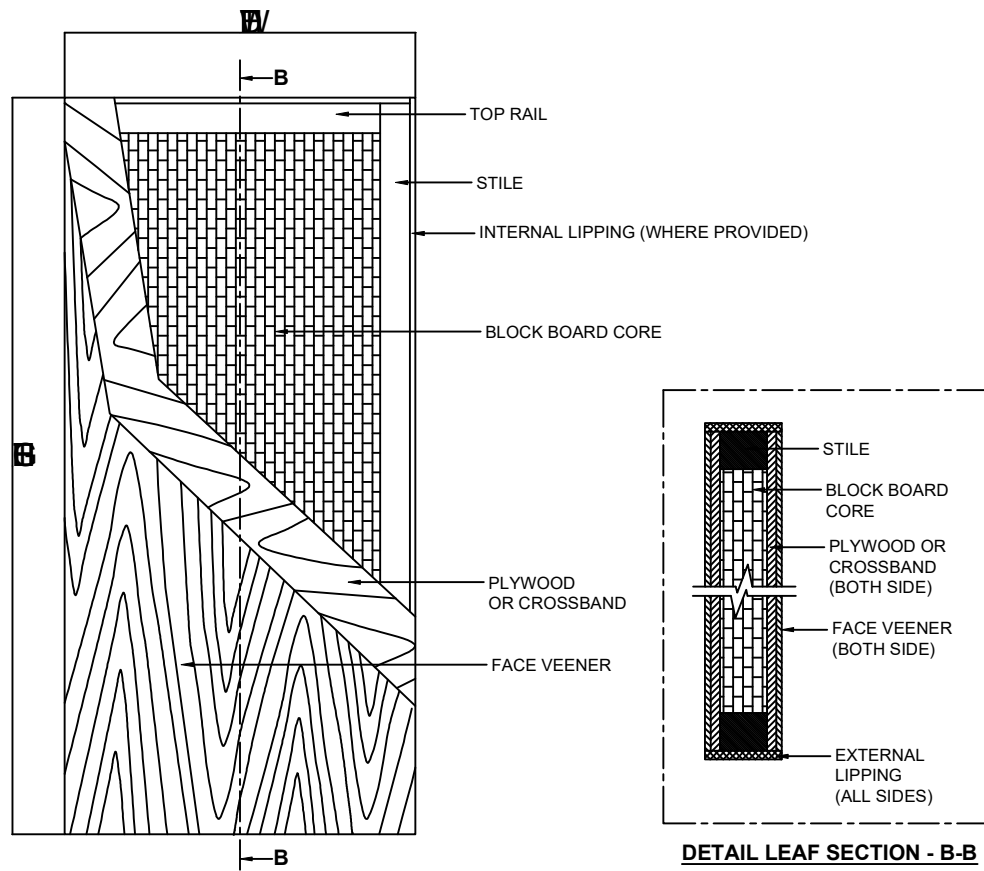


FIG. 2 TYPICAL SKETCH OF BLOCK BOARD CORE FLUSH DOOR SHUTTER

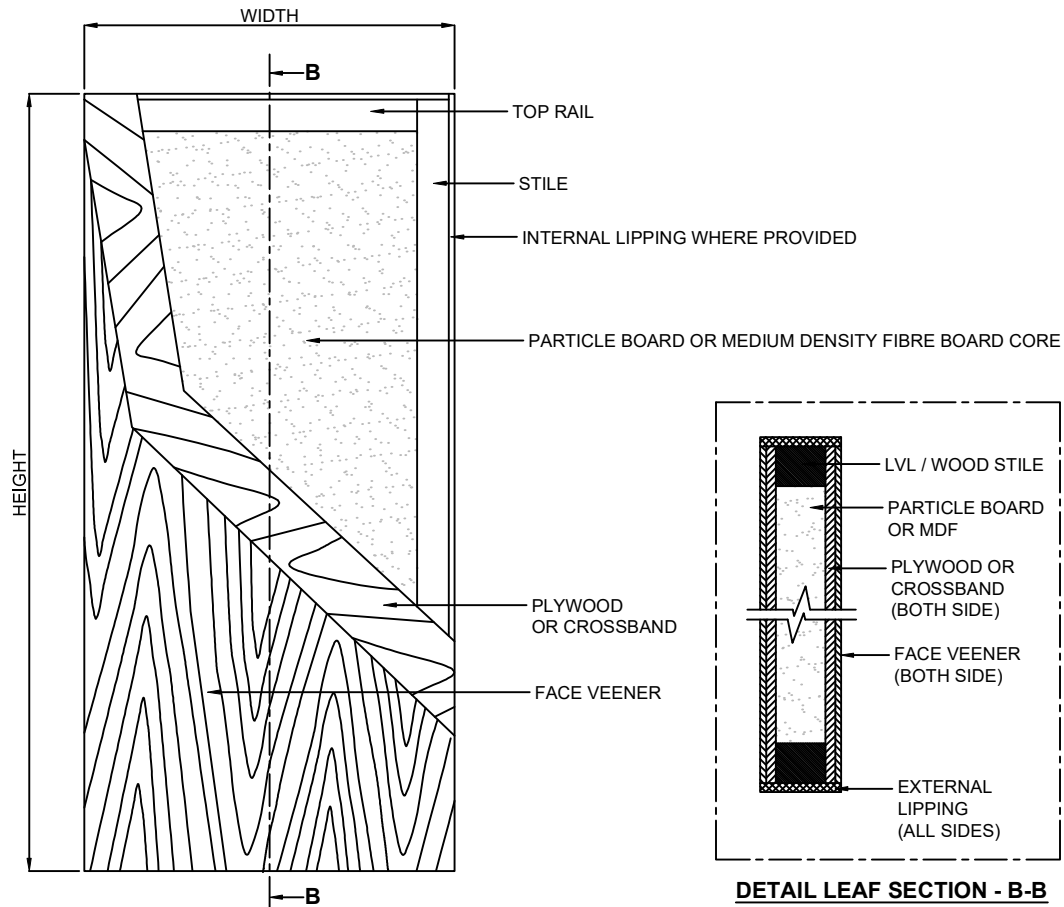


FIG. 3 TYPICAL SKETCH OF PARTICLE BOARD MEDIUM DENSITY FIBRE BOARD FLUSH DOOR SHUTTER

7.5 Face Panel

The face panel shall be formed by gluing (*see 6.6*) on both faces of the core either plywood or cross bands and face veneers by the hot press process. The thickness of the cross bands as such or in the plywood shall be between 1 mm and 3 mm. The thickness of the face veneer as such or in the plywood shall be between 0.4 mm and 1.5 mm for commercial veneers and between 0.35 mm and 1.0 mm for decorative veneers, provided that the combined thickness of both is not less than 2.2 mm. The plywood conforming to these requirements shall be glued under pressure on both faces of the core. When the panel consists of cross bands and face veneers glued separately, the cross bands shall be laid with their grains at right angles

to those of the core and glued to its both faces. Face veneer shall then be laid with their grains at right angles to those of the cross bands. Where it is desired to have wooden strips in the block board core horizontal rather than vertical, this shall be permitted only if 3 ply panel is pressed on both sides of the core and total is a 7 ply construction. Application of a decorative face veneer on a finished face panel having veneer in the same direction as the facing veneer shall be avoided. Where, however, this is unavoidable due to special circumstances the already existing veneer, whether commercial or decorative, shall be so sanded that the total thickness of both the existing and the approved face veneers together shall not exceed the maximum thickness specified; the thickness of decorative veneer after finishing is, in no case, less than 0.35 mm.

7.6 Lipping

7.6.1 Lipping shall be provided, if so desired by the purchaser. Lipping, where provided, may be internal or external as specified by the purchaser. Joint shall not be permitted in the lipping. Some typical ways of lipping are shown in Fig. 4 for guidance.

7.6.2 Internal lipping shall have a total depth of not less than 25 mm. It may be provided separately, when it is of a species different from that of backing or as one piece with the stile, designated as frame-cum-lipping, when internal lipping and backing are of the same species. The overall width shall be as given in 7.1 unless specifically asked for by the purchaser.

7.6.3 External lipping where provided, shall have their edges lipped by timber external lipping of any of the species mentioned in Annex B for guidelines or by any other edge banding (as agreed to between the manufacturer and the purchaser) and shall be glued using a moisture resistant glue.

7.7 Rebating

In the case of double-leaf shutters, the meeting of the stiles shall be rebated by 8 mm to 10 mm. The rebating shall be either splayed or square type as shown in Fig. 5. Where lipping is provided, the depth of lipping at the meeting of stiles shall not be less than 30 mm.

7.8 Opening for Glazing

When required by the purchaser, opening for glazing

shall be provided and unless otherwise specified, the opening provided shall be 250 mm in height and 150 mm or 200 mm in width. Unless otherwise specified by the purchaser, the bottom of the opening shall be at a 1 400 mm from the bottom of the shutter (see Fig. 6). Opening for glazing shall be lipped internally with solid timber or LVL or VLL.

7.9 Venetian

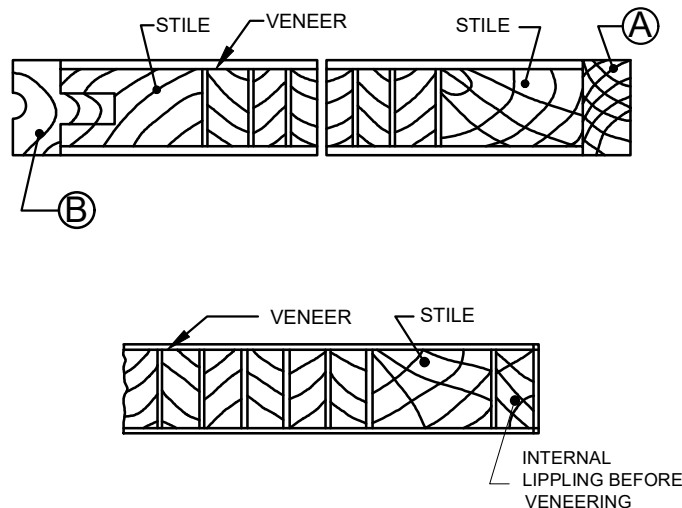
When required by the purchaser, a venetian opening shall be provided and, unless otherwise specified, the height of the opening shall be 350 mm. The width of the opening shall be as specified by the purchaser but shall provide for a clear space of at least 75 mm between the edge of the door and the venetian opening.

8 FITTINGS

8.1 Locks

Shutters shall be shop-prepared for taking mortice locks or latches as may be agreed to between the manufacturer and the purchaser. Shop-preparing the door with mortised holes for lock fixing shall be done only when desired, suitable blocks of wood or LVL or VLL may be provided for fixing the hardware; in the absence of specific requirements, the sizes of blocks shall preferably correspond to the maximum size of lock covered in IS 16015.

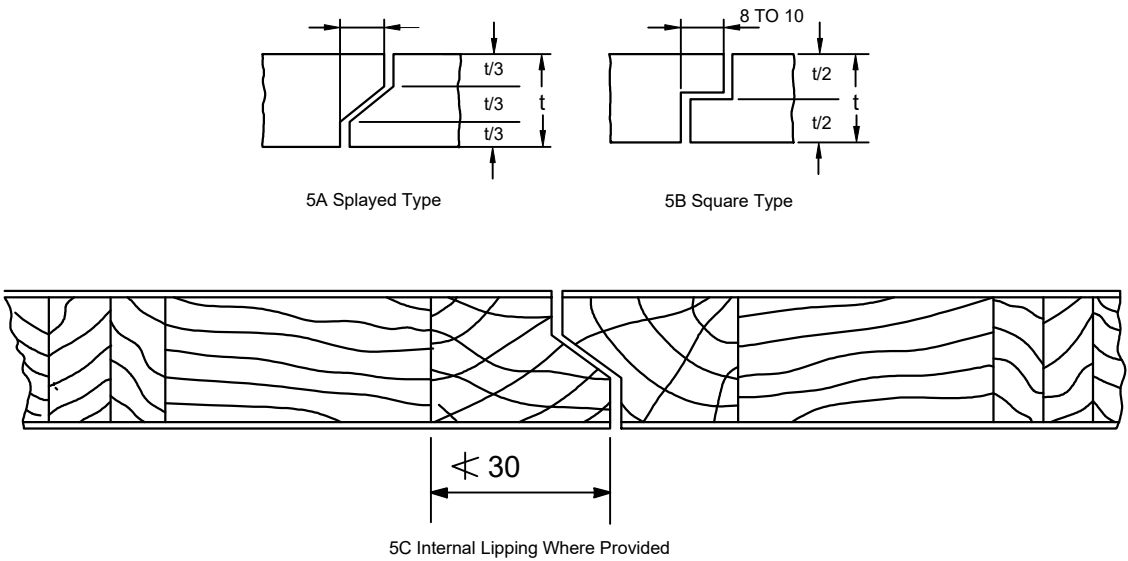
8.2 Other fittings, such as pull bolt, tower bolt, doors handle etc, may be provided as agreed to between the purchaser and the manufacturer.



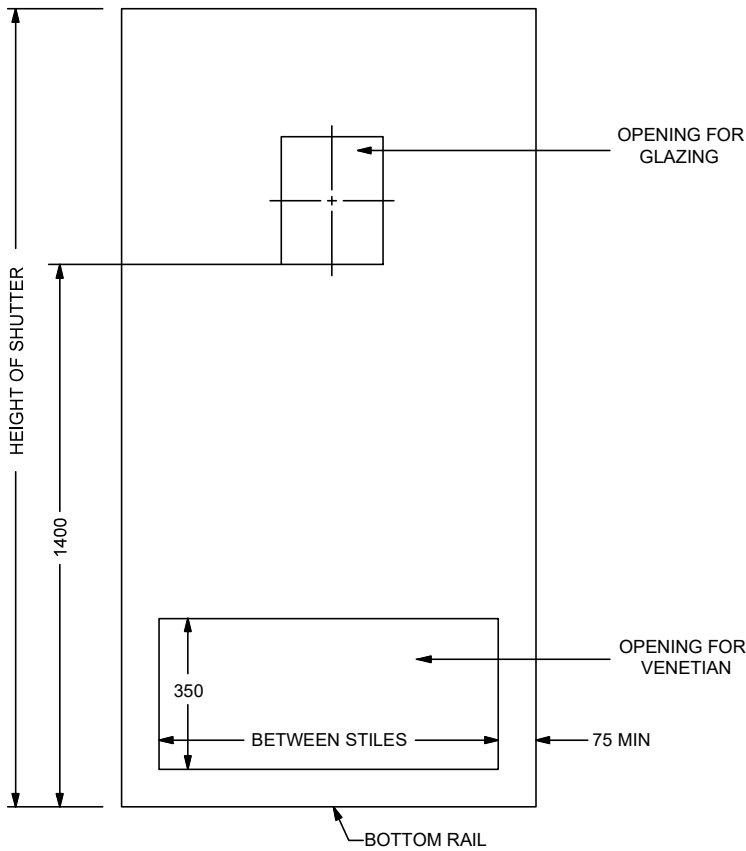
A – External lipping after veneering

B – External lipping with tongue and groove for single or double door shutters

FIG. 4 TYPICAL FIGURES SHOWING DIFFERENT WAYS OF LIPPING



All dimensions in millimetres
FIG. 5 MEETING OF STILES FOR DOUBLE-LEAF DOOR SHUTTER



All dimensions in millimetres
FIG. 6 TYPICAL LOCATION OF OPENINGS FOR GLAZING AND VENETIAN

9 WORKMANSHIP AND FINISH

9.1 All the four edges of the door shutter shall be square.

9.2 Both faces of door shutter shall be sanded to a smooth even texture. If required by the purchaser, all surfaces of shutters which are required to be painted ultimately shall be covered evenly by brush painting with a suitable priming coat as may be ordered by the purchaser, *see also* IS 2338 (Part 1). In the case of shutters to be polished or varnished; a priming coat of suitable polish or varnish shall be given before delivery. However, only unpainted doors shall be subjected to the tests mentioned under **10**.

9.3 Workmanship and finish of the face panels shall be in conformity with those specified in IS 710 for non-decorative and IS 1328 for decorative type.

10 TESTS

10.1 Classification of Tests

10.1.1 Acceptance Tests

The following shall constitute the acceptance (product identification) tests:

- a) Dimensions and squareness test,
- b) General flatness test,
- c) Local planeness test,
- d) Slamming test,
- e) End immersion test,
- f) Knife test, and
- g) Glue adhesion test.

10.1.2 Type Tests

The following shall constitute type (product approval) tests:

- a) Dimensions and squareness test,
- b) General flatness test,
- c) Local planeness test,
- d) Impact indentation test,
- e) Flexure test,
- f) Edge loading test,
- g) Shock resistance test,
- h) Buckling resistance test,
- j) Slamming test,
- k) Misuse test,
- m) Varying humidity test,
- n) End immersion test,
- p) Knife test,
- q) Glue adhesion test, and
- r) Screw withdrawal resistance test.

11 REQUIREMENTS

11.1 Dimensions and Squareness Test

Door shutters, when tested in accordance with IS 4020 (Part 2), the dimensions of width and height shall be within a limit of ± 5 mm. The door shutter shall not deviate by more than 1 mm on a length of 500 mm. The thickness of the door shutter shall be uniform throughout with the permissible variation of not more than 0.8 mm between any two points. The thickness of the shutter shall be within a limit of ± 1 mm.

11.2 General Flatness Test

Door shutters, when tested in accordance with IS 4020 (Part 3), the twist, cupping and warping shall not exceed 6 mm.

11.3 Local Planeness Test

Door shutters, when tested in accordance with IS 4020 (Part 4), the depth of deviation measured at any point shall not be more than 0.5 mm.

11.4 Impact Indentation Test

Door shutters, when tested in accordance with IS 4020 (Part 5), shall have no defects, such as cracking, tearing or delamination and the depth of indentation shall not be more than 0.2 mm.

11.5 Flexure Test

Door shutters when tested in accordance with IS 4020 (Part 6), the deflection at the maximum load shall not be more than one thirtieth of the length and one fifteenth of the width, whichever is less. On removal of the loads, the residual deflection shall not be more than one tenth of the allowable maximum deflection.

11.6 Edge Loading Test

Door shutters, when tested in accordance with IS 4020 (Part 7), the deflection of the edge at the maximum load shall not be more than 5 mm. On removal of the loads, the residual deflection shall not be more than 0.5 mm, failing which the test may be repeated on the other edge in the reverse direction. Also, there shall be no lateral buckling by more than 2 mm during loaded condition and no residual lateral buckling after removal of the load.

11.7 Shock Resistance Test

11.7.1 Door shutters, when tested in accordance with **2.1** of IS 4020 (Part 8), there shall be no visible damage in any part of the door after twenty-five blows on each end.

11.7.2 Door shutters, when tested in accordance with **3.1** of IS 4020 (Part 8), the normally hung shutter, with hangings, fixings and fastenings shall stand without any significant permanent deformation and without deterioration the five impacts on both sides of the shutter.

11.8 Buckling Resistance Test

Door shutters, when tested in accordance with IS 4020 (Part 9), shall not show any deterioration and any residual deformation of more than 5 mm after 15 min of unloading and the initial deflection also shall not be more than 50 mm.

11.9 Slamming Test

11.9.1 Anyone of the following test given in **11.9.2** and **11.9.3** shall be used.

11.9.2 Door shutters, when tested in accordance with **2.1** of IS 4020 (Part 10), shall not have any visible damage in any part of the door at the end of 50 successive impacts.

11.9.3 Door shutters, when tested in accordance with **3.1** of IS 4020 (Part 10), shall not have any visible damage in any part of the door at the end of 100 successive impacts.

11.10 Misuse Test

Door shutters, when tested in accordance with IS 4020 (Part 11), there shall not be any permanent deformation of the fixing or any other part of the doorset in hindering its normal working after the test.

11.11 Varying Humidity Test

Door shutters, when tested in accordance with IS 4020 (Part 12), there shall not be any visible warping, twisting or delamination and where precision is required the maximum departure from the general planeness shall not be more than 1.0 mm. The recovery of the original size after subjecting the door to high and low humidity shall be at least 90 percent of the change in dimensions.

11.12 End Immersion Test

When tested in accordance with IS 4020 (Part 13), there shall be no delamination at the end of the test. Glue lines in all the exposed edges of the plywood on both faces of the specimen, between the plywood faces and the stile and rail shall be examined for delamination. The immersion cycles for MR grade door shutter shall however be three.

11.13 Knife Test

11.13.1 Door shutters, when tested in accordance with IS 4020 (Part 14), the results of adhesion shall be reported as follows.

11.13.2 The adhesion is excellent when it is difficult to find the glue line and impossible to keep the tool within it for more than 6 mm without cutting into adjacent wood. On prising upwards, the veneer/facing sheet usually breaks off over a width only slightly greater than that of the tool. Examples of 'excellent bond' is illustrated in Fig. 7.

11.13.3 Example of 'minimum pass standard bond' is illustrated in Fig. 8.

11.13.4 The adhesion is poor when the knife meets little opposition in to the glue line and the prise results in the easy removal of almost all the veneers/facings sheets from one side of the tests specimen. The separated veneers/facing sheets are usually almost free from adjacent fibre. Examples of 'poor bond' is illustrated in Fig. 9. Door shutter designated as poor shall be declared as unsatisfactory.

11.14 Glue Adhesion Test

Door shutters, when tested in accordance with IS 4020 (Part 15), shall be considered to have passed the test if no delamination has occurred in the glue lines in the plywood or if no single delamination or more than 50 mm in length and more than 3 mm in depth has occurred in the assembly glue lines only between the plywood faces and stile and rail. Delamination at a knot, knot hole, a pitch pocket and wormhole or other permissible wood defects shall not be considered in assessing the sample. A door shutter shall be deemed to have passed the test if both the specimen tested passed the test. However, in the test for MR grade door shutter, the water with submerged specimens shall be brought to $(60 \pm 2)^\circ\text{C}$ in the place of boiling water.

11.15 Screw Withdrawal Resistance Test

Edge of door shutters, when tested in accordance with IS 4020 (Part 16), the required load to withdraw the screw completely shall not be less than 1 000 N. On withdrawal, there shall be no visible damage to the surface either by delamination or extra chipping off at the points of withdrawal.

12 SAMPLING AND CRITERIA FOR CONFORMITY

12.1 Lot

In any consignment, all the shutters of the same grade and type and manufactured under similar conditions of production in one day shall be grouped together to constitute a lot.

12.2 Sample Size

12.2.1 The number of specimens to be taken for testing of shutters for dimensions and squareness, flatness, and local planeness shall be in accordance with col 3 of Table 3.

12.2.2 For knife test, glue adhesion test, slamming test and end immersion test the number of shutters shall be as per col 5 of Table 3.

12.2.3 For impact test and screw withdrawal resistance test, shutters shall be tested on production of 1 000 shutters of the same size, thickness, grade and type.

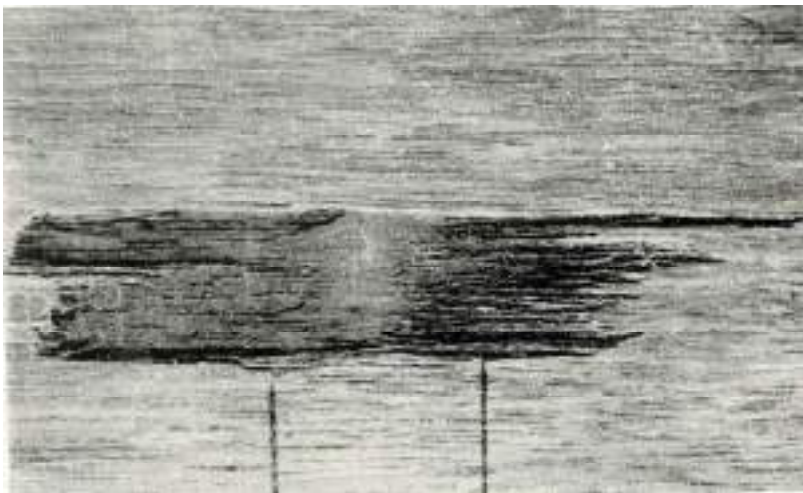


FIG.7 EXAMPLES OF 'EXCELLENT' ADHESION



FIG. 8 EXAMPLE OF 'MINIMUM PASS STANDARD' ADHESION

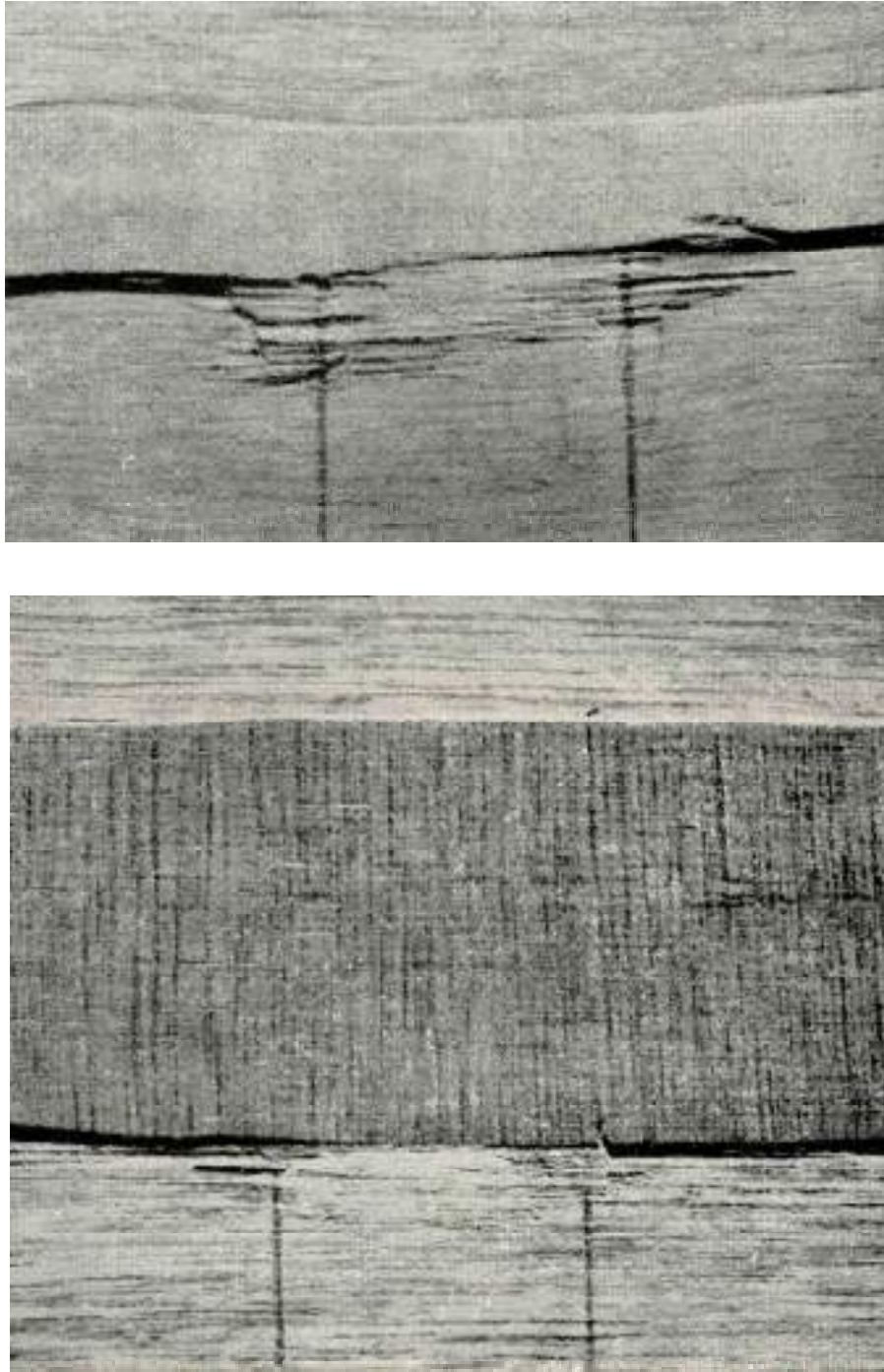


FIG. 9 EXAMPLES OF 'POOR ADHESION'

12.2.4 For flexure edge loading, shock resistance, misuse, varying humidity test and buckling test the shutters shall be tested once a year and whenever the design and construction is changed.

12.3 Criteria for Conformity

The lot shall be declared as conforming to the requirements of the standard when the number of defective samples does not exceed the permissible number given in col 4 of Table 3.

13 ADDITIONAL REQUIREMENTS FOR ECO MARK

Door shutters shall be manufactured from wood from sources other than natural forests such as timber from industrial and social forestry plantations, shade trees from tea and coffee estates, etc, as applicable to various components under 6 and such doors shutters shall conform to the requirements of quality and performance as specified in this standard as well as the requirements of ECO Mark for all the referred standards.

NOTES

1 The manufacturers shall provide documentary evidence by way of certificate or declaration to Bureau of Indian Standards which applying for ECO Mark.

2 The manufacturers shall provide 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* along with the authorization, if required under the *Environment (Protection) Act, 1986*, while applying for ECO Mark.

14 MARKING

14.1 Each shutter shall be legibly and indelibly marked on any of its edges with the following information:

- Name of the manufacturer or trade-mark, if any;
- Grade of door shutter;
- Abbreviation indicating the nature of construction of the shutter (*see* Table 1);
- Whether the size of the shutter is 'Modular' or 'Non-Modular';
- Designation as specified in Table 2 of the standard for modular sizes; or the actual size (width and height) for non-modular sizes along with appropriate designation for door shutters as given in 'Table 2';
- Thickness of door shutter;
- Species of timber, in case of ECO Mark; and
- The criteria for which the shutter has been labelled as ECO Mark (in case the flush door shutter has been marked with ECO Mark).

14.2 BIS Certification Marking

The shutters 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 shutters may be marked with the Standard Mark.

Table 3 Sample Size and Criteria for Conformity

(Clause 12.2)

Sl No.	Lot Size	Sample Size	Permissible No. of Defective Sample	Sub-sample Size
(1)	(2)	(3)	(4)	(5)
i)	26 to 30	8	0	1
ii)	51 to 100	13	1	2
iii)	101 to 150	20	1	2
iv)	151 to 300	32	1	3
v)	301 to 500	50	2	4
vi)	501 and above	80	2	5

NOTE — For lot size 25 or less, number of samples to be taken for testing shall be as agreed to between the manufacturer and the purchaser.

ANNEX A

(Clause 2)

LIST OF REFERRED INDIAN STANDARDS

<i>IS No.</i>	<i>Title</i>	<i>IS No.</i>	<i>Title</i>
303 : 1989	Plywood for general purposes — Specification (<i>third 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>)
401 : 2001	Preservation of timber — Code of practice (<i>fourth revision</i>)		
707 : 2011	Timber technology and utilization of wood, bamboo and cane — Glossary of terms (<i>third revision</i>)	4020 (Parts 1 to 16) : 1998	Door shutters — Methods of tests (<i>third revision</i>)
710 : 2010	Marine plywood — Specification (<i>second revision</i>)	4021 : 1995	Specification for timber door, window and ventilator frames (<i>third revision</i>)
848 : 2006	Synthetic resin adhesives for plywood (phenolic and aminoplastic) — Specification (<i>second revision</i>)	4351 : 2003	Steel door frames — Specification (<i>second revision</i>)
1328 : 1996	Veneered decorative plywood — Specification (<i>third revision</i>)	10428 : 1983/ ISO 1804 : 1972	Glossary of terms relating to doors
1708 (Part 1) : 1986	Method of testing of small clear specimens of timber: Part 1 Determination of moisture content (<i>second revision</i>)	12406 : 2021	Medium density fibre boards for general purpose — Specification (<i>second revision</i>)
2338 (Part 1) : 1967	Code of practice for finishing of wood and wood based materials : Part 1 Operations and workmanship	14616 : 1999	Laminated veneer lumber — Specification
		16015 : 2013	Mortice locks with lever mechanism (vertical type, sliding door locks and dead locks) — Specification
		16171 : 2014	Veneer laminated lumber — Specification

ANNEX B

(Clauses 6. 1. 1, 6. 1.2 and 6.1.5)

SPECIES OF TIMBER SUITABLE FOR THE MANUFACTURE OF FLUSH DOOR SHUTTERS

Group 1 Species Suitable for Core

SI No.	Standard Trade Name	Botanical Name	Abbreviated Symbol
1	Alder	<i>Alnus</i> spp.	ALD
2	Chatian	<i>Alstonia scholaris</i> R.Br.	CHT
3	Chir	<i>Pinus roxburghii</i> Sargent (Syn. <i>P. longifolia</i>)	CHR
4	Cypress	<i>Cupressus torulosa</i> D.Don.	CVP
5	Debdaru (Nedunar)	<i>Polyalthia</i> spp.	DEB
6	Deodar	<i>Cedrus deodara</i> G.Don.	DEO
7	Fir	<i>Abies</i> spp. (other than <i>A.densa</i> Griff.)	FIR
8	Gendelipoma	<i>Dysoxylum hamiltonii</i> Hiren.	GEN
9	Gokul	<i>Ailanthus integrifolia</i> (Syn. <i>A. grandis</i>)	GOK
10	Jathikai	<i>Knema</i> spp.	JAT
11	Kadam	<i>Anthocephalus chinensis</i> (Syn. <i>A. cadamba</i>)	KAD
12	Kail	<i>Pinus wallichiana</i> Jackson (Syn. <i>P. exceisa</i> Wall.)	KAL
13	Kattucheru	<i>Holigarna arnottiana</i> Hook.f.	KCH
14	Lampati	<i>Duabanga grandiflora</i> (Syn. <i>D. sonneratioides</i>)	LAP
15	Maharukh	<i>Ailanthus</i> spp. (other than <i>A. integrifolia</i>)	MAH
16	*Maina	<i>Tetrameles nudiflora</i> R. Br.	MAI
17	Makai	<i>Shorea assamica</i> Dyer	MAK
18	Malabar Neem	<i>Melia dubia</i> Cav.	MNE
19	Narikel	<i>Pterygota alata</i> (Roxb.) R. Br.	NAR
20	Poplar	<i>Populus</i> spp.	POP
21	Red Dhup	<i>Parishia insignis</i> Hook.f.	RDH
22	Rubber		
23	Rudrak	<i>Elaeocarpus</i> spp.	RUD
24	Salai	<i>Boswellia serrata</i> Roxb.	SAA
25	Silver		
26	Siris	<i>Albizia chinensis</i> Merr. (Syn. <i>A stipulate</i> Boiv.)	SIR
27	Spruce	<i>Picea smithiana</i> Boiss. (Syn. <i>P. morinda</i> Link)	SPR
28	Tanaku	<i>Gyrocarpus jacquini</i> Roxb. (Syn. <i>G. americanus</i>)	TAN
29	Toon	<i>Toona ciliata</i> (Syn. <i>Cedrela toona</i> Roxb.)	TOO
30	Vatica	<i>Vatica</i> spp.	VAT
31	*White Dhup	<i>Canarium</i> spp.	WDH

*These species of timber are to be treated.

Group 2A Species Suitable for Stiles, Rails and Lipping

SI No.	Standard Trade Name	Botanical Name	Abbreviated Symbol
1	Aini	<i>Artocarpus hirsutus</i> Lam.	AIN
2	Arjun	<i>Terminalia arjuna</i> Bedd.	ARJ
3	*Bahera	<i>Terminalia bellirica</i> Roxb.	BAH
4	Birch	<i>Betula</i> spp.	BIR
5	Bonsum	<i>Phoebe</i> spp.	BON
6	Carallia (Maniawga)	<i>Carallia brachiata</i> (Syn. <i>C. integerrima</i> DC.)	CAR
7	Champ	<i>Michelia</i> spp.	CHM
8	Chaplash	<i>Artocarpus chaplasha</i> Roxb.	CHP
9	Chickrassy	<i>Chukrasia velutina</i> (Syn. <i>C. tabularis</i>)	CHI
10	Chilauni	<i>Schima wallichii</i>	CHL
11	Cinnamon	<i>Cinnamomum</i> spp.	CIN
12	*Debdaru (Nedunar)	<i>Polyalthia</i> spp.	DEB
13	Devdam	<i>Dysoxylum binectariferum</i> Bedd.	DEV
14	Dillenia	<i>Dillenia</i> spp.	DIL
15	Dipika (Lapse)	<i>Mansonia dipikae</i> Purkay.	DIP
16	Ebony	<i>Diospyros</i> spp. (other than <i>D. marmorata</i>)	EBO
17	Gamari	<i>Gmelina arborea</i> Roxb.	GAM
18	Garcinia	<i>Garicina</i> spp.	GAC
19	Gurjan	<i>Dipterocarpus</i> spp. (other than <i>D. macrocarpus</i> Vesque)	GUR
20	Haldu	<i>Adina Cordifolia</i> (Roxb.)	HAL
21	Hathipaila	<i>Pterospermum accerifolium</i> Willd.	HAT
22	Hollock	<i>Terminalia myriocarpa</i>	HOC
23	Hollong	<i>Dipterocarpus macrocarpus</i>	HOL
24	Jaman	<i>Syzygium</i> spp.	JAM
25	Jathikai	<i>Knema</i> spp.	JAT
26	Jhingan	<i>Lannea coromandelica</i> (Syn. <i>L. grandis</i>)	JHI
27	Kaim	<i>Mitragyna parvifolia</i> Korth. (Syn. <i>Stephengyne parvifolia</i>)	KAI
28	Kala-Siris	<i>Albizia odoratissima</i> Benth.	KSI
29	Kanju	<i>Holoptelea integrifolia</i> Planch.	KAN
30	*Karani	<i>Cullenia exarillata</i> Robyns (Syn. <i>C. excelsa</i> Wight)	KAR
31	Kathal	<i>Artocarpus heterophyllus</i> Lam. (Syn. <i>A. integrifolius</i>)	KAT
32	Kindal	<i>Terminalia paniculata</i> Roth	KIN
33	Kokko	<i>Albizia lebbbeck</i> Benth.	KOK
34	Lakooch	<i>Artocarpus lacucha</i> Buch-Ham (Syn. <i>A. lakoocha</i> Roxb.)	LAK
35	Lampati	<i>Duabanga grandiflora</i> (Syn. <i>D. sonneratioides</i>)	LAP
36	Laurel	<i>Terminalia alata</i> Roth (Syn. <i>T. coriacea</i> W & A; & <i>T. crenulata</i>)	LAU
37	Machilus	<i>Persea</i> spp. (Syn. <i>Machilus</i> Spp.)	MAC

SI No.	Standard Trade Name	Botanical Name	Abbreviated Symbol
38	Mango	<i>Mangifera</i> spp.	MAN
39	Maple	<i>Acer</i> spp.	MAP
40	Mullilam	<i>Zanthoxylum rhetsa</i> DC. (Syn. <i>Fagara budrunga</i> Roxb.)	MUI
41	*Mundani	<i>Acrocarpus fraxinifolius</i> W. & A.	MUN
42	Padauk	<i>Pterocarpus dalbergioides</i> Roxb.	PAA
43	Pali	<i>Palaquium ellipticum</i> Engler.	PAL
44	*Piney	<i>Kingiodendron pinnatum</i> (Syn. <i>Hardwickia pinnata</i> Roxb. Ex. DC.)	PIN
45	Poon	<i>Calophyllum</i> spp.	POO
46	Pussur	<i>Xylocarpus</i> spp.	PUS
47	Pyinma	<i>Lagerstroemia hypoleuca</i> Kurz	PYI
48	Red Bombwe	<i>Planchonia andmanica</i> King. <i>valida</i> (Syn. <i>P. valida</i>)	RBO
49	Rosewood	<i>Dalbergia latifolia</i> Roxb.	ROS
50	Safedsiris	<i>Albiua procera</i> Benth.	SSI
51	Silver Oak	<i>Grevillea robusta</i> A. Cunn.	SOA
52	Sissoo	<i>Dalbergia sissoo</i> Roxb.	SIS
53	Teak	<i>Tectona grandis</i> Linn.	TEA
54	Toon	<i>Toona ciliate</i> Roem. (Syn. <i>Cedrela toona</i> Roxb.)	TOO
55	*Vellapine	<i>Vateria</i> spp.	VEL
56	Walnut	<i>Juglans regia</i> Linn.	WAL
57	While Bombwe	<i>Terminalia procera</i> Roxb.	WBO
58	White Cedar	<i>Dysoxylum malabaricum</i> Bedd.	WCE
59	White Chuglam	<i>Terminalia bialata</i> Kurz (Sapwood)	WCH
60	While Dhup	<i>Canarium</i> spp.	WDH
61	Ywegi	<i>Adenanthera pavonina</i> Linn.	YWE
62	Mahogany	<i>Swietenia</i> spp.	MAG

*These species of timber are to be treated.

Group 2B List of Species of Timber being imported for Door Shutter and considered Suitable from the Foreign Literature available

SI No.	Trade Name	Botanical Name	Country Name From Where Imported
1	Abura	<i>Mitragyna stipulosa</i> O.Ktze	Africa (A)
2	Afrormosia\$	<i>Afrormosia angolensis</i> Harms	A
3	Alan Batu*	<i>Shorea albida</i> Sym.	Malaysia (M)
4	Amoora*	<i>Ammora cucullata</i> Roxb.	Papua New Guinea (PNG)
5	Bintangor	<i>Calophyllum</i> spp.	M
6	Dark Red Meranti*	<i>Shorea</i> spp	M
7	Durian	<i>Coelostegia</i> spp <i>Duria</i> and <i>Neesia</i> spp	M
8	Iroko\$	<i>Chlorophora excelsa</i> Benth. & Hook.f	A
9	Keruing	<i>Dipterocarpus acutangulus</i> Vasque	M
10	Kwila*	<i>Intsia bijuga</i> Kuntze	M

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SI No.	Trade Name	Botanical Name	Country Name From Where Imported
11	Light Red Meranti*	<i>Shorea spp</i>	M
12	Merawan*	<i>Hopea beccariana</i> Burck	M
13	Merbau*	<i>Intsia palembanica</i>	M
14	Nyatoh*	<i>Ganua spp Palaquium spp and Payuena spp</i>	M
15	Nyatoh Kuning*	<i>Planchonella maingayi</i> Van Royen <i>Pouteria malaccensis</i> Baehni	M
16	Sapele*	<i>Entandophragma cylindricus</i> Sprague	A
17	Terminalia red brown group*	<i>Termmalia spp</i>	PNG
18	Utile*	<i>Entandophragma utile</i> Sprague	A
19	Vitex*	<i>Vitex cofassus</i> Reinw.	PNG

NOTE — Above imported species shall be used for shutters only after proper treatment as prescribed in IS 401 and concerned clause of this standard, as suitable and sufficient information regarding their durability is not available and whatever is available may not fully hold good in Indian conditions. However, heartwood of species marked '\$' to be very durable. Further, where sufficient retention/absorption/penetration of preservative is not obtained as per IS 401 due to poor treatability character of the species, the door shall be treated with PCP solvent system after complete fabrication to ensure minimum penetration of preservative to the depth of 2 mm in the finished products. Such species which are refractory to treatment are marked*.

ANNEX C

(Foreword)

COMMITTEE COMPOSITION

Doors, Windows and Shutters Sectional Committee, CED 11

<i>Organization</i>	<i>Representative(s)</i>
In Personal Capacity (<i>B-094, Trinity Towers DLF Phase – V, Sector 53, Gurugram 122002, Haryana</i>)	SHRI R. K. KAKAR (Chairman)
A B Composites Private Limited, Kolkata	REPRESENTATIVE
A P Road and Buildings, Hyderabad	CHIEF ENGINEER (R & B)
APL Apollo Tubes Limited, Noida	SHRI TAPESH GUPTA
Aluminum Association of India, Bengaluru	DR PRADYUMNA KUMAR PRADHAN
B G Shirke Construction Technology Ltd, Pune	COL (RETD) SANJAY M. ADSAR SHRI Y. B. PATHAN (<i>Alternate</i>)
Bhoruka Extrusions Private Limited, Mumbai	SHRI SEIJI KUMAMOTO SHRI OM PRAKASH VERMA (<i>Alternate</i>)
Builders Association of India, Chennai	SHRI SUDIP KUMAR DUTTA SHRI M. SATHYANARAYANAMURTHY (<i>Alternate</i>)
Building Material and Technology Promotion Council, New Delhi	SHRI C. N. JHA SHRI D. P. SINGH (<i>Alternate</i>)
Central Institute of Plastics Engg. and Technology, Chennai	DR S. N. YADAV DR R. K. SINGH (<i>Alternate</i>)
Central Public Works Department, New Delhi	SHRI A. K. SHARMA MS NANDINI MUKHOPADHYAY (<i>Alternate</i>)
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Delhi Development Authority, New Delhi	REPRESENTATIVE
Engineers India Limited, New Delhi	SHRI SAMIR DAS MS JYOTSNA SHRIDHAR (<i>Alternate I</i>) SHRI AKHILESH MAURYA (<i>Alternate II</i>)
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Glazing Society of India, Chennai	SHRI G. N. GOHUL DEEPAK SHRI NAVEEN KARKI (<i>Alternate</i>)
Greenlam Industries, Kolkata	SHRI INDER KOCHHAR
Gujarat State Forest Development Corporation Limited, Vadodara	SHRI R. K. SUGOOR SHRI A. K. GANDHI (<i>Alternate</i>)
Hindalco Industries Limited, Mumbai	SHRI A. JAYAGOPAL SHRI CHANDAN AGRAWAL (<i>Alternate</i>)
Indian Buildings Congress, New Delhi	SHRI A. K. SRIVASTAVA
Indian Plywood Industries Research and Training Institute, Bengaluru	SHRI ANAND NANDANWAR
Jindal Aluminium Limited, Bengaluru	REPRESENTATIVE
Military Engineer Services, Engineer-in-Chief's Branch, Integrated HQ of MoD (Army), New Delhi	SHRIMATI UPINDER KAUR SHRIMATI SHOBHANA V. (<i>Alternate</i>)
Ministry of Micro, Small & Medium Enterprises, New Delhi	SHRI G. RAJAMONICKAM SHRI K. K. FUNDA (<i>Alternate</i>)

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<i>Organization</i>	<i>Representative(s)</i>
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Modern Fabrications, Kolkata	REPRESENTATIVE
NBCC (India) Ltd, New Delhi	SHRI M. C. SHARMA SHRIMATI RESHMA DUDHANI (<i>Alternate</i>)
National Bamboo Mission, New Delhi	MISSION COORDINATOR
National Test House, Kolkata	SHRI D. V. S. PRASAD SHRI ALOKE DE (<i>Alternate</i>)
Northern Indian Plywood Manufacturer Association, Yamuna Nagar	SHRI N. K. TIWARI
Public Works Department, Govt of NCT of Delhi, New Delhi	REPRESENTATIVE
Polywindows, Pune	SHRI PARMESH ARORA
Rajasthan Housing Board, Jaipur	SHRI B. N. MOOLCHANDANI SHRI D. C. BABEL (<i>Alternate</i>)
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Reliance Industries Limited, Mumbai	SHRI JAYESH M. DESAI SHRI AMIT J. SHAH (<i>Alternate</i>)
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Spacewood Furnishers Pvt Ltd, Nagpur	SHRI SHIRISH BHATT SHRI VIVEK DESHPANDE (<i>Alternate</i>)
The Indian Institute of Architects, New Delhi	REPRESENTATIVE
U P Awas Evam Vikas Parishad (U P Housing & Development Board), Lucknow	REPRESENTATIVE
UPVC Windows and Door Manufactures Association, New Delhi	SHRI MARIO SCHMIDT SHRI ULLAS GULIANI (<i>Alternate</i>)
Uttaranchal Plywood Manufacturers Association, Ramnagar	REPRESENTATIVE
BIS Directorate General	SHRI SANJAY PANT, SCIENTIST 'F' AND HEAD (CIVIL ENGINEERING) [REPRESENTING DIRECTOR GENERAL (<i>Ex-officio</i>)]

Member Secretary

SHRI PRADEEP SINGH SHEKHAWAT
SCIENTIST 'D'/JOINT DIRECTOR (CIVIL ENGINEERING), BIS

Bureau of Indian Standards

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Amendments Issued Since Publication

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