

भारतीय मानक
Indian Standard

IS 2191 (Part 1) : 2022

लकड़ी के सपाट दरवाजे के शटर
(सेलुलर, खोखले एवं ट्यूबलर प्रकार के कोर) —
विशिष्टि

भाग 1 प्लाईवुड सतहयुक्त पल्ले
(पांचवाँ पुनरीक्षण)

Wooden Flush Door Shutters
(Cellular, Hollow and Tubular Core
Type) — Specification

Part 1 Plywood Face Panels
(Fifth Revision)

ICS 91.060.50

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Price Group 8

Doors, Windows and Shutters Sectional Committee, CED 11

FOREWORD

This Indian Standard (Part 1) (Fifth 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 and 1983. During this period the standard has undergone modifications relating to grade of doors, species of timber, inclusion of tests, etc and the sizes were rationalized.

Considering the rapid changes in lifestyle as well as material availabilities and acceptance of ecofriendly options in door constructions during the last four decades, this fifth revision is a major makeover.

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

- a) Tubular type core has been added and accordingly both title and scope of the standard have been modified.
- b) Wooden flush door shutters (cellular, hollow and tubular core type) have been categorized in two grades namely BWP (Boiling Water Proof) Grade and MR (Moisture Resistance) Grade.
- c) Thickness criteria for wooden flush door shutters for all designations have been revised.
- d) Raw materials requirements have been modified as per new grades of wooden flush door shutters (cellular, hollow and tubular core type).
- e) Laminated veneer lumber (LVL) and veneer laminated lumber (VLL) have been incorporated as raw materials for use as stiles and rails.
- f) End immersion test and glue adhesion test requirements have been modified as per grades of wooden flush door shutters (cellular, hollow and tubular core type).
- g) 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 clear in terms of interpretation and also 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 (CELLULAR, HOLLOW AND TUBULAR CORE TYPE) — SPECIFICATION

PART 1 PLYWOOD FACE PANELS

(Fifth Revision)

1 SCOPE

This standard (Part 1) specifies the requirements for cellular, hollow and tubular core wooden flush door shutters with face panels of plywood or 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 of the following two grades:

- a) *BWP (Boiling Water Proof) Grade* — Flush door shutters may be used in both humid and dry locations.
- b) *MR (Moisture Resistance) Grade* — Flush door shutters may be used in dry locations only.

4.2 Each of the grade 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
(Cellular, Hollow and Tubular Core Type)**

[Clauses 4.2 and 14.1 (c)]

SI No.	Core	Type	Abbreviation
(1)	(2)	(3)	(4)
i)	Cellular	Decorative	CD
		Non-decorative	CN
ii)	Hollow	Decorative	HD
		Non-decorative	HN
iii)	Tubular	Decorative	TD
		Non-decorative	TN

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.

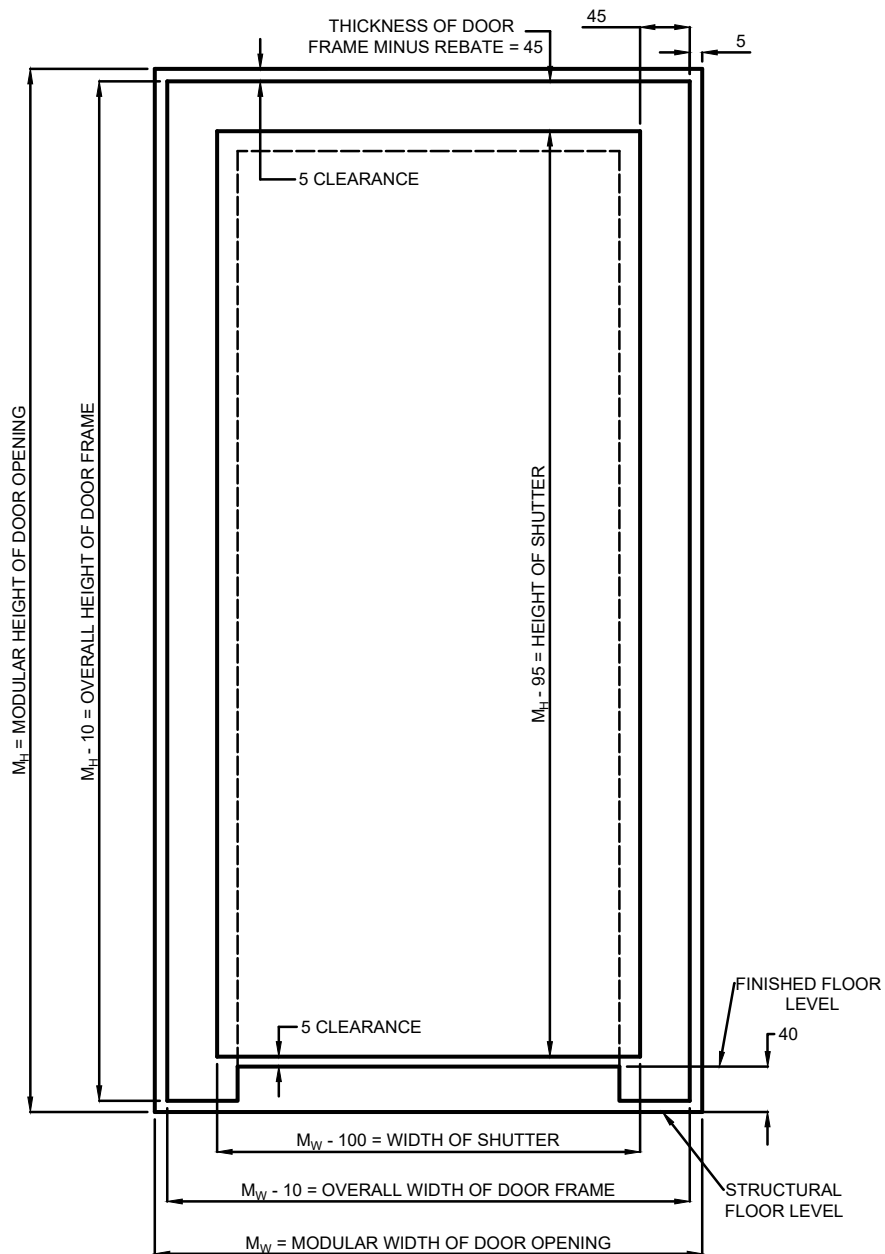
6 MATERIALS

6.1 Timber

6.1.1 Any Species of timber for may be used as stiles and rails in the flush door shutters. The species of timber suitable for use in the stiles, rails and lipping core of flush door shutters for guidance purpose only are specified in Annex B.

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

IS 2191 (Part 1) : 2022



All dimensions in mm

FIG. 1 TYPICAL 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 shutters, the rebate shall be as given in 7.8.

*Combined width of two shutters in closed position.

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

6.1.3 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 maybe permitted. Pitch pockets, pitch streaks and harmless pin-boles 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.

6.1.4 Timber shall be preservative treated before assembly as specified in 6.1.5. Trimmed cut ends shall be given to a protective treatment by brush or spray application.

6.1.5 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 93°C to 100°C for a period of 10 min 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 the block stacked for at least two hours. 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 shall be dried to a suitable moisture content before bonding.

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 laid down 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.

IS 2191 (Part 1) : 2022

6.5 Cross-bands and face veneers made from species of timber marked with an asterisk in Annex B used shall be treated in accordance with **6.1.5**. Preservative treated plywood shall be used as specified in their respective Indian Standards (*see* **6.2.1** and **6.2.2**).

6.6 Adhesives

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.

6.7 Particle Board

Particle board used for the core of the flush doors shall be either flat-pressed type, 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 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 Cellular Core (*see* Fig. 2)

Frame for holding the core shall be constructed from stiles; and top and bottom rails, each not less than, 40 mm wide including internal lipping where provided. The cellular core shall be of any of the following types of construction:

- a) *Type A* — Particle board, fibre hardboard, wooden or plywood battens, tubulars, strips of blocks or batten strips of not less than 25 mm width so fixed that each of the voids formed shall not exceed 2 500 mm² in area and the volumetric content of the voids shall not exceed 50 percent of the total core volume, that is, when measured from edge to edge.
- b) *Type B* — The rolls, strips, coils or corrugations of veneers not less than 1 mm in thickness and not less than 100 mm in length (when fully flat), so fixed that the distance between any two faces of the rolls, strips, coils or corrugations, at any place is such that at least one strip is intercepted by a square of side 200 mm in any position.

7.1.1 The voids shall be uniformly distributed throughout the core.

7.2 Hollow Core (*see* Fig. 3)

Frame for holding the core shall be constructed from stiles; top and bottom; and minimum two intermediate rails, each not less than 40 mm wide including internal lipping where provided. In each segment, battens not less than 25 mm wide shall be fixed in such a way that the voids are equally distributed and the void area in any segment is less than 50 000 mm². Battens may also be replaced by suitable rolls or strips of veneers.

7.3 Tubular Core (*see* Fig. 4)

Frame for holding the core shall be constructed from stiles; and top and bottom rails, each not less than 40 mm wide including internal lipping where provided (if agreed to between manufacturer and purchaser). The tubular core shall be of one of the following types of construction:

- a) Tubular cores of uniform tubes across the height of the door;
- b) Tubular cores of small tubes in lock area; and
- c) Tubular cores of solid area in lock area.

7.3.1 The tubes shall be always horizontally positioned while filling the door internal frame.

7.3.2 Expansion gap of 3 mm shall be maintained between tubular board and stiles.

7.4 Stiles and Rails

7.4.1 Stiles and rails of shutters shall be of timber or LVL or VLL (*see* **6.8**). Second stile and rail of alternative material (other than LVL and VLL) (*see* **6.8**) 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.

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

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

7.4.3 The rails shall be made without any joints.

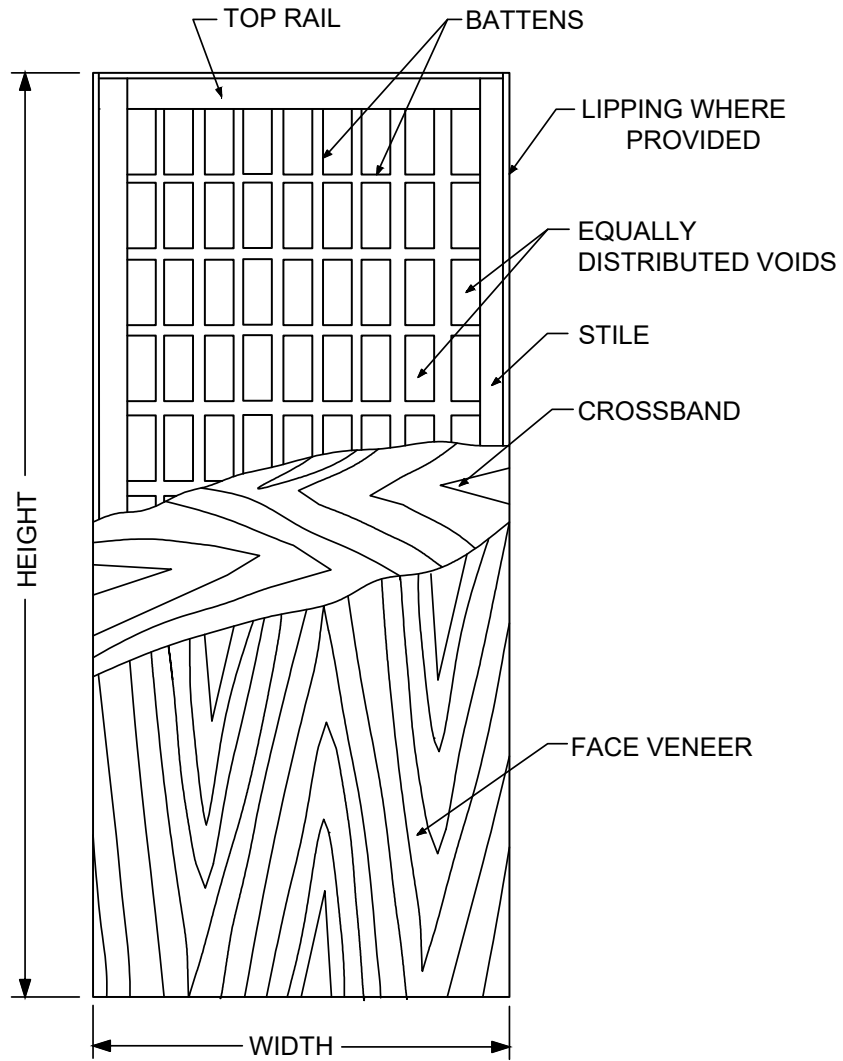


FIG. 2 TYPICAL SKETCH OF CELLULAR CORE FLUSH DOOR SHUTTER

IS 2191 (Part 1) : 2022

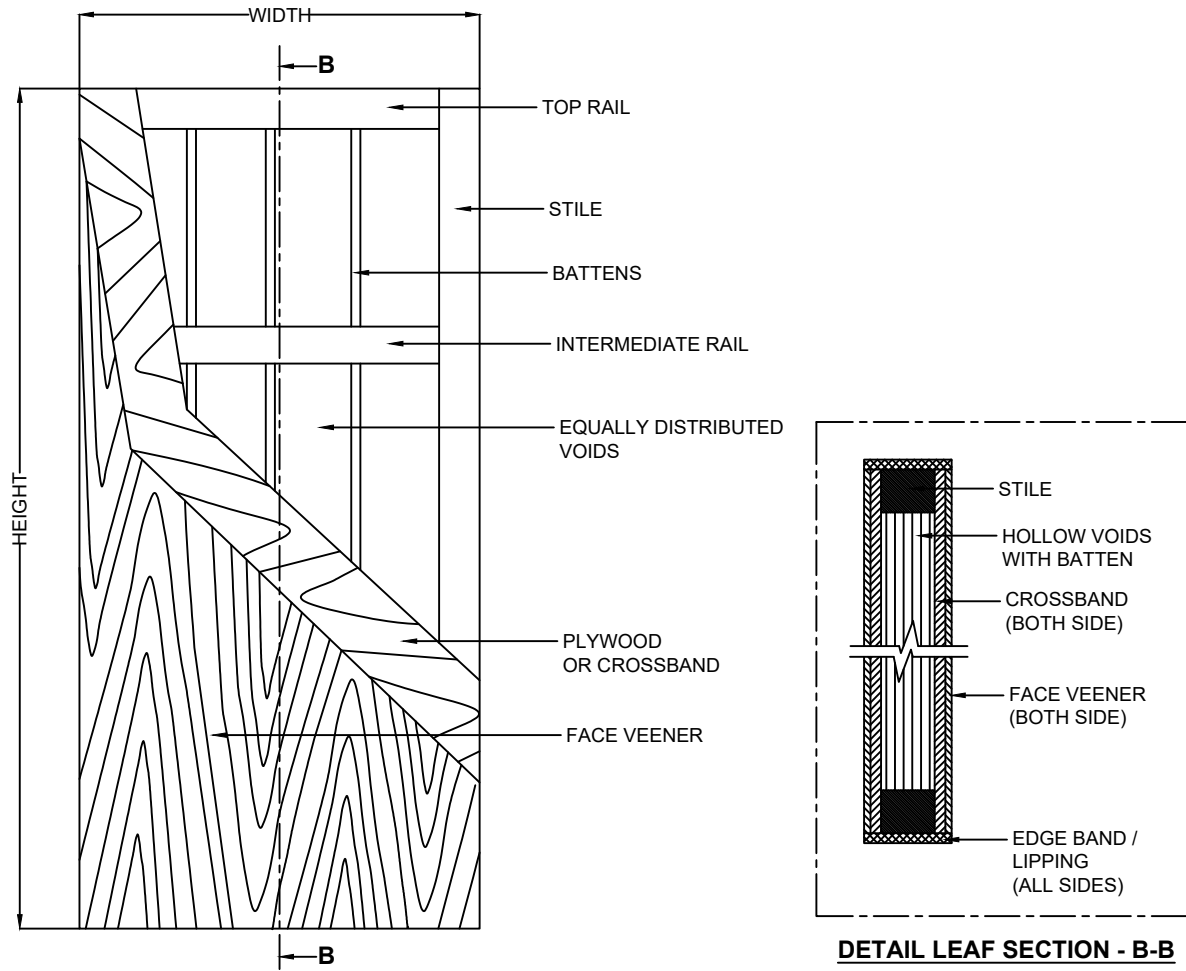


FIG. 3 TYPICAL SKETCH OF HOLLOW CORE FLUSH DOOR SHUTTER

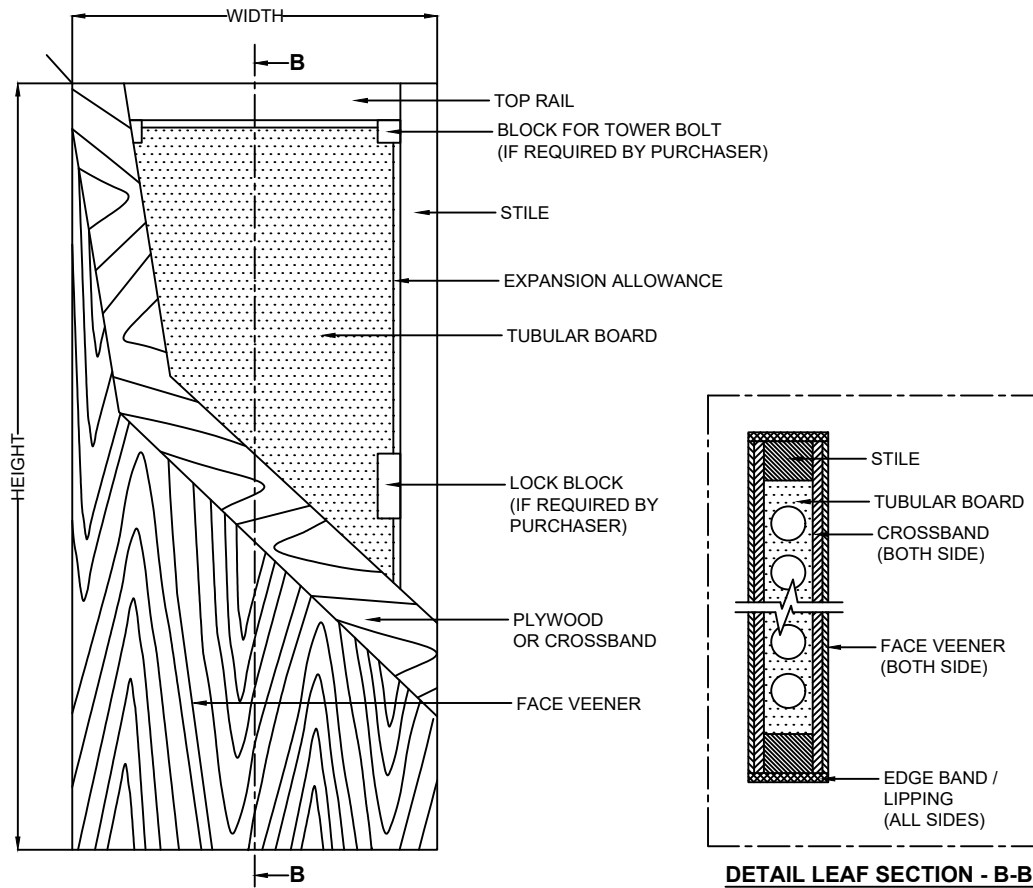


FIG. 4 TYPICAL SKETCH OF TUBULAR CORE FLUSH DOOR SHUTTER

IS 2191 (Part 1) : 2022

7.5 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.

7.6 Face Panel

7.6.1 The plywood or combination of cross-band and veneer forming the face panel shall not be less than 3 mm in thickness in the case of cellular and tubular core shutters, and not less than 6 mm in thickness in the case of hollow core shutters. Two-ply face skin construction in a combination of cross-band and face veneers may also be adopted for cellular core shutters only but in that case the combined thickness of one cross-band and one face veneer shall be not less than 4 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. The plywood face skin or cross-band and veneer assembly conforming to these requirements shall be glued (*see 6.6*) under pressure on both faces of the core.

7.6.2 Application of a decorative face veneer on a finished face panel having veneer in the same direction as the proposed veneer shall be avoided. However, where 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 applied face veneers together shall not exceed the maximum thickness specified, and provided that the thickness of decorative veneer is in no case less than 0.35 mm.

7.7 Lipping

7.7.1 Lipping shall be provided, if so desired by the purchaser. Lipping, where provided, shall be internal or external as specified by the purchaser. Joint shall not be permitted in the lipping.

7.7.2 External lipping, like edge-banding where provided, shall be of solid timber or by any other edge banding (as agreed to between the manufacturer and the purchaser) and shall be glued using a moisture resistant glue.

7.8 Rebating

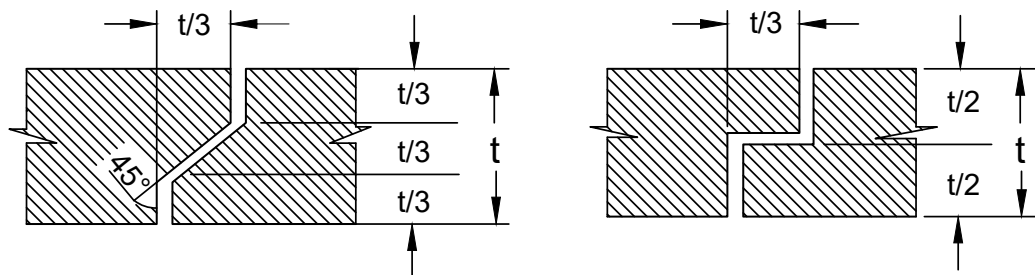
In the case of double leaf shutters, the meeting of the stiles shall be rebated by one-third the thickness of door shutter. The rebating shall be either splayed or square type as shown in Fig. 5. Where lipping is provided, the depth of lipping at the meeting of stiles shall not be less than 30 mm.

7.9 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 is 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.

7.10 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 it shall be provide for a clear space of minimum 75 mm between the edge of the door and the venetian opening.

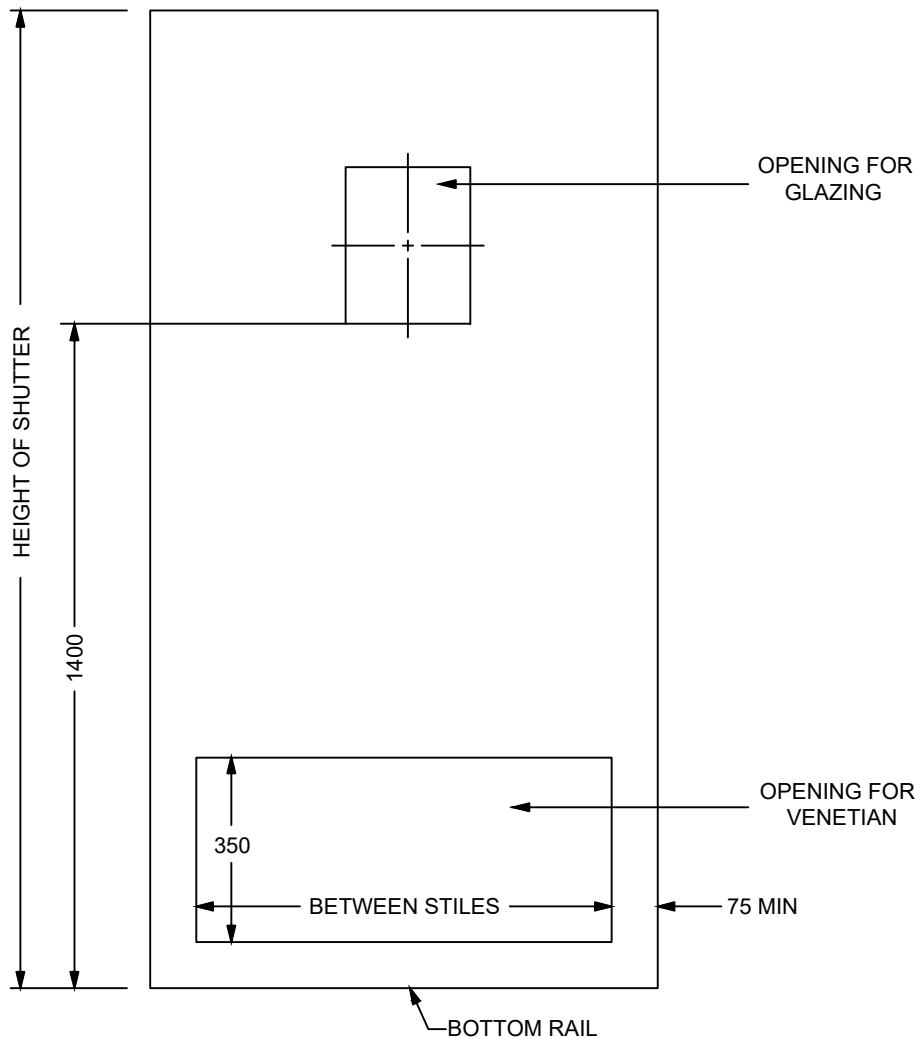


5A SPLAYED TYPE

5B SQUARE TYPE

NOTE — t Thickness of Shutter

FIG. 5 TYPICAL DETAILS OF MEETING OF STILES FOR DOUBLE-LEAF DOOR SHUTTERS



All dimensions in millimetres

FIG. 6 TYPICAL LOCATION OF OPENING FOR GLAZING AND VENETIAN

8 FITTINGS

8.1 Locks — Shutters shall be shop-prepared for taking mortice locks or latches as may be ordered. Shop preparing the door with morticed holes for lock fixing shall be done only when desired by the purchaser. Where the purchaser so desires, suitable blocks of wood or LVL or VLL may be provided for fixing the hardware. In the absence of specific requirements, block 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.

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 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.

IS 2191 (Part 1) : 2022

9.3 Workmanship and finish of the face panels shall be in conformity with those specified in IS 710 for commercial type 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 with 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 decoration 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), door shutters shall be considered to have passed the test if no delamination or disintegration 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 ± 2) °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 1000 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 and type.

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.

IS 2191 (Part 1) : 2022

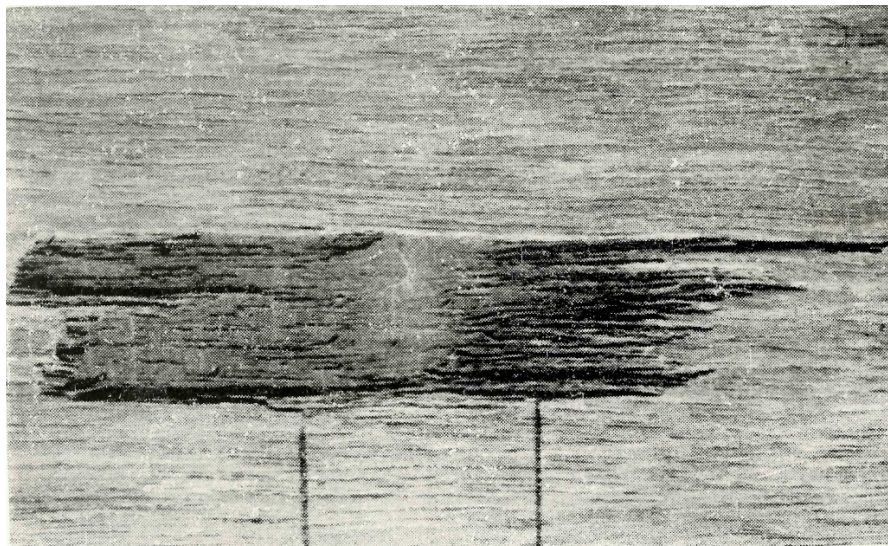
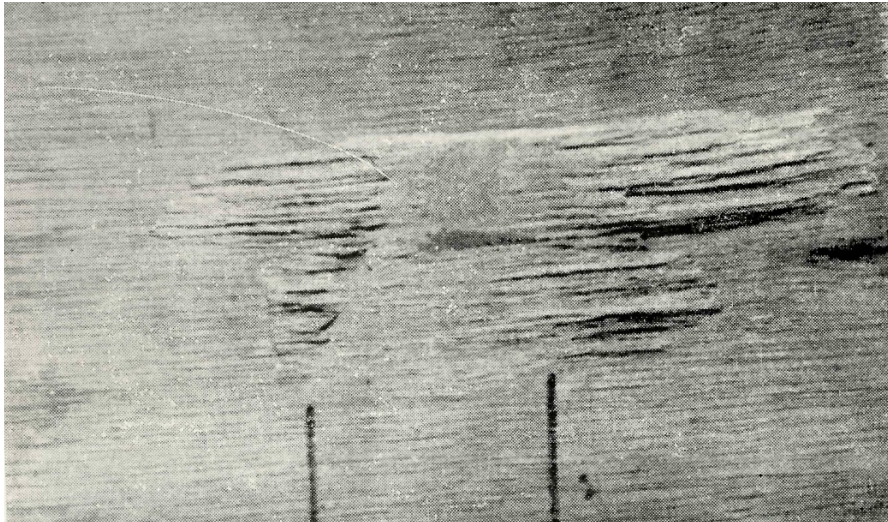


FIG.7 EXAMPLES OF 'EXCELLENT' ADHESION

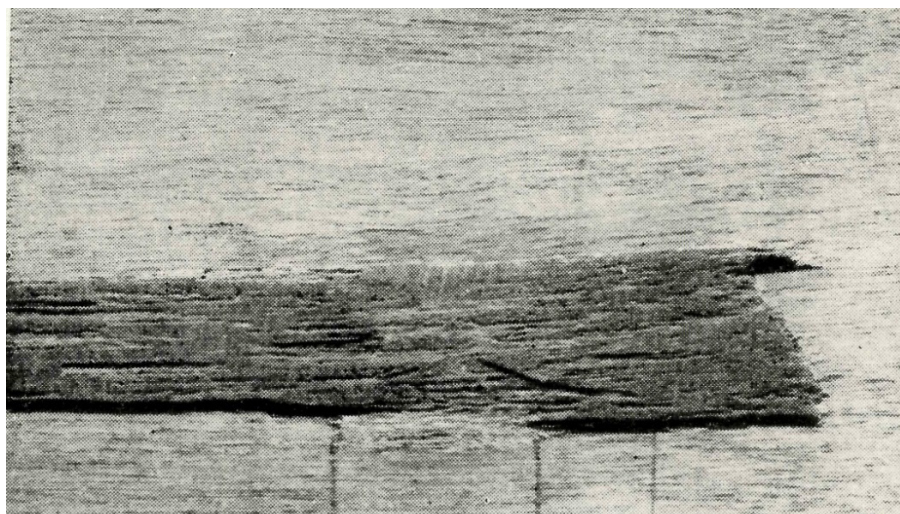


FIG. 8 EXAMPLE OF 'MINIMUM PASS STANDARD' ADHESION

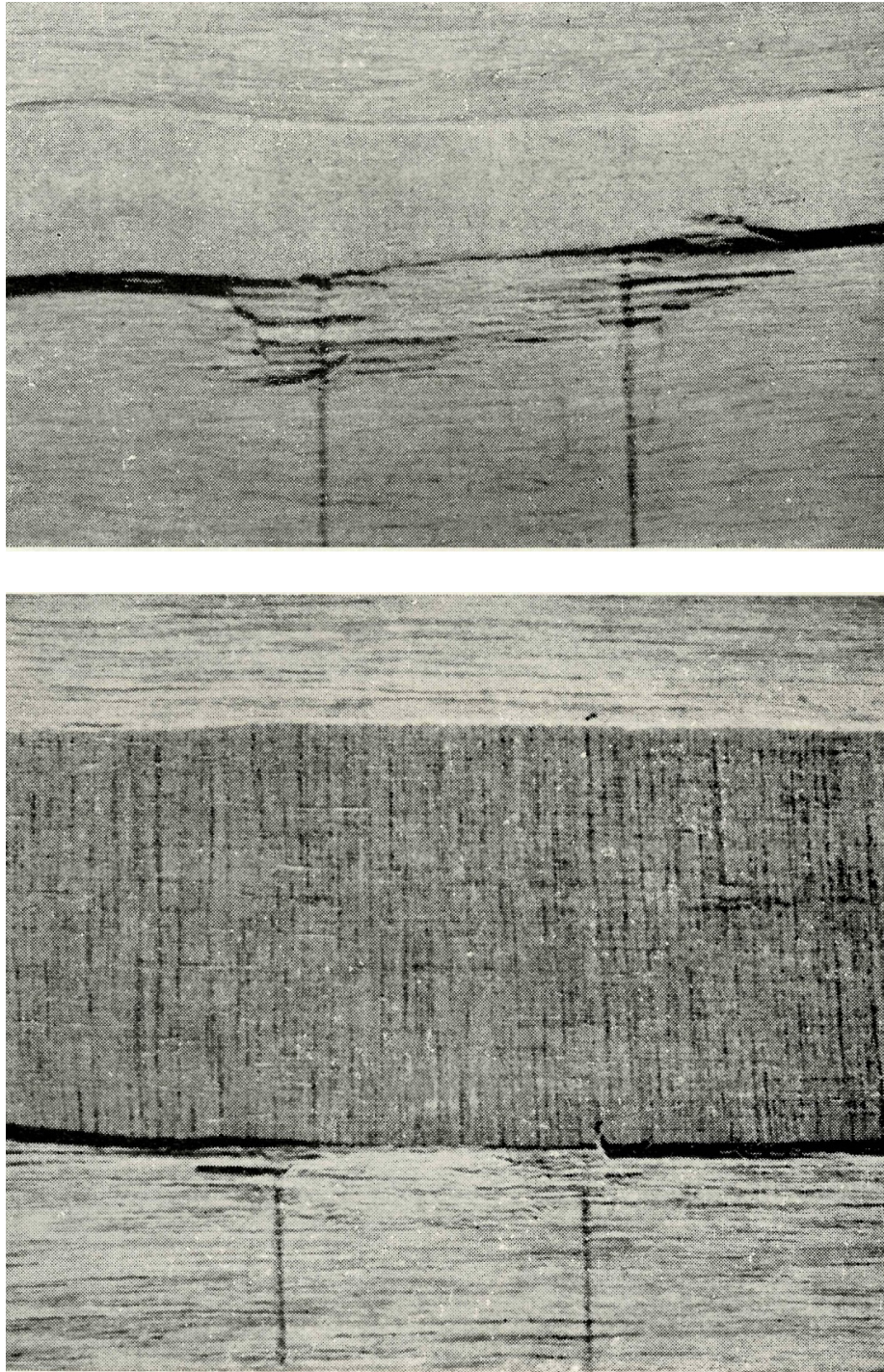


FIG. 9 EXAMPLES OF 'POOR ADHESION'.

IS 2191 (Part 1) : 2022

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 in addition to those specified in this standard and face panels shall conform to the requirements of quality and performance as specified in this standard as well as the specific requirements for all the referred standards.

NOTES

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

2 The manufacturers 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* 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 faces/edges with the following information on a sticker:

- a) Name of the manufacturer or trade-mark, if any;
- b) Grade of door shutter;
- c) Abbreviation indicating the nature of construction of the shutter (*see* Table 1);
- d) Whether the size of the shutter is ‘Modular’ or ‘Non-modular’;
- e) 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 symbols for door shutters as given in Table 2;
- f) Thickness of door shutter;
- g) Species of timber, in case of ECO Mark; and
- h) The criteria for which the shutter has been labelled as ECO-Mark (in case the board has been marked with ECO-Mark) (*see Foreword*).

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)

SI No.	Lot Size	Sample Size Defective	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>)
707 : 2011	Timber technology and utilization of wood, bamboo and cane — Glossary of terms (<i>third revision</i>)	3087 : 2005	Particle boards of wood and other lignocellulosic materials (medium density) for general purposes — Specification (<i>second revision</i>)
710 : 2010	Marine plywood — Specification (<i>second revision</i>)	4020 (Parts 1 to 16) : 1998	Door shutters — Methods of tests (<i>third revision</i>)
848 : 2006	Synthetic resin adhesives for plywood (phenolic and aminoplastic) — Specification (<i>second revision</i>)	4021 : 1995	Timber door, window and ventilator frames — Specification (<i>third revision</i>)
1328 : 1996	Veneered decorative plywood — Specification (<i>third revision</i>)	4351 : 2003	Steel door frames — Specification (<i>second revision</i>)
1658 : 2006	Fibre hardboards — Specification (<i>third revision</i>)	12406 : 2021	Medium density fibre boards for general purpose — Specification (<i>second revision</i>)
1708 (Part 1) : 1986	Method of testing of small clear specimens of timber: Part 1 Determination of moisture content (<i>second revision</i>)	10428 : 1983/ ISO 1804 : 1972	Glossary of terms relating to doors
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

IS 2191 (Part 1) : 2022

ANNEX B

(Clause 6.1.1)

SPECIES OF TIMBER SUITABLE FOR THE MANUFACTURE OF FLUSH DOOR SHUTTERS

Group 1 Species Suitable for Core and Cross-Bands Only

Sl 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> Roxb.)	CHR
4	CyPress	<i>Cupressus torulosa</i> D.Don	CYP
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 integrifoita</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	Mahogany	<i>Switetenia</i> spp.	MAG
17	*Maina	<i>Tetrameles nudiflora</i> R. Br.	MAI
18	Makai	<i>Shorea assamica</i> Dyer	MAK
19	Malabar Neem	<i>Melia dubia</i> Cav.	MNE
20	Narikel	<i>Pterygota alata</i> (Roxb.) R. Br.	NAR
21	Red Dhup	<i>Parishia insignis</i> Hook.f.	RDH
22	Rudrak	<i>Elaeocarpus</i> spp.	RUD
23	Salai	<i>Boswellia serrata</i> Roxb.	SAA
24	Siris	<i>Albizia chinensis</i> Merr. (Syn. <i>A stipulate</i> Boiv.)	SIR
25	Spruce	<i>Picea smithiana</i> Boiss. (Syn. <i>P. morinda</i> Link)	SPR
26	Toon	<i>Toona ciliata</i> (Syn. <i>Cedrela toona</i> Roxb.)	TOO
27	Vatica	<i>Vatica</i> spp.	VAT
28	*White Dhup	<i>Canarium</i> spp.	WDH

* These species of timber are to be treated.

Group 2 Species Suitable for Frame, Core and Cross-Bands

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 lebeck</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
38	Mango	<i>Mangifera</i> spp.	MAN
39	Maple	<i>Acer</i> spp.	MAP

IS 2191 (Part 1) : 2022

SI No.	Standard Trade Name	Botanical Name	Abbreviated Symbol
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>Grevillea robusta</i> A. Cunn.	SSI
51	Silver Oak	<i>Dalbergia sissoo</i> Roxb.	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	White 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	White Dhup	<i>Canarium</i> spp.	WDH
61	Ywegi	<i>Adenanthera pavonina</i> Linn.	YWE

* These species of timber are to be treated.

ANNEX C

(Foreword)

COMMITTEE COMPOSITION

Doors, Windows and Shutters Sectional Committee, CED 11

<i>Organization</i>	<i>Representative(s)</i>
In Personal Capacity (B-094, Trinity Towers DLF Phase – V, Sector 53, Gurugram 122002, Haryana)	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>)
CSIR-Central Building Research Institute, Roorkee	DR B. SINGH DR SUKHDEO RAO KARADE (<i>Alternate</i>)
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>)
Forest Research Institute, Dehradun	SHRI VIMAL KOTHIYAL SHRI D. P. KHALI (<i>Alternate</i>)
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>)

IS 2191 (Part 1) : 2022

<i>Organization</i>	<i>Representative(s)</i>
Ministry of Railways, New Delhi	REPRESENTATIVE
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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UPVC Windows and Door Manufactures Association, New Delhi	SHRI MARIO SCHMIDT SHRI ULLAS GULIANI (<i>Alternate</i>)
Uttaranchal Plywood Manufacturers Association, Ramnagar	REPRESENTATIVE
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SHRI PRADEEP SINGH SHEKHAWAT
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Amendments Issued Since Publication

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