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Wooden door shutters— Test methods

EAST AFRICAN COMMUNITY

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WORKING DRAFT STANDARD

Foreword

Development of the East African Standards has been necessitated by the need for harmonizing requirements governing quality of products and services in the East African Community. It is envisaged that through harmonized standardization, trade barriers that are encountered when goods and services are exchanged within the Community will be removed.

The Community has established an East African Standards Committee (EASC) mandated to develop and issue East African Standards (EAS). The Committee is composed of representatives of the National Standards Bodies in Partner States, together with the representatives from the public and private sector organizations in the community.

East African Standards are developed through Technical Committees that are representative of key stakeholders including government, academia, consumer groups, private sector and other interested parties. Draft East African Standards are circulated to stakeholders through the National Standards Bodies in the Partner States. The comments received are discussed and incorporated before finalization of standards, in accordance with the Principles and procedures for development of East African Standards. XXXXXX.

East African Standards are subject to review, to keep pace with technological advances. Users of the East African Standards are therefore expected to ensure that they always have the latest versions of the standards they are implementing.

The committee responsible for this document is Technical Committee EASC/TC: 022,

Attention is drawn to the possibility that some of the elements of this document may be subject of patent rights. EAC shall not be held responsible for identifying any or all such patent rights.

Wooden door shutters— Test methods

1 Scope

This Draft East African Standard specifies test methods which shall be followed to subject the door shutters to evaluate their quality.

2 Normative references

There are no normative references in this document.

3 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

— ISO Online browsing platform: available at <http://www.iso.org/obp>

4 Tests

4.1 General

4.1.1 The door shutters shall be subjected to the following tests, in the order listed below:

- 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;
- i) slamming test;
- j) misuse test;
- k) varying humidity test;

- l) end immersion test;
- m) knife test;
- n) glue adhesion test; and
- o) screw withdrawal resistance test.

4.1.2 It may be noted that while all tests on all types of doors may not be necessary, only the required tests on different doors may be performed for performance evaluation, which are given in the individual specification on door shutters. The door shutters for the tests shall not be painted or varnished.

4.2 Precautions

4.2.1 The test specimens shall not have been exposed to a temperature below 4°C for 24 h immediately preceding the test and shall be free from all visible moisture. The specimen shall be inspected and any specimen with visible flaws shall be discarded.

4.2.2 If any test specimen fails because of mechanical reason, such as failure of testing equipment or improper specimen preparation, it shall be discarded and another specimen taken.

5 Measurement of dimensions and squareness

5.1 General

This clause specifies a method for measuring the dimensions and the squareness of door shutters.

5.2 Procedure

5.2.1 Measurement of height

Measure the height along the lines A-A and B-B (see Figure 1) each of which is parallel to and 20 mm or less from a longitudinal edge. The height shall be measured with an accuracy of 1 mm. The measuring points shall be 20 mm ± 5 mm from the edges. It shall be measured to an accuracy of 0.1 mm.

5.2.2 Measurement of width

Measure the width along the lines C-C and D-D (see Figure 1) each of which is parallel to and 20 mm or less from a transverse edge. The width shall be measured with an accuracy of 1 mm.

NOTE In the case of a door shutter with rebated edges, the dimension of height or width should be measured to the inner edges of the rebate.

5.2.3 Measurement of thickness

Measure the thickness at six points which are located approximately 20 mm from the edges, at the middle of the width of the door shutter and at each one-third of the height (see Figure 1). The thickness shall be measured with an accuracy of 0.1 mm.

5.2.4 Measurement of squareness

Determine the deviation from squareness of adjacent edges of the door shutter at all the four corners of the door leaf with a square with arms 500 mm long (see Figure 2). The deviation from squareness shall be measured to an accuracy of 0.1 mm.

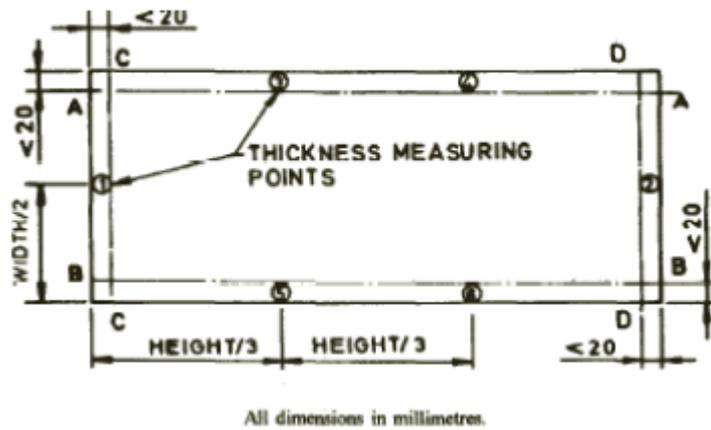


Figure 1 — Measurement of Dimensions

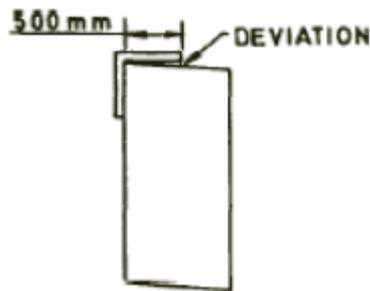


Figure 2 — Determination of squareness

6 Measurement of general flatness

6.1 General

This clause specifies a method for measuring the general flatness of door shutters.

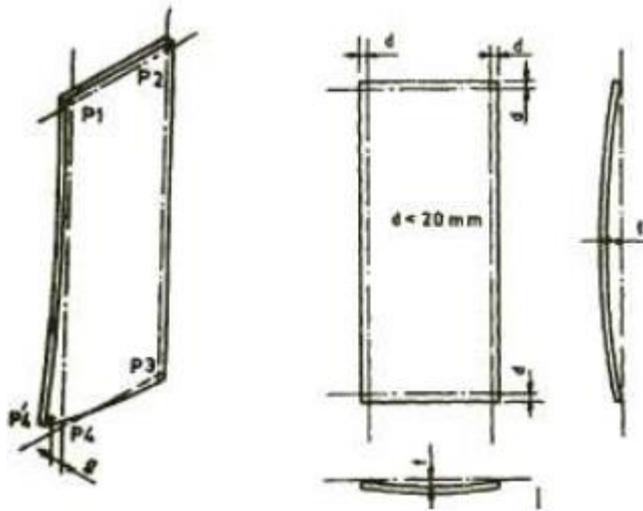
6.2 Procedure

6.2.1 Measurement of twist

The door shutter is held freely in a vertical plane or mounted vertically so that there is no external restraint. Any three corners of this face determine a plane of reference. The deviation of the fourth corner is measured with respect to this plane with a plumb bob or any other suitable device (see Figure 3). The measuring points shall not be more than 20 mm from the edges. It shall be measured to an accuracy of 0.1 mm.

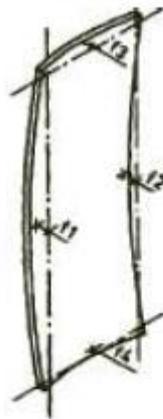
6.2.2 Measurement of warping and cupping

The door shutter is held as given in 3.2. Measurement(s) of warping and cupping on one of the faces of the door shutters is measured with respect to straight lines parallel to each edge and located 20 mm or less from the edge. The distance of the face from these straight lines is measured (see Figure 4). The deviation shall be measured to an accuracy of 0.1 mm.



The reference plane is defined by the three points P1, P2, and P3, P4, is also situated on this plane. The measurement of the distance P4-P4', (g) gives the value of twist.

Figure 3 — Measurement of twist



f_1, f_2, f_3, f_4 are the different measurements of warping, and f_1, f_2, f_3, f_4 are the different measurements of cupping.

Figure 4 — Measurement of warping and cupping

7 Local planeness test

7.1 General

This clause specifies a test method to ascertain the general smoothness of the surface of the door shutters.

7.2 Procedure

The door shutter shall be positioned or held freely and in placed in a horizontal a convenient position. Squares of 200 mm x 200 mm shall be drawn, spread over the entire area of the shutter for measurement purposes. A suitable measuring device suitably fixed at the centre of a straight edge of 200 mm length shall be placed on the different squares on the face of the door shutter. The depth at each point shall be measured to an accuracy of 0.05 mm. The procedure shall be repeated for the other face.

8 Impact indentation test

8.1 General

This clause specifies a test to determine the impact indentation on door shutters.

8.2 Steel ball impact tests

The door shutter shall be placed horizontally resting on a suitable frame equally on all the four edges. A steel ball of about 50 mm diameter and weighing 500 g \pm 10 g, shall be allowed to fall freely from a height of 750 mm \pm 5 mm at any randomly selected 10 different points on both the surfaces of the door shutter leaving distance of 75 mm from the edges. The depth of indentation shall be measured to an accuracy of 0.1 mm.

9 Flexure test

9.1 General

This clause specifies a test method for flexure resistance of door shutters.

9.2 Procedure

The door shutter shall be held firmly along one long edge and the adjacent short edge and it shall be ensured that the three fixed corners are in one horizontal plane. Loading shall be done on the top corner of the door shutter 50 mm from the free edge, resulting deformation in the vertical plane of the door shutter. The loading shall be done in steps of 100 N (10 kgf) up to a maximum of 500 N (50 kgf) and unloaded after 15 min in the same steps. The deflection shall be measured initially and after 15 min with the load and finally after 3 min of the removal of the load. All deflections of the free corner shall be measured to an accuracy of 0.1 mm with reference to the diagonally opposite fixed corner.

10 Edge loading test

10.1 General

This clause specifies a test method to determine the deflections on door shutters due to load applied at the edges.

10.2 Procedure

The door shutter shall be hung vertically, bearing or with 12 mm dia pivot supported at the top and bottom or hinged on one longitudinal edge. The test set up shall be sufficiently rigid to withstand the test load without deflecting to an extent likely to impair jointing or to impose bending stresses on the test specimen. If installation conditions are known, the specimen shall wherever practical, be installed to simulate these.

The door shall be opened at an angle of 45° or 90° and measurements taken at the lower corner of the door shutter, to the nearest 0.1 mm. The load shall be applied on the top of the other longitudinal edge parallel to the plane of the door shutter at a distance of 50 mm from the edge. The loading shall be done in steps of not more than 200 N (20 kgf) at a time until a load of 1 000 N (100 kgf) is reached and kept constant for a period of 15 min. The deflection at the loaded edge, at the end of 15 min and after 3 min after removal of the load, measured to an accuracy of 0.1 mm, shall be recorded.

11 Shock resistance test

11.1 General

This clause specifies two tests to be carried out for determining the resistance of door shutters to shock.

11.2 Soft and light body impact test

The door shutter shall be hinged in a vertical plane flush with a fixed frame. The rope with a leather ball of approximately 200 mm in diameter and containing 50 N (5 kgf) of sand hung vertically by a rope required for giving the shock. The rope with the leather ball shall be tied on the central vertical line just above the door.

The length of the rope shall be such that the ball may strike the door at a point 200 mm above the bottom end on the vertical central line of the door (see Figure 5). The ball shall be pulled away from the door to a height of 1.25 m from the plane of striking place and shall be allowed to strike the door for twenty five times at the rate of 4 to 5 shocks/min. on which door of various sizes can be mounted in a manner similar to their installation in practice. The frame shall be sufficiently rigid so that any deformation that occurs in the frame during testing will have negligible effect on the test results.

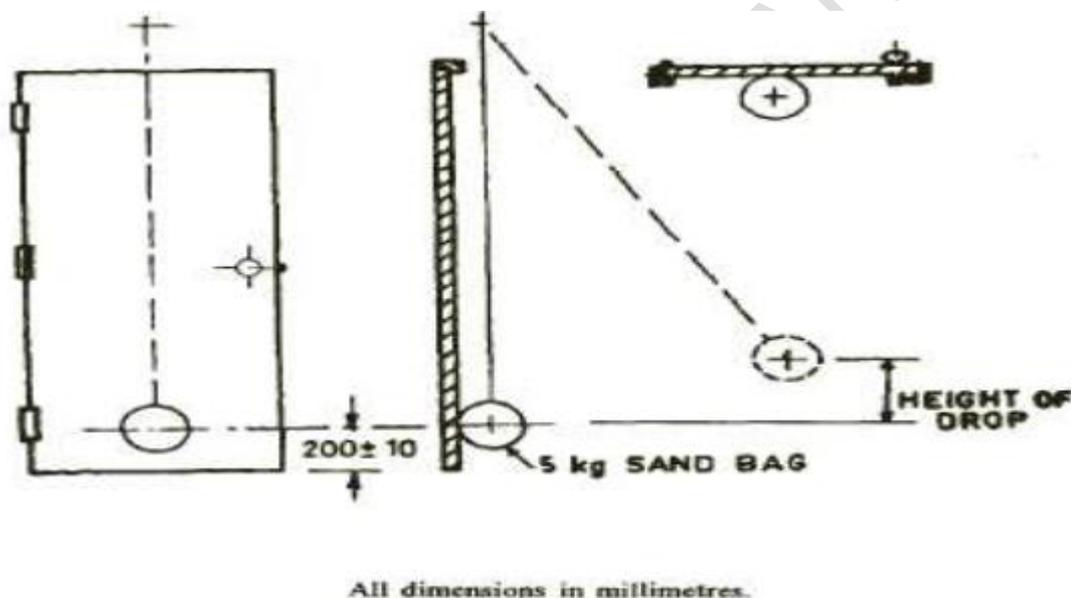


Figure 5 — Test arrangement for resistance to soft and light body impact

11.3 Soft and heavy body impact test

An arrangement for mounting the door shutter as shall be made. A spherical leather sail cloth bag of approximately 350 mm in diameter is filled with sand 'of apparent density approximately 1,500 kg/m³ (sand which passes through a sieve of aperture size 2 mm until it reaches a mass of 300 N (30 kgf)). The bag shall be hung as a pendulum arrangement to strike the door shutter at the level of the handle in the position shown, and hung in such a way that when at rest the bag just touches the shutter (see Figure 6). The spherical leather bag shall be pulled away from the door to a height of 230 mm from the plane of striking place and the normally hung shutter (with hangings, fixings and fastenings) shall be given five impacts at the handle level on both sides of the shutter.'

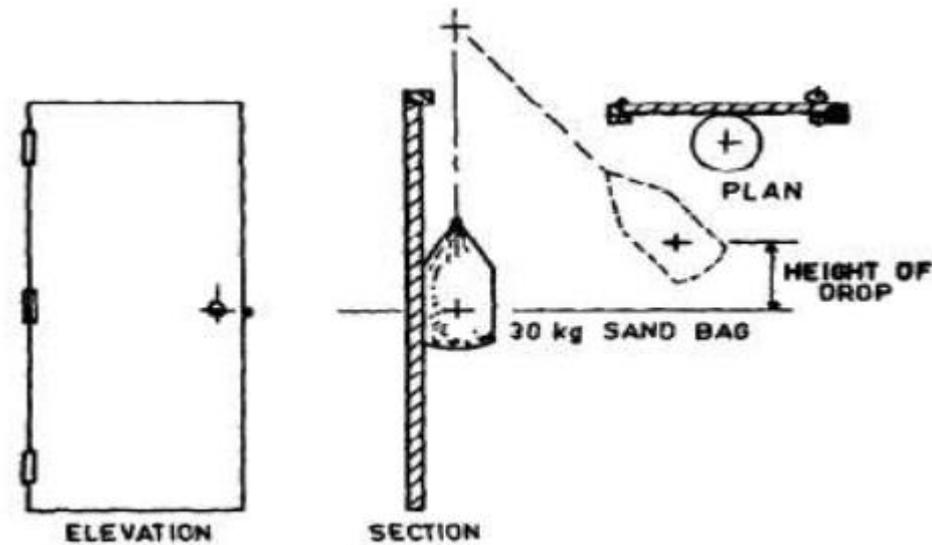


Figure 6 — Test arrangement for resistance to soft and light body impact

12 Buckling resistance test

12.1 General

This clause specifies test method to determine the resistance of door shutters to buckling.

12.2 Procedure

The door shutter shall be placed in a rigid rig and fixed in a way similar to actual installation. The door shutter shall be opened to an angle of 90° and secured at its top free corner to prevent any lateral movement. A typical method of attachment of the load and its location is shown in Figure 7 for guidance. A load of 400 N (40 kgf) is applied at 1 000 mm from the bottom of the door at right angles to the plane of the door shutter and in the direction of opening, in increments of 100 N each. Incremental load is applied only after stabilization of the deformation created by the previous loading. The deformation at the lower free corner is measured to an accuracy of 1 mm, 5 min after the application of the load and 15 min after unloading.

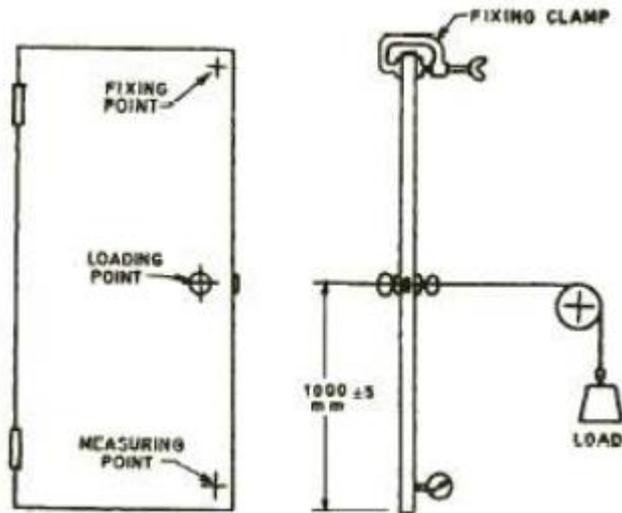


Figure 7 — Mounting of door shutter of buckling resistance test

13 Slamming test

13.1 General

This clause specifies two tests to determine the effect on door shutters due to slamming actions. Any one of the tests shall be followed.

13.2 Test I

Suitable fixture shall be made to hold the door shutter horizontally flat and hinged on one long edge and resting freely on a wooden rail 50 mm from the other long edge. The door shutter shall be placed in a horizontal position suitably hinged at three equidistant places or at the discretion of the manufacturer on one of the long edges. The other edge is lifted up so as to form an angle of not less than 30° at the hinged edge and allowed to drop under its own weight, 50 times on the rail at the rate of four to five drops per minute.

13.2 Test II

The door shutter shall be hung with three hinges vertically on one long edge or as per manufacturer's instructions in a suitable frame. Suitable arrangement to apply a force of 150 N (15 kgf) to the shutter at not more than 150 mm from the locking edge of the shutter shall be made. The force shall act perpendicularly to the plane of the frame throughout the closing movement (see Figure 8). The door shutter shall be opened at an angle of $60^\circ \pm 5^\circ$ and shall be made to close for hundred times by the continuous application of a force of 150 N which ceases to act at the moment of impact.

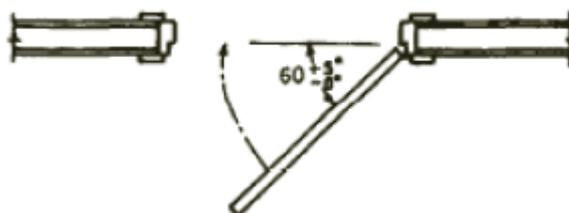


Figure 8 — Typical arrangement of slamming test

14 Misuse test

14.1 General

This clause specifies a test method to determine the resistance of door shutters to misuse.

14.2 Procedure

Suitable frame to hold the door shutter vertically in a manner similar to its installation in practice shall be made. The door shutter shall be hinged on one long edge to the frame. A hard wood slip such as Laurel, Sal, Bijasal of 50 mm x 50 mm and of thickness, adequate to match the thickness of the door shutter shall be placed vertically at the bottom of the hinged stile of the frame in such a way as to keep the door ajar at $70^\circ \pm 5^\circ$. The force is applied progressively to the handle or equivalent position and at right angles to the plane of the frame in the direction of closing until it reaches 200 N (20 kgf) (see Figure 9).

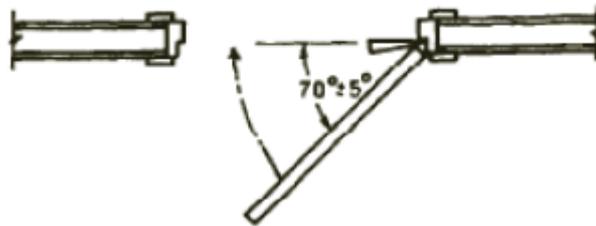


Figure 9 — Typical arrangement of misuse test

15 Varying humidity test

15.1 General

This clause specifies method which is to be used to test the behavior, under humidity variations, of door shutters placed in successive uniform climates.

15.2 Procedure

The door shutter shall be placed in a conditioning chamber at a temperature $27^\circ\text{C} \pm 2^\circ\text{C}$, and humidity maintained at $30\% \pm 5\%$ for one week. The height, width, thickness as per Clause 3 of this standard, general flatness as per Clause 4 of this standard, local planeness as per Clause 5 of this standard and diagonal of the door shutter shall be measured. Then the humidity shall be raised to $85\% \pm 5\%$ and the door shutter shall remain there again for one week. The test may be stopped before the end of the period specified, if two successive measurements of general flatness taken at two-day interval, do not differ by more than 1 %.

The changes in the above dimensions shall be noted. After this, the door shutter shall be kept inside the chamber for one week at a humidity level of $30\% \pm 5\%$. The dimensions shall be measured again after the end of the period and the extent of return to the original sizes shall be calculated. General planeness of the door shutter shall be measured as per Clause 5 of this standard.

16 End immersion test

16.1 General

This clause specifies a test method for resistance of door shutters to immersion in water.

16.2 Procedure

The door shutter shall be immersed to a minimum depth of 300 mm in water at ambient temperature for 24 h and then allowed to dry for 24 h at ambient temperature. This cycle shall be repeated eight times. The door shutter shall be examined for any delamination in the immersed portion of the shutter.

17 Knife test

17.1 General

This clause specifies test method for testing the glue adhesion strength of door shutters with a knife.

17.2 Procedure

The type of knife required to be used in the test is given in Figure 10. It may be made from a file. The cutting edge should be kept chisel sharp. The test shall be carried out on a stout table to which is screwed a wooden batten against which the edge of the test specimen is placed as indicated in Figure 10. The knife is inserted with its cutting edge parallel to the grain of the outer veneer and worked into, or if possible, along a glue line and the veneer is prized upward. It is essential that the knife be firmly guided along the glue line.

17.3 Test for glue adhesive between core and adjoining veneers

17.3.1 General

To test the glue adhesion between the core and the adjoining veneers, the qualitative test may be used.

17.3.2 Procedure

The central core strips shall be forcibly separated from its adjacent veneer by a chisel inserted in the bond line and affecting the separation in the direction of the core strips. The capacity of the bond should be judged by the relative amount of wood fibres left by the veneer and the core strips. Force shall be needed to effect the separation. The grading should be assessed on the basis of the appearance of the failure.

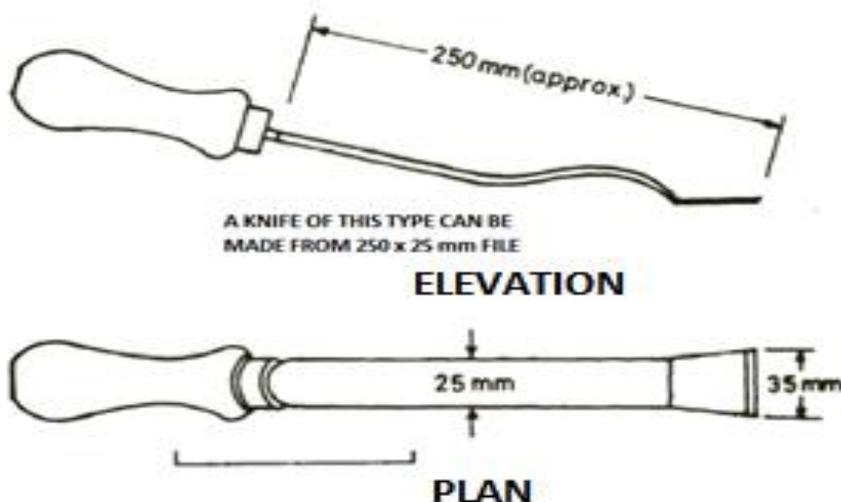


Figure 10 — Knife for testing plywood for adhesive of plies

18 Glue adhesion test

18.1 General

This clause specifies a test method to assess the glue adhesion of door shutters.

18.2 Procedure

Two square sections, 150 mm x 150 mm shall be cut from the corners of the door shutter. These corner sections, as cut from the door shutter, shall be submerged in a pan of water at ambient temperature, care being taken that the pieces do not touch the bottom of the pan. The water shall then be brought to the boiling temperature and maintained at this temperature for 4 h and then dried in a chamber at $27\text{ }^{\circ}\text{C} \pm 2\text{ }^{\circ}\text{C}$ and relative humidity of $65\% \pm 5\%$ for 24 h. At the end of the drying period the samples shall be examined for delamination. Glue lines in all the four exposed edges of the plywood on both faces of a specimen and the glue lines between the plywood faces and the stile and rail shall be examined for delamination.

19 Screw withdrawal resistance test

19.1 General

This clause specifies a test method to determine the screw withdrawal resistance of door shutters.

19.2 Procedure

This test shall be carried out on three test specimens of size 150 mm x 75 mm cut along the longitudinal edge of upper/lower half portion of the door shutter, using a suitable test equipment having an arrangement to pull the screws fixed on the specimen so as to measure the maximum load required for complete withdrawal. Prior to testing, the test specimen shall be conditioned at $27\text{ }^{\circ}\text{C} \pm 2\text{ }^{\circ}\text{C}$ and at relative humidity of $65\% \pm 5\%$ for one week. Two prebores of 3-mm diameter shall be made along the stile at an interval of 50 mm on the face and along the edges of the specimen. Screws of size No. 8 and 50 mm length shall be fixed at these points to a depth of 25 mm. The specimen shall then be placed on the test equipment and load applied at the specified rate of 2 mm per min for withdrawal of one screw at a time. The maximum load required for complete withdrawal shall be noted in each case.

Bibliography

- [1] US 1875 :2019, Wooden door shutters — Test methods

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