BRITISH STANDARD

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13446:2002

Wood-based panels — Determination of withdrawal capacity of fasteners

The European Standard EN 13446: 2002 has the status of a British Standard

ICS 79.060.01

National foreword

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The UK participation in its preparation was entrusted to Technical Committee B/541, Wood-based Panels, which has the responsibility to:

— aid enquirers to understand the text;

— present to the responsible international/European committee any enquiries on the interpretation, or proposals for change, and keep the UK interests informed;

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This British Standard, having been prepared under the direction of the Building and Civil Engineering Sector Policy and Strategy Committee, was published under the authority of the Standards Policy and Strategy Committee on 1 July 2002

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English version

Wood-based panels - Determination of withdrawal capacity of fasteners

Panneaux à base de bois - Détermination de la capacité à l'arrachement d'éléments de fixation

Holzwerkstoffe - Bestimmung des Haltevermögens von Verbindungsmitteln

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Ref. No. EN 13446:2002 E

Contents

Foreword

This document EN 13446:2002 has been prepared by Technical Committee CEN/TC 112 “Wood-based panels”, the secretariat of which is held by DIN.

This European Standard shall be given the status of a national standard, either by publication of an identical text or by endorsement, at the latest by November 2002, and conflicting national standards shall be withdrawn at the latest by November 2002.

The standard is partly based EN 1382.

According to the CEN/CENELEC Internal Regulations, the national standards organizations of the following countries are bound to implement this European Standard: Austria, Belgium, Czech Republic, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Luxembourg, Malta, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland and the United Kingdom.

1 Scope

This European Standard specifies a test method for determining the withdrawal capacity of nails, screws and staples inserted into wood-based panels.

This test method can be used for any combination of fastener type and wood-based panel product.

NOTE This method differs from EN 320 which characterises fibreboards in terms of their resistance to the withdrawal load of only a single type of screw.

2 Normative references

This European Standard incorporates, by dated or undated reference, provisions from other publications. These normative references are cited at the appropriate places in the text, and the publications are listed hereafter. For dated references, subsequent amendments to or revisions of any of these publications apply to this European standard only when incorporated in it by amendment or revision. For undated references the latest edition of the publication referred to applies (including amendments).

EN 323, *Wood-based panels — Determination of density.*

EN 325, *Wood-based panels — Determination of dimensions of test pieces.*

EN 1381, *Timber structures — Test methods — Load bearing stapled joints.*

EN 10230-1, *Steel wire nails — Part 1: Loose nails for general applications*.

3 Terms and definitions

For the purposes of this European Standard, the terms and definitions given in EN 1381 relating to staples and those given in EN 10230-1 relating to nails and the following apply.

3.1
withdrawal capacity
parameter measuring the resistance to withdrawal of fasteners from wood-based panels

4 Symbols

4.1 Fastener characteristic

d nominal diameter of fastener, in millimetres

for square nails d is the side dimension
for round nails d is the diameter
for grooved and ring shank nails d is the smallest projected diameter
for screws d is the diameter given by the manufacturer
for staples d is the smallest dimension of the cross-section

a staple width, in millimetres.

4.2 Test characteristics

l length of test piece, in millimetres

h height of test piece, in millimetres

t thickness of test piece, in millimetres

F_{max} maximum withdrawal load, in newtons

f withdrawal capacity, in newtons per square millimetre

l_p depth of penetration of fastener, in millimetres

5 Principle

The panel surface and panel edge withdrawal capacities of fasteners are determined by measuring the force required to withdraw a defined fastener with a defined depth of penetration from the test piece.

6 Apparatus

6.1 Testing machine

Testing machine, capable of applying a tensile force at a controlled rate of loading to the fastener by means of a grip and measuring the force to a tolerance of 1 % of the maximum load.

6.2 Grip

Self-aligning grip, incorporating a ball — and — socket joint.

In the case of testing withdrawal of staples, the grip shall be as wide as possible in order to prevent bending of the staple.

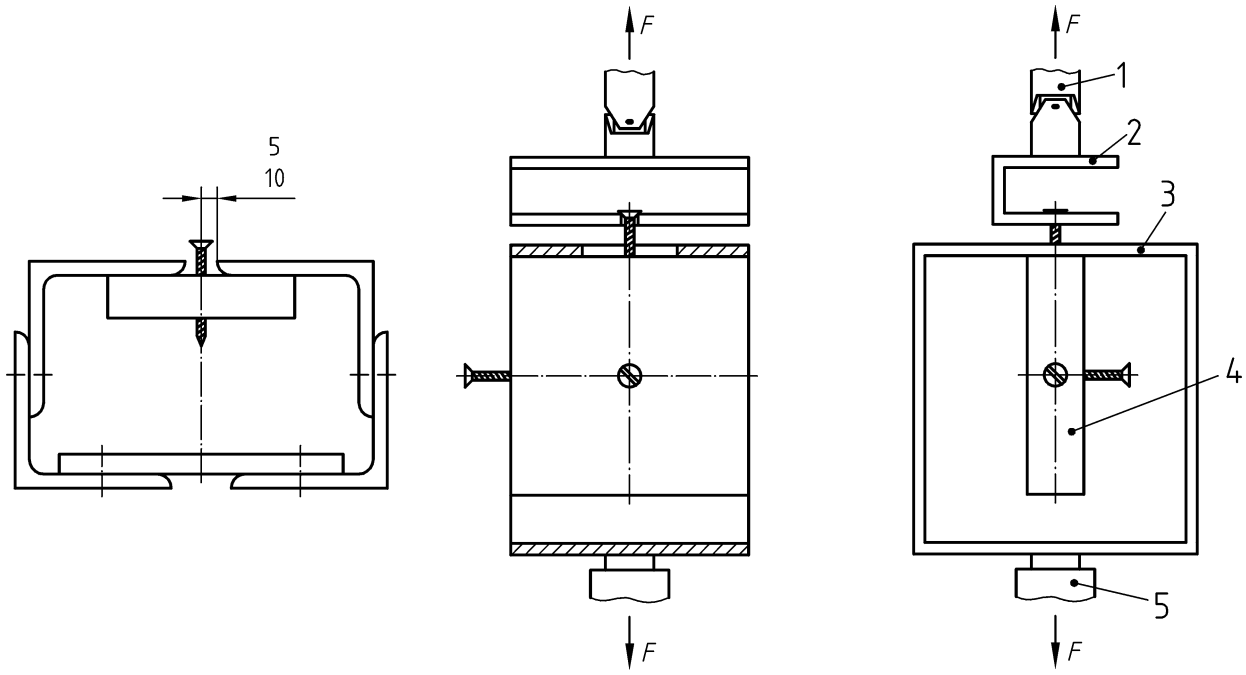
6.3 Test jig

For the connection of the test piece to the testing machine, a jig is necessary (see Figure 1).

It comprises a support with a central hole or slot, where the edges of which are located between 5 mm and 10 mm from the edge of the fastener.

The jig shall be stiff enough to avoid distortion during testing.

Dimensions in millimetres



a) Panel surface withdrawal

b) Panel edge withdrawal (front view)

c) Panel edge withdrawal (side view)

Key
1 Ball
2 Grip
3 Support
4 Test piece
5 Fixed to test machine

Figure 1 — Principle of a test jig for fastener withdrawal

6.4 Measuring instrument

A suitable instrument capable of measuring the thickness of the test piece and the depth of embedment to a limit deviation of 0,1 mm according to EN 325.

6.5 Conditioning equipment

Equipment capable of establishing and maintaining the following climates:

(20 2) °C and (65 5) % relative humidity;

(20 2) °C and (85 5) % relative humidity.

7 Test pieces

7.1 Sampling

Three side-matched test pieces shall be removed from six locations from a panel. Each of the side matched test pieces shall be used to determine the density and the withdrawal capacity of the fastener in the surface or in the edge per condition (see 7.3).

7.2 Dimensions

The dimension of the test pieces shall be 50 mm 50 mm thickness, t, or defined by the user.

7.3 Conditioning

Prior to the insertion of the fastener, test pieces shall be conditioned at an equilibrium moisture content corresponding to the appropriate conditions of use.

For dry conditions the test pieces shall be conditioned to constant mass at a temperature of (20 2) °C and a relative humidity of (65 5) % prior to insertion of the fasteners and testing.

For humid conditions the test pieces shall be conditioned to constant mass at a temperature of (20 2) °C and a relative humidity of (85 5) %. After insertion of the fasteners at 85 % relative humidity, the test pieces shall be reconditioned to constant mass at a temperature of (20 2)° and a relative humidity of (65 5) %.

Constant mass is considered to be reached when the results of two successive weighing operations, carried out at an interval of 24 h, do not differ by more than 0,1 % of the mass of the test piece.

For certain investigations other moisture contents can be appropriate. These shall be reported.

7.4 Insertion of fasteners

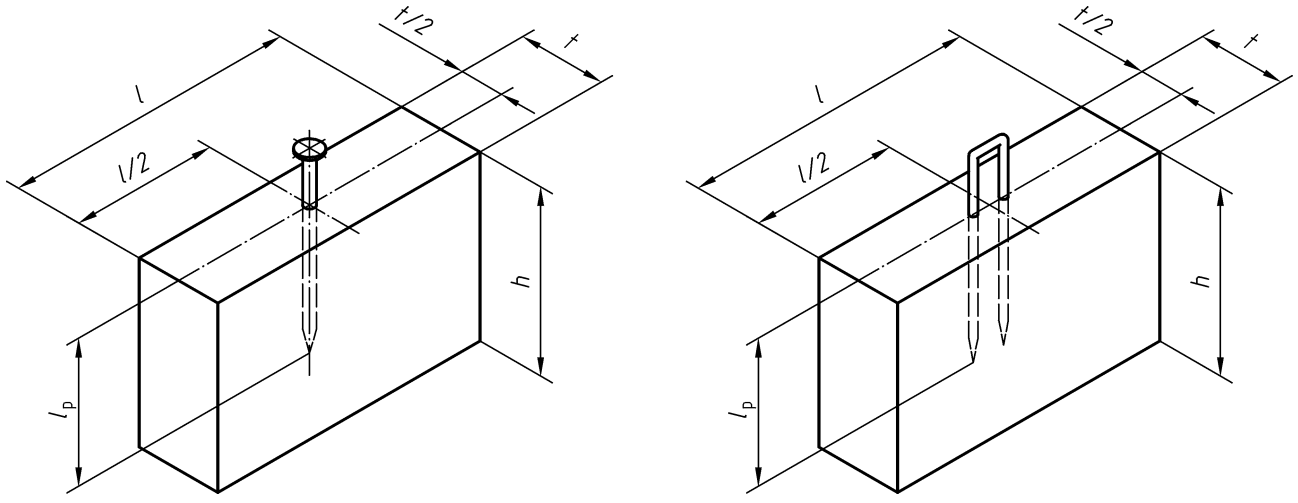
7.4.1 General

Unless otherwise specified, the insertion of fasteners shall be carried out according to the manufacturers recommendations. The axis of the fasteners shall be perpendicular to the panel surface or panel edge.

7.4.2 Edge withdrawal

The test pieces shall comply with Figure 2. The fasteners shall be inserted, unless otherwise specified, into the panel edge to a penetration of 8 d, up to a space maximum of 30 mm and shall be positioned as shown in Figure 2.

NOTE In panels with a high degree of anisotropy (e. g. Plywood, OSB and LVL) the edge withdrawal capacity can vary with panel direction and the orientation of the tested edge should be recorded.

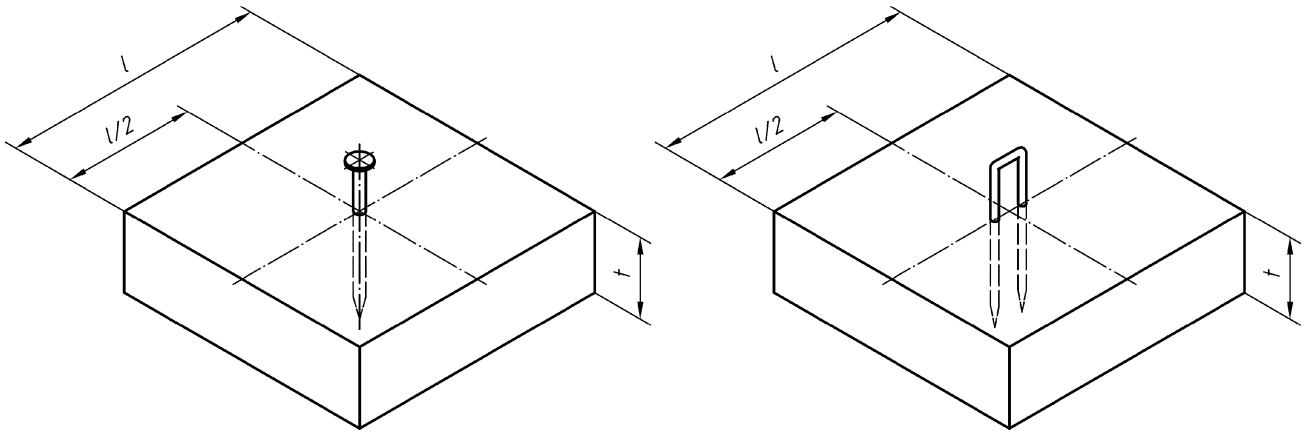


a) Nail or screw b) Staple

Figure 2 — Edge withdrawal capacity

7.4.3 Surface withdrawal

The test pieces shall comply with figure 3. The fasteners shall be inserted, unless otherwise specified, to a penetration of 8 d or the full thickness of the test piece (whichever the shorter) and shall be positioned as shown in figure 3.



a) Nail or screw b) Staple

Figure 3 — Surface withdrawal capacity

8 Test procedure

8.1 Thickness and density

Determine the thickness of the test piece to the nearest 0,1 mm in accordance with EN 325 and the density in accordance with EN 323.

8.2 Fastener penetration

Determine the depth of the fastener penetration l_p to the nearest 0,1 mm and record the result.

8.3 Application of load

Place the test piece in the test jig, ensuring the application of the withdrawal force is along the axis of the fastener or that the axis of the staple legs are parallel to the tension force.

The load shall be applied at a constant rate of crosshead-movement throughout the test.

The rate of crosshead-movement shall be adjusted so that the maximum load is reached within (60 ± 30) s.

8.4 Measurement of maximum load

Measure the maximum load with a tolerance of 1 % and record the result.

9 Expression of result

The withdrawal parameter f shall be determined in Newtons per square millimetre from the equations:

$$f = \frac{F_{\max}}{d \times l_p} \text{ for nails or screws} \quad (1)$$

$$f = \frac{F_{max}}{d \times 2 \times l_p} \text{ for staples} \quad (2)$$

If the fasteners penetrate the panel thickness, l_p is the panel thickness.

10 Test report

The test report shall contain the following information:

a) reference to this standard;

b) sampling procedure;

c) specification of the wood-based panel;

d) dimensions and density of the test pieces;

e) conditioning or, if necessary, moisture content;

f) number of test pieces used;

g) specification and number of fasteners tested (type, sizes, material, surface coating or condition and other particulars);

h) method of insertion of fastener;

i) individual test results, mean values and standard deviation of f, l_p, F_{max}, time to reach the maximum load F_{max}, description of the mode of failure.

Bibliography

[1] EN 320, *Fibreboards — Determination of resistance to axial withdrawal of screws.*

[2] EN 1382, *Timber structures — Test methods — Withdrawal capacity of timber fasteners.*

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