BS EN 1383:2016

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Timber structures — Test methods — Pull through resistance of timber fasteners

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National foreword

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The UK participation in its preparation was entrusted to Technical Committee B/518, Structural timber.

A list of organizations represented on this committee can be obtained on request to its secretary.

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Timber structures - Test methods - Pull through resistance of timber fasteners

Structures en bois - Méthodes d'essais - Résistance à la traversée de la tête d'éléments de fixation à travers le bois

Holzbauwerke - Prüfverfahren - Prüfung von Holzverbindungsmitteln auf Kopfdurchziehen

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European foreword

This document (EN 1383:2016) has been prepared by Technical Committee CEN/TC 124 "Timber Structures", the secretariat of which is held by AFNOR.

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of an identical text or by endorsement, at the latest by August 2016, and conflicting national standards shall be withdrawn at the latest by August 2016.

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This document supersedes EN 1383:1999.

Compared to EN 1383:1999, the following changes have been made:

— replacement of EN 28970 by EN ISO 8970;

— improvement to figures and definitions.

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1 Scope

This European Standard specifies the test method for determining the resistance of timber to the head pull through of timber fasteners.

In this standard 'timber' includes solid timber, glued laminated timber and wood-based products.

The test method applies to all types of nails, screws and staples excluding screws with fully threaded shank.

2 Normative references

The following documents, in whole or in parts, are normatively referenced in this document and are indispensable for its application. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

EN 322, *Wood-based panels - Determination of moisture content*

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

EN 14592, *Timber structures – Dowel-type fasteners – Requirements*

EN 26891:1991, *Timber structures - Joints made with mechanical fasteners - General principles for the determination of strength and deformation characteristics (ISO 6891:1983)*

EN ISO 8970:2010, *Timber structures - Testing of joints made with mechanical fasteners - Requirements for wood density (ISO 8970:2010)*

ISO 13061-1, *Physical and mechanical properties of wood — Test methods for small clear wood specimens — Part 1: Determination of moisture content for physical and mechanical tests*

ISO 13061-2, *Physical and mechanical properties of wood — Test methods for small clear wood specimens — Part 2: Determination of density for physical and mechanical tests*

3 Terms and definitions

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

3.1
staple
double-bent, u-shaped piece of round, square, rectangular or oval wire with pointed legs

3.2
staple crown
connection between the two staple legs

3.3
staple leg diameter
nominal diameter of a round staple leg, the side length of a rectangular leg, or the diameter of an oval cross section as defined in EN 14592

3.4
staple length
length of each staple leg, including point

3.5
staple crown width
width across the staple legs

3.6
head pull through parameter
parameter measuring the resistance of a timber test piece to the pulling through of the head of a timber fastener or the crown of a staple

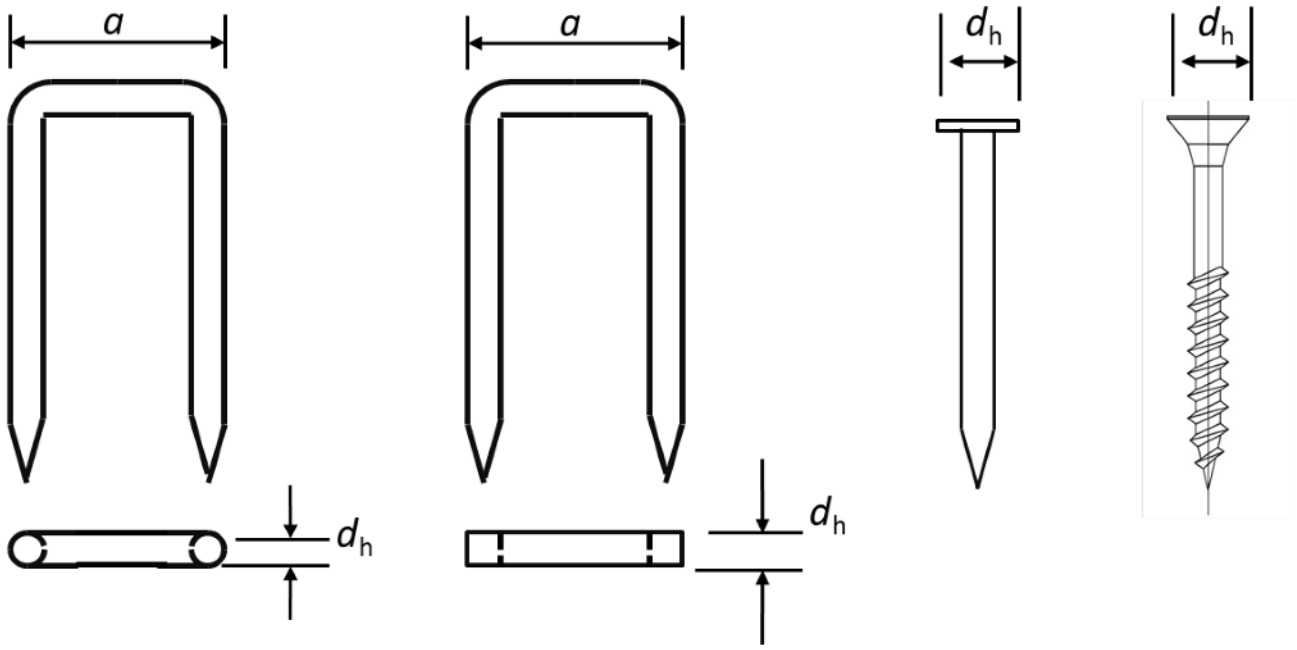
Note 1 to entry See Figures 1 and 2.

Note 2 to entry For other timber fasteners the definitions of EN 14592 apply.

4 Symbols and abbreviations

For the purposes of this document, the following symbols and abbreviations apply.

a	staple crown width, see Figure 1, in millimetres
$D_{(l.2)}$	dimensions of hole in steel plate in millimetres
d	nominal value of the diameter of the fastener as defined in EN 14592, in millimetres
d_h	effective diameter of fastener head (for nails or screws), or, see Figure 1, width of staple crown, in millimetres. For a non-circular head d_h is the diameter of a circle with an area equal to that of the head
F_{max}	maximum pull through load, in newtons
f_{head}	pull through parameter, in newtons per square millimetres
t	timber thickness, in millimetres
α_{crn}	angle between the direction of a staple crown and the grain direction or the main direction of the wood based products, respectively, see Figure 2, in degrees

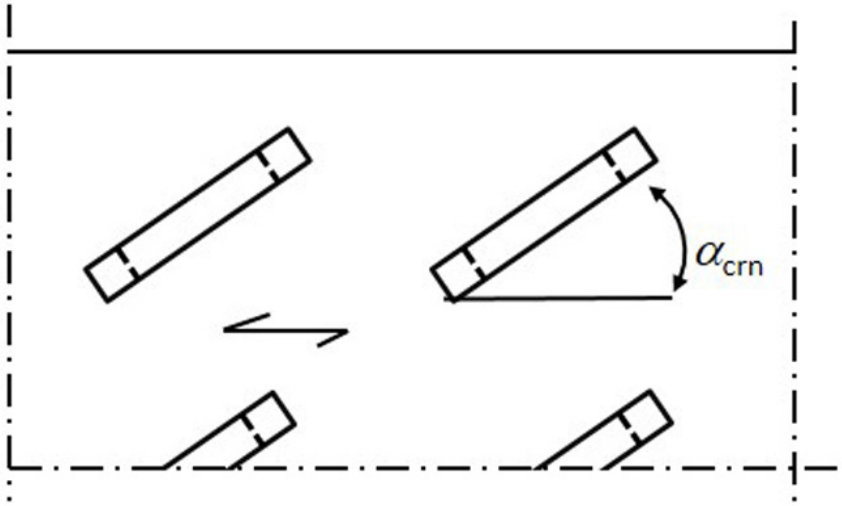


Key

d_h is head diameter

a is staple crown width

Figure 1 — Staple, screw and nail dimensions



Key

1 is the fibre direction

Figure 2 — Angle between the staple direction and the grain direction or the main direction

5 Materials

5.1 Timber and wood-based products

The solid timber shall be selected in accordance with the method given in EN ISO 8970:2010.

The specification of the LVL, glued laminated timber and wood-based products shall be established. The products used for the individual test pieces shall be representative of the class or range of product to which they belong and the relevant properties shall be declared.

5.2 Fasteners

The specification of nails, screws or staples shall be established.

6 Test methods

6.1 General

The moisture content and density of the timber or wood-based products at test shall be determined as specified in ISO 13061-1, ISO 13061-2, EN 322 and EN 323 as appropriate.

6.2 Conditioning

The test pieces shall be manufactured with the timber or wood based products at an equilibrium moisture content corresponding to (20 ± 2) °C and (65 ± 5) % relative humidity. The material is conditioned when it attains constant mass. Constant mass is considered to be attained when the results of two successive weightings, carried out at an interval of 6 h, do not differ by more than 0, 1 % off the mass of the material.

For certain investigations other moisture conditioning can be appropriate, and shall be reported.

6.3 Fabrication of test pieces

The axis of the fastener shall be perpendicular to the surface, see Figure 3. The insertion of fasteners shall follow normal preparation (e.g. pre-boring) and practice. The test piece size shall be as given in Table 1. Where the test pieces are of solid timber, half of the fasteners shall be inserted radially to the growth rings and half tangentially to the growth rings.

Test shall be made with test pieces with $\alpha_{crn} = 30°$. If wood-based products are included in the test piece the test shall be carried out at either $\alpha_{crn} = 30°$ or $\alpha_{crn} = 60°$, whichever gives the smallest load carrying capacity.

Table 1 — Test pieces

Test piece material	Test piece size (minimum)
Solid timber	4 *t* x 4 *t* Where *t* ≤ *7 d*
Wood based products	4 *t* x 4 *t* Where *t = panel thickness as produced*

6.4 Apparatus

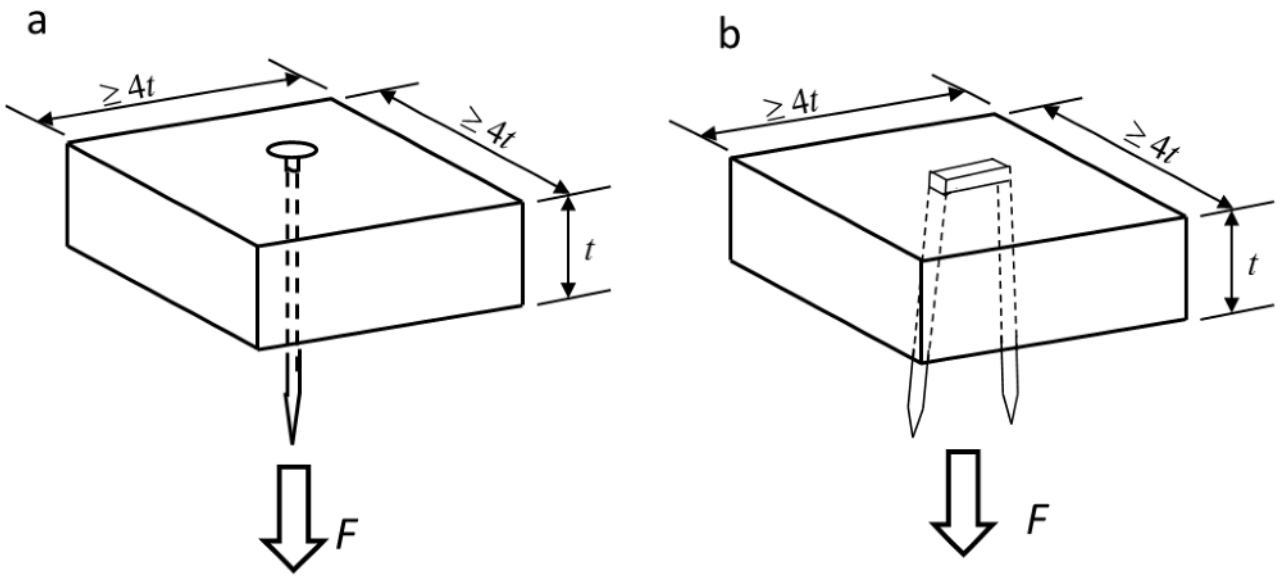
The pieces shall be tested in an apparatus as shown in Figure 4.

6.5 Test procedure

The apparatus used shall be as required in Clause 7 of EN 26891:1991. The test piece shall be placed in a device ensuring the application of the pull through force along the axis of the fastener.

Pull the fastener through the test piece material with a continuous movement of the head of the testing machine. The rate of movement shall be such that the time taken to reach F_{max} is 300s ± 120s.

Determine F_{max} to an accuracy of 1 %.

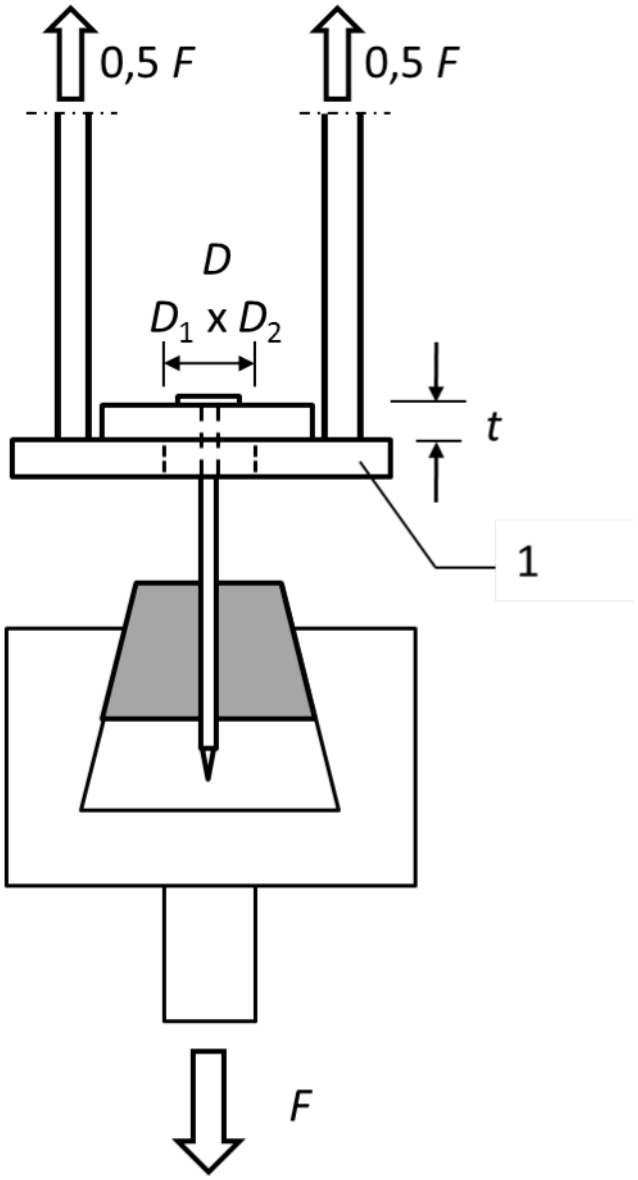


Key

a nails or screws

b staples

Figure 3 — Test specimens for pulling through testing



Key

1 Steel plate with a circular hole (diameter D) for nails and screws and a rectangular hole (side lengths D_1 and D_2) for staples.

$D \geq (2t + d_h)$

$D_1 \geq (2t + a)$

$D_2 \geq (2t + d_h)$

Figure 4 — Test arrangement for pull through testing

6.6 Test results

The pull through parameter, f_{head}, shall be determined from the equations:

$$f_{head} = \frac{F_{max}}{d_h^2} \quad \text{for nails and screws} \tag{1}$$

or

$$f_{head} = \frac{F_{max}}{a \times d_h} \quad \text{for staples} \tag{2}$$

The symbols are as given in Clause 4.

6.7 Test report

The test report shall contain the following information:

a) sampling procedure;

b) specification of the timber;

c) dimensions, density, moisture content and conditioning history of the test pieces;

d) diagram showing the layout of the fasteners and the method of insertion used in the test pieces;

e) angle, α_{crn}, between staple crown and grain as used in the test;

f) number of test pieces used;

g) specification (including shape, geometry, d_h) and number of fasteners (type, sizes, material, surface coating or condition and other particulars);

h) time to failure;

i) individual test results, including F_{max}, mean values and standard deviations, and description of the mode of failure.

NOTE Characteristic values can be determined using EN 14358.

Bibliography

[1] EN 1381, *Timber structures - Test methods - Load bearing stapled joints*

[2] EN 14358, *Timber structures - Calculation of characteristic 5-percentile values and acceptance criteria for a sample*

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