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Timber structures — Test methods — Torsional resistance of driving in screws

Structures en bois — Méthodes d'essai — Résistance à la torsion des vis lors du vissage

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Foreword

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The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular the different approval criteria needed for the different types of ISO documents should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see www.iso.org/directives).

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For an explanation on the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the WTO principles in the Technical Barriers to Trade (TBT) see the following URL: Foreword - Supplementary information

The committee responsible for this document is ISO/TC 165, *Structural Timber*.

Timber structures — Test methods — Torsional resistance of driving in screws

1 Scope

This International Standard specifies a test method to determine the torsional resistance to driving of screws in solid timber or glued laminated timber or other wood-based materials. The method is used primarily to ensure the torque that may be applied to install screws will be less than the specified failure torque of the screw.

2 Normative references

The following documents, in whole or in part, 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.

ISO 3130, *Wood — Determination of moisture content for physical and mechanical tests*

ISO 3131, *Wood — 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
moment cell
device that records the torque applied

3.2
test piece
element or part of an element that will include the driven screw after the test made of solid timber, glued laminated timber or wood-based materials, or combinations of these materials

4 Symbols

$R_{tor,max}$	maximum screw insertion moment, in Newton millimetre
d	screw nominal diameter, in millimetre
l	total length of the screw, in millimetre

5 Material requirements

5.1 Description

The screws and solid timber, glued laminated timber or wood based material to be used in the test shall be clearly defined.

NOTE 1 Screws should be defined by reference to a recognized standard (e.g. EN 14592), in a manufacturer's specification, or in a technical specification that includes material properties and screw characteristics.

NOTE 2 The wood-based material specification should include species or type, grade, density, moisture content, deviations from specifications, and characteristics near the insertion point that might affect the result.

6 Test methods

6.1 General

The moisture content and density of the test piece shall be determined according to ISO 3130 and ISO 3131.

6.2 Conditioning

The test pieces shall be conditioned at (20 ± 2) °C and (65 ± 5) % relative humidity to a constant mass. Constant mass is considered to be attained when the results of successive weighings, carried out at an interval of not less than 6 h, do not differ by more than 0,1 % of the mass of the material.

For further investigations, other moisture conditioning might be appropriate and shall be reported.

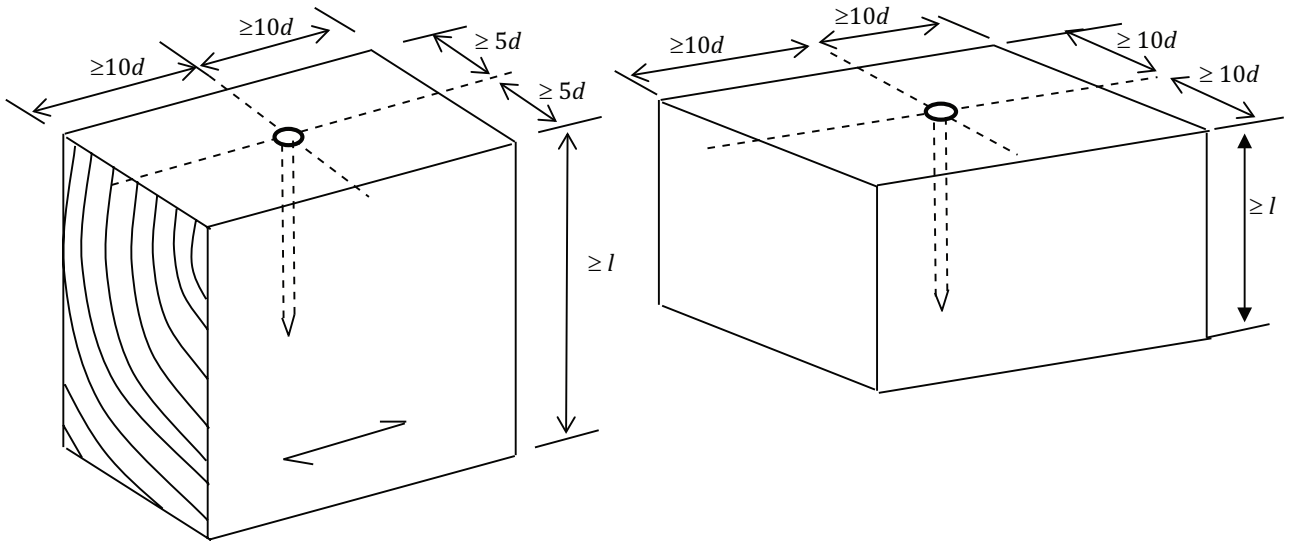
6.3 Sampling

The density of the test pieces or components of the test piece shall comply with the density of the grade used in practise.

The upper surface (receiving the point) shall predominantly be radial or tangential.

6.4 Test piece dimensions

For solid timber and glued laminated timber test pieces, the minimum dimensions are given in Figure 1. For test pieces made of wood-based materials or combinations of wood-based materials and solid timber or glued laminated timber, the dimensions in the direction perpendicular to penetration shall be a minimum of 20d, where d is the nominal diameter of the screw. The test piece dimension in the penetration direction shall always allow full penetration of the screw.



Key

d	screw nominal diameter
l	total length of the screw
⟷	grain direction

Figure 1 — Test piece of solid wood (left) and wood-based materials (right)

7 Test

7.1 Test setup

The test piece shall be mounted on the base plate of a frame and fixed in such a way as to prevent any movement during the test.

The test rig shall allow for fixing a moment cell to the screwing device capable of moving in a vertical axis and for mounting displacement transducers on either side of the screwing device to measure vertical displacement.

The moment cell used shall be capable of measuring the torque to an accuracy of 1 % of the torque applied to the screw.

The equipment for measuring displacement shall be capable of measuring to an accuracy of 1 % of the measured value.

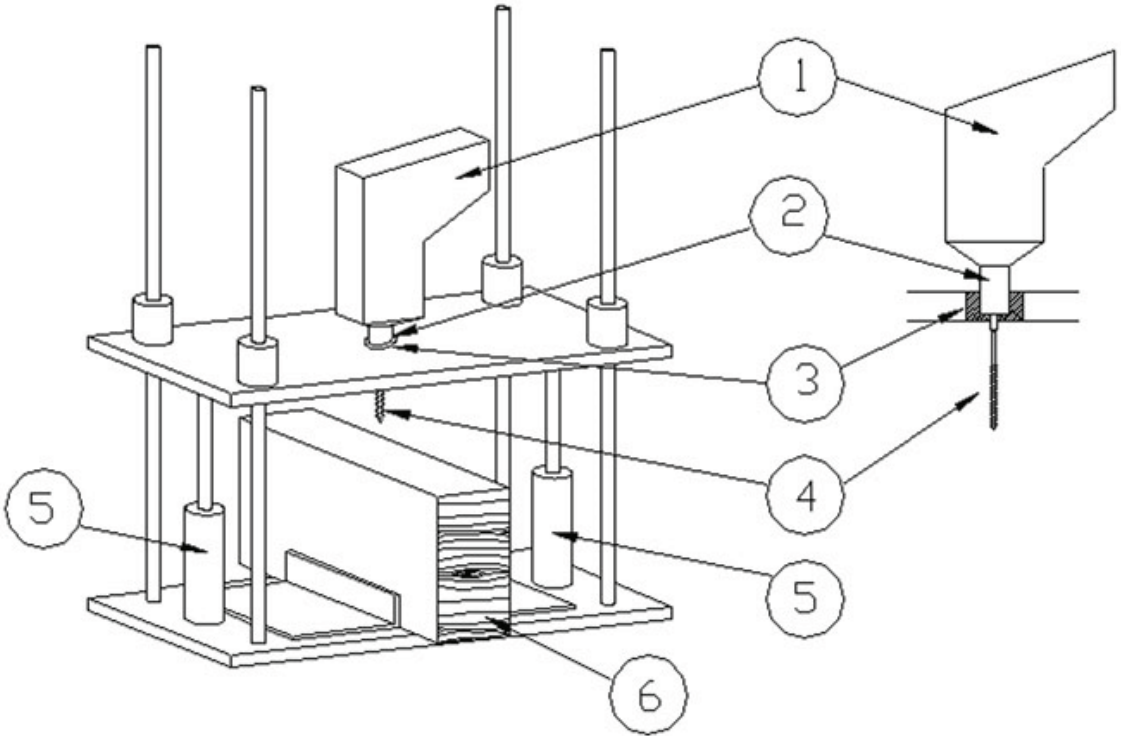
NOTE An example test arrangement is given in Figure 2.

7.2 Procedure

A drive bit shall be fixed into the moment cell and a screw shall be mounted into the bit. The screw shall be installed according to the manufacturer's instructions, including any pre-drilling requirements.

Move the cross-head/screw assembly into a position where the screw tip is resting on the top of the test specimen.

Drive the screw into the test specimen, either by using a mechanical drill or screwing machine or by using a hand screw wrench (≤100 r/min), until the screw is fully embedded along its entire length in the specimen. For countersunk screws, this includes the thickness of the head.



Key

1 mechanical drill, screwing machine, or hand screw wrench, screwing device
2 drill chuck/bit
3 moment cell
4 screw
5 displacement transducers
6 timber

NOTE The vertical displacement of the cross-head to screw assembly has to be recorded via the displacement transducers, and the screw insertion moment has to be recorded via the moment cell.

Figure 2 — Example of a test arrangement for screw insertion in timber

7.3 Results

Determine for each specimen the maximum value of the screw insertion moment from the moment cell, $R_{tor,max}$, prior to the point at which the screw head comes into contact with the test piece surface.

NOTE Care is required to ensure that the moment is recorded before the head comes into contact with the test piece.

8 Test report

8.1 Test piece

The following information shall be given:

a) the technical specification of the screw and relevant information on their sampling;

b) the description of the test piece, specification of the material, species or type, grade, density, moisture content, deviations from specifications, and characteristics near the insertion point that might affect the result;

c) the sizes of the test pieces;

d) the method of conditioning;

e) the position and orientation of the screw;

f) the details of pre-drilling (including any countersink);

g) any other information which may have influenced the test results.

8.2 Test method

The following information shall be given:

a) a reference to this International Standard (i.e. ISO 17754);

b) the test method applied — insertion method and speed;

c) the temperature and relative humidity at the time of test;

d) the description of the testing device, the test equipment, and the measuring instruments;

e) any other information which may have influenced the test results.

8.3 Test results

The following information for each test piece shall be given:

a) the maximum value of the screw insertion moment;

b) the moisture content of the test piece material;

c) the actual dimensions, position of the insertion point;

d) the location of failure, if any, in the test piece or screw;

e) a plot of the moment to penetration depth for each specimen;

f) the rotational speed of insertion;

g) any other information which may have influenced the test results.