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**Timber structures — Testing of joints  
made with mechanical fasteners —  
Requirements for timber density**

*Structures en bois — Essai sur assemblages réalisés par organes  
mécaniques — Exigences concernant la masse volumique du bois*

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## Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

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](http://www.iso.org/directives)).

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights. Details of any patent rights identified during the development of the document will be in the Introduction and/or on the ISO list of patent declarations received (see [www.iso.org/patents](http://www.iso.org/patents)).

Any trade name used in this document is information given for the convenience of users and does not constitute an endorsement.

For an explanation of the voluntary nature of standards, the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the World Trade Organization (WTO) principles in the Technical Barriers to Trade (TBT) see [www.iso.org/iso/foreword.html](http://www.iso.org/iso/foreword.html).

This document was prepared by Technical Committee ISO/TC 165, *Timber structures*, in collaboration with the European Committee for Standardization (CEN) Technical Committee CEN/TC 124, *Timber structures*, in accordance with the Agreement on technical cooperation between ISO and CEN (Vienna Agreement).

This third edition cancels and replaces the second edition (ISO 8970:2010), which has been technically revised.

The main changes compared to the previous edition are as follows:

In this edition the sampling method aims not only at ensuring that the selected pieces have a mean density comparable to the wood to which the test result is intended to be applied<sup>[1]</sup>, but also requiring the coefficient of variation of the density to be reflected. Only then the characteristic value of the strength determined by the test can be used directly<sup>[2]</sup>.

If it is not possible to obtain wood with the target mean value and variation of the wood density, the normative [Annex A](#) provides a correction method. The informative [Annex B](#) provides background to the correction procedure.

Any feedback or questions on this document should be directed to the user's national standards body. A complete listing of these bodies can be found at [www.iso.org/members.html](http://www.iso.org/members.html).

## Introduction

The sampling method given aims at ensuring that the selected pieces have a density distribution comparable to the timber to which the test result is intended to be applied. When this is fulfilled, the results can be used directly to determine the characteristic value of the strength parameter.

As it is often difficult to obtain a variation of the density similar to that allowed in a strength class, a correction method is given to obtain a corrected coefficient of variation for the strength parameter.

It should be kept in mind that the effect of density on the load-bearing capacity of connections is in many cases less significant than expected, and that many other parameters influence it.

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# Timber structures — Testing of joints made with mechanical fasteners — Requirements for timber density

## 1 Scope

This document specifies a method based on density, for the selection of pieces of wood used in determining the strength and stiffness properties of joints between members of structural timber made with mechanical fasteners. It is intended to be used in conjunction with a test standard specifying a test method.

It is assumed that the wood pieces are conditioned to the relevant conditions, that the wood density is normally distributed and that any deviations are reported.

This document is applicable only to specimens of structural timber.

**NOTE** It is emphasized that the wood density is only one of the properties that can influence the strength of a joint. Other relevant properties are, for example, growth-ring size and orientation, toughness and hardness.

## 2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

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* 74a-428a-baa3-265935e41f57/iso-8970-2020

## 3 Terms and definitions

No terms and definitions are listed in this document.

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

- ISO Online browsing platform: available at <https://www.iso.org/obp>
- IEC Electropedia: available at <http://www.electropedia.org/>

## 4 Symbols

$\rho$  is the density of a wood piece, expressed in kilograms per cubic metre.

## 5 Wood sampling method and requirements

### 5.1 General

The wood shall be at equilibrium at a relative humidity (RH) of  $(65 \pm 5) \%$  and a temperature of  $(20 \pm 2) ^\circ\text{C}$  at the time of testing. It shall be reported whether the wood was dried or moistened during the conditioning.

**NOTE** The moisture content at equilibrium is lower when reached by moistening than if reached by drying, which can affect the test results. The product test standard can specify if the equilibrium condition is to be reached through drying.

The density for the actual moisture content shall be determined in accordance with ISO 13061-2.

This density is referred to as  $\rho_W$  in ISO 13061-2. The moisture content need not be determined, unless the product test standard requires it.

If other conditions, such as tropical conditions, are used, they shall be reported.

## 5.2 Sampling method and requirements

The sampling method is based on the principle that all selected pieces have a density distribution comparable with that of the timber to which the test results are applied. This may be assumed if [Formula \(1\)](#) and [Formula \(2\)](#) are fulfilled. The observed strengths may then be used directly for calculating characteristic values of the strength.

NOTE The test results apply only to the timber species or the group of timber species used.

The wood shall be of uniform quality and without localized defects that can influence the test results.

The mean wood density,  $\rho_{m,sel}$ , of the selected pieces shall satisfy the condition given by [Formula \(1\)](#):

$$0,95 \rho_{m,tar} \leq \rho_{m,sel} \leq 1,05 \rho_{m,tar} \quad (1)$$

where

$\rho_{m,tar}$  is the mean density of the timber to which the test results are applied;

$\rho_{m,sel}$  is the mean density of the selected pieces.

The coefficient of variation,  $C_{V,\rho,sel}$ , of the wood density of the selected pieces shall satisfy the condition given by [Formula \(2\)](#):

$$C_{V,\rho,sel} \geq C_{V,\rho,tar} \quad (2)$$

where

$C_{V,\rho,tar}$  is the coefficient of variation of the density of the timber to which the test results are applied;

$C_{V,\rho,sel}$  is the coefficient of variation of the density of selected pieces.

NOTE The target value,  $C_{V,\rho,tar}$  will usually be reached if the wood densities  $\rho$  of the selected pieces cover the range:

$$[(1 - k) \rho_{m,tar}; (1 + k) \rho_{m,tar}] \quad (3)$$

where  $k$  is a statistical factor equal to 1,65  $C_{V,\rho,tar}$  or 0,25 for cases where  $C_{V,\rho,tar}$  is unknown.

If [Formula \(1\)](#) and [Formula \(2\)](#) are not fulfilled and if permitted by the product test standard, the observed strengths shall be corrected according to [Annex A](#).

## 6 Test report

The following information shall be included in the test report:

- reference to this document, i.e. ISO 8970:2020;
- the wood species or wood species group;
- the conditioning used, including whether moistened or dried during conditioning;



- d) the densities of the selected wood pieces at the time of testing, the mean density and the coefficient of variation;
- e) if determined, the moisture content of the selected wood pieces at the time of testing;
- f) evidence that the selected pieces satisfy the conditions required in this document or possible deviations;
- g) any other information which can influence the use of the test results.

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