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**Timber structures — Finger-jointed  
timber — Manufacturing and  
production requirements**

*Structures en bois — Bois assemblé par entures multiples —  
Exigences de fabrication et de production*

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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 on 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 the following URL: [www.iso.org/iso/foreword.html](http://www.iso.org/iso/foreword.html). (standards.iteh.ai)

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## Introduction

Finger-jointed timber is viewed as an alternative and substitute for sawn timber. Finger-jointed timber makes use of timber of various lengths and enables localized defects, particularly knots, to be docked out of otherwise high-quality sawn timber.

Qualification (initial type testing) and compliance (factory production control) testing are specified to assess if the components and manufacturing procedures used (finger joint profile, end pressure and other production variables) are appropriate for the characteristic values being claimed. A representative sample of the potential production is evaluated for tension and bending strength and finger joints are assessed for bond quality using delamination or wood fibre failure tests.

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# Timber structures — Finger-jointed timber — Manufacturing and production requirements

## 1 Scope

This document specifies the product and performance requirements for finger-jointed structural timber made from sawn timber elements.

The document does not cover products made using impressed (die-formed) joints or finger-jointed laminations for glued laminated timber, which is covered in ISO 12578.

## 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 9709, *Structural timber — Visual strength grading — Basic principles*

ISO 10983, *Timber — Finger joints — Minimum production requirements and testing methods*

ISO 12122-2, *Timber structures — Determination of characteristic values — Part 2: Sawn timber*

ISO 13910, *Timber structures — Strength graded timber — Test methods for structural properties*

ISO 13912, *Structural timber — Machine strength grading — Basic principles*

ISO 20152-1, *Timber structures — Bond performance of structural adhesives — Basic requirements*

## 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:

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

### 3.1

#### **finger joint**

end joint formed by machining a number of similar, tapered, symmetrical fingers in the ends of timber pieces that are then bonded together

### 3.2

#### **finger-jointed timber**

timber that contains two or more component pieces end-joined by *finger joints* (3.1)

Note 1 to entry: All pieces are of a single species or recognized species group, have the same nominal cross-section and the finger joints are formed using a common adhesive and production method.

### 3.3

#### **production batch**

*finger-jointed timber* (3.2) made during a continuous run on one production line

## 3.4 strength grade

population of timber having a set of structural properties and utility requirements

Note 1 to entry: Strength grade is defined in accordance with principles detailed with ISO 9709 (visual grading) or ISO 13912 (machine grading).

## 3.5 service class

service conditions to which *finger-jointed timber* (3.2) is subjected

Note 1 to entry: Service classes are defined in ISO 20152-1.

## 3.6 qualification initial type testing

testing of *finger joints* (3.1) or *finger-jointed timber* (3.2) that is used to establish the statistical variables that describe the finger joint strength applicable to *strength grade* (3.4) and the parameters appropriate to the bond quality of the *service class* (3.5)

## 3.7 compliance factory production control testing

process of demonstrating that *finger-jointed timber* (3.2) has strength values and bond quality of the specified *strength grade* (3.4) and *service class* (3.5)

## 3.8 standard length

length used in testing to determine characteristic values

Note 1 to entry: Standard lengths are defined in ISO 13910:2017

Note 2 to entry: Characteristic values are defined in ISO 12122-2  
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Note 3 to entry: Finger-jointed timber can be used as a substitute for sawn timber and therefore has its properties determined over the same test lengths.

## 4 Symbols

$d$	depth of finger-jointed timber in millimetres
$b$	width of finger-jointed timber in millimetres
$f_{k,m}$	characteristic strength in bending of a strength grade in megapascals
$f_{k,t}$	characteristic strength in tension of a strength grade in megapascals
$f_{k,m,verif} = k_{ff}f_{k,m}$	characteristic finger joint strength in bending of a single finger joint required for verification in megapascals
$f_{k,t,verif} = k_{ff}f_{k,t}$	characteristic finger joint strength in tension of a single finger joint required for verification in megapascals
$k_{ff}$	factor that allows for the effect of multiple finger joints in a standard length
$L$	standard test length for tension or bending as defined in ISO 13910 in millimetres
$M$	number of finger joints that occur in a standard length



NOTE Factor  $k_{ff}$  makes allowance for the negative impact of multiple finger joints on characteristic strengths and is used with the analytical method of assigning characteristic strengths. With the empirical method, the allowance is unnecessary.

## 5 Conformance

### 5.1 Quality systems requirements

Products conforming to this document shall be manufactured to a formalized manufacturing specification covering all relevant process variables under a quality system that includes

- in plant process control and internal auditing procedures, and
- auditing of plant process control and end-product quality.

### 5.2 Manufacturing specifications

The manufacturing specifications shall set the limits on all variables that affect or correlate with final product quality properties, including

- a) materials,
- b) glue bond quality,
- c) manufacturing process, and
- d) secondary processes and treatment, when applicable.

NOTE The above list is not necessarily exhaustive.

## 6 Requirements

### 6.1 Structural strength

#### 6.1.1 Timber components

All timber components between finger joints shall have strength and stiffness characteristics of a declared strength grade. Where preservative or flame retardant treatment is used, the properties shall be determined after completion of the treatment.

#### 6.1.2 Grading methods

All timber grading methods shall comply with the requirements of either ISO 9709 in the case of visual grading or ISO 13912 in the case of machine grading.

#### 6.1.3 Finger-jointed timber

Bending and tension strengths are defined by reference to standard lengths defined in ISO 13910. Over these test lengths, finger-jointed timber shall have characteristic structural strengths in both bending and tension not less than the bending or tension strengths of the declared strength grade. The bending and tension strengths of the finger-jointed timber shall be determined during qualification and verified for each production batch except, if tension tests are omitted, then, in stress terms, the tension strength shall be deemed equal to 0,55 times the declared bending strength ( $f_{k,t} = 0,55 f_{k,m}$ ).

NOTE 1 For verification of performance requirements in [6.1](#), refer to [7.1](#).

NOTE 2 Increasing the number of finger joints in these standard test lengths potentially lowers the overall tension strength. This is most obvious in tension tests where there is an increased tendency to fail at the weakest finger joint; see [Annexes F](#) and [H](#) for details.

### 6.2 Adhesive

The adhesive shall comply with the Service Class 2 or 3 requirements of ISO 20152-1. For product intended for use under full weather exposure, the adhesive shall meet the requirements for Service Class 3 conditions.

NOTE For verification of performance requirements in [6.2](#), refer to [7.2](#).

### 6.3 Finger joint glue bond integrity

When determined in accordance with either [Annex D](#) or [Annex E](#), the glue bond quality shall exhibit characteristics appropriate to the Service Class claimed by a manufacturer. Alternatively, a nationally accepted test method may be used.

NOTE 1 For verification of performance requirements in [6.3](#), refer to [7.3](#).

NOTE 2 [Annex D](#) involves wood fibre failure assessment and [Annex E](#) involves cyclic delamination testing. Cyclic delamination testing is unsuitable for testing of finger joint of length less than 12 mm.

### 6.4 Utility

Finger-jointed structural timber produced to a declared strength grade shall meet the utility requirements that correspond to those listed for the relevant strength grade.

NOTE For verification of performance requirements in [6.4](#), refer to [7.4](#).

### 6.5 Product identification

Finger-jointed structural timber shall be identified with sufficient information to facilitate its correct use and to allow for traceability from end user to manufacturer.

NOTE For verification of performance requirements in [6.5](#), refer to [7.5](#).

## 7 Verification

### 7.1 Structural strength

#### 7.1.1 Qualification

Compliance with the declared strength grade shall be assessed by either analytical or empirical method.

##### 7.1.1.1 Analytical method

Single joint specimens shall be sampled and tested in accordance with ISO 10983 in both bending and tension (if necessary, see [6.1.3](#)) and the test data evaluated in accordance with ISO 12122-2 to determine the characteristic finger joint strengths. In addition, the finger joint strengths shall meet the requirements of [Annex F](#).

ISO 10983 requires at least 30 test specimens for both bending and tension (if necessary) strength tests.

Qualification is required to establish that all the requirements of this document have been met for each strength grade that is to be produced by the manufacturer. Qualification target test loads are required to take into account multiple joint effects; see [Annex F](#) for magnitude of the effects.

### 7.1.1.2 Empirical method

A representative sample shall be drawn from production, then tested and evaluated in accordance with ISO 12122-2. The qualification specimens shall have a representative number of joints as anticipated in typical length put on the market. The characteristic values for bending and tension strengths shall equal or exceed the declared strength grade values.

If the number of joints between pieces and batches are likely to vary, it is recommended that the qualification specimens contain the maximum number of joints that is expected to occur in typical length put on the market. This provides assurance that the qualification testing adequately assesses the representativeness of the components selected.

ISO 12122-2 requires testing in accordance with ISO 13910 which means that specimens are tested at the same standardized lengths used to define the characteristic strengths of sawn timber. This document specifies the requirements for finger-jointed timber that can be used in place of sawn timber so that testing to the standardized lengths provides the characteristic tension and bending strengths on the same basis. Other structural properties are ensured by grading the timber components to a national grading standard.

## 7.1.2 Compliance testing

### 7.1.2.1 Analytical method

- a) Finger joints shall be sampled in accordance with [Annex A](#) and tested in accordance with ISO 10983. Finger-jointed timber components shall be graded as described in [6.1](#), sampled in accordance with [Annex A](#), tested in accordance with ISO 10983 in either bending or tension and shall comply with the criteria of [Annex A](#).
- b) Where finger-jointed timber is proof loaded in reverse bending or in tension as defined in [Annex B](#) or [C](#) at a level of  $0,5 f_{k,m}$  or  $0,5 f_{k,t}$ , respectively, or non-destructively assessed by other nationally accepted destructive methods of finger joint testing, reduced sampling rates shall apply as detailed in [Annex A](#).

### 7.1.2.2 Empirical method

Finger-jointed timber shall be verified by one of the following methods applicable to standard length finger-jointed timber.

- a) Finger-jointed timber shall be sampled in accordance with [Annex A](#), tested in accordance with ISO 13910 in either bending or tension and shall comply with the criteria of [Annex A](#).
- b) Where finger-jointed timber is proof loaded in reverse bending or in tension as defined in [Annex B](#) or [C](#) at a level of  $0,5 f_{k,m}$  or  $0,5 f_{k,t}$ , respectively, or non-destructively assessed by other nationally accepted destructive methods of finger joint testing, reduced sampling rates shall apply as detailed in [Annex A](#).

Monitoring the average number of joints per piece may be used to assess if the sample tested at qualification (i.e. number of joints) continues to be applicable. The information may also be used to initiate qualification testing involving a greater number of joints per piece by reference to the analytical method.

## 7.2 Adhesive

Documentary evidence shall be available to verify compliance with the provisions of ISO 20152-1.

### 7.3 Finger-joint glue bond integrity

#### 7.3.1 Verification at qualification

##### 7.3.1.1 Sampling

Five specimens of the same type used for strength testing shall be taken.

##### 7.3.1.2 Testing

Finger joints shall be tested in accordance with either [Annex D](#) for assessment of wood fibre failure or [Annex E](#) for cyclic delamination.

##### 7.3.1.3 Acceptance criteria

In the case of assessment of wood fibre failure, the levels given in [Table D.1](#) may be used as a guideline; otherwise it shall be necessary to establish wood failure levels appropriate for the wood species, adhesive and Service Class conditions. In the case of cyclic delamination, the criteria given in [Annex E](#) shall be met.

#### 7.3.2 Verification for compliance testing

##### 7.3.2.1 Sampling

The sample shall be

- a) one specimen at the commencement of each adhesive batch, and
- b) one specimen per machine per day (24 h period) with at least five specimens per week.

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##### 7.3.2.2 Testing

Finger joints shall be tested in accordance with either [Annex D](#) for assessment of wood fibre failure or [Annex E](#) for cyclic delamination.

##### 7.3.2.3 Acceptance criteria

The criteria specified in [7.3.1.3](#) shall apply.

### 7.4 Utility requirements

The utility requirements of this document including dimension, wane, machine skip and distortion shall be deemed to comply with this document if they meet those of the declared strength grade.

### 7.5 Product identification requirements

The product shall be deemed to comply with this document if it is identified as described in [Annex G](#).