
**Timber structures — Glued laminated
timber — Component performance
requirements**

*Structures en bois — Bois lamellé-collé — Performance des
composants et exigences*

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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).

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).

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 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.

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

This second edition cancels and replaces the first edition (ISO 12578:2008), which has been technically revised.

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Introduction

Glued laminated timber is obtained by bonding together a number of laminations having their grain essentially parallel. In this way, a member with rectangular solid cross-section can be produced. Other non-rectangular shapes can also be produced.

The purpose of the requirements in this International Standard is to provide minimum performance requirements to ensure the in-service performance of the glued laminated timber. The requirements will need to be supplemented to take into consideration special conditions, materials or functional requirements.

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Timber structures — Glued laminated timber — Component performance requirements

1 Scope

This International Standard specifies requirements for the components of glued laminated timber members for structural use.

This International Standard is applicable to products with a finished lamination thickness of not more than 50 mm.

Although most glued laminated timber is made from coniferous species, this International Standard also applies to broad leaf species if the tests specified in this International Standard show that a satisfactory glue bond can be achieved.

The basic requirements apply to structural members of all service classes; however, special precautions are necessary for service class 3, for example, the use of weather resistant adhesives (see 5.3).

This International Standard does not apply to the determination of strength and stiffness characteristics. Annex B contains informative materials for formaldehyde emission.

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2 Normative references (standards.iteh.ai)

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

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

ISO 10983:2014, *Timber — Finger joints — Minimum production requirements and testing methods*

ISO 8375:—¹⁾, *Timber structures — Glued laminated timber — Test methods for determination of physical and mechanical properties*

ISO 12579, *Timber structures — Glued laminated timber — Method of test for shear strength of glue lines*

ISO 12580, *Timber structures — Glued laminated timber — Methods of test for glue-line delamination*

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

3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 12579, ISO 12580, ISO 20152-1 and the following apply.

3.1

glued laminated timber

glulam

structural member formed by bonding together timber *laminations* (3.7) with their grain running essentially parallel to the member's longitudinal axis

1) To be published. (Revision of ISO 8375:2009)

3.2 horizontal glulam

glued laminated timber (3.1) with the wide faces of the *laminations* (3.7) perpendicular to the direction of the larger cross-sectional dimension

Note 1 to entry: See [Figure 1](#).

Note 2 to entry: This International Standard does not cover vertical glulam.

3.3 service class

group designation characterized by the moisture content of the members corresponding to the temperature and relative humidity of the surrounding air

3.3.1 service class 1

group designation characterized by a moisture content in the materials corresponding to a temperature of 20 °C and the relative humidity of the surrounding air exceeding 65 % for a few weeks per year

Note 1 to entry: In service class 1, the average equilibrium moisture content of most softwoods does not exceed 12 %.

[SOURCE: ISO 20152-1:2010, 3.1]

3.3.2 service class 2

group designation characterized by a moisture content in the materials corresponding to a temperature of 20 °C and the relative humidity of the surrounding air exceeding 85 % for a few weeks per year

Note 1 to entry: In service class 2, the average equilibrium moisture content of most softwoods does not exceed 20 %. Such conditions include resistance to the effects of moisture on structural performance due to construction delays or other conditions of similar severity.

[SOURCE: ISO 20152-1:2010, 3.2]

3.3.3 service class 3

group designation characterized by climatic conditions leading to moisture contents higher than *service class 2* (3.3.2), such as when a member is fully exposed to the weather

[SOURCE: ISO 20152-1:2010, 3.3]

3.4 maximum delamination percentage

maximum delamination length of one glue line in the test piece, measured on both end-grain surfaces of the test specimen multiplied by 100 and divided by the total length of glue lines on the two end-grain surfaces of each test piece for a single glue line in a test piece

Note 1 to entry: As defined in ISO 12580:2007, 8.3.

3.5 total delamination percentage

delamination length of all glue lines on the two end-grain surfaces in the test piece multiplied by 100 and divided by two times the length of one glue line

Note 1 to entry: As defined in ISO 12580:2007, 8.2.

3.6 wood failure percentage

percentage of the wood failure area in relation to the total sheared area

[SOURCE: ISO 12579:2007, 3.5]

3.7 lamination

piece or pieces of timber of not more than 50 mm in thickness, with or without end joints forming part of a glulam member

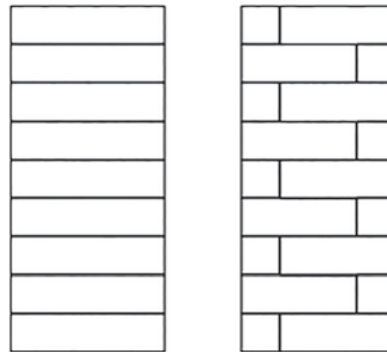


Figure 1 — Glue lines in cross-sections showing the normal position of the glue lines

3.8 declared strengths

<values or properties> mean strength, $\bar{f}_{x,dc}$, and characteristic strength, $f_{x,dc,k}$, of end joints strengths chosen by the manufacturer and used as a basis for determining compliance with the end joint strength requirements of this International Standard

Note 1 to entry: All values can be either bending (m) or tension (t) strength depending on which method of compliance testing is chosen.

Note 2 to entry: For established production facilities, the declared strengths may be determined using historical data and appropriate statistical methods.

3.9 qualification

process of assessing, through physical testing and statistical processing of test data, if the output from a combination of tools, materials and people engaged in producing glued laminated timber products meets the requirements of this International Standard

4 Symbols

\bar{f}_x	mean end joint strength determined by qualification testing and statistical processing (mPa)
$f_{x,k}$	characteristic end joint strength determined by qualification tests and statistical processing (mPa)
$\bar{f}_{x,dc}$	required mean strength of the end joints (mPa)
f_v	shear strength (mPa)
x	subscript indicating bending (m) or tension (t)
dc	declared properties

5 Component requirements

5.1 General

The grading of the timber shall result in reliable strength and stiffness properties in the laminations. The bonding operations shall result in reliable and durable bonds in end joints and between laminations.

5.2 Timber

The timber shall be graded in conformity with either ISO 9709 or ISO 13912. The strength and stiffness properties of the glued laminated timber shall be established in accordance with ISO 8375.

5.3 Adhesives

The adhesive shall enable joints of such strength and durability to be produced such that the integrity of the bond is maintained throughout the intended lifetime of the structure.

The adhesive shall be chosen considering the conditions during construction and in service including climate, moisture conditions, exposure to elevated temperature, the timber species, the preservative used (if any) and the production methods.

Adhesives shall meet the requirements of ISO 20152-1.

NOTE Additional requirements for adhesives may be specified by national standards or governing codes.

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5.4 End joints in laminations

5.4.1 Qualification requirements

Mean declared strength, $\bar{f}_{x,dc}$, and characteristic declared strength, $f_{x,dc,k}$, of end joints shall be selected by the manufacturer after qualification testing using one of the methods described in ISO 10983:2014, 6.5. Alternatively, the values may be obtained from historical records where these are available. Declared values of this strength shall satisfy the following:

- mean declared strength, $\bar{f}_{x,dc} \leq \bar{f}_{x,k}$;
- characteristic declared strength, $f_{x,dc,k} \leq f_{x,k}$.

5.4.2 Verification of on-going production

End joints shall comply with the requirements of ISO 10983:2014, 6.6. In interpreting ISO 10983:2014, 6.6, the declared values may be used in lieu of the corresponding \bar{f}_x and $f_{x,k}$ values.

5.5 Glue line integrity and strength

5.5.1 The glue line integrity shall be based on testing of the glue line in a full cross-sectional specimen, cut from the manufactured glulam member.

The specimens shall be representative of the manufacturing process and any pre-gluing chemical treatment of the laminations. For all service classes, bond strength shall be determined using block shear tests according to ISO 12579. Delamination tests shall be performed based on service class as specified in [5.5.2](#).

5.5.2 For structures of service class 3, delamination tests shall be made according to methods A, B or a combination of D and E of ISO 12580.

For structures of service class 2, delamination tests shall be performed according to methods A, B, C or a combination of D and E of ISO 12580.

For quality control, the test methods are specified in 7.1.3.2.

5.5.3 Depending on the method and number of cycles as required in ISO 12580, the total delamination percentage of each cross-sectional specimen shall be less than the values given in [Table 1](#).

Table 1 — Maximum delamination

Service class	Delamination method ISO 12580	Delamination — % after cycle 1	Delamination — % after cycle 2
3	A	5	10
3	B	5	10
3	Db	—	5
	Eb	—	5
2	A ^a	5	10
2	B ^a	5	10
2	C	5	—
2	Db	5	—
	Eb	5	—

^a Methods A and B are not required for service class 2; but if they are used, the same delamination requirements as for service class 3 apply.

^b It is necessary that methods D and E be used together.

For all delamination methods, the maximum delamination percentage of any single glue line shall be less than or equal to 20 %.

NOTE As an alternative to [5.5.3](#), the provisions of EN 14080:2013, 5.5.5.2.2 are applicable.

5.5.4 Each test result from the block shear tests of each cross-sectional specimen performed in accordance with ISO 12579 shall comply with the following requirements with regard to the shear strength and wood failure percentage.

The average glue line shear strength shall be no less than 90 % of the shear strength of the unbonded wood of the same species. The average shear strength of all glue lines in a cross-section shall be at least 6,0 MPa. For coniferous wood, poplar and broad leaf species with a specific gravity of 0,5 or less, a shear strength of 4,0 MPa for all glue lines in a cross-section shall be regarded as acceptable if the wood failure percentage is 100.

The average wood failure percentage for all glue lines in a cross-section and any individual value shall exceed the minimum wood failure percentages stated in [Table 2](#).