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

*Structures en bois — Bois lamellé-collé — Méthode d'essai de
cisaillement des plans de collage*



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Contents

Page

Foreword.....	iv
Introduction	v
1 Scope	1
2 Normative references	1
3 Terms and definitions.....	1
4 Symbols and abbreviated terms	2
5 Principle.....	2
6 Test samples and test specimens.....	2
6.1 Test samples	2
6.2 Test specimens	3
6.3 Alternative test specimens	4
6.4 Adjustments to results for alternative test specimens.....	5
6.5 Rectangular-prism test specimens from wide glulam timber members	5
7 Apparatus	6
7.1 Testing machine.....	6
7.2 Shearing apparatus	6
8 Procedure	7
9 Results	7
9.1 Calculation of shear stress	7
9.2 Test report	8



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.

International Standards are drafted in accordance with the rules given in the ISO/IEC Directives, Part 2.

The main task of technical committees is to prepare International Standards. Draft International Standards adopted by the technical committees are circulated to the member bodies for voting. Publication as an International Standard requires approval by at least 75 % of the member bodies casting a vote.

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.

ISO 12579 was prepared by Technical Committee ISO/TC 165, *Timber structures*.



Introduction

This International Standard was developed by TC 165 as a production quality-control test to be used for structural glulam. It is meant to be used in conjunction with ISO 12578 and to be applied to each production batch. The frequency of testing and the pass/fail criteria are detailed in ISO 12578. There is nothing, in principle, that would prevent the test method from being applied to non-structural glulam.



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Timber structures — Glued laminated timber — Method of test for shear strength of glue lines

1 Scope

This International Standard specifies a production quality-control test method for measuring the shear strength of the glue line of glued laminated timber.

2 Normative references

The following referenced documents are indispensable for the application 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 12578, *Timber structures — Glued laminated timber — Component performance and production requirements*

3 Terms and definitions

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

3.1

glued laminated timber

glulam

structural member formed by bonding together timber laminations with the grain running essentially parallel

3.2

test sample

one or more test specimens taken from a press load or production lot detailed in ISO 12578

3.3

test specimen

test piece of rectangular prismatic or cylindrical form

See Figures 2 to 5.

3.4

wood failure

rupture in or between wood fibres

3.5

wood-failure percentage

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

4 Symbols and abbreviated terms

A : area, in square millimetres;

b : width of test specimen, in millimetres;

d : diameter of cylindrical cored specimen, in millimetres;

F_u : ultimate load, in newtons;

f_s : shear strength, in newtons per square millimetre;

l : length of test specimen, in millimetres;

s : step height in a stepped rectangular-prism specimen, in millimetres;

t : thickness of shear plane, in millimetres;

w : full width of glulam timber member, in millimetres.

5 Principle

A shear stress is applied at the glue line until failure occurs. The load at failure is recorded and the wood-failure percentage is evaluated.

6 Test samples and test specimens

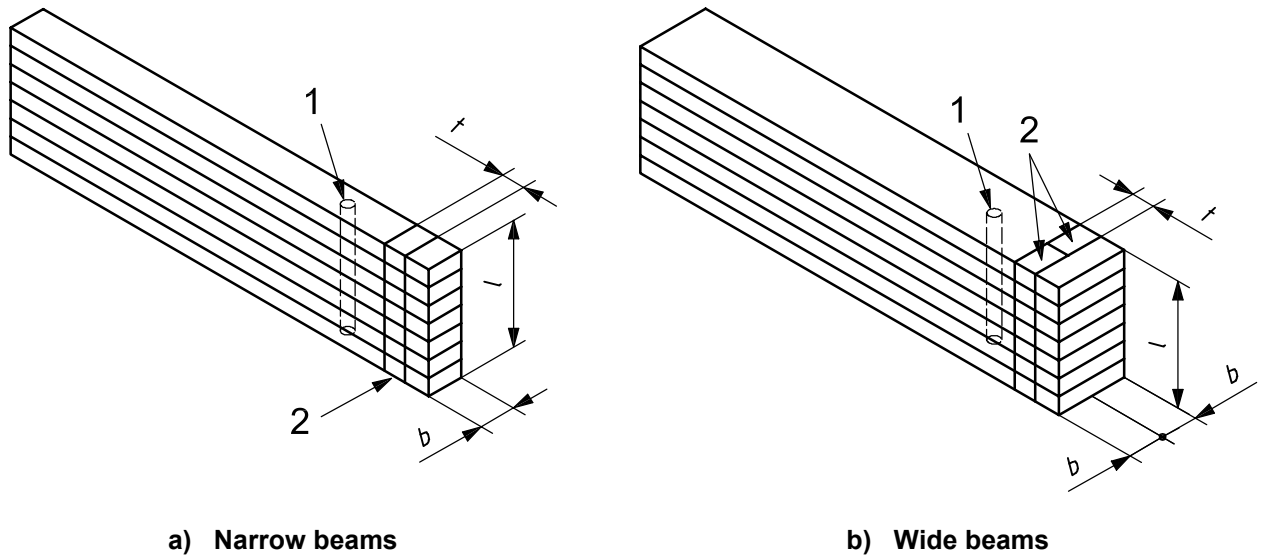
6.1 Test samples

Test samples shall be taken from production at a sampling rate detailed in ISO 12578. One or more test specimens shall be taken from the glued laminated timber member as illustrated in Figure 1.

NOTE Rectangular-prism specimens from wider members can require a reduction in width to fit into the shearing apparatus. See also 6.5 and Figure 6.

It is recommended that the specimens be taken within areas of the glulam member where sufficient clamping pressure has been established. In practice, the specimens are frequently cut from the end of the glulam members where the clamping pressure may be variable and insufficient. If the required shear strength is obtained from test pieces of this nature, the quality of the glue lines in the member shall be deemed adequate.



**Key**

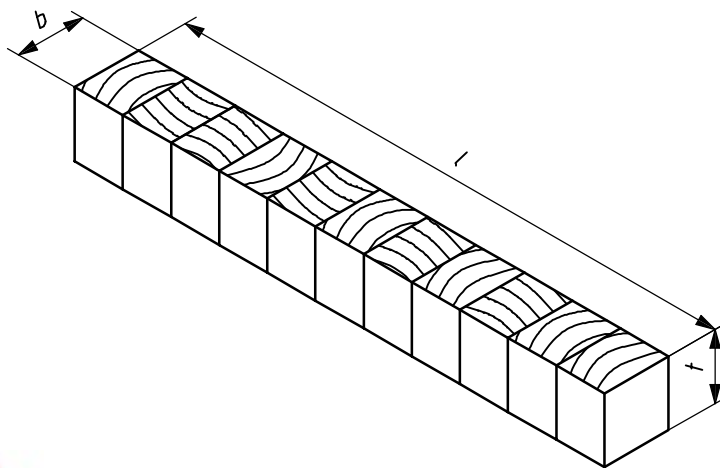
- 1 cut cylindrical specimen clear of the manufactured end
- 2 cut rectangular specimen clear of the manufactured end

Figure 1 — Sampling from glued laminated members**6.2 Test specimens**

The standard test specimen shall be the rectangular-prism specimen shown in Figure 2. The width, b , and thickness, t , of the shear plane shall be a nominal 50 mm. Actual dimensions shall be measured for each shear plane tested. The specimen length, l , is not critical. Alternative test specimens shall be permitted in accordance with 6.3.

Special care shall be taken in preparing the test specimens to ensure that the loaded surfaces are smooth and parallel to each other and perpendicular to the grain direction.

At least three glue lines in each of the top one-third, center one-third, and bottom one-third of the cross-section shall be included in the sampling. If there are fewer than 10 laminations, all glue lines shall be included.

**Figure 2 — Standard rectangular-prism specimen**

6.3 Alternative test specimens

Alternative test-specimen configurations or sizes shall be permitted, provided that the test results from the alternative specimen are correlated to test results of the standard rectangular-prism specimen according to 6.4. Common configurations for alternative specimens include stepped rectangular-prism specimens (Figure 3), cylindrical specimens (Figure 4), and rectangular-prism specimens with saw kerfs (Figure 5). Cylindrical specimens typically have a diameter of 25 mm. For rectangular-prism and stepped rectangular-prism specimens, common shear-plane dimensions, b and t , range from 25 to 50 mm. Step heights, s , for stepped rectangular-prism specimens are typically approximately 5 mm.

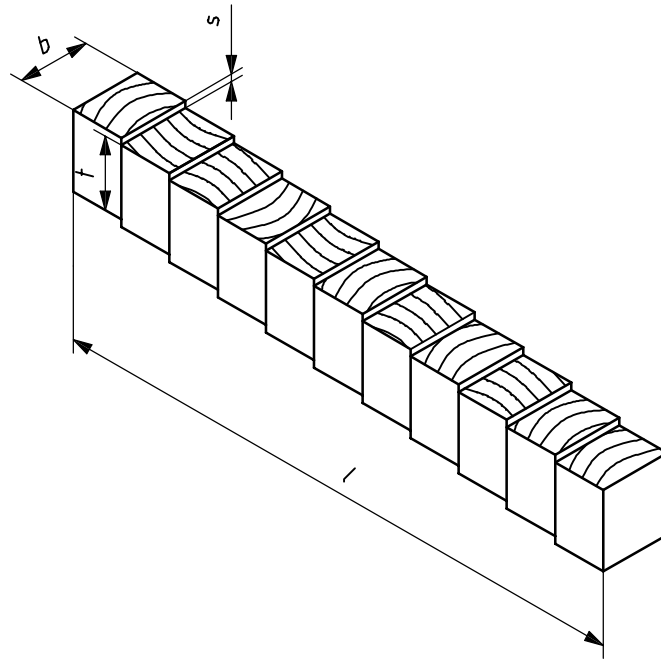


Figure 3 — Stepped rectangular-prism specimen

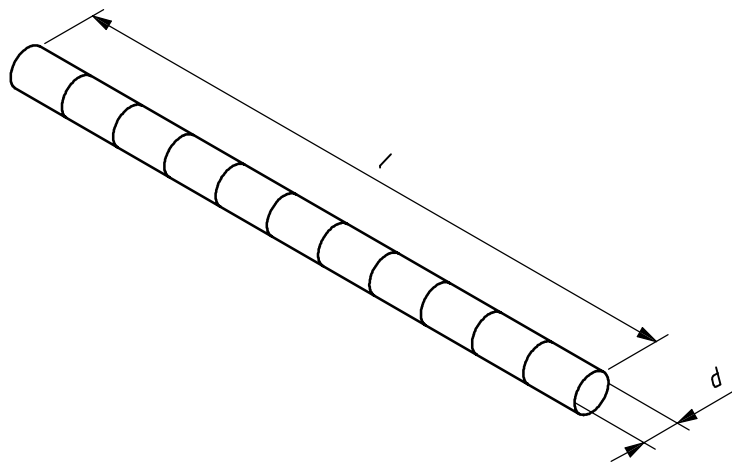


Figure 4 — Cylindrical test specimen

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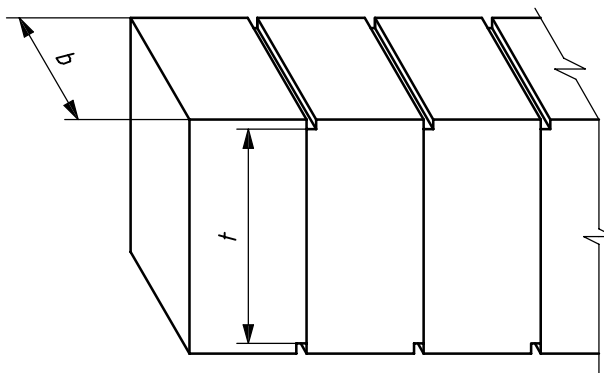


Figure 5 — Rectangular-prism specimen with saw kerfs

6.4 Adjustments to results for alternative test specimens

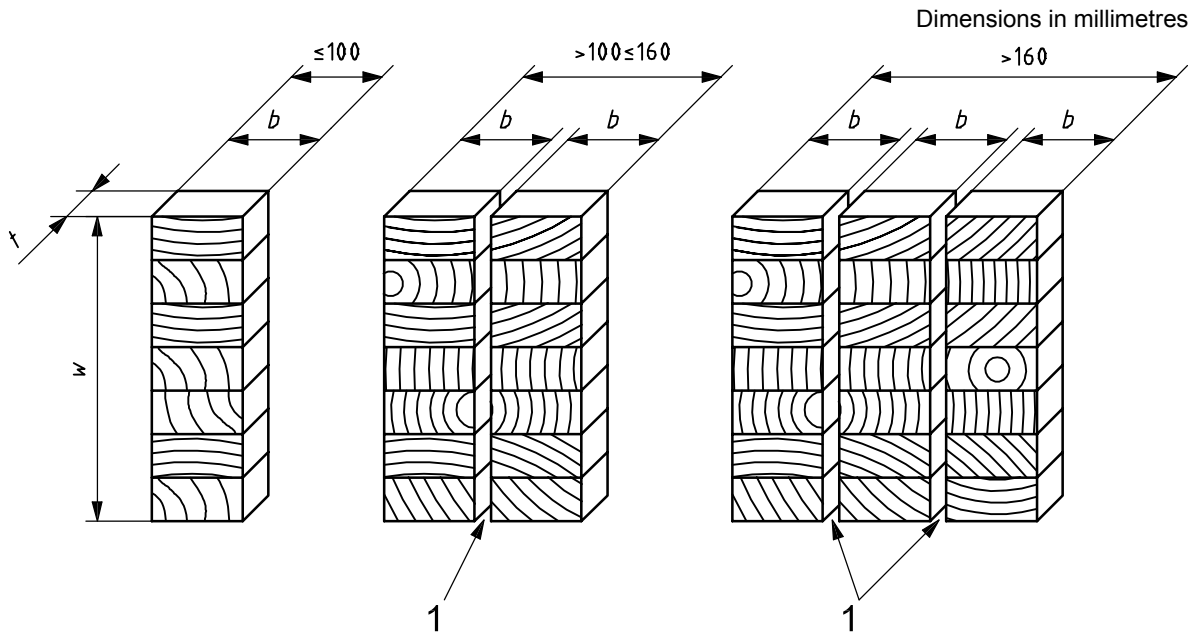
The values obtained from tests of rectangular-prism specimens shall be considered standard. When using alternative specimens, a regression between the shear values obtained using the alternative specimen and the shear values obtained using the rectangular-prism specimen shall be established using a minimum of 20 tests of each specimen type. Matching specimens shall be taken from the same piece of glulam, as close to one another as cutting conditions permit. The regression equation shall be used to adjust the test values of the alternative specimen to an equivalent rectangular-prism result.

6.5 Rectangular-prism test specimens from wide glulam timber members

Depending on the width of the glulam timber member, multiple specimens shall be cut in accordance with the details given in Table 1. Where such multiple specimens are taken, a full cross-section shall first be cut and then subdivided by vertical cuts as illustrated in Figure 6.

Table 1 — Number of test specimens from wide glulam timber members

Width, w , of full cross-section (see Figure 1) mm	Number of test specimens
≤ 100	1
$> 100 \leq 160$	2
> 160	3



Key

1 saw cut

Figure 6 — Test specimens to be cut from a full cross-section of a glulam member

7 Apparatus

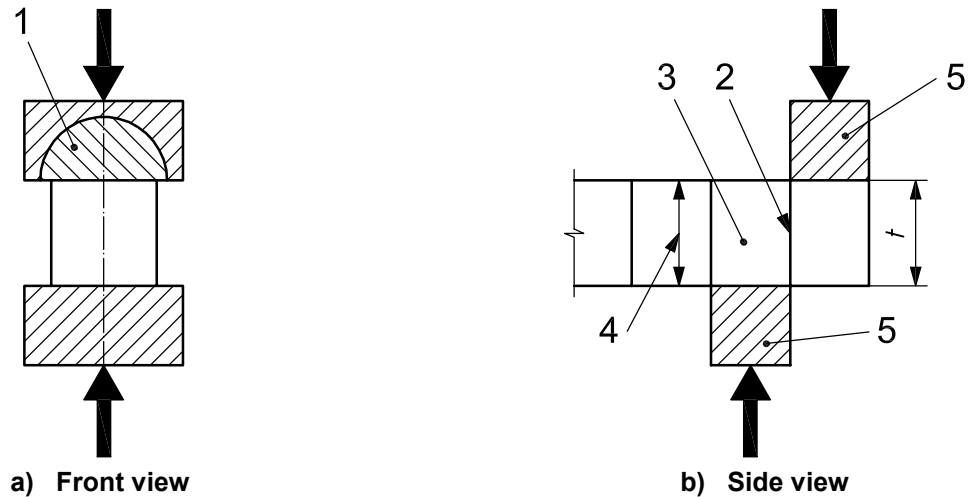
7.1 Testing machine

A calibrated testing machine shall be used that is capable of applying a compressive shear force to the shearing apparatus referred to in 7.2. The accuracy of measuring the maximum load shall be better than $\pm 5\%$.

7.2 Shearing apparatus

The shearing apparatus shall be capable of applying a shear force in the plane of the glue line as illustrated in Figure 7.





Key

- 1 cylindrical self-aligning platen
- 2 sheared plane and bond line
- 3 test specimen to be clamped as necessary
- 4 grain direction
- 5 shearing apparatus

Figure 7 — Method of applying shear load to a glue line

8 Procedure

The test specimens shall be tested in an environment typical of the production conditions. For internal quality control, the moisture content of the wood shall correspond to that used in the production of the glulam.

The dimensions b and t of the sheared area shall be measured to the nearest 0,5 mm.

The test specimen shall be placed in the shearing tool so that it is loaded in the direction of the grain. The glue line shall be positioned so that the distance between this and the sheared plane nowhere exceeds 1 mm.

The loading shall be undertaken at a constant rate, so that failure occurs after at least 20 s.

The percentage of wood-failure shall be estimated to the nearest 5 %.

Every test specimen shall be marked with a durable identification. This shall indicate the location of the test specimen within the cross-section of the glulam member.

9 Results

9.1 Calculation of shear stress

The shear strength f_s shall be computed to two significant digits from the following equation:

$$f_s = \frac{F_u}{A}$$

where

F_u is the ultimate load, in newtons;

A is the sheared area, in square millimetres (for a rectangular-prism test specimen $A = bt$).

9.2 Test report

The test report shall include the following items:

- a) date of the test;
- b) description of the product;
- c) identification of test specimens and their location in the member;
- d) species of timber;
- e) type of adhesive;
- f) dimensions and configuration of the test specimen;
- g) ultimate load and shear strength;
- h) regression equation used to adjust test values to standard values;
- i) wood-failure percentage;
- j) signature of the person responsible for the testing.



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