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Lepila za nosilne lesene konstrukcije - Preskusne metode - 1. del: Določanje vzdolžne natezne strižne obremenitve

Adhesives for load-bearing timber structures - Test methods - Part 1: Determination of longitudinal tensile shear strength

Klebstoffe für tragende Holzbauteile - Prüfverfahren - Teil 1: Bestimmung der Längszugscherfestigkeit

Adhésifs pour structures en bois - Méthodes d'essais - Partie 1: Détermination de la résistance du joint au cisaillement en traction longitudinale

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Adhesives for load-bearing timber structures - Test methods - Part 1: Determination of longitudinal tensile shear strength

Adhésifs pour structures en bois - Méthodes d'essais -
Partie 1: Détermination de la résistance du joint au
cisaillement en traction longitudinale

Klebstoffe für tragende Holzbauteile - Prüfverfahren - Teil 1:
Bestimmung der Längszugscherfestigkeit

This draft European Standard is submitted to CEN members for enquiry. It has been drawn up by the Technical Committee CEN/TC 193.

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Recipients of this draft are invited to submit, with their comments, notification of any relevant patent rights of which they are aware and to provide supporting documentation.

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Contents

Page

Foreword.....	3
1 Scope	5
2 Normative references	5
3 Terms and definitions	5
4 Symbols	6
5 Principle.....	6
6 Apparatus	6
7 Method	6
7.1 Preparation of panels	6
7.2 Preparation of the bonded assemblies.....	7
7.2.1 Wood adherends and bonding procedure	7
7.2.2 Close contact glue lines.....	8
7.2.3 Thick glue lines (gap joints)	8
7.3 Preparation of test pieces	8
7.4 Number of test pieces	9
7.5 Treatment prior to tensile shear testing.....	10
7.6 Test procedure	10
8 Expression of results	11
9 Test report	11
9.1 The adhesive	11
9.2 Preparation of test pieces and testing procedure.....	11
9.3 Test results.....	11

Foreword

This document (prEN 302-1:2011) has been prepared by Technical Committee CEN/TC 193 “Adhesives for wood and derived timber products”, the secretariat of which is held by AENOR.

This document is currently submitted to the CEN Enquiry.

This document will supersede EN 302-1:2004.

This document is one of a series dealing with adhesives for use with timber structures, and is published in support to EN 1995 *Eurocode 5: Design of timber structures*. The series consists of a classification and performance requirements for phenolic and aminoplastic polycondensation adhesives for use in different climatic conditions (EN 301), five test methods (EN 302 Parts 1 to 4 and EN 15416-2) used to assess the performance of adhesives after specified heat and humidity treatments, and three test methods (EN 302 Parts 5 to 7) to characterize the working properties of the adhesive.

EN 301, EN 302 Parts 1 to 7 and EN 15416-2 have the following titles.

EN 301, *Adhesives, phenolic and aminoplastic, for load-bearing timber structures — Classification and performance requirements*

EN 302, *Adhesives for load-bearing timber structures — Test methods*

— *Part 1: Determination of longitudinal tensile shear strength*

— *Part 2: Determination of resistance to delamination*

— *Part 3: Determination of the effect of acid damage to wood fibres by temperature and humidity cycling on the transverse tensile strength*

— *Part 4: Determination of the effects of wood shrinkage on the shear strength*

— *Part 5: Determination of the maximum assembly time under referenced conditions*

— *Part 6: Determination of the minimum pressing time under referenced conditions*

— *Part 7: Determination of the working life under referenced conditions*

EN 15416-2, *Adhesives for load bearing timber structures other than phenolic and aminoplastic — Test methods — Part 2: Static load test of multiple bondline specimens in compression shear*

Safety statement

Persons using this document should be familiar with the normal laboratory practice, if applicable. This document cannot address all of the safety problems, if any, associated with its use. It is the responsibility of the user to establish appropriate safety and health practices and to ensure compliance with any regulatory conditions.

Environmental statement

It is understood that some of the material permitted in this standard may have negative environmental impact. As technological advantages lead to better alternatives for these materials, they will be eliminated from this standard to the extent possible.

prEN 302-1:2011 (E)

At the end of the test, the user of the standard shall take care to carry out an appropriate disposal of the wastes, according to local regulation.

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1 Scope

This part of EN 302 specifies a method of determining the shear strength of adhesive bonds in close contact glue line and thick glue line.

It is suitable for the following applications:

- a) for assessing the compliance of adhesives with EN 301 and EN 15425;
- b) for assessing the suitability and quality of adhesives for load-bearing timber structures.

This test is intended primarily to obtain performance data for the classification of adhesives for load-bearing timber structures according to their suitability for use in defined climatic environments.

This method is not intended for use to provide for structural design, and does not necessarily represent the performance of the bonded member in service.

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.

EN 301, *Adhesives, phenolic and aminoplastic, for load-bearing timber structures — Classification and performance requirements*

ISO 5893, *Rubber and plastics test equipment — Tensile, flexural and compression types (constant rate of traverse) — Specification*

ISO 6344-2, *Coated abrasives — Grain size analysis — Part 2: Determination of grain size distribution of macrogrits P12 to P220*

3 Terms and definitions

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

3.1

bond line

glue line in combination with the outer layer of wood in contact with the adhesive

3.2

glue line

adhesive layer between the wood members

3.3

thick glue line

glue line of thickness in the range of 0,3 mm to 2,0 mm achieved by using spacers or grooves when two plain members are glued together

3.4

close contact glue line

glue line, maximum 0,1 mm thick, achieved by pressing together two plane wood members with a clamping pressure of $(0,8 \pm 0,1)$ N/mm² without additional grooves, spacers or similar device

prEN 302-1:2011 (E)**4 Symbols**

A	area, in mm ²
f_v	strength, in N/mm ²
F_{\max}	load at failure, in N
h	thickness of glue line, in mm
α	angle between the growth rings and bonded surface
l_1	length of test pieces, (150 ± 5) mm
l_2	length of overlap (length of tested surface), (10,0 ± 0,2) mm
l_3	width of groove for thick glue line, ≈ 14 mm
b	width of test pieces, (20 ± 0,1) mm
t	thickness of panel for close contact glue line, (5 ± 0,1) mm
$t + h$	thickness of panel outside the grooves for thick glue line

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5 Principle

The shear strength of adhesive bonds is determined by applying a longitudinal tensile force to a single lap joint with close contact or thick glue lines between two rectangular wooden adherends made of beech (*Fagus sylvatica* L). The joints are loaded to rupture.

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6 Apparatus

The testing machine shall be either

- a) capable of maintaining a constant rate of loading of (2,0 ± 0,5) kN/min; or
- b) capable of maintaining constant crosshead speed as described in ISO 5893.

The jaws of the testing machine shall grip the test pieces firmly and prevent slippage during loading. The grip shall be fixed in hinged manner.

7 Method**7.1 Preparation of panels**

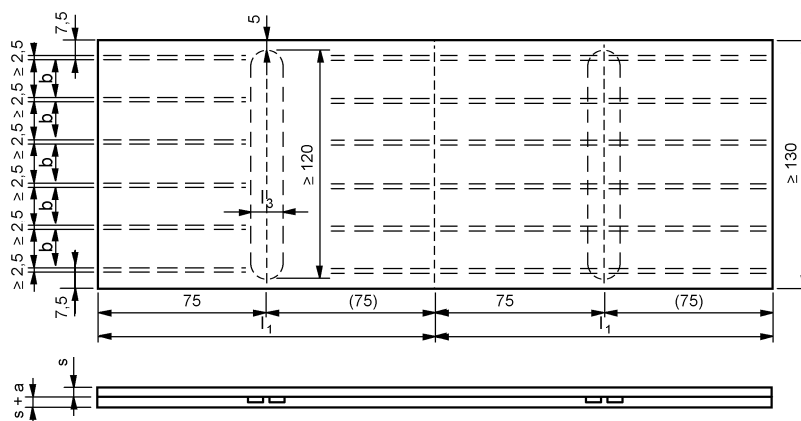
By planing prepare a sufficient number (see 7.4) of panels to be bonded, with or without 14 mm wide grooves as shown in Figure 1, from an untreated straight-grained board of beech (*Fagus sylvatica* L.) with a density of (700 ± 50) kg/m³ at (12 ± 1) % moisture content. Ensure that the angle, α , between the growth rings and the surface to be bonded, see Figure 3 a), is between 30° and 90°.

Cut the panels across the direction of the grain to a length of at least 300 mm with the necessary allowance for cross-cutting (saw blade thickness) and along the grain to a width of at least 130 mm with the necessary allowance for the width of cut as shown in Figure 1. For tests on close contact glue lines, use two panels of

($5,0 \pm 0,1$) mm. For tests on thick glue lines with a thickness h ($0,3 \text{ mm} \leq h \leq 2,0 \text{ mm}$), use one ($5,0 \pm 0,1$) mm thick panel and one ($5,0 \text{ mm} + h \pm 0,1 \text{ mm}$) thick panel. Make grooves with a depth h and a width of approximately 14 mm that end 5 mm from the side edges, see Figure 1.

Condition the panels at a temperature of (20 ± 2) °C and (65 ± 5) % RH, referred to subsequently as “the standard atmosphere [20/65]”.

Dimensions in millimetres



Key

- h depth of groove for thick glue line
- b width of test pieces, ($20,0 \pm 0,1$) mm
- l_1 length of test pieces, (150 ± 5) mm
- l_3 width of groove for thick glue line, ≈ 14 mm ($l_3 = 0$ for close contact glue lines)
- t thickness of panel for close contact glue line, ($5,0 \pm 0,1$) mm
- $t + h$ thickness of panel outside the grooves for thick glue line

Figure 1 — Example of a bonded panel marked for division into individual test pieces

7.2 Preparation of the bonded assemblies

7.2.1 Wood adherends and bonding procedure

Prepare bonded assemblies using the requested glue line thickness.

Not more than 24 h before bonding either lightly plane or lightly sand each surface to be bonded (using an abrasive paper of grain size P100 as defined in ISO 6344-2). Remove any dust carefully. Do not touch or soil the prepared surfaces.

Comply with the adhesive manufacturer's instructions regarding the processing conditions, including the mixing of adhesive with the hardener, the spreading of the adhesive mix, the open and closed assembly time and duration of the assembly pressure, and report them in the test report. For thick glue lines only adhesives whose components have been previously mixed are suitable. After adhesive application, and before pressure application, the board shall be put together as shown in the lower part of Figure 1.

Bond the panels with a clamping pressure of ($0,8 \pm 0,1$) N/mm² uniformly distributed over the bonded surface, or as recommended by the adhesive manufacturer.

prEN 302-1:2011 (E)

7.2.2 Close contact glue lines

Bond two 5 mm thick panels as shown in Figure 1 under pressure to produce a 10 mm thick bonded assembly. The planed panels may be assembled as shown in Figure 2.



Figure 2 — Bonding of panels with close contact joint

7.2.3 Thick glue lines (gap joints)

Pour the adhesive into the grooves of the grooved panel so that it will be squeezed out when pressure is applied. Assemble under pressure one $(5 + h)$ mm thick grooved panel with one 5 mm thick ungrooved panel, to produce a $(10 + h)$ mm thick bonded assembly (see Figure 1).

7.3 Preparation of test pieces

After bonding and pressing and before testing, condition the assembly for 7 to 14 days in the standard atmosphere [20/65]. Test pieces shall not be cut earlier than 3 days after bonding.

Cut five strips of width $b = 20$ mm from each bonded assembly along the grain, avoiding areas within 7,5 mm of the outside long edges of the panel as shown in Figure 1. Cut these strips into test pieces of length $l_1 = (150 \pm 5)$ mm as shown in Figure 3. The test pieces taken from one board shall be distributed randomly for the different treatment classes.

Make flat bottomed cuts of $(2,5 \pm 0,5)$ mm width in the bonded sections across the grain so that an overlap of length $l_2 = (10,0 \pm 0,1)$ mm is defined in the middle section (see Figure 3) centred in the groove in test pieces on thick glue lines. The cuts shall separate the wood layers and the adhesive layer, but they shall not go beyond the adhesive layer.