



SLOVENSKI STANDARD

SIST EN 302-4:2004

01-oktober-2004

Nadomešča:
SIST EN 302-4:1998

Lepila za nosilne lesene konstrukcije - Preskusne metode - 4. del: Ugotavljanje vpliva krčenja lesa na strižno trdnost

Adhesives for load-bearing timber structures - Test methods - Part 4: Determination of the effects of wood shrinkage on the shear strength

Klebstoffe für tragende Holzbauteile - Prüfverfahren - Teil 4: Bestimmung des Einflusses von Holzschwindung auf die Scherfestigkeit

Adhésifs pour structures portantes en bois - Méthodes d'essai - Partie 4: Détermination de l'influence du retrait du bois sur la résistance au cisaillement

Ta slovenski standard je istoveten z: EN 302-4:2004

ICS:

83.180	Lepila	Adhesives
91.080.20	Lesene konstrukcije	Timber structures

SIST EN 302-4:2004 en,fr,de

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EUROPEAN STANDARD
NORME EUROPÉENNE
EUROPÄISCHE NORM

EN 302-4

July 2004

ICS 83.180

Supersedes EN 302-4:1992

English version

Adhesives for load-bearing timber structures - Test methods -
Part 4: Determination of the effects of wood shrinkage on the
shear strength

Adhésifs pour structures portantes en bois - Méthodes
d'essai - Partie 4: Détermination de l'influence du retrait du
bois sur la résistance au cisaillement

Klebstoffe für tragende Holzbauteile - Prüfverfahren - Teil 4:
Bestimmung des Einflusses von Holzschwindung auf die
Scherfestigkeit

This European Standard was approved by CEN on 16 April 2004.

CEN members are bound to comply with the CEN/CENELEC Internal Regulations which stipulate the conditions for giving this European Standard the status of a national standard without any alteration. Up-to-date lists and bibliographical references concerning such national standards may be obtained on application to the Central Secretariat or to any CEN member.

This European Standard exists in three official versions (English, French, German). A version in any other language made by translation under the responsibility of a CEN member into its own language and notified to the Central Secretariat has the same status as the official versions.

CEN members are the national standards bodies of Austria, Belgium, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Slovakia, Slovenia, Spain, Sweden, Switzerland and United Kingdom.

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EUROPEAN COMMITTEE FOR STANDARDIZATION
COMITÉ EUROPÉEN DE NORMALISATION
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Foreword

This document (EN 302-4:2004) has been prepared by Technical Committee CEN/TC 193 "Adhesives", the secretariat of which is held by AENOR.

This European Standard shall be given the status of a national standard, either by publication of an identical text or by endorsement, at the latest by January 2005, and conflicting national standards shall be withdrawn at the latest by January 2005.

This document supersedes EN 302-4:1992.

This document is one of a series dealing with adhesives for use with timber structures, and is published in support of Eurocode No. 5 "Common unified rules for timber structures". The series consists of a classification and performance requirements for two types of phenolic and aminoplastic adhesives for use in different climatic conditions (EN 301), four test methods (EN 302 Parts 1 to 4) used to assess the performance of adhesives after specified heat and humidity treatments, and three test methods (ENV 302-5 and EN 302 Parts 6 and 7) to characterise the working properties of the adhesive.

EN 301 and EN 302 Parts 1 to 4 and Parts 6 and 7 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 bond strength in 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 6: *Determination of the conventional pressing time*

Part 7: *Determination of the conventional working life*

ENV 302-5:2001 has the title '*Adhesives for load-bearing timber structures — Test methods — Part 5: Determination of the conventional assembly time*'.

According to the CEN/CENELEC Internal Regulations, the national standards organizations of the following countries are bound to implement this European Standard: Austria, Belgium, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Slovakia, Slovenia, Spain, Sweden, Switzerland and United Kingdom.

EN 302-4:2004 (E)

1 Scope

This part of EN 302 specifies a method for determining the extent to which wood shrinkage under drying conditions will weaken an adhesive bond.

It is suitable for the following applications:

- a) for assessing the compliance of adhesives with EN 301;
- b) for assessing the suitability and quality of adhesives for load-bearing timber structures;
- c) for determining if the adhesive is capable of withstanding stresses due to wood shrinkage without unacceptable loss of strength.

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 test is carried out on spruce (*Picea abies* L.).

This method is not intended for use to provide numerical design data and does not necessarily represent the performance of the bonded member in service. It is not intended to be used to assess the suitability of adhesives for the manufacture of wood-based panels.

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.*

EN 13183-1, *Moisture content of a piece of sawn timber — Part 1: Determination by oven dry method.*

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

3 Principle

A crosswise double joint with a 0,5 mm thick glue line is submitted to a dry storage treatment and then strained to failure by a compressive shear force.

4 Safety

Persons using this document shall be familiar with normal laboratory practice.

This document does not purport to address all safety problems, if any, associated with its use.

It is the responsibility of the user to establish safety and health practices and to ensure compliance with any European or national regulatory conditions.

5 Apparatus

5.1 Testing machine

The testing machine shall be either:

- a) a constant rate of loading machine, capable of maintaining a rate of loading of (20 ± 5) kN/min; or
- b) a constant rate of traverse machine as described in ISO 5893.

5.2 Climatic cabinets

The cabinets shall be enclosures capable of maintaining the bonded assemblies under the following conditions:

- a) (40 ± 2) °C and a relative humidity of (30 ± 2) % and an air speed of $(0,6$ to $0,8)$ m/s (air speed as measured in an empty cabinet);
- b) (20 ± 2) °C and a relative humidity of (65 ± 5) %;
- c) (20 ± 2) °C and a relative humidity of $(75$ to $80)$ %.

6 Method

6.1 Selection of timber

6.1.1 General

Use spruce (*Picea abies* L.) having a density of (425 ± 25) kg/m³ measured at (12 ± 1) % moisture content as determined by oven drying (according to EN 13183-1).

6.1.2 Preparation of cover pieces

From three boards with a length of at least 1 200 mm prepare three pairs of solid spruce cover pieces that are knot-free, straight grained and

- a) 400 mm in length
- b) 140 mm in width
- c) $(20 \pm 0,5)$ mm in thickness

after conditioning, measurement of moisture content (oven dry method according to EN 13183-1) and final preparation, with growth rings that are approximately tangential to the face and have a radius of 60 mm to 140 mm. Each matching pair of cover pieces is intended for the production of a specimen.

6.1.3 Preparation of core pieces

Prepare three laminated spruce core pieces that are knot-free, straight-grained and with annual rings at an angle of 35° to 55° relative to the surface (see Figure 1). The core pieces shall be

- a) 400 mm in length
- b) 140 mm in width

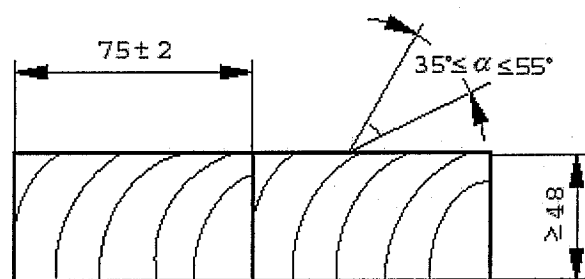
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c) $(40,0 \pm 0,5)$ mm in thickness

after conditioning, measurement of moisture content (oven dry method according to EN 18183-1) and final preparation.

These laminated core pieces shall be produced from two boards with a width of (75 ± 2) mm, and a thickness of at least 48 mm. The two boards shall be bonded together longitudinally with a phenol-resorcinol-formaldehyde adhesive that has passed EN 301 (used according to the adhesive manufacturer's instructions), with an annual ring orientation as indicated in Figure 1.

Dimensions in millimetres



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Key

- 1 PRF bond line
 α Angle of annual ring orientation to the surface

Figure 1 — Cross-section of the laminated spruce core piece before planning and capping to the required dimensions of 140 mm wide by $(40,0 \pm 0,5)$ mm thick

6.1.4 Conditioning

Condition the core and cover pieces such that the average moisture content of all three pieces used in an assembly is $(17,5 \pm 0,5)$ %. Individual core and cover pieces may have a moisture content of (17 ± 1) %, as determined by the oven-dry method, according to EN 13183-1.

NOTE Storage at 20 °C and 75 % to 80 % relative humidity would be expected to give rise to a moisture content in the wood of between 16 % and 18 %.

Not more than eight hours before bonding, either lightly plane, or lightly sand using a grade P 100 abrasive paper complying with FEPA Standard 43-GB, each surface to be bonded. Remove any dust carefully.

Do not touch or soil the prepared surface.

6.2 Preparation of the bonded assemblies

Before bonding the specimens together, take a sample from each of the core and cover pieces for the wood moisture content determination, using the oven-dry method, according to EN 13183-1.

Calculate and record each specimen's mean moisture content using the following formula:

$$U_m = \frac{U_1 + U_2 + 2U_3}{4}$$

where

U_m = the specimens mean moisture content in percent;

U_1 = the moisture content of the first cover piece in percent;

U_2 = the moisture content of the second cover piece in percent;

U_3 = the moisture content of the core piece in percent.

Prepare the bonded assemblies as shown in Figure 2 with the curvature of the growth rings of the cover pieces away from the surfaces to be bonded (Figure 2 c)), and the grain of the cover pieces at right angles to the grain of the core piece (Figures 2 a) and 2 b)). Fix two ($0,5 \pm 0,01$) mm thick aluminium spacer frames (Figure 3), one spacer on the core piece and one spacer on the cover piece to limit the bond area to ($100 \pm 0,1$) mm x ($100 \pm 0,1$) mm and the nominal bond line thickness to 0,50 mm.

NOTE 1 If no other instructions are provided by the adhesive manufacturer, apply the adhesive on the surface of the core piece to be bonded as well as on the surface of the cover piece to be bonded, to ensure good surface wetting.

NOTE 2 To aid in the removal of the left over, hardened adhesive after bonding, it is recommended to use tape strips on the lateral sides of the core and cover pieces before bonding.

Bonding shall take place in a standard atmosphere of (20 ± 2) °C and (65 ± 5) % relative humidity. Apply a load of ($7,7 \pm 0,1$) kN and maintain for 24 h. This load corresponds to a pressure of approximately 0,8 N/mm² applied to the surface of the frame (9 600 mm²).

Remove the clamps and carefully remove any left-over hardened adhesive from the surfaces of the assembled specimen. Weigh and record each specimen's weight to the nearest gram, which is now considered the initial weight of the specimen. Store the assemblies for seven days at (20 ± 2) °C and (65 ± 5) % relative humidity.