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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

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English Version

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

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

If this draft becomes a European Standard, 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.

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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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COMITÉ EUROPÉEN DE NORMALISATION
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Foreword

This document (prEN 302-4:2011) 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 302-4:2004.

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.

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.

1 Scope

This part of EN 302 specifies a method for determining the influence of shear strength in crosswise gluing by wood shrinkage under drying conditions.

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;

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.

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 1245, *Adhesives — Determination of pH*

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

EN 15425, Adhesives - One component polyurethane 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) — Description*

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

3 Principle

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

4 Apparatus

4.1 Testing machine

The testing machine shall be either

a) capable of maintaining a constant rate of loading of (20 ± 5) kN/min; or

b) capable of maintaining a constant crosshead speed as described in ISO 5893.

4.2 Climatic cabinets

The climatic cabinets shall be 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 (0,7 ± 0,15) m/s measured in the centre of 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) %.

5 Method

5.1 Selection of timber

5.1.1 General

Use spruce (*Picea abies* L.) having a density of (450 ± 25) kg/m³ measured at (12 ± 1) % moisture content as determined by oven drying (according to EN 13183-1).

5.1.2 Preparation of cover pieces

From three boards with a length of at least 1200 mm. prepare three pairs of solid spruce cover pieces that are knot-free, straight grained with

a) 400 mm. in length;

b) 140 mm. in width; and

c) (20 ± 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.

5.1.3 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 dimensions of the core pieces shall be

a) 400 mm in length;

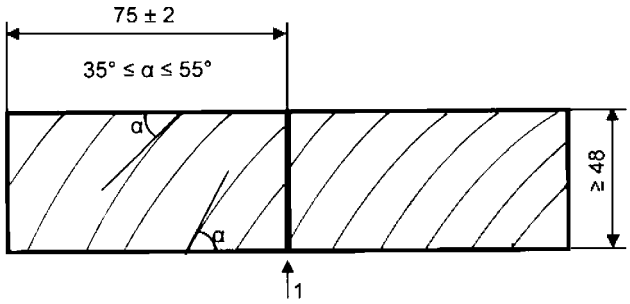
b) 140 mm in width; and

c) (40,0 ± 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 of 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 which passed EN 301 (used according to the adhesive manufacturer's instructions), with an annual ring orientation as indicated in Figure 1.

Dimensions in millimetres



Key

1 PRF glue line

α angle of annual line orientation to the surfaces

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

5.1.4 Conditioning

Condition the core and cover pieces such that the average moisture content of all three pieces used in an assembly is (17, 5 ± 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 moisture content in the wood of between 16 % and 18 %.

Not more than 8 h before bonding, either lightly plane, or lightly sand using a grade P100 abrasive paper as defined in ISO 6344-2, each surface to be bonded. Remove any dust carefully.

Do not touch or soil the prepared surface.

5.2 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 is the specimens mean moisture content in percent;

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

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

U_3 is 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 ± 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 ± 0,1) mm x (100 ± 0,1) mm and the nominal bond line thickness to 0,50 mm.

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 To aid in the removal of the leftover, 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 at standard atmosphere [20/65] ((20 ± 2) °C and a relative humidity of (65 ± 5) %). Apply a load of (7,7 ± 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 (9600 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 7 days at standard atmosphere [20/65].