



SLOVENSKI STANDARD

SIST EN 302-2:2004

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**Lepila za nosilne lesene konstrukcije - Preskusne metode - 2. del: Določanje
odpornosti lepljenega stika proti razslojevanju - delaminaciji**

Adhesives for load-bearing timber structures - Test methods - Part 2: Determination of
resistance to delamination

Klebstoffe für tragende Holzbauteile - Prüfverfahren - Teil 2: Bestimmung der
Delaminierungsbeständigkeit

Adhésifs pour structures portantes en bois - Méthodes d'essai - Partie 2: Détermination
de la résistance au délaminage

Ta slovenski standard je istoveten z: EN 302-2:2004

ICS:

83.180	Lepila	Adhesives
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EUROPEAN STANDARD
NORME EUROPÉENNE
EUROPÄISCHE NORM

EN 302-2

July 2004

ICS 83.180

Supersedes EN 302-2:1992

English version

Adhesives for load-bearing timber structures - Test methods -
Part 2: Determination of resistance to delamination

Adhésifs pour structures portantes en bois - Méthodes
d'essai - Partie 2: Détermination de la résistance au
délamination

Klebstoffe für tragende Holzbauteile - Prüfverfahren - Teil 2:
Bestimmung der Delaminierungsbeständigkeit

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
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Foreword

This document (EN 302-2:2004) 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 302-2:1992.

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 302-2:2004 (E)**1 Scope**

This part of EN 302 specifies a method for determining the resistance to delamination of bonded joints.

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 comparing the effects on the bond strength resulting from the choice of bonding conditions, from different climatic conditioning and from the treatment of the test pieces before and after bonding.

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 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

Not applicable.

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3 Principle

Bonded, laminated specimens are subjected to an impregnation-drying procedure. The specimens are impregnated with water by immersing them and applying alternating high and low (vacuum) pressures. They are then dried rapidly at low humidity in a high velocity air stream. The extent of open glue lines, delamination, as a result of these treatments is measured and compared with the total length of glue lines on both end-grain faces of the specimen.

4 Safety

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

This document does not purport to address all the 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 Autoclave or similar pressure vessel, designed to safely withstand a pressure of at least 625 kPa absolute (525 kPa above nominal atmospheric pressure).

5.2 Vacuum pump or similar device, capable of reducing the pressure in the vessel (5.1) to below 20 kPa absolute (80 kPa below nominal atmospheric pressure).

5.3 Pump or similar device, for obtaining a pressure of at least 600 kPa absolute (500 kPa above nominal atmospheric pressure).

5.4 Air-circulating oven(s) or chamber(s), capable of maintaining:

- a) a temperature of $(27,5 \pm 2,5)$ °C and of circulating the air within the chamber at a velocity of $(2,25 \pm 0,25)$ m/s and of maintaining a constant relative humidity of (30 ± 5) %; and
- b) a temperature of (65 ± 3) °C and of circulating the air within the chamber at a velocity of $(2,25 \pm 0,25)$ m/s, and of maintaining a relative humidity of $(12,5 \pm 2,5)$ %.

5.5 Balance, allowing measurements with an accuracy of ± 1 g.**5.6 Metal wedge and wooden hammer**, or similar devices capable of opening the glue lines.**6 Method****6.1 Selection of timber**

Make four laminated members out of plain-sawn, straight-grained spruce (*Picea abies* L.), free of reaction wood, with a density of (425 ± 25) kg/m³ at 12 % moisture content. Preferably knot-free wood should be used, but allowances are made for boards with knots up to a maximum of 20 mm in diameter, but splay (spike) knot is not allowed. Do not use radial-cut lamellae. If the adhesive is to be used on wood from hardwood species and/or on chemically treated wood, also prepare four laminated members using representative samples of that wood.

Condition the timber in the standard atmosphere ((20 ± 2) °C and a relative humidity of (65 ± 5) %) for at least seven days prior to bonding, ensuring that the timber has a moisture content of (12 ± 1) %.

6.2 Preparation of the bonded members

For each laminated member prepare at least six lamellae (150 ± 5) mm wide, (30 ± 1) mm thick and approximately 500 mm long. The desired thickness is achieved by planing 38 mm thick lamellae. Bond the lamellae in accordance with Table 1, within eight hours of planing. Within each assembly, ensure that the six lamellae present the same growth ring orientation.

Table 1 — Preparation of the bonded members

Parameters	Members 1 and 2	Members 3 and 4
Adhesive spread (2 faces)	As recommended ^b	As recommended ^b
Air temperature	(20 ± 2) °C	(20 ± 2) °C
Open assembly time	≤ 5 min	≤ 5 min
Closed assembly time	Minimum ^b	Maximum ^b
Pressure (conifers) ^a	(0,6 ± 0,1) N/mm ²	(0,6 ± 0,1) N/mm ²
Pressure time ^b	As recommended ^b	As recommended ^b
<p>^a For hardwood species, the pressure shall be that recommended by the adhesive manufacturer.</p> <p>^b As recommended by the adhesive manufacturer for a curing temperature of (20 ± 2) °C.</p>		

After bonding and pressing, and before cutting and testing, condition the assembly for seven days in the standard atmosphere ((20 ± 2) °C and a relative humidity of (65 ± 5) %).

NOTE A longer conditioning time may be used if recommended by the adhesive manufacturer.

6.3 Preparation of the test pieces

From a full cross-section of each of the four laminated members to be tested, cut two test pieces using a sharp saw or other tool that produces a smooth surface. Remove sections 75 mm long by cutting perpendicularly to the surface of the assembly and not less than 50 mm from either end of the member. Record the time elapsed between the preparation of the test pieces and testing.

6.4 Test procedures

6.4.1 General

Weigh and record the test pieces weight to the nearest gram. Place the test pieces in the pressure vessel and secure them to prevent them from floating. Add water at a temperature of (10 to 25) °C to submerge completely the test pieces. Separate the test pieces by using at least 5 mm thick stickers, wire screens or other means in such a way that all end-grain surfaces are freely exposed to the water. Carry out either the high temperature procedure according to 6.4.2 for testing compliance with the requirements for type I adhesives for use in severe climatic conditions, or the low temperature procedure according to 6.4.3 for testing compliance with the requirements for type II adhesives for use in moderate climatic conditions.

6.4.2 High temperature procedure (for type I adhesives)

Reduce the pressure in the vessel to (25 ± 5) kPa absolute and maintain that pressure for 15 min. Release the vacuum and apply a pressure of (600 ± 25) kPa absolute for one hour. With the test pieces still completely immersed, repeat this vacuum-pressure cycle once again to give a two-cycle impregnating period requiring a total of about 2 h 30 min.

Dry the test pieces for 20 h in air let in at (65 ± 3) °C and a relative humidity of (10 to 15) % and circulating at a velocity of $(2,25 \pm 0,25)$ m/s. During drying, place the test pieces at least 50 mm apart with the end-grain surfaces parallel to the air stream.

After the elapsed drying period, control the mass of the test pieces on a weighing scale to the nearest gram. The end of an impregnating-drying cycle for any given test piece shall only be considered when the mass of the test piece is between 100 % and 110 % of the original mass (O_m). Should the mass of any given test piece exceed its original mass (O_m) by more than 10 % after the 20 h drying treatment has elapsed, place the test piece in the drying duct once again, and subject it to further identical drying conditions. Remove the test piece and re-weigh its mass after one hour. Repeat this process until the test piece is within the required mass range. Record the mass of the test piece after every impregnating-drying cycle and record the total drying time needed to reach the required mass of the respective test piece. Should the mass of the test piece be lower than its original mass (O_m) after the drying treatment, the test piece shall be rejected, and new test pieces shall be made and tested.

NOTE Test pieces may be removed and subjected to a weight inspection during the drying treatment before the 20 h have elapsed, so as to ensure that the test pieces are not over-dried.

Repeat the entire impregnating-drying cycle twice more, to comprise a total test period of just over three days.

6.4.3 Low temperature procedure (for type II adhesives)

Reduce the pressure in the vessel to (25 ± 5) kPa absolute and maintain that pressure for 15 min. Release the vacuum and apply a pressure of (600 ± 25) kPa absolute for one hour. With the test pieces still completely immersed, repeat this vacuum-pressure cycle once more to give a two-cycle impregnating period requiring a total of 2 h 30 min.

Dry the test pieces for 90 h in air at $(25$ to $30)$ °C and (30 ± 5) % relative humidity, and circulating at a velocity of $(2,25 \pm 0,25)$ m/s. During drying, place the test pieces at least 50 mm apart with the end-grain surfaces parallel to the air stream.

After the elapsed drying period, control the mass of the test pieces on a weighing scale to the nearest gram. The end of an impregnating-drying cycle for any given test piece shall only be considered when the mass of the test piece is between 100 % and 110 % of the original mass (O_m). Should the mass of any given test piece exceed its original mass (O_m) by more than 10 % after the 90 h drying treatment has elapsed, place the test piece in the drying duct again, and subject it to further identical drying conditions. Remove the test piece and re-weigh its mass after two hours. Repeat this process until the test piece is within the required mass range. Record the mass of the test piece after every impregnating-drying cycle and record the total drying time needed to reach the required mass of the respective test piece. Should the mass of the test piece be lower than its original mass (O_m) after the drying treatment, the test piece shall be rejected, and new test pieces shall be made and tested.

NOTE Test pieces may be removed and subjected to a weight inspection during the drying treatment before the 90 h have elapsed, so as to ensure that the test pieces are not over-dried.

Repeat the entire impregnating-drying cycle once more to comprise a total test period of eight days.