SLOVENSKI STANDARD
SIST EN 17418:2021

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Dvokomponentna epoksi in poliuretanska lepila za popravilo nalomljenih lesenih konstrukcij na kraju samem - Preskušanje, zahteve in preverjanje trdnosti popravljenih delov

Two-component epoxy and polyurethane adhesives for on-site repair of cracked timber structures - Testing, requirements and repair strength verification

Zwei-Komponenten-Epoxid und Zwei-Komponenten-Polyurethan-Klebstoffe zur Reparatur von beschädigten Holzbauteilen auf der Baustelle - Prüfung, Anforderungen und Nachweis der Reparatur-Festigkeit

Adhésifs bicomposants polyuréthanes et époxydiques pour la réparation sur site de structures en bois fissurées - Essais, exigences et vérification de la résistance des réparations

Ta slovenski standard je istoveten z: **EN 17418:2021**

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Two-component epoxy and polyurethane adhesives for on-site repair of cracked timber structures - Testing, requirements and repair strength verification

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This European Standard was approved by CEN on 8 February 2021.

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EUROPEAN COMMITTEE FOR STANDARDIZATION
COMITÉ EUROPÉEN DE NORMALISATION
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European foreword

This document (EN 17418:2021) has been prepared by Technical Committee CEN/TC 193 “Adhesives”, the secretariat of which is held by UNE.

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of an identical text or by endorsement, at the latest by September 2021, and conflicting national standards shall be withdrawn at the latest by September 2021.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. CEN shall not be held responsible for identifying any or all such patent rights.

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1 Scope

This document specifies test methods and requirements for two-component epoxy and polyurethane adhesives for on-site repair of cracks in timber structures made of strength graded structural timber with rectangular cross-section, structural finger-jointed timber, glued solid timber and glued laminated timber made of softwood species by injection of the repair adhesive with glue line thicknesses up to 8 mm. The adhesive can also be used to rehabilitate cracks in the area of joints made by nails, screws, dowel-type fasteners and dowels with threads. The adhesive can also be used to fill gaps between the faces of structural components. This document addresses exclusively adhesives which fulfil the requirements according to Clause 8.

NOTE There is no sufficient experience with adhesives which do not fulfil the requirements in 8.4.4.

This document also covers the repair of surface treated wood. It does not cover the repair of preservative treated wood, modified and stabilized wood with considerably reduced swelling and shrinkage properties, e.g. acetylated wood, heat treated wood and polymer impregnated wood.

The adhesive is intended for the repair of load bearing timber structures not subjected to temperatures more than 60 °C over a longer time in service classes 1 and 2 according to EN 1995-1-1 which are loaded predominantly static or non-fatigue quasi static, see EN 1990 and EN 1991-1-1. A verification of quality and bond line integrity of the on-site repair bonding is given in an informative Annex A.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements 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 302-1, *Adhesives for load-bearing timber structures — Test methods — Part 1: Determination of longitudinal tensile shear strength*

EN 302-2, *Adhesives for load-bearing timber structures — Test methods — Part 2: Determination of resistance to delamination*

EN 302-4, *Adhesives for load-bearing timber structures — Test methods — Part 4: Determination of the effects of wood shrinkage on the shear strength*

EN 302-6, *Adhesives for load-bearing timber structures — Test methods — Part 6: Determination of the minimum pressing time under referenced conditions*

EN 302-7, *Adhesives for load-bearing timber structures — Test methods — Part 7: Determination of the working life under referenced conditions*

EN 302-8, *Adhesives for load-bearing timber structures — Test methods — Part 8: Static load test of multiple bond line specimens in compression shear*

EN 383, *Timber Structures — Test methods — Determination of embedment strength and foundation values for dowel type fasteners*

EN 408, *Timber structures — Structural timber and glued laminated timber — Determination of some physical and mechanical properties*

EN 923, *Adhesives — Terms and definitions*

EN 13183-2, *Moisture content of a piece of sawn timber — Part 2: Estimation by electrical resistance method*

EN 14080:2013, *Timber structures — Glued laminated timber and glued solid timber — Requirements*

EN 14358, *Timber structures — Calculation and verification of characteristic values*

EN 17334:2021, *Glued-in rods in glued structural timber products — Testing, requirements and bond shear strength classification*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in EN 923 and the following apply.

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

— ISO Online browsing platform: available at https://www.iso.org/obp

— IEC Electropedia: available at http://www.electropedia.org/

3.1
two component epoxy adhesive
thermosetting synthetic resin derived from an exothermic polymerization reaction of an epoxide group with amines, acid anhydrides, phenols, alcohols or thiols

3.2
two component polyurethane adhesive
2C-PUR
urethane polymers which are cross-linked by the reaction between polyol or polyamine with isocyanate

3.3
service class 1
climatic conditions characterized by a moisture content in the materials corresponding to a temperature of 20 °C and the relative humidity of the surrounding air only exceeding 65 % for a few weeks per year

Note 1 to entry: In service class 1, which comprises typical indoor conditions, the average moisture content in most soft-woods will not exceed 12 %.

[SOURCE: EN 1995-1-1:2004, 2.3.1.3, modified – Indoor conditions added in Note 1 to entry]

3.4
service class 2
climatic conditions characterized by a moisture content in the materials corresponding to a temperature of 20 °C and the relative humidity of the surrounding air only exceeding 85 % for a few weeks per year

Note 1 to entry: In service class 2, to which most covered exterior conditions belong, the average moisture content in most softwoods will not exceed 20 %.

[SOURCE: EN 1995-1-1:2004, 2.3.1.3, modified – Covered exterior conditions added in Note 1 to entry]

3.5
service class 3
climatic conditions leading to a higher moisture contents than in service class 2

[SOURCE: EN 1995-1-1:2004, 2.3.1.3]

3.6
glue line
adhesive layer between the wood members

[SOURCE: EN 301:2017, 3.7]

3.7
thick glue line
glue line of nominal thickness in the range of 0,3 mm up to the maximum tested thickness but not more than 8,0 mm at the time of bonding

Note 1 to entry: This definition of a thick glue line is different from that in EN 301. Thick glue lines are achieved by using spacers, grooves or similar devices with a thickness of 0,3 mm to 8,0 mm when two plain members are glued together.

3.8
close contact glue line
glue line thickness of maximum 0,1 mm

Note 1 to entry: Close contact glue line is achieved by pressing together two plane wood members with a clamping pressure of (0,8 ± 0,1) N/mm^2 without grooves, spacers or similar device.

[SOURCE: EN 301:2017, 3.9]

3.9
bond line
glue line including the two intermediate zones between adhesive and wood

[SOURCE: EN 15425:2017, 3.6]

4 Symbols

a	distance between loading and support, in millimetres (mm)
b	specimen width of the net cross-section, in millimetres (mm)
$f_{c,app}$	apparent compression strength, in newtons per square millimetre (N/mm²)
$f_{h,app}$	apparent embedment strength, in newtons per square millimetre (N/mm²)
$f_{h,k}$	embedment strength, in newtons per square millimetre (N/mm²)
$f_{t,app}$	apparent tensile strength, in newtons per square millimetre (N/mm²)
$f_{v,app}$	apparent shear strength, in newtons per square millimetre (N/mm²)
$F_{c,max}$	compression test failure load, in newtons (N)
F_{perm}	load in long term tests, in newtons (N)
$F_{t,max}$	tensile test failure load, in newtons (N)
F_u	ultimate load, in newtons (N)
$F_{v,max}$	shear test failure load, in newtons (N)
h	specimen height, in millimetres (mm)
h_w	component height, in millimetres (mm)
t	specimen thickness of the net cross-section, in millimetres (mm)
t_b	glue line thickness, in millimetres (mm)
$\sigma_{m,u}$	ultimate bending stress, in newtons per square millimetre (N/mm²)
$\sigma_{t,90,u}$	ultimate tensile stress perpendicular to grain, in newtons per square millimetre (N/mm²)
τ_u	ultimate shear stress, in newtons per square millimetre (N/mm²)

5 General requirements

Adhesives for structural purpose shall produce joints of such strength and durability that the integrity of the bond in the rehabilitated element is maintained throughout the intended service life of the structure.

6 Classification

If the adhesive meets the requirements of Clauses 7 to 9, the adhesive shall be classified as type I. The classification of adhesive consists of:

— number of this document;

— type of adhesive (I);

— temperature in bond creep rupture test in °C;

— working properties (Adhesives tested for all working properties according to Clause 11 are specified by the letter “w” at the end of the designation code.).

EXAMPLE EN 17418-I-60-w.

NOTE Presently, exclusively a temperature testing/classification for 60 °C is covered by the standard.

The wood species for which the tested adhesive can be used shall be given in the adhesive manufacturer’s declaration.

7 Bond strength of adhesive-wood interface

7.1 General

Adhesives complying with this document shall meet the performance requirements specified in 7.2.1 to 7.2.4 when tested in accordance with the following test methods:

a) longitudinal tensile shear test (see 7.3.1) using bonded specimens made from beech (*Fagus sylvatica* L.);

b) delamination test (see 7.3.2) on bonded specimens made from Norway spruce (*Picea abies* L. H.KARST). The test with Norway spruce also covers silver fir (*Abies alba* MILL.) and Scots pine (*Pinus sylvestris* L.). If the adhesive is to be used on wood from other conifers species or treated wood, also prepare four laminated members using representative samples from those species or wood treated that way and perform the delamination test according to 7.3.2;

c) shrinkage stress test (see 7.3.3) on bonded specimens made from Norway spruce (*Picea abies* L. H.KARST);

d) multiple compression shear test (see 7.3.4) on bonded specimens made from beech (*Fagus sylvatica* L.).

The adhesives shall be applied according to the manufacturer`s instructions.

7.2 Requirements

7.2.1 Bond strength in longitudinal tensile shear tests

The tensile shear strength values of close contact glue lines, 1,0 mm and 4,0 mm thick glue lines determined according to 7.3.1 shall meet the requirements given in Table 1.

Table 1 — Minimum mean tensile shear strengths for close contact and gap joints on beech specimens (in N/mm²)

Treatment Serial No EN 302-1	**Close contact glue line**	**Thick glue line** 1,0 mm	**Thick glue line** 4,0 mm
	Type I	**Type I**	**Type I**
A1	10,0	8,0	6,0
A2	6,0	4,0	3,0
A3	8,0	6,4	4,8
A4	6,0	4,0	3,0
A5	8,0	6,4	4,8
A7	8,0	5,5	4,5

7.2.2 Resistance to delamination

The limits on delamination for specimens of any glue line thickness determined according to 7.3.2 shall be less or equal than 5 % in any specimen.

7.2.3 Effect of wood shrinkage on the shear strength

The mean shear strength after climatic treatment determined according to 7.3.3 shall not be lower than 1,5 N/mm².

7.2.4 Effect of compression shear stress and climatic changes

When tested in accordance with 7.3.4, not more than one of the six specimens may fail during the test period. The mean creep deformation of all the bond lines in each of the remaining test specimens shall not exceed 0,05 mm after the test.

If a failure within a specimen occurs as a solid wood failure without any interference with the bond line, the specimen shall not be counted and four of the five remaining specimens shall fulfil the requirements. In the case that more than two specimens in a test series collapse due to solid wood failure (low wood quality), the whole test shall be repeated.

7.3 Test methods

7.3.1 Determination of bond strength in longitudinal tensile shear test

The tests shall be made in accordance with EN 302-1, but with glue line thicknesses close contact, 1,0 mm and 4,0 mm. The specimens with glue line thickness 4 mm shall be prepared with a pressureless preparation.

NOTE Applying a narrow slot (width about 2 mm, depth about 2 mm) between the end of the groove and the wide side of the adherent has shown to be a suitable method for ensuring pressureless bonding of the specimens.

The method of preparation of the specimens is described in EN 302-1. Following this method, the specimens are built-up with the adhesive layer covered by two adherents of the same thickness (on top and below the adhesive layer).

7.3.2 Determination of resistance to delamination

The tests shall be made in accordance with EN 302-2, but with glue line thicknesses close contact and 4 mm. The close contact glue line may be replaced by a test with a defined (spacers) glue line thickness of 0,2 mm. The specimens with glue line thickness 4 mm shall be prepared with a pressureless preparation. Different from EN 302-2 the tests with bonded members with close contact or 0,2 mm glue line shall be performed exclusively with two specimens with long assembly time.

7.3.3 Determination of the effect of wood shrinkage on the shear strength

The tests shall be made in accordance with EN 302-4, but with a glue line thickness of 2 mm.

7.3.4 Determination of the effect of compression shear stress and climatic changes

The tests shall be made in accordance with EN 302-8 but with a temperature of 60 °C to 62 °C in the first cycle and a glue line thickness of 2 mm.

The test may be replaced by the tests according to EN 17334:2021, 7.3.4 and EN 17334:2021, Clause 9.