SLOVENSKI STANDARD
SIST EN 302-7:2023

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Lepila za nosilne lesene konstrukcije - Preskusne metode - 7. del: Določanje dobe trajanja pri referenčnih pogojih

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

Klebstoffe für tragende Holzbauteile - Prüfverfahren - Teil 7: Bestimmung der Gebrauchsdauer bei Referenzbedingungen

Adhésifs pour structures portantes en bois - Méthodes d'essai - Partie 7 : Détermination de la durée d'utilisation dans des conditions de référence

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English Version

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

Adhésifs pour structures portantes en bois - Méthodes d'essai - Partie 7 : Détermination de la durée d'utilisation dans des conditions de référence

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EUROPEAN COMMITTEE FOR STANDARDIZATION
COMITÉ EUROPÉEN DE NORMALISATION
EUROPÄISCHES KOMITEE FÜR NORMUNG

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European foreword

This document (EN 302-7:2023) 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of an identical text or by endorsement, at the latest by August 2023, and conflicting national standards shall be withdrawn at the latest by August 2023.

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.

This document supersedes EN 302-7:2013.

The main changes compared to the previous edition are listed below:

a) the list of standards in the Introduction has been updated;

b) one new clause (Symbols) has been introduced;

c) in 6.2, “Brookfield type viscometer” has been changed to “single cylinder type rotational viscometer”;

d) Clause 9 Test report has been changed.

Any feedback and questions on this document should be directed to the users’ national standards body. A complete listing of these bodies can be found on the CEN website.

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

Introduction

This document is one of a series dealing with adhesives for use with timber structures, and is published in support of the EN 1995 series *Eurocode 5: Design of timber structures*. The series consists of five classification and performance requirements for adhesives for load-bearing timber structures, phenolic and aminoplastic adhesives (EN 301), one component polyurethane adhesives (EN 15425), emulsion polymer isocyanate adhesives (EN 16254), two component epoxy and polyurethane adhesives for glued in rods (EN 17334) and for on-site repair of cracked timber structures (EN 17418) and all together twelve test methods (EN 302-1, EN 302-2, EN 302-3, EN 302-4, EN 302-5, EN 302-6, EN 302-7, EN 302-8, EN 15416-3, EN 15416-4 and EN 15416-5).

These European Standards 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 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*

— *Part 8: Static load test of multiple bond line specimens in compression shear*

EN 15416, *Adhesives for load bearing timber structures other than phenolic and aminoplastic — Test methods*:

— *Part 1: Long-term tension load test perpendicular to the bond line at varying climate conditions with specimens perpendicular to the glue line (Glass house test)*

— *Part 3: Creep deformation test at cyclic climate conditions with specimens loaded in bending shear*

— *Part 4: Determination of open assembly time under referenced conditions*

— *Part 5: Determination of minimum pressing time under referenced conditions*

EN 15425, *Adhesives — One component polyurethane (PUR) for load-bearing timber structures — Classification and performance requirements*

EN 16254, *Adhesives — Emulsion polymer isocyanate (EPI) for load-bearing timber structures — Classification and performance requirements*

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

EN 17418, *Two-component epoxy and polyurethane adhesives for on-site repair of cracked timber structures — Testing, requirements and repair strength verification*

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 can have a negative environmental impact. As technological advantages lead to better alternatives for these materials, they will be eliminated from this standard to the greatest extent possible.

At the end of the test, it is recommended that the users of the standard take care to carry out an appropriate disposal of the wastes, according to local regulations.

1 Scope

This document specifies a method for determining the working life for adhesives mixed with hardener for load-bearing timber structures, by a viscosity test.

This method does not apply to determining the working life of a multi-component adhesive whose actual working life is very short.

This document is only intended for obtaining a reliable basis for comparison between adhesives. The method gives results which cannot be applied to the safe manufacture of timber structures without modifications for the influences of factory temperature and relative air humidity.

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 923, *Adhesives - Terms and definitions*

EN ISO 2555:2018, *Plastics - Resins in the liquid state or as emulsions or dispersions - Determination of apparent viscosity using a single cylinder type rotational viscometer method (ISO 2555:2018)*

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 terminology databases for use in standardization at the following addresses:

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

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

3.1
working life under referenced conditions
period of time at 20 °C during which an adhesive, prepared for application, increases in apparent viscosity to 25 000 mPas

4 Symbols

η viscosity

k a coefficient depending on the rotational frequency-spindle combination used

l value read on the scale

5 Principle

The viscosity of a specified volume of adhesive at 20 °C is monitored using a single cylinder type rotational viscometer, until it reaches 25 000 mPa s.

6 Apparatus

6.1 Beaker, approximately 850 ml capacity, 90 mm to 95 mm internal diameter, 115 mm to 160 mm height with a wall thickness not exceeding 1 mm.

The beaker shall be made of a material that ensures a good heat conductivity and that does not react with the adhesive.

NOTE A stainless steel beaker is suitable for most of the commercial adhesives used for the gluing of load-bearing timber structures.

6.2 Single cylinder type rotational viscometer

The detailed operating principle of this apparatus, its description and characteristics are given in EN ISO 2555.

The viscometer comprises the following elements:

— the viscometer body;

— seven removable, interchangeable spindles, numbered 1 to 7;

— a support which holds the viscometer and moves it into the vertical plane;

— a removable guard stirrup, which is not used in this method.

NOTE A Brookfield RVF model is an example of a suitable product available commercially[1].

6.3 Temperature regulated water bath, capable of maintaining the mixture to be tested at 20 °C with a maximum permissible error of ± 2 °C.

6.4 Thermometer, graduated to 0,1 °C, to measure the temperature of the adhesive being tested.

7 Procedure

7.1 Handle the adhesive components in accordance with the instructions of the manufacturer of the adhesive. Ensure that at the start of the test, all the components have a temperature of (20 ± 0,5) °C. Ensure that during the test, the relative humidity of the air in the testing room remains at (65 ± 5) %.

It is a common practice to store the components at (20 ± 2) °C for one night before testing.

7.2 Set up, calibrate and operate the viscometer in accordance with the instructions of the instrument manufacturer. Choose a rotational frequency of 20 min^{-1}. Spindles shall be chosen such that the instrument reading is in the range from 20 % to 95 % of the full-scale value.

7.3 Prepare a sufficient amount of the glue mix in the beaker (6.1) to fill 2/3 of its volume, in accordance with the specifications of the manufacturer. Start to record the time at the moment (t_0) the component that initiates the reaction is added.

7.4 Gently stir the mixture manually for 5 min at (20 ± 2) °C. In order to allow any exothermic reaction to proceed normally, do not place the beaker in the water bath during this operation and avoid heating the mixture by body heat through the hand.

[1] This information is given for the convenience of users of this document and does not constitute an endorsement by CEN of the product named. Equivalent products may be used if they can be shown to lead to the same results.

7.5 Place the beaker in the water bath (6.3) adjusted at (20 ± 2) °C for the rest of the procedure. Adjust the water level of the water bath so that it is slightly above that of the adhesive in the beaker (6.1). Keep the beaker uncovered throughout the test.

7.6 Determine the viscosity of the adhesive system at 15 min intervals, or with shorter intervals for fast setting adhesives, from the initial time (t_0). About one minute before each reading, gently stir the sample for 15 s to ensure homogeneity.

7.7 Remove the beaker from the water bath, hold the spindle at an angle of about 45° to the surface of the adhesive and immerse it in the product, taking care not to introduce air bubbles. Orientate the spindle vertically and connect it to the shaft of the apparatus. Check that the spindle is vertical using the bubble level and that the spindle is immersed to the underside of the mark on its shaft. Allow the instrument to run for 30 s and, for digital viscometers, take the reading immediately after this time. For analogues viscometers, read the torque meter to the nearest 0,25 % of the maximum value indication at the pre-set time. Lock the needle and stop the motor to take the reading. Immerse the thermometer (6.4) into the sample and record the temperature. Place the beaker back into the water bath (6.3).

7.8 After each measurement, detach the spindle from the instrument, wash it thoroughly in a suitable solvent and dry it before re-use.

7.9 Continue determining the viscosity of the sample at 15 min intervals until the viscosity exceeds 25 000 mPa s.

In order to increase the accuracy of the determination of the conventional working life, it is advisable to reduce the time interval between two readings in the final stage of the reaction.

8 Expression of results

For digital viscosimeters, the viscosity value for each time can be taken directly from the display of the instrument.

Only for analogues viscosimeters, calculate the apparent viscosity, in millipascal seconds (mPa s), of the adhesive system tested, using the formula:

$$\eta = k \times l$$

where

η is viscosity, in millipascal seconds;

k is a coefficient depending on the rotational frequency-spindle combination used; in the case of apparatus as specified in 6.2 and in EN ISO 2555:2018, B.3, the values of k are as shown in Table 1;

l is the value read on the scale.

Table 1 — Coefficient k (scale 0 to 100) for each spindle and a rotational frequency of 20 min^{-1}

Spindle number	1	2	3	4	5	6	7
Coefficient k	5	20	50	100	200	500	2 000