BS EN 205:2016

BSI Standards Publication

Adhesives — Wood adhesives for non-structural applications — Determination of tensile shear strength of lap joints

bsi.

National foreword

This British Standard is the UK implementation of EN 205:2016. It supersedes BS EN 205:2003 which is withdrawn.

The UK participation in its preparation was entrusted to Technical Committee PRI/52, Adhesives.

A list of organizations represented on this committee can be obtained on request to its secretary.

This publication does not purport to include all the necessary provisions of a contract. Users are responsible for its correct application.

ISBN 978 0 580 89030 7

ICS 83.180

Compliance with a British Standard cannot confer immunity from legal obligations.

This British Standard was published under the authority of the Standards Policy and Strategy Committee on 31 August 2016.

Amendments issued since publication

Date	Text affected

EUROPEAN STANDARD

NORME EUROPÉENNE

EUROPÄISCHE NORM

EN 205

August 2016

ICS 83.180

Supersedes EN 205:2003

English Version

Adhesives - Wood adhesives for non-structural applications - Determination of tensile shear strength of lap joints

Adhésifs - Colles pour bois à usages non structuraux - Détermination de la résistance au cisaillement en traction des joints à recouvrement

Klebstoffe - Holzklebstoffe für nicht tragende Anwendungen - Bestimmung der Klebfestigkeit von Längsklebungen im Zugversuch

This European Standard was approved by CEN on 8 July 2016.

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 CEN-CENELEC Management Centre 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 CEN-CENELEC Management Centre has the same status as the official versions.

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

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

CEN-CENELEC Management Centre: Avenue Marnix 17, B-1000 Brussels

Contents

Page

European foreword

This document (EN 205:2016) 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 February 2017, and conflicting national standards shall be withdrawn at the latest by February 2017.

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 205:2003.

Compared to EN 205:2003 the following modifications have been made:

a) assessment of the strength based on thick bond lines deleted;

b) processing conditions for adhesive application specified in 6.1 if no manufacturer's instructions are available;

c) number of test pieces modified in 6.3;

d) test results of all 20 test pieces to be given in the test report.

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, Former Yugoslav Republic of Macedonia, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey and the United Kingdom.

Introduction

European Standards giving a common classification with respect to durability classes for wood adhesives will allow considerable improvement in consumer protection in any future product liability system with regard to properties guaranteed by the adhesive manufacturer.

The methods described in this standard are suitable for the following and other applications:

— assessing the usability and quality of adhesives for wood and derived timber products;

— classifying these adhesives into the durability classes D1 to D4 of EN 204 (thermoplastic adhesives) and C1 to C4 of EN 12765 (thermosetting adhesives);

— assessing effects on the bond strength resulting from the bonding conditions chosen, the various conditioning sequences and the treatment of the test pieces before and after bonding.

SAFETY STATEMENT — Persons using this document should be familiar with the normal laboratory practice, if applicable. This document does not purport to 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 acceptable alternatives for these materials, they will be eliminated from this standard to the extent possible.

At the end of the test, it is essential that the user of the standard take care to carry out an appropriate disposal of the wastes, according to local regulation

1 Scope

This European Standard specifies tests for adhesives for wood and derived timber products for the assessment of their resistance to hot and cold water. It can be used for the assessment of the strength of bonds with a thin bond-line. It does not apply to adhesives for structural use or to the manufacture of particleboards, fibreboards and plywood. It does not replace tests on finished products.

2 Normative references

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

EN 204, *Classification of thermoplastic wood adhesives for non-structural applications*

EN 923, *Adhesives - Terms and definitions*

EN 12765, *Classification of thermosetting wood adhesives for non-structural applications*

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

ISO 6344-2:1998, *Coated abrasives — Grain size analysis — Part 2: Determination of grain size distribution of macrogrits P12 to P220*

3 Terms and definitions

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

3.1
thin bond line
close contact adhesive joint where the adhesive layer is nominally 0,1 mm thick

4 Principle

A symmetrical bonded single lap joint between two symmetrical wooden adherends is subjected to specified conditioning treatments and strained to rupture by a tensile force parallel to the grain.

5 Apparatus

The testing machine shall be a constant-rate-of-traverse machine as described in ISO 5893. If a constant-rate-of-traverse machine is not available, a constant-rate-of-loading machine shall be used causing a rupture within the time limits specified in 6.5.

The jaws shall grip the test pieces with a wedge action and permit self-alignment while the test pieces are being pulled.

6 Procedure

6.1 Preparation of bonded assemblies

Prepare two panels (see Figure 1) from a thick unsteamed, conditioned, straight-grained board of beech (Fagus sylvatica L.) with a nominal density of (700 ± 50) kg/m3 with a moisture content of (12 ± 1) %.

It is permissible to prepare panels from different boards unless it is essential to minimize differences in the wood in order to conduct special comparative tests.

Ensure that the angle between the growth rings and the surface to be bonded is between 30° and 90°.

Cut the panels across the direction of the grain to a length equal to a multiple of 300 mm with the necessary allowance for cross-cutting and along the grain to a width of approximately 130 mm making an allowance for the width of cut as shown in Figure 1.

For tests use two panels of (5,0 ± 0,1) mm thickness.

For conventional tests, condition the panels at a temperature of either (20 ± 2) °C and (65 ± 5) % relative humidity or (23 ± 2) °C and (50 ± 5) % relative humidity subsequently referred to as the standard atmosphere (20/65) or (23/50) for a minimum of 7 days.

Prepare bonded assemblies using thin (approximately 0,1 mm) bond-lines. Not more than 24 h before bonding, either lightly plane or lightly sand each surface to be bonded (using an abrasive paper of grain size P100 complying with ISO 6344-2:1998 is recommended). Remove any dust carefully. Do not touch or soil the prepared surfaces.

Comply with the adhesive manufacturer's instructions regarding the processing conditions, including the preparation of the adhesive, the amount of adhesive to be applied, whether the adhesive is to be applied on one or both surfaces, the open and closed assembly time and the magnitude and duration of the assembly pressure and report them in the test report.

Where no manufacturer's instructions are available the following processing conditions shall be used:

— adhesive applied on both sides;

— adhesive spread: (150 ± 10) g/m^2;

— open assembly time: (120 ± 10) s;

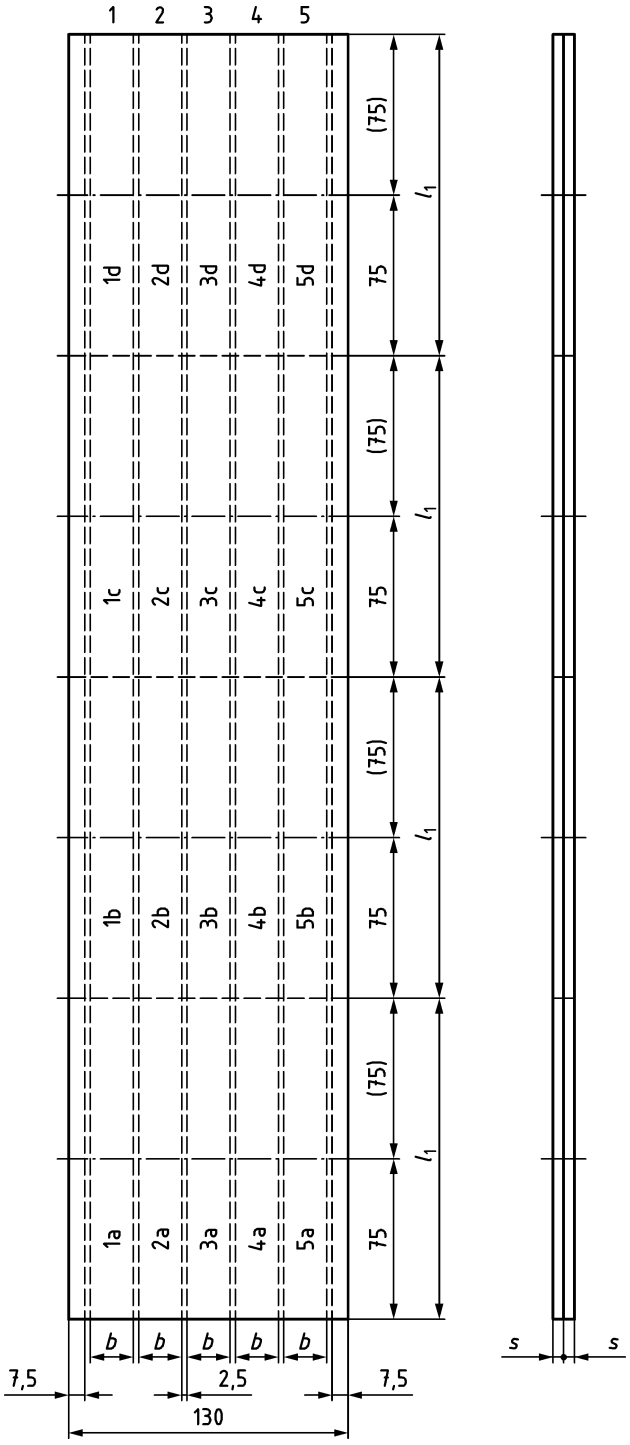
— closed assembly time (180 ± 10) s;

— pressing pressure (0,7 ± 0,1) N/mm^2;

— pressing time: 2 h;

Bond the two 5 mm thick panels as shown in Figure 1 with the pressure uniformly distributed over the bonded surface.

Dimensions in millimetres



Key

l_1 (150 ± 5) mm: length of test piece

b (20,0 ± 0,2) mm: width of test piece

s (5,0 ± 0,1) mm: thickness of the panels

Figure 1 — Example of a bonded panel marked for division into individual test pieces using 2,5 mm saw cuts

6.2 Preparation of test pieces

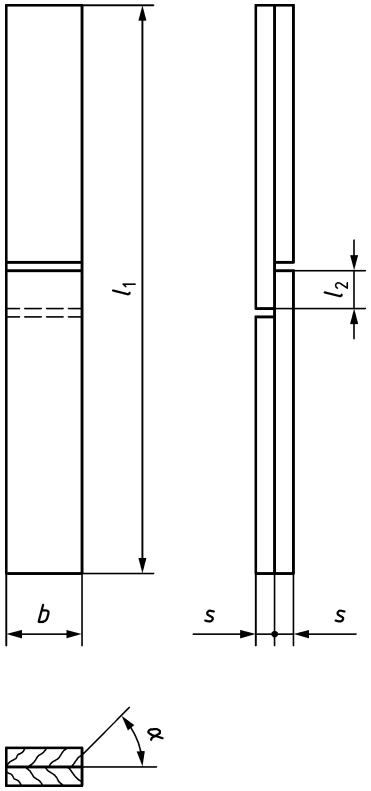
After pressing condition the assembly for 7 days in standard atmosphere.

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

The test pieces shall not be cut earlier than 5 days after bonding.

Cut five strips of width b = (20 ± 0,2) mm from each bonded assembly along the grain, avoiding areas within 7,5 mm of the outside long edges of the panel as shown in Figure 1. Cut these strips into test pieces of length l_1 = (150 ± 5) mm as shown in Figure 2.

Make flat bottomed cuts of (2,5 ± 0,5) mm wide in the bonded sections across the grain so that an overlap of length l_2 = (10,0 ± 0,2) mm is defined in the middle section (see Figure 2). The cuts are to separate the wood layers. Take care that the cuts completely cut through the bond line but only penetrate as little as possible into the other part of the joint.



Key

l_1 (150 ± 5) mm: total length of test piece

s (5,0 ± 0,1) mm: thickness of the panels

b (20,0 ± 0,2) mm: width of test piece (width of tested surface)

α 30° to 90°: angle between growth ring and surfaces to be bonded

l_2 (10,0 ± 0,2) mm: length of overlap (length of tested surface)

Figure 2 — Lap joint test pieces with a thin bond line

6.3 Number of test pieces

Test 20 test pieces for each of the conditioning sequences chosen.

6.4 Treatment prior to tensile shear testing

Subject the test pieces from conditioned bonded assemblies as in 6.2 to the appropriate conditioning sequences.

Ensure that the test pieces are in a horizontal plane, not touching each other and are supported in such a way that no stress is applied to them.

NOTE For classifying an adhesive in accordance with EN 204:2016, or EN 12765:2016, the appropriate conditioning sequences are given in Table 2 of these standards.

6.5 Tensile shear test

Test the test pieces shown in Figures 2 and A.1 in a tensile testing machine.

Clamp the ends of the test pieces in the jaws of the tensile testing machine up to a length of 40 mm to 50 mm. Ensure that the force is applied centrally and in the plane of the bond. Load the test piece until rupture. Record the applied maximum force F_{max} in newtons (N).

For comparative tests of adhesives and for assigning an adhesive to the durability classes specified in EN 204 or EN 12765 conduct the test at a rate of traverse of approximately 50 mm/min for thermoplastic adhesives (EN 204) or 6 mm/min to12 mm/min for thermosetting adhesives (EN 12765) respectively.

If a constant-rate-of-traverse machine is not available a constant-rate-of-loading machine shall be used causing a rupture after 5 s to 15 s for thermoplastic adhesives (EN 204) and 30 s to 60 s for thermosetting glues (EN 12765).

7 Expression of results

Calculate the strength τ in Newtons per square millimetre (N/mm²) using Formula (1).

$$\tau = \frac{F_{max}}{A} = \frac{F_{max}}{l_2 \times b} \quad (1)$$

where

F_{max} the applied maximum force in Newtons (N);

A the bonded test surface in square millimetres (mm^2);

l_2 the length of the bonded test surface in millimetres (mm);

b the width of the bonded test surface in millimetres (mm).

8 Test report

The following items shall be reported:

a) Data about the adhesive:

1) type and origin of the adhesive;

2) batch number or other marking of uniquely identifying the adhesive used;

3) number of components and working methods (procedure of preparing and applying of adhesive);

4) durability class (for information only);

b) Preparation of the test pieces and testing:

1) species of wood with botanical name;

2) moisture content of wood relative to oven-dry mass;

3) characteristic data relating to the bonding procedure (for instance information about the amount of adhesive applied, the open and closed assembly time, pressing pressure, pressing temperature, pressing time);

4) special treatment of the surface of the boards to be bonded;

5) time between the termination of pressing and the cutting of the test pieces;

6) number of bonded test pieces;

7) conditioning sequences applied;

8) rate of traverse or the time required to rupture;

c) Test results and data about the durability class:

1) strength τ in N/mm^2 of 20 test pieces rounded to 0,1 N/mm^2.

Results from tests in which failure occurred in the wood at values below the specified minimum are invalid. Test pieces that are twisted, bended or showing other irregularities in form are valid if they reach the requirements; otherwise, or if visual examination shows that the adhesive was not correctly applied, the results are invalid. All results, valid or invalid, shall be reported. Explanation of the invalid values shall be reported:

— indication of the estimated portion of wood failure as a percentage graded as follows: 0 %, 25 %, 50 %, 75 %, 100 % breakage of wood (mean value of all test pieces);

— description of further peculiarities of the appearance of the break;

— if necessary, deviations from this standard;

— indication of durability class specified in EN 204, or EN 12765;

— date of issue of the report.

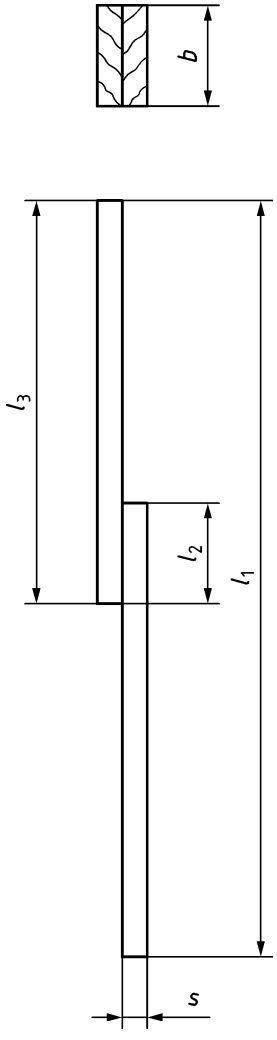
Annex A
(informative)

Single lap joint test pieces

For in-house tests and for quick-setting adhesives, single-lap joint test pieces as shown in Figure A.1 can be used rather than the test pieces shown in Figures 1 and 2. When clamping these test pieces into the tensile testing machine, ensure that the applied force is in the plane of the bond line and centrally applied by using either shims or appropriately designed clamps.

Selection and the bonding of the wood should be in accordance with 6.1 and 6.2.

When bonding test pieces in accordance with Figure A.1 it is recommended that two cuts be laid one on top of the other in such a way that the angles of the growth rings run in opposite directions.



Key

l_1 length of test piece (150 ± 2) mm
b width of test piece (20 ± 0,2) mm
l_3 length of test slip (80 ± 2) mm
s thickness of test slip (5 ± 0,1) mm
l_2 length of overlap (10 ± 0,2) mm

Figure A.1 — Lap joint test piece for in-house test (single lap joint test piece for tensile shear test)

This page deliberately left blank

British Standards Institution (BSI)

BSI is the national body responsible for preparing British Standards and other standards-related publications, information and services.

BSI is incorporated by Royal Charter. British Standards and other standardization products are published by BSI Standards Limited.

About us

We bring together business, industry, government, consumers, innovators and others to shape their combined experience and expertise into standards -based solutions.

The knowledge embodied in our standards has been carefully assembled in a dependable format and refined through our open consultation process. Organizations of all sizes and across all sectors choose standards to help them achieve their goals.

Information on standards

We can provide you with the knowledge that your organization needs to succeed. Find out more about British Standards by visiting our website at bsigroup.com/standards or contacting our Customer Services team or Knowledge Centre.

Buying standards

You can buy and download PDF versions of BSI publications, including British and adopted European and international standards, through our website at bsigroup.com/shop, where hard copies can also be purchased.

If you need international and foreign standards from other Standards Development Organizations, hard copies can be ordered from our Customer Services team.

Copyright in BSI publications

All the content in BSI publications, including British Standards, is the property of and copyrighted by BSI or some person or entity that owns copyright in the information used (such as the international standardization bodies) and has formally licensed such information to BSI for commercial publication and use.

Save for the provisions below, you may not transfer, share or disseminate any portion of the standard to any other person. You may not adapt, distribute, commercially exploit, or publicly display the standard or any portion thereof in any manner whatsoever without BSI's prior written consent.

Storing and using standards

Standards purchased in soft copy format:

- A British Standard purchased in soft copy format is licensed to a sole named user for personal or internal company use only.
- The standard may be stored on more than 1 device provided that it is accessible by the sole named user only and that only 1 copy is accessed at any one time.
- A single paper copy may be printed for personal or internal company use only.

Standards purchased in hard copy format:

- A British Standard purchased in hard copy format is for personal or internal company use only.
- It may not be further reproduced – in any format – to create an additional copy. This includes scanning of the document.

If you need more than 1 copy of the document, or if you wish to share the document on an internal network, you can save money by choosing a subscription product (see 'Subscriptions').

Reproducing extracts

For permission to reproduce content from BSI publications contact the BSI Copyright & Licensing team.

Subscriptions

Our range of subscription services are designed to make using standards easier for you. For further information on our subscription products go to bsigroup.com/subscriptions.

With **British Standards Online (BSOL)** you'll have instant access to over 55,000 British and adopted European and international standards from your desktop. It's available 24/7 and is refreshed daily so you'll always be up to date.

You can keep in touch with standards developments and receive substantial discounts on the purchase price of standards, both in single copy and subscription format, by becoming a **BSI Subscribing Member**.

PLUS is an updating service exclusive to BSI Subscribing Members. You will automatically receive the latest hard copy of your standards when they're revised or replaced.

To find out more about becoming a BSI Subscribing Member and the benefits of membership, please visit bsigroup.com/shop.

With a **Multi-User Network Licence (MUNL)** you are able to host standards publications on your intranet. Licences can cover as few or as many users as you wish. With updates supplied as soon as they're available, you can be sure your documentation is current. For further information, email subscriptions@bsigroup.com.

Revisions

Our British Standards and other publications are updated by amendment or revision.

We continually improve the quality of our products and services to benefit your business. If you find an inaccuracy or ambiguity within a British Standard or other BSI publication please inform the Knowledge Centre.

Useful Contacts

Customer Services
Tel: +44 345 086 9001
Email (orders): orders@bsigroup.com
Email (enquiries): cservices@bsigroup.com

Subscriptions
Tel: +44 345 086 9001
Email: subscriptions@bsigroup.com

Knowledge Centre
Tel: +44 20 8996 7004
Email: knowledgecentre@bsigroup.com

Copyright & Licensing
Tel: +44 20 8996 7070
Email: copyright@bsigroup.com

BSI Group Headquarters

389 Chiswick High Road London W4 4AL UK

bsi.