FINAL
DRAFT

INTERNATIONAL
STANDARD

**ISO/FDIS
26842-2**

ISO/TC **61**/SC **11**

Secretariat: JISC

Voting begins on:
2020-03-03

Voting terminates on:
2020-04-28

Adhesives — Test methods for the evaluation and selection of adhesives for indoor wood products —

Part 2: Resistance to delamination in severe environments

Adhésifs — Méthodes d'essai pour l'évaluation et la sélection des adhésifs destinés aux produits en bois pour l'usage intérieur —

Partie 2: Résistance à la délamination dans des environnements sévères

Reference number
ISO/FDIS 26842-2:2020(E)

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Published in Switzerland

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Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular, the different approval criteria needed for the different types of ISO documents should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see www.iso.org/directives).

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights. Details of any patent rights identified during the development of the document will be in the Introduction and/or on the ISO list of patent declarations received (see www.iso.org/patents).

Any trade name used in this document is information given for the convenience of users and does not constitute an endorsement.

For an explanation of the voluntary nature of standards, the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the World Trade Organization (WTO) principles in the Technical Barriers to Trade (TBT) see www.iso.org/iso/foreword.html.

This document was prepared by Technical Committee ISO/TC 61, *Plastics*, Subcommittee SC 11, *Products*.

This third edition cancels and replaces the second edition (ISO 26842-2:2013), which has been technically revised. The main changes compared to the previous edition are as follows:

— in Clause 5, the first paragraph has been clarified.

A list of all parts in the ISO 26842 series can be found on the ISO website.

Any feedback or questions on this document should be directed to the user's national standards body. A complete listing of these bodies can be found at www.iso.org/members.html.

Adhesives — Test methods for the evaluation and selection of adhesives for indoor wood products —

Part 2:
Resistance to delamination in severe environments

SAFETY STATEMENT — Persons using this document should be familiar with 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.

It is recognized that some of the materials permitted in this document might have a negative environmental impact. As technological advances lead to more acceptable alternatives for such materials, they will be eliminated to the greatest extent possible.

At the end of the test, care should be taken to dispose of all waste in an appropriate manner.

1 Scope

This document gives guidelines to select, by means of delamination-resistance tests, adhesive/wood combinations for use in wood products placed in severe environments, in which the products are exposed to extreme change of temperature and humidity. A series of exposure cycles at various temperature and humidity values is provided to verify that the adhesive selected, or a product bonded with the adhesive, meets the necessary requirements for resistance to delamination.

This document is intended to help the user not only to select a suitable adhesive, but also to evaluate adhesives and adhesively bonded wood products.

NOTE When actual wood products are tested using this method, the test results might not be comparable because the test laboratory do not normally have had adequate control over the way the product was assembled.

This document is not intended for use in the qualification of structural components.

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.

ISO 6238, *Adhesives — Wood-to-wood adhesive bonds — Determination of shear strength by compressive loading*

ISO 9424, *Wood-based panels — Determination of dimensions of test pieces*

ISO 16999, *Wood-based panels — Sampling and cutting of test pieces*

3 Terms and definitions

No terms and definitions are listed in this document.

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/

4 Principle

Test specimens or actual products that have been bonded with the test adhesive are placed in chambers at a specified temperature and humidity for a length of time and/or number of cycles depending on the grade of resistance to delamination under consideration. On completion of this exposure, the length of any delamination at the bond line is determined as a percentage of the overall length. If the length of delamination does not exceed 10 %, the adhesive can be certified as complying, under the test conditions used, with the requirements of the grade of resistance to delamination under consideration.

5 Apparatus

Apparatus that includes the features of all the chambers specified in 5.1 to 5.4 might be available. Not all the types of chambers are needed. Air should circulate at a velocity of (2,25 ± 0,25) m/s.

5.1 Conditioning chamber, capable of being maintained either at a temperature of (23 ± 2) °C and a relative humidity of (50 ± 5) % or at a temperature of (20 ± 2) °C and a relative humidity of (65 ± 5) %.

5.2 Dry-heat chamber, capable of being maintained at temperatures of (50 ± 2) °C and (80 ± 2) °C, with no provision for humidity control.

NOTE These temperatures can be experienced in the bottom of ships sailing in tropical seas or on heated floors.

5.3 Cold chamber, capable of being maintained at temperatures of (−20 ± 3) °C and (−30 ± 3) °C, with no provision for humidity control.

NOTE These temperatures can be experienced inside warehouses in cold latitudes.

5.4 Humidity chambers, capable of being maintained at relative humidity of 20 % and 90 %, and fitted with the following:

a) equipment capable of maintaining the temperature at (50 ± 2) °C and measuring it to within ± 2 °C;

b) equipment capable of measuring the relative humidity to within ± 3 %.

6 Specimens

6.1 Preparation and number

Test specimens shall be parallel two-ply laminates of dimensions 300 mm (width) × 300 mm (length) × 7,5 mm (thickness), prepared in accordance with ISO 6238 and measured in accordance with ISO 9424. The wood shall be cut to size in accordance with ISO 16999 and then adhesively bonded. Other test specimen dimensions may be agreed upon between the wood product manufacturer and the supplier of the adhesive, depending on the purpose of the test.

For each grade of resistance to delamination and specific set of test conditions within the grade, a minimum of 10 specimens is required.

NOTE If appropriate, actual adhesively bonded products can be tested using the test requirements and conditions specified in this document.

These specimens shall be prepared in accordance with ISO 16999.

6.2 Conditioning

Prior to testing, condition all specimens in the conditioning chamber (4.1) at the standard atmospheric conditions of (23 ± 2) °C and (50 ± 5) % RH, unless agreed otherwise at a minimum of 7 days. If a longer conditioning period is deemed necessary, the wood product manufacturer and the manufacturer of the adhesive should agree on a longer time.

NOTE For actual bonded products, 88 h might not be sufficient.

Specimens should be conditioned to the equilibrium moisture content corresponding to the specified use conditions.

Conditioning shall be carried out after the adhesive has been cured in accordance with the material specification or as specified by the manufacturer of the adhesive.

7 Delamination-resistance grades

Two grades of resistance to delamination are specified, each representing a different type of use, i.e. the different conditions of temperature and humidity which different adhesively bonded wood products may experience in service:

— grade 3 of resistance to delamination applies to high-durability indoor use (such as chair legs, fixtures, musical instruments);

— grade 4 of resistance to delamination applies to semi-outdoor use (such as window frames and flooring exposed to the sunlight near windows);

8 Delamination-resistance tests

The following four tests, which take into consideration the meteorological conditions of service and transport, shall be used in this document:

a) test A – cyclic hot/cold test: intended for testing using temperature variation only;

b) test B – cyclic humid/dry test: intended for testing at a fixed temperature using humidity variation only;

c) test C – hot and humid test: intended to represent the conditions of service or transport in tropical regions;

d) test D – hot and dry test: intended to represent the conditions of service or transport in desert regions.

Details of these tests are given in Tables 1 and 2.

9 Procedure

Select a grade of resistance to delamination based on the conditions in which the wood product is expected to be used (see Clause 7) and then select a suitable grade of resistance to delamination based on the expected meteorological conditions of service and transport (see Clause 8).

Conduct the tests of resistance to delamination in accordance with Table 1 and Table 2, placing the test specimens at least 50 mm apart with the end-grain surfaces parallel to the air flow in the chamber appropriate to the particular test being sure to keep the grain direction of the wood oriented to the direction of the air flow in the chamber.

— For test A, place the specimens in a cold chamber (5.3) for the specified length of time, then immediately transfer them to a dry-heat chamber (5.2) or programme the fastest change of

atmosphere in an automatic climate chamber for the specified length of time. Carry out the number of cycles specified in Table 1.

— For test B, place the specimens in a humidity chamber (5.4) at the higher humidity for the specified length of time, then immediately transfer them to a humidity chamber (5.4) or programme the fastest change of atmosphere in an automatic climate chamber at the lower humidity for the specified length of time. Carry out the number of cycles specified in Table 1.

— For tests C and D, place the specimens in a humidity chamber (5.4) for the specified length of time.

Except when transferring the specimens from one chamber to another, do not remove them from the chamber until the test has been completed.

At the end of the final test period, measure and record the total length of delamination of each specimen at the bond line.

Table 1 — Delamination-resistance grades

Delamination-resistance grade	Delamination-resistance test and test conditions							
	Test A		Test B		Test C		Test D	
3	A2	10 cycles	B1	1 cycle	C1	7 days	D1	7 days
4	A1	10 cycles	B1	2 cycles	C1	14 days	D1	14 days

Table 2 — Delamination-resistance tests and test conditions

Test cycle	Conditions for 1 cycle
A1	−30 °C for 16 h/80 °C for 8 h
A2	−20 °C for 16 h/50 °C for 8 h
B1	50 °C, 90 % RH for 2 days/50 °C, 20 % RH for 5 days
C1	50 °C, 90 % RH
D1	50 °C, 20 % RH

10 Assessment of the delamination-resistance grade chosen

Within an hour (1 h) of the test period specified in Table 1, visually examine each test specimen as it is removed from the test condition using a magnifying glass with a magnification of approximately 10 × and with strong lighting recommended. Immediately measure and record, to the nearest 1 mm, and record the length of any delamination (bond line separation) in each of the four edges of each specimen. Calculate the total delamination length by adding together the individual delamination lengths recorded for the bond lines in the edges of all the specimens.

If the percentage delamination, i.e. the total delamination length divided by the total length of the bond lines in all four edges of all the specimens multiplied by 100, does not exceed 10 %, the adhesive tested can be certified as having, for the specific set of test conditions used, the grade of resistance to delamination initially selected.

Delamination caused by wood checking, knots or other wood issues should not be read as delamination and should be excluded from measurement.

11 Test report

The test report shall include the following particulars:

a) a reference to this document, i.e. ISO 26842-2:2020;

b) all details necessary for the identification of the adhesive tested;

c) (if actual wood products were tested) all details necessary for the identification of the products tested;

d) (if test specimens were prepared) the type of wood used to prepare the specimens;

e) the method of application of the adhesive and the drying or curing conditions, as applicable, including the temperature and pressure;

f) the number of specimens tested and the conditions under which the specimens were conditioned before testing;

g) the delamination-resistance grade to which the specimens were tested and the specific delamination- resistance tests carried out (see Table 1);

h) the percentage delamination measured after the test and the result of the assessment of the delamination-resistance grade chosen;

i) the date(s) of testing.

Annex A gives an example of a report form which may be used to record the results.