BRITISH STANDARD

BS EN
321:2002

# Wood-based panels — Determination of moisture resistance under cyclic test conditions

The European Standard EN 321:2001 has the status of a British Standard

ICS 79.060

# National foreword

This British Standard is the official English language version of EN 321:2001. It supersedes BS EN 321:1993 which is withdrawn.

The UK participation in its preparation was entrusted to Technical Committee B/541, Wood-based panels, which has the responsibility to:

— aid enquirers to understand the text;

— present to the responsible European committee any enquiries on the interpretation, or proposals for change, and keep the UK interests informed;

— monitor related international and European developments and promulgate them in the UK.

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

**Cross-references**

The British Standards which implement international or European publications referred to in this document may be found in the BSI Standards Catalogue under the section entitled "International Standards Correspondence Index", or by using the "Find" facility of the BSI Standards Electronic Catalogue.

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This British Standard, having been prepared under the direction of the Sector Policy and Strategy Committee for Building and Civil Engineering, was published under the authority of the Standards Policy and Strategy Committee on 28 January 2002

**Summary of pages**

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EUROPEAN STANDARD

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# EN 321

November 2001

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Supersedes EN 321:1993

English version

# Wood-based panels - Determination of moisture resistance under cyclic test conditions

Panneaux à base de bois - Détermination de la résistance à l'humidité selon essais cycliques

Holzwerkstoffe - Bestimmung der Feuchtebeständigkeit durch Zyklustest

This European Standard was approved by CEN on 30 September 2001.



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

**Management Centre: rue de Stassart, 36 B-1050 Brussels**



Ref. No. EN 321:2001 E

# Contents

## Foreword

This European Standard has been prepared by Technical Committee CEN/TC 112 "Wood-based panels", the secretariat of which is held by DIN.

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 May 2002, and conflicting national standards shall be withdrawn at the latest by May 2002.

This European Standard supersedes EN 321:1993.

This standard is one of a series specifying methods of test for determining the behaviour of wood-based panels under the influence of moisture.

This standard is a revised version of EN 321:1993 and AC:1994. Compared to the version EN 321:1993 and AC:1994 the following modifications have been made:

a) The scope has been extended from fibreboards to wood-based panels.

b) The method has been described in more detail in order to avoid misinterpretation and improve reproducibility.

According to the CEN/CENELEC Internal Regulations, the national standards organizations of the following countries are bound to implement this European Standard: Austria, Belgium, Czech Republic, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Luxembourg, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland and the United Kingdom.

# 1 Scope

This European Standard specifies a test method for the determination of the moisture resistance of wood-based panels under cyclic test conditions.

# 2 Normative references

This European Standard incorporates, by dated or undated reference, provisions from other publications. These normative references are cited at the appropriate places in the text, and the publications are listed hereafter. For dated references, subsequent amendments to or revisions of any of these publications apply to this European Standard only when incorporated in it by amendment or revision. For undated references, the latest edition of the publication referred to applies (including amendments).

EN 310, *Wood based panels — Determination of modulus of elasticity in bending and of bending strength.*

EN 317, *Particleboards and fibreboards — Determination of swelling in thickness after immersion in water.*

EN 319, *Particleboards and fibreboards — Determination of tensile strength perpendicular to the plane of the board.*

EN 325, *Wood based panels — Determination of dimensions of test pieces.*

EN 326-1, *Wood based panels — Sampling, cutting and inspection — Part 1: Sampling and cutting of test pieces and expression of test results.*

# 3 Principle

Test pieces are exposed to three cycles, each comprising immersion in water, freezing, and drying at elevated temperature. After cyclic treatment, the test pieces are then reconditioned and their swelling in thickness and residual strength determined.

# 4 Apparatus

## 4.1 Water bath

A water bath which shall maintain water at a temperature of (20 ± 1) °C.

## 4.2 Freezing cabinet

A freezing cabinet which shall be capable of maintaining a temperature of between - 12 °C and - 25 °C. It shall also be capable of regaining this temperature within 1 h after inserting the test pieces.

## 4.3 Drying cabinet

A laboratory drying cabinet with forced, evenly distributed air ventilation, which shall maintain a temperature of (70 ± 2) °C and have (25 ± 5) air exchanges per hour. It shall be capable of reaching a temperature of (70 ± 2) °C within 2 h after inserting the test pieces.

# 5 Test pieces

## 5.1 Sampling

Sampling and cutting of the test pieces shall be carried out according to EN 326-1 and the relevant material specification standard.

## 5.2 Dimensions of test pieces

Dimensions shall be in accordance with EN 310, EN 317 and EN 319 as appropriate.

## 5.3 Conditioning

The test pieces shall be conditioned to constant mass in an atmosphere with a relative humidity of (65 ± 5) % and a temperature of (20 ± 2) °C. Constant mass is considered to be reached when the results of two successive weighing operations, carried out at an interval of 24 h, do not differ by more than 0,1 % of the mass of each test piece.

# 6 Procedure

## 6.1 Treatment of the test pieces

The following sequence of operations shall be carried out:

### 6.1.1 Initial conditioning and measurement

1) Condition the test pieces in accordance with 5.3.

2) Determine the dimensions of the test pieces in accordance with EN 325.

### 6.1.2 Cyclic treatment

**6.1.2.1** First cycle

3) Immerse the test pieces in the water bath which shall contain fresh water of pH = (7 ± 1) and be at a temperature of (20 ± 1) °C.

The test pieces shall be placed standing on one edge (one long edge in the case of the bending test pieces) and shall be separated from each other, and from the bottom and sides of the water bath by at least 15 mm. The upper edges of test pieces shall be covered by (25 ± 5) mm of water throughout the immersion period.

The immersion period shall be (70 ± 1) h.

4) Remove the test pieces from the water bath. Allow the surface water to drain off for a few minutes and then place the test pieces in the freezing cabinet which shall be at a temperature between - 12 °C and - 25 °C.

The test pieces shall be placed standing on the same edge as when immersed, and shall be separated from each other by at least 15 mm.

The freezing period shall be (24 ± 1) h.

5) Remove the test pieces from the freezing cabinet and immediately place them in the drying cabinet which shall be at a temperature of (70 ± 2) °C.

The test pieces shall be placed standing on the same edges as when immersed and frozen, and shall be separated from each other by at least 15 mm. The total volume of the test pieces shall not exceed 10 % of the internal volume of the drying cabinet.

The drying period shall be (70 ± 1) h.

6) Remove the test pieces from the drying cabinet and place them in a room at a temperature of (20 ± 5) °C.

The test piece shall be placed standing on the same edge as when immersed, frozen and dried, and shall be separated from each other by at least 15 mm.

The cooling period shall be (4 ± 0,5) h.

**6.1.2.2** Second cycle

7) At the end of the cooling period immerse the test pieces again in the water bath which shall contain fresh water of pH = (7 ± 1) and be at a temperature of (20 ± 1) °C.

Before standing them in the water bath, the test pieces shall be inverted to stand on its opposite edge. The test pieces shall be separated from each other and from the bottom and sides of the bath by at least 15 mm. The upper edges of test pieces shall be covered by (25 ± 5) mm of water throughout the immersion period.

The immersion period shall be (70 ± 1) h.

8) Remove the test pieces from the water bath. Allow the surface water to drain off for a few minutes and then place the test pieces in the freezing cabinet which shall be at a temperature between - 12 °C and - 25 °C.

The test pieces shall be placed standing on the same edges as when immersed (7), and shall be separated from each other by at least 15 mm.

The freezing period shall be (24 ± 1) h.

9) Remove the test pieces from the freezing cabinet and immediately place them in the drying cabinet which shall be at a temperature of (70 ± 2) °C.

The test pieces shall be placed standing on the same edge as when immersed (7) and frozen (8), and shall be separated from each other by at least 15 mm. The total volume of the test pieces shall not exceed 10 % of the internal volume of the drying cabinet.

The drying period shall be (70 ± 1) h.

10) Remove the test pieces from the drying cabinet and place them in a room with a temperature of (20 ± 5) °C.

The test piece shall be placed on the same edge as when immersed (7), frozen (8) and dried (9), and shall be separated from each other by at least 15 mm.

The cooling period shall be for (4 ± 0,5) h.

**6.1.2.3** Third cycle

11) At the end of the cooling period immerse the test pieces again in the water bath which shall contain fresh water of pH = (7 ± 1) and be at a temperature of (20 ± 1) °C.

Before standing them in the water bath, the test pieces shall be inverted to stand on its opposite edge (i.e. each test piece shall be standing on the same edge as during the initial immersion period described in 3). The test pieces shall be separated from each other and from the bottom and sides of the bath by at least 15 mm. The upper edges of test pieces shall be covered by (25 ± 5) mm of water throughout the immersion period.

The immersion period shall be (70 ± 1) h.

12) Remove the test pieces from the water bath. Allow the surface water to drain off for a few minutes and then place the test pieces in the freezing cabinet which shall be at a temperature between - 12 °C and - 25 °C.

The test pieces shall be placed standing on the same edge as when immersed (11), and shall be separated from each other by at least 15 mm.

The freezing period shall be (24 ± 1) h.

13) Remove the test pieces from the freezing cabinet and immediately place them in the drying cabinet which shall be at a temperature of (70 ± 2) °C.

The test pieces shall be placed standing on the same edge as when immersed (11) and frozen (12), and shall be separated from each other by at least 15 mm. The total volume of the test pieces shall not exceed 10 % of the internal volume of the drying cabinet.

The drying period shall be (70 ± 1) h.

NOTE Stages 3 to 13 above take approximately 500 h to complete.

#### 6.1.3 Reconditioning

14) Remove the test piece from the drying cabinet and condition them to constant mass.

15) Determine the dimensions of the test pieces in accordance with EN 325.

### 6.2 Determination of swelling in thickness

Determine the swelling in thickness of the test pieces after cyclic test according to EN 317.

### 6.3 Determination of tensile strength perpendicular to the plane of the board

Determine the tensile strength perpendicular to the plane of the board according to EN 319 using the dimensions determined in 6.1.1.

NOTE Before bonding the test pieces to the loading blocks, their faces may be lightly sanded to remove any roughness caused by the cyclic test.

### 6.4 Determination of bending strength

When required, determine the bending strength according to EN 310 using the dimensions of the test pieces after either initial (6.1.1) or final (6.1.3) conditioning depending on the requirements of the relevant specification.

## 7 Expression of results

### 7.1 Swelling in thickness

According to EN 317.

### 7.2 Tensile strength

According to EN 319.

### 7.3 Bending strength

According to EN 310. The method of calculation used shall be stated in the report.

## 8 Test report

According to EN 326-1.

## Bibliography

EN 300, *Oriented Strand Boards (OSB) — Definitions, classification and specifications.*

EN 312-5, *Particleboards — Specifications — Part 5: Requirements for loadbearing boards for use in humid conditions.*

EN 312-7, *Particleboards — Specifications — Part 7: Requirements for heavy duty load bearing boards for use in humid conditions.*

EN 622-5, *Fibreboards — Specifications — Part 5: Requirements for dry process boards (MDF).*

EN 634-2, *Cement bonded particleboards — Specifications — Part 2: Requirements for OPC bonded particleboards for use in dry, humid and exterior conditions.*

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