BRITISH STANDARD

BS EN
326-1:1994

Wood-based panels — Sampling, cutting and inspection —

Part 1: Sampling and cutting of test pieces and expression of test results

The European Standard EN 326-1:1994 has the status of a British Standard

UDC 674.03:674.815:620.113

Cooperating organizations

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This British Standard, having been prepared under the direction of the Technical Sector Board for Building and Civil Engineering, was published under the authority of the Standards Board and comes into effect on
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The following BSI references relate to the work on this standard:
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Amendments issued since publication

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Contents

National foreword

This British Standard has been prepared under the direction of the Technical Sector Board for Building and Civil Engineering and is the English language version of EN 326-1:1993, *Wood-based panels — Sampling, cutting and inspection — Part 1: Sampling and cutting of test pieces and expression of test results.*

It is one of three standards dealing with sampling, cutting and inspection; the remaining two are:

EN 326-2, *Wood-based panels — Sampling, cutting and inspection — Part 2: Quality control in the factory;* and

EN 326-3, *Wood-based panels — Sampling, cutting and inspection — Part 3: Inspection of a consignment of panels.*

These three standards provide sampling plans and statistical procedures for verifying compliance with all the EN specifications for wood-based panels, under the chosen method of assessment given in the title of the separate Part standards.

These Part standards, fulfil the same function to this group of ENs as BS 6566-3 and the relevant clauses of BS 1142 and BS 5669-1 to BS 5669-4. However the procedures are fundamentally different and cannot be used as alternatives to the existing British Standards.

This standard, together with a number of other ENs, will form a series of BS ENs in the field of wood-based panels, superseding BS 1142, BS 5669 and BS 6566.

A British Standard does not purport to include all the necessary provisions of a contract. Users of British Standards are responsible for their correct application.

Compliance with a British Standard does not of itself confer immunity from legal obligations.

Summary of pages

This document comprises a front cover, an inside front cover, pages i and ii, the EN title page, pages 2 to 10, an inside back cover and a back cover.

This standard has been updated (see copyright date) and may have had amendments incorporated. This will be indicated in the amendment table on the inside front cover.

EUROPEAN STANDARD

NORME EUROPÉENNE

EUROPÄISCHE NORM

EN 326-1

February 1994

UDC 674.03:674.815:620.113

Descriptors: Wooden boards, sampling, test specimens, cutting, test results

English version

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

Panneaux à base de bois — Echantillonnage, découpe et contrôle —
Partie 1: Echantillonnage et découpe des éprouvettes expression des résultats d'essai

Holzwerkstoffe — Probenahme, Zuschnitt und Überwachung — Teil 1: Probenahme und Zuschnitt der Prüfkörper sowie Angabe der Prüfergebnisse

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Up-to-date lists and bibliographical references concerning such national standards may be obtained on application to the Central Secretariat or to any CEN member.

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CEN

European Committee for Standardization
Comité Européen de Normalisation
Europäisches Komitee für Normung

Central Secretariat: rue de Stassart 36, B-1050 Brussels

Foreword

This European Standard has been prepared by CEN/TC 112, Woodbased panels, the secretariat of which is held by DIN.

It was submitted to Formal Vote and the result was positive.

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 1994, and conflicting national standards shall be withdrawn at the latest by December 1994.

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

Contents

1 Scope

This European Standard specifies certain rules for the sampling and cutting of test pieces and the expression and presentation of test results, in order to obtain information on the properties of wood-based panels.

NOTE This standard does not cover the sampling and cutting of test pieces for the derivation of characteristic values for structural design. These tests have to be carried out on medium-sized test pieces according to the rules given in EN 789 using the minimum number of panels to be sampled according to EN 384.

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.

EN 322, *Wood-based panels — Determination of moisture content.*

EN 323, *Wood-based panels — Determination of density.*

3 Symbols

3.1 Letter symbols

m	Number of test pieces cut from each single panel of the sample, in each direction
n	Number of panels taken as sample = size of the sample
N	Number of panels in one inspection lot = inspection lot size
$L^{q}_{5\ \%}$, $U^{q}_{5\ \%}$	Lower and upper 5 % quantile values of the sample, respectively
s	Estimate of the standard deviation calculated from test values or measurements
s^2	Estimate of the variance calculated from test values or measurements
$s_{w,j}{}^2$	Estimate of the variance within a panel j of the sample
$s_{\bar{x}}$	Estimate of the standard deviation between panel means
$s_{\bar{x}}{}^2$	Estimate of the variance between panel means
$\bar{s}_{w}{}^2$	Estimate of the mean variance within panels
t_n	Single-sided 5 %-t-value of a normally distributed sample of n panels
x_{ij}, x_{ijkl}	Single test value or measurement
$\bar{x}_j$, $\bar{x}_{jkl}$	Mean value (arithmetic mean) of the m single test values (or measurements) or of a group k and/or l of test values (or measurements), obtained from a single panel j
$\bar{\bar{x}}$, $\bar{\bar{x}}_{kl}$	Grand mean; mean value (arithmetic mean) of all mn test values (or measurements) or of a group k and/or l of test values (or measurements), obtained from a sample

3.2 Indices

i	Serial test piece number within a panel (i = 1, 2, ..., m)
j	Test panel identification number within a sample (j = 1, 2, ..., n)
k, l	Marks identifying the grouping of test pieces with regard to the direction in the plane of the panel and to their surfaces, respectively
w	Property within a panel
L	Lower specification limit
U	Upper specification limit

4 Definitions

For the purpose of this standard, the following definitions apply:

drawn at random

sampling of panels in such a way that each panel of the inspection lot has an equal chance of being selected, and cutting of test pieces from a single panel in such a way that each part of the panel has an equal chance of being selected as a test piece

inspection lot

a proportion of production, which is presented at a given time for sampling and inspection, consisting of panels of the same type within the same thickness range and coming from the same production line

inspection lot size

number of panels in one inspection lot

quality characteristic

a property that is essential for the judgement of a product in accordance with a relevant EN specification

sample

a collection of panels which are drawn from an inspection lot. Unless otherwise agreed, the panels of the sample are drawn at random

measurement

the value of a specific quality characteristic obtained either from a test piece or from a direct measurement

test piece

a piece of panel cut to the size required for testing a specific property

test value

the value of a specific quality characteristic obtained from a test piece

variable

a test value or measurement which can be measured on a continuous scale

5 Sampling

5.1 Sampling of panels

The size of the sample n depends on the purpose of the determination of panel properties. Detailed information on the size of the sample for quality control in the factory is given in EN 326-2, and for the inspection of the performance of a consignment of panels in EN 326-3. Alternatively, the sample size may be specified in the relevant EN specification.

5.2 Sampling of test pieces

Due to the variability both within and between panels, it is necessary to test a certain number of panels n as well as a certain number of test pieces m, cut from a single panel, in order to obtain reliable results.

Examples of the minimum number of test pieces m are given in Table 1, for other panel properties m shall be as laid down in the relevant EN for the respective test method.

Table 1 — Minimum number m of small test pieces cut from each single panel

Panel property	EN standard	m
Moisture content	EN 322	4
Dimensional movement	EN 318	
Density	EN 323	6
Modulus of elasticity in bending and bending strength	EN 310	
Internal bond	EN 319	8
Swelling in thickness after immersion in water	EN 317	
Surface soundness	EN 311	
Plywood bonding quality	EN 314-2	10

For the determination of those properties which differ in the two principal directions of the plane of the panel, two groups of m test pieces shall be cut from each panel. One group shall have its longitudinal axis parallel to the direction of the production (or the length of the panel), the other shall have its longitudinal axis perpendicular to this direction.

In testing the bonding quality of plywood, m relates to a pair of glue lines and to each pretreatment (see Annex A).

6 Test pieces

6.1 The test pieces shall be cut from the individual panels to the dimensions specified in the relevant standards of test methods, using a suitable method to ensure unbiased selection. At least one test piece of each group of test pieces shall be cut from the edge of the trimmed panel after any edge profiling and/or protective treatment has been removed.

6.2 An example of a cutting plan for small is test pieces given in Figure 1. Except for plywood bonding quality tests, for which a cutting plan is given in Annex A, the minimum distance between two test pieces for the same test shall be 100 mm. This requirement may be waived if replacement test pieces are required.

6.3 All test pieces cut from a panel shall be marked on the same surface with:

— the test panel identification number;

— the test piece serial number;

— and if possible, the original length direction and the original upper or lower surface of the panel.

6.4 For panels which are asymmetric about the centre of their thickness, so that the test result is influenced by which surface is uppermost when tested (e.g bending strength), half of the total number of test pieces m (i.e. $m/2$) shall be tested in each surface orientation.

In all other cases where the orientation of the surface of the panel is of minor influence on the property tested, the position of the upper or lower surface during the test shall be chosen at random.

6.5 Cutting of test pieces shall be carried out in such a way that their edges are clean, without burns, and perpendicular to the plane of the panel.

7 Expression of test results

7.1 Each specific property of each panel of the sample shall be determined as specified in the relevant EN using either test pieces or measurements taken from whole panels.

7.2 The test results of each individual test piece, from each panel of the sample, shall be reported.

7.3 With the exception of testing the bonding quality of plywood[1)], further evaluation of the test results of the sample (either for inspection procedures or for internal as well as external production control) shall be made using the following calculations:

7.3.1 *Mean value of each individual panel (panel mean)*

For each group of test pieces (or measurements, respectively) calculate the mean value $\bar{x}_j$ of each individual panel according to:

$$\bar{x}_j = \sum_{i=1}^{m} x_{ij}/m \qquad (1)$$

7.3.2 *Variance within each panel*

For each group of test pieces (or measurements, respectively) calculate the variance $s_{w,j}^2$ within each panel according to:

$$s_{w,j}^2 = \sum_{i=1}^{m} (x_{ij} - \bar{x}_j)^2/(m-1) \qquad (2)$$

7.3.3 *Grand mean (mean of panel means)*

Calculate the grand mean $\bar{\bar{x}}$ of all test values, or of a group of test values, from the sample according to:

$$\bar{\bar{x}} = \sum_{j=1}^{n} \sum_{i=1}^{m} x_{ij}/(mn) = \sum_{j=1}^{n} \bar{x}_h/n \qquad (3)$$

7.3.4 *Variance between panel means*

Calculate the variance $s_{\bar{x}}^2$ between panel means according to:

$$s_{\bar{x}}^2 = \sum_{j=1}^{n} (\bar{x}_j - \bar{\bar{x}})^2/(n-1) \qquad (4)$$

7.3.5 *Mean variance of the test values within panels*

Calculate the mean variance $\bar{s}_w^2$ of the test values within panels according to:

$$\bar{s}_w^2 = \sum_{j=1}^{n} s_{w,j}^2/n \qquad (5)$$

7.3.6 *5 %-quantile of a normally distributed panel property*

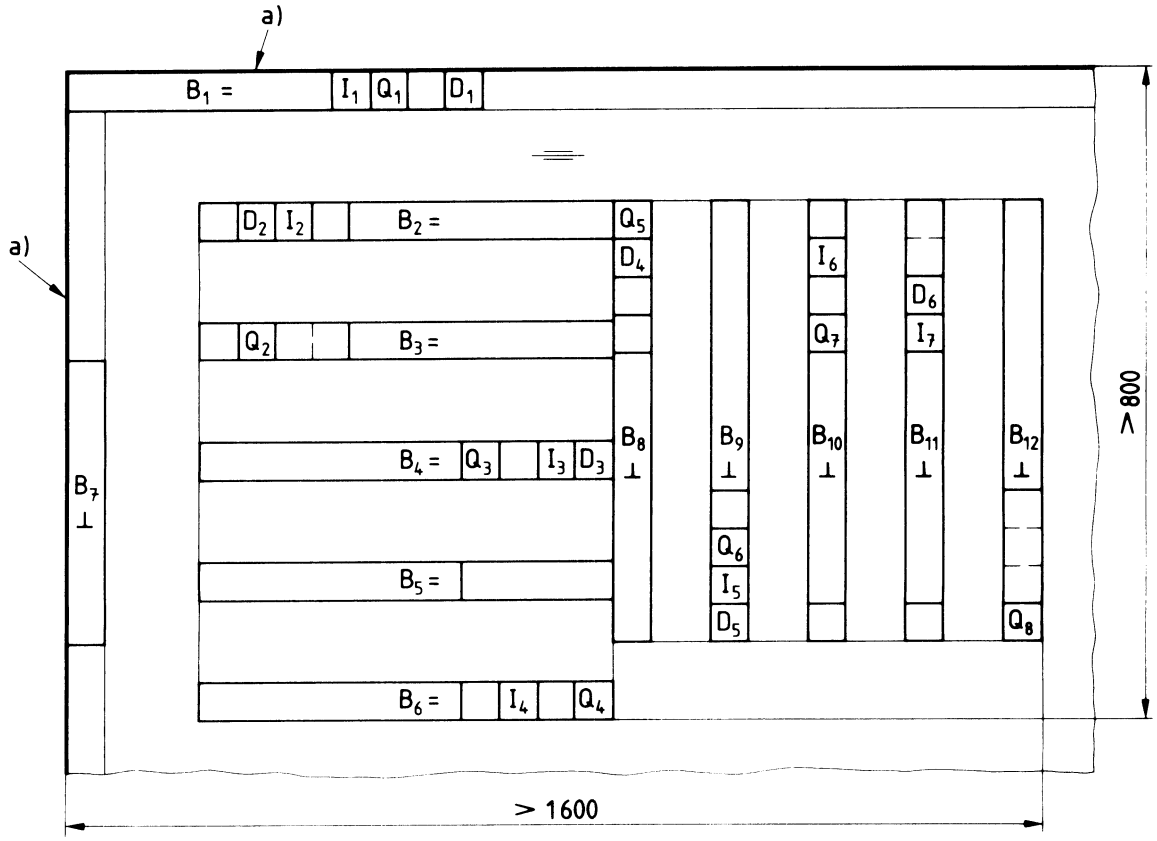
Calculate the lower 5 %-quantile $L^q_{5\,\%}$ of a panel property according to:

$$L^q_{5\,\%} = \bar{\bar{x}} - t_n\, s_{\bar{x}} \qquad (6a)$$

and the upper 5 %-quantile $U^q_{5\,\%}$, respectively:

$$U^q_{5\,\%} = \bar{\bar{x}} + t_n\, s_{\bar{x}} \qquad (6b)$$

[1)] For testing the shear strength of glue lines in plywood the mean value of each pair of glue lines for each panel has to be calculated according to **7.3.1**.



Dimensions in millimetres

(=) Orientation of the longitudinal axis of the test piece parallel to the length of a plywood panel or to the machine direction of other panel types

⊥ Orientation of the longitudinal axis of the test piece perpendicular to the length of a plywood panel or to the machine direction of other panel types.

a) Outer edge trimmed

NOTE For properties which are independent from orientation (e.g. D, I and Q) one test piece shall be taken from an outer edge of a trimmed panel where this can be identified.

Test	Test piece number
Density	D1 to D6
Bending	B1 to B12
Thickness swelling	Q1 to Q8
Internal bond	I1 to I8

Figure 1 — Example of a cutting plan for small test pieces for determination of certain properties (thickness of the panel about 20 mm)

Table 2 — Single-sided t-values in relation to the sample size n

Sample size n	8	10	15	20	25	30	35	40	60	100
t_n	1,89	1,83	1,76	1,72	1,71	1,70	1,69	1,68	1,67	1,66

8 Test report

8.1 Mandatory information

Each report on sampling and cutting of test pieces and expression of test results shall contain:

8.1.1 Name of the testing institute

8.1.2 Description of the inspection lot

8.1.2.1 Name of the supplier (or his representative)

8.1.2.2 Place and date of sampling and persons present at sampling

8.1.2.3 General condition of the inspection lot

8.1.2.4 Type, kind, and characteristics of the panels as specified in the relevant EN

8.1.2.5 Density according to EN 323

8.1.2.6 Moisture content at the time of testing according to EN 322

8.1.2.7 Nominal dimensions of the panels

8.1.2.8 Inspection lot size

8.1.3 Description of the sample

8.1.3.1 Sample size

— number of panels n

— number of test pieces taken from each panel for each group of test pieces m

8.1.3.2 A copy of the cutting plan used

8.1.4 Expression of the test results of each property investigated in accordance with the relevant EN

8.1.4.1 Mean value of each panel $\bar{x}_j$

8.1.4.2 Grand mean $\bar{\bar{x}}$

8.1.4.3 Mean standard deviation within panels $\bar{s}_w$

8.1.4.4 Standard deviation between panel means $s_{\bar{x}}$

8.1.5 Any deviation from this EN and from relevant EN test methods as well as any information which may be of importance with regard to testing.

8.2 Additional, non-mandatory information

In addition the test report may contain the following non-mandatory information:

8.2.1 Additional description of the inspection lot, time of manufacture of the panels, if known

8.2.2 Additional description of the sample, description of any identification mark according to **6.4**

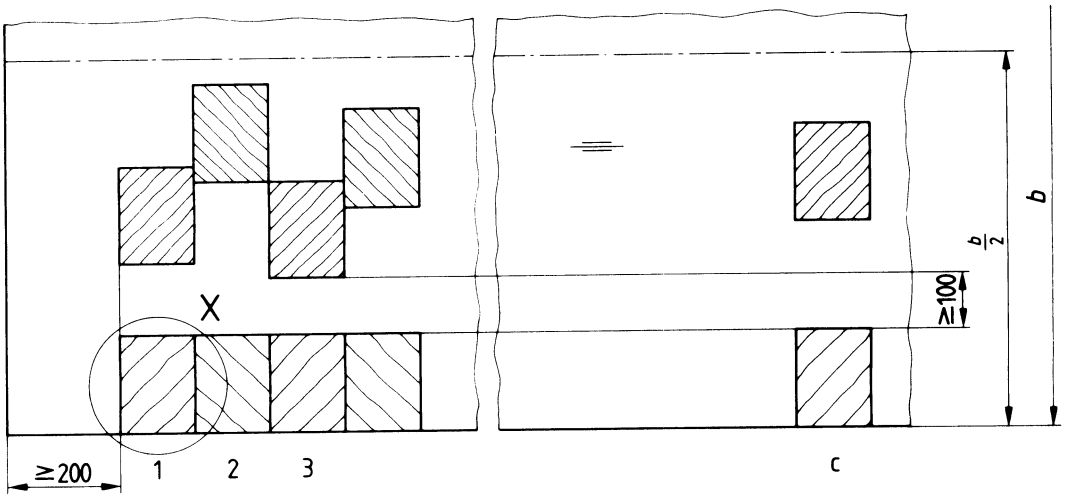
8.2.3 Additional information on test results

8.2.3.1 All single test results x_{ij}

8.2.3.2 The lower or upper 5 %-quantile ($L^q_{5\,\%}$ or $U^q_{5\,\%}$, respectively)

8.2.4 Any further relevant information

Annex A (informative)
Example of a cutting plan for the plywood bonding quality test



Dimensions in millimetres

b width

a) Pair of blocks

indicates the fibre direction of the outer veneers

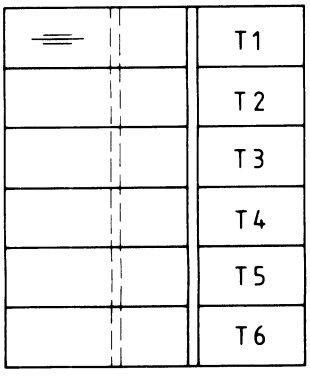
Centre blocks

a) (random distance from the middle of the panel)

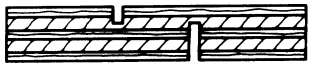
Edge blocks

1 → c Number of pairs of blocks

X



For each pretreatment and each pair of glue lines separate test pieces are required.



Test piece T6 (and possibly T7 and more) is a spare test piece.

Annex B (informative)
Bibliography

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

EN 311, *Particleboards — Surface soundness of particleboards — Test method.*

EN 314-2, *Plywood — Bonding quality — Part 2: Requirements.*

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

EN 318, *Fibreboards — Determination of dimensional changes associated with changes in relative humidity.*

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

EN 324-1, *Wood-based panels — Determination of dimensions of boards — Part 1: Determination of thickness, width and length.*

EN 324-2, *Wood-based panels — Determination of dimensions of boards — Part 2: Determination of squareness and edge straightness.*

EN 326-2, *Wood-based panels — Sampling, cutting and inspection — Part 2: Quality control in the factory*[2)].

EN 326-3, *Wood-based panels — Sampling, cutting and inspection — Part 3: Inspection of a consignment of panels*[2)].

EN 789, *Timber structures — Testing methods for the determination of mechanical properties for structural uses*[2)].

EN 384, *Wood-based panels — Determination of characteristic values of mechanical properties and density*[2)].

[2)] At present at the draft stage.

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National annex NA (informative)
Committees responsible

The United Kingdom participation in the preparation of this European Standard was entrusted by the Technical Sector Board for Building and Civil Engineering (B/-) to Technical Committee B/541, upon which the following bodies were represented:

American Plywood Association
Association of British Plywood and Veneer Manufacturers
British Woodworking Federation
Chartered Institute of Building
Co-ordinator for Timber and Timber Products
Council of the Forest Industries of British Columbia
Department of the Environment (Building Research Establishment)
Finnish Plywood International
Flat Roofing Contractors' Advisory Board
Forestry Commission
Furniture Industry Research Association
Institution of Structural Engineers
Local Authority Organizations
Municipal Mutual
National Federation of Roofing Contractors
National House-building Council
National Panel Products Association
Royal Institute of British Architects
Structural Board Association
Timber Research and Development Association
Timber Trade Federation
Wood Panel Products Federation

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