



SLOVENSKI STANDARD SIST EN 326-2:2004

01-januar-2004

Wood-based panels - Sampling, cutting and inspection - Part 2: Quality control in the factory

Holzwerkstoffe - Probenahme, Zuschnitt und Überwachung -Teil 2: Qualitätskontrolle in der Fertigung

Panneaux a base de bois - Echantillonnage, découpe et contrôle - Partie 2: Contrôle de qualité en usine

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Wood-based panels in general

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EUROPEAN STANDARD
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English version

Wood-based panels - Sampling, cutting and inspection - Part 2: Quality control in the factory

Panneaux à base de bois - Echantillonnage, découpe et
contrôle - Partie 2: Contrôle de qualité en usine

Holzwerkstoffe - Probenahme, Zuschnitt und Überwachung
- Teil 2: Qualitätskontrolle in der Fertigung

This European Standard was approved by CEN on 10 June 2000.

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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 Central Secretariat has the same status as the official versions.

CEN members are the national standards bodies of Austria, Belgium, Czech Republic, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Luxembourg, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland and United Kingdom.

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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of an identical text or by endorsement, at the latest by January 2001, and conflicting national standards shall be withdrawn at the latest by January 2001.

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.

This standard is one of a series dealing with sampling, cutting and inspection of wood-based panels. The other parts of this series are listed in clause 2.

1 Scope

This European Standard specifies methods for both factory production control and external control of conformity of the properties of wood-based panels with the relevant EN specifications. However, it may also apply, at the option of the manufacturer, to wood-based panels applied for non-construction purposes.

This European Standard is not applicable for the assessment of conformity with specifications of the properties of panels comprised in consignments. In such cases, EN 326-3 applies.

For factory production control, if required, methods for the assessment of conformity of batches and of production over longer periods are given.

For external control, if required, methods for the initial inspection of a factory and initial type testing of a product, and for the surveillance of the factory production control, are given.

In this standard, control is based on the testing of small test pieces.

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 326-1 : 1994

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

EN 326-3

Wood-based panels – Sampling, cutting and inspection – Part 3: Inspection of a consignment of panels

ISO 2602

Statistical interpretation of test results – Estimation of the mean – Confidence interval

ISO 2859-1 : 1989

Sampling procedures for inspection by attributes – Part 1: Sampling plans indexed by acceptable quality level (AQL) for lot-by-lot inspection

ISO 8258

Shewhart control charts

3 Symbols and indices

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3.1 Letter symbols (see also EN 326-1)

<i>Ac</i>	Acceptance number
<i>AQL</i>	Acceptable quality level
<i>c</i>	Correlation factor established by the manufacturer between test results from standard and alternative testing
δ	Relative difference
Δ	Difference
<i>L</i>	Lower specification limit
<i>m</i>	Number of test pieces cut from each single panel of the sample, in either test direction
<i>n</i>	Sample size (number of panels)
<i>N</i>	Number of panels in one inspection lot, i.e. inspection lot size
<i>r</i>	Correlation coefficient
<i>Re</i>	Rejection number
s_{wj}	Estimate of the standard deviation of a property within a panel <i>j</i> of the sample
$s_{\bar{x}, n}$	Estimate of the standard deviation of a property between panel means
t_m	Single-sided 5 % value factor related to the number of test pieces
<i>U</i>	Upper specification limit

v_{wj}	Coefficient of variation within a panel j of the sample
$v_{\bar{x}}$	Coefficient of variation between the panel means
x_{ij}	Single test value or measurement
\bar{x}_j	Mean value of the m test values (or measurements) obtained from a single panel j
$\bar{\bar{x}}_n$	Grand mean of n single panel mean values or measurements

3.2 Indices (see also EN 326-1)

attr	Related to inspection by attributes
b	Property between panels
cu	Cumulative value
d	Related to double sample plan
ext	Test results from the external control
fac	Test results from the manufacturer's laboratory
i	Serial test piece number within a panel ($i = 1, 2, \dots, m$)
init	Test results related to initial inspection
j	Test panel identification number within a sample ($j = 1, 2, \dots, n$)
si	Related to single sampling plan SIST EN 326-2:2004
w	Property within a panel SIST EN 326-2:2004

4 Definitions (see also EN 326-1)

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

4.1 Acceptable quality level (AQL): The maximum percentage of non-conforming panels that for the purpose of sampling inspection can be considered satisfactory as a process average.

4.2 At random (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.

4.3 Attributes: Qualitative panel characteristics which can be taken for a yes or no decision about the conformity of a panel property with the specification requirements.

4.4 Batch: Panels of the same product type produced in a shift.

4.5 Defective: A panel which does not meet the required specification limit of the relevant property.

4.6 Inspection body: Approved body which is responsible for external control.

4.7 Inspection by attributes: Inspection whereby either the unit of product is classified simply as conforming or non-conforming, or the number of nonconformities in the unit of product is counted, with respect to a given requirement or set of requirements.

4.8 Inspection by variables: Inspection the conformity of a panel property which can be measured on a continuous scale.

4.9 Inspection lot (for quality control in the factory): A portion of production which is presented for sampling and inspection, consisting of panels of the same type, normally within the same thickness range, coming from the same production line and manufactured under essentially the same conditions.

4.10 Inspection lot size: Number of panels in one inspection lot.

4.11 Lower specification limit (L): Value required by the EN specification that 95 % of the panels should have values greater than or equal to.

4.12 Percent defective: The extent of non-conformity of a panel product expressed by percentage defective panels in the total number of panels inspected.

4.13 Product type: A panel type, irrespective of thickness, as defined in the relevant EN specification.

4.14 Quality characteristic: A property that is essential for the evaluation of a product or product type in accordance with a relevant EN specification.

4.15 Sample: A collection of panels which are drawn from an inspection lot. Unless otherwise agreed, the panels of the sample are drawn at random.

4.16 Test piece: A piece of panel cut to the size required for testing a specific property.

4.17 Test value: The value of a specific property obtained from a test piece.

4.18 Thickness range: Panels with a thickness for which the same specification limits are valid according to the relevant EN specification.

4.19 Upper specification limit (U): Value required by the EN specification that 95 % of the panels should have values lower than or equal to.

4.20 Variable: A test value or measurement which can be measured on a continuous scale.

5 Factory production control

5.1 General

The manufacturer shall control in each separate production line those properties of panels which are required by the relevant EN specifications.

In cases where the manufacturer chooses to claim panel properties higher than the EN specification levels, then

factory production control shall be carried out according to the property levels claimed.

Samples shall be drawn from each product type and thickness range. The production may be further subdivided, for example, by thickness.

Procedures alternative to the standardised procedure (for example, unconditioned or in-line testing) may be used for the determination of panel properties, provided that a statistically significant relationship can be established between the specified property and the measured property (see clause 8).

Systematic differences arising from the use of alternative procedures shall be taken into account by individual correction factors which shall be determined by experiment. The correction factors shall be verified from time to time.

5.2 Sampling

5.2.1 General

Sampling shall be carried out in accordance with the relevant EN specification.

5.2.2 Dimensional tolerances, squareness and edge straightness

The first panel produced after each change in dimensions shall be taken as the sample. Control shall be in accordance with 5.4.3.2.1.

5.2.3 Other properties assessed as attributes and not included in 5.2.1 or 5.2.2

In the case of alternative test procedures the results of which are assessed as attributes, a single or double sampling plan shall be carried out. Sample size is dependent on the size of the inspection lot N_{str} as given in table 1.

Depending on the properties which are controlled and the level of established knowledge, other inspection levels in accordance with ISO 2859-1 may be used.

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Table 1: Size of the sample in relation to the inspection lot N_{attr}

Size of the inspection lot N_{attr}	Sample size		
	Single sampling $n_{\text{attr, si}}$	Double sampling	
		$1^{\text{st}} n_{\text{attr, d}}$	$2^{\text{nd}} n_{\text{attr, d}}$
≤ 500	20	13	13
501 to 1 200	32	20	20
1 201 to 3 200	50	32	32
3 201 to 10 000	80	50	50

These sample sizes for the inspection by attributes correspond to a normal inspection of level I according to ISO 2859-1 : 1989.

5.2.4 Sampling and cutting of test pieces

The minimum number of test pieces m which shall be cut from each panel is given either in EN 326-1 or in the EN for the relevant test method, or otherwise shall be agreed with the inspection agency.

The principles of sampling and cutting of test pieces are described in EN 326-1.

5.3 Inspection by variables (see annex A)

5.3.1 Properties

The following shall be calculated and recorded for each property:

- the panel mean \bar{x}_j of the m test values x_{ij} obtained from each single panel according to the equation (1) (equation (1) of EN 326-1 : 1994):

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

- and the standard deviation within a panel s_{wj} according to the equation (2) (by analogy to equation (2) of EN 326-1 : 1994):

$$s_{\text{wj}} = \left[\sum_{i=1}^m (x_{ij} - \bar{x}_j)^2 / (m-1) \right]^{1/2} \quad (2)$$

5.3.2 Product types

For each product type under inspection, the following shall also be calculated and recorded:

- the rolling grand mean $\bar{\bar{x}}_{30}$ of the last 30 panel means according to the equation (3) (by analogy to equation (3) of EN 326-1 : 1994):

$$\bar{\bar{x}}_{30} = \sum \bar{x}_j / 30 \quad (3)$$

- and the rolling standard deviation $s_{\bar{x}, 30}$ between the last 30 panel means according to the equation (4) (by analogy to equation (4) of EN 326-1 : 1994):

$$s_{\bar{x}, 30} = \left[\sum (\bar{x}_j - \bar{\bar{x}}_{30})^2 / 29 \right]^{1/2} \quad (4)$$

5.4 Control of production

5.4.1 Internal records of an established product

5.4.1.1 Control charts

The history of an established product type under inspection shall be given by recording the test results according to 5.3 on a continuous basis by using control charts, e.g. Shewhart control charts as given in ISO 8258.

5.4.1.2 Conformity of established product

For an established product, the conformity of the quality of the panels of the last 30 production periods can be considered confirmed for each property listed in the EN specification if:

- the lower 5 percentile limit $L_{5\%}$ of the control charts is equal to or greater than the lower specification limit

$$\text{or } L_{5\%} = \bar{\bar{x}}_{30} - 1,7 s_{\bar{x}_j, 30} \quad (5a)$$

- the higher 95 percentile limit $U_{5\%}$ of the control chart is equal to or smaller than the upper specification limit.

$$U_{5\%} = \bar{\bar{x}}_{30} + 1,7 s_{\bar{x}_j, 30} \quad (5b)$$

In order to evaluate the quality of the last batch production the manufacturer shall use the procedure given in 5.4.2 unless alternative procedures are adopted giving at least the same level of confidence.

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5.4.2 Factory production control by variables for batch production (see annex A)

To give a reliable estimate of the conformity of the quality of the panels with the requirements of the relevant EN specification, estimates shall be calculated of the lower (${}_1L_x$) or upper (${}_1U_x$) confidence limit, respectively, for the last production period for which the last panel sampled is considered to be representative, according to the equation:

$${}_1L_x = \bar{x}_j (1 - t_m v_{w,j} / m^{1/2}) \quad (6a)$$

or

$${}_1U_x = \bar{x}_j (1 + t_m v_{w,j} / m^{1/2}) \quad (6b)$$

If the coefficient of variation within the panel $v_{w,j}$ calculated according to the equation

$$v_{w,j} = s_{w,j} / \bar{x}_j \quad (7)$$

is lower than 0,08, a constant value of the coefficient of variation $v_{w,j} = 0,08$ shall be used in equation (6a) or (6b).

The t -values in relation to the number of test pieces m are given in table 2.

Table 2: t_m -values

Number of test pieces m	4	5	6	8	10	12	16	18
t	2,35	2,13	2,02	1,89	1,83	1,80	1,75	1,74

The table values correspond to a 95 % confidence limit, one-sided case in accordance with ISO 2602.

If ${}_1L_x$ is equal to or greater than the lower specification limit L , or if ${}_1U_x$ is equal to or less than the upper specification limit U , respectively, the requirements for the panel properties may be considered to be in conformity with the relevant EN specification.

If the single panel does not meet the requirements, one or two more panels may be tested. In this case the grand mean value $\bar{\bar{x}}_{1,2}$ or $\bar{\bar{x}}_{1,2,3}$ calculated according to the equations:

$$\bar{\bar{x}}_{1,2} = (\bar{x}_1 + \bar{x}_2)/2 \quad (8a)$$

and

$$\bar{\bar{x}}_{1,2,3} = (\bar{x}_1 + \bar{x}_2 + \bar{x}_3)/3 \quad (8b)$$

and the mean coefficient of variation within panels calculated according to the equations:

$$\bar{s}_{w,1,2} = \left(\frac{s_{w,1}^2 + s_{w,2}^2}{2} \right)^{1/2} \quad (9a)$$

$$\bar{v}_{w,1,2} = \bar{s}_{w,1,2} / \bar{\bar{x}}_{1,2} \quad (9b)$$

and

$$\bar{s}_{w,1,2,3} = \left(\frac{s_{w,1}^2 + s_{w,2}^2 + s_{w,3}^2}{3} \right)^{1/2} \quad (9c)$$

$$\bar{v}_{w,1,2,3} = \bar{s}_{w,1,2,3} / \bar{\bar{x}}_{1,2,3} \quad (9d)$$

shall be used for calculating the estimate of the lower (${}_{1,2}L_{\bar{x}}$ or ${}_{1,2,3}L_{\bar{x}}$) or upper (${}_{1,2}U_{\bar{x}}$ or ${}_{1,2,3}U_{\bar{x}}$) property limit, respectively, according to the equations:

$${}_{1,2}L_{\bar{x}} = \bar{\bar{x}}_{1,2} (1 - t_m \bar{v}_{w,1,2} / (2m)^{1/2}) \quad (10a)$$

and

$${}_{1,2}U_{\bar{x}} = \bar{\bar{x}}_{1,2} (1 + t_m \bar{v}_{w,1,2} / (2m)^{1/2}) \quad (10b)$$

or

$${}_{1,2,3}L_{\bar{x}} = \bar{\bar{x}}_{1,2,3} (1 - t_m \bar{v}_{w,1,2,3} / (3m)^{1/2}) \quad (10c)$$

and

$${}_{1,2,3}U_{\bar{x}} = \bar{\bar{x}}_{1,2,3} (1 + t_m \bar{v}_{w,1,2,3} / (3m)^{1/2}) \quad (10d)$$

If the requirements are not met, the panels of the respective production period shall be down-graded and marked accordingly.

5.4.3 Factory production control by attributes for batch production

5.4.3.1 Bonding quality of plywood (see annex B)

At the factory production control of the bonding quality of plywood the following requirements shall be fulfilled:

If the number of defective test pieces is equal to or less than 10 %, the requirement for the panel property is fulfilled.

NOTE: In the case of testing the bond quality of plywood, a test piece corresponds to one pair of glue lines.

If the number of defective test pieces is greater than 10 %, two other panels shall be taken and tested.

If the number of defective test pieces from these two panels is equal to or less than 10 %, the requirement for the panel property is fulfilled.

If the requirements are not met, the panels of the respective production period shall be down-graded and marked accordingly.