SLOVENSKI STANDARD
SIST EN 310:1996

01-marec-1996

Lesne plošče - Ugotavljanje upogibne trdnosti in modula elastičnosti

Wood-based panels - Determination of modulus of elasticity in bending and of bending strength

Holzwerkstoffe - Bestimmung des Biege-Elastizitätsmoduls und der Biegefestigkeit

Panneaux a base de bois - Détermination du module d'élasticité en flexion et de la résistance a la flexion

Ta slovenski standard je istoveten z: **EN 310:1993**

ICS:

79.060.01	Lesne plošče na splošno	Wood-based panels in general

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EN 310:1993

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English version

Wood-based panels - Determination of modulus of elasticity in bending and of bending strength

Panneaux à base de bois - Détermination du module d'élasticité en flexion et de la résistance à la flexion

Holzwerkstoffe - Bestimmung des Biege-Elastizitätsmoduls und der Biegefestigkeit

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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

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Contents

Foreword

This European Standard was prepared by Working Group 4 "Common test methods" (Secretariat: United Kingdom) of Technical Committee CEN/TC 112, Wood-based panels (Secretariat: Germany).

The text is based on ISO 9429 (at present ISO/DIS) which has been elaborated with European participation.

This standard is one of a series of standards specifying methods of test for determining dimensions and properties of wood-based panels.

No existing European Standard is superseded.

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of an identical text or by endorsement, at the latest by August 1993, and conflicting national standards shall be withdrawn at the latest by December 1994.

In accordance with 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, United Kingdom.

1 Scope

This European Standard specifies a method of determining the apparent modulus of elasticity in flatwise bending and bending strength of wood-based panels of nominal thickness equal to or greater than 3 mm.

NOTE: Structural design values shall be determined according to methods according to EN 789.

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 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 [1)]

3 Principle

The modulus of elasticity in bending and bending strength are determined by applying a load to the centre of a test piece supported at two points. The modulus of elasticity is calculated by using the slope of the linear region of the load-deflection curve; the value calculated is the apparent modulus, not the true modulus, because the test method includes shear as well as bending. The bending strength of each test piece is calculated by determining the ratio of the bending moment M, at the maximum load F_{max}, to the moment of its full cross-section.

4 Apparatus

4.1 Measuring instruments, as specified in EN 325.

4.2 Testing apparatus (figure 1), having the following essential components.

4.2.1 Two parallel, cylindrical, roller-bearing supports of length exceeding the width of the test piece and of (15 ± 0,5) mm diameter.

The distance between the supports shall be adjustable.

A cylindrical loading head, of the same length and (30 ± 0,5) mm in diameter, placed parallel to the supports and equidistant from them.

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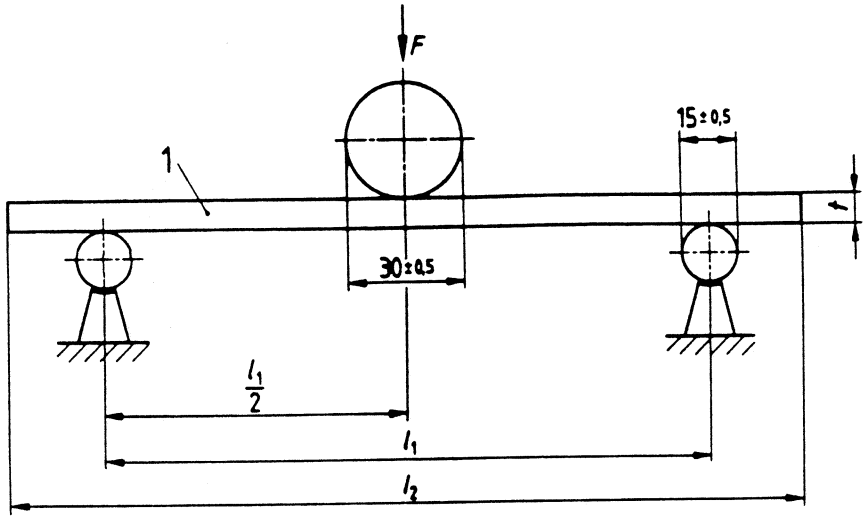
1) At present at the draft stage

Dimensions in millimeters



1 = test piece
F = load
t = thickness of the test piece

l_1 = 20 t
l_2 = l_1 + 50

Figure 1: Arrangement of the bending apparatus.

4.2.2 A suitable instrument capable of measuring the deflection of the test piece in the middle of the span with an accuracy of 0,1 mm.

4.2.3 A suitable load measurement system capable of measuring the load applied to the test piece with an accuracy of 1 % of the measured value.

5 Test pieces

5.1 Sampling and cutting

Sampling and cutting of the test pieces shall be carried out according to EN 326-1. Series of both transverse and longitudinal test pieces are required.

5.2 Dimensions of test pieces

The test pieces shall be rectangular, and of the following dimensions:

The width b shall be (50 ± 1) mm.

In the case of extruded panels, cellular panels, or panels of similar structure with cavities parallel to the length of the test piece, the width of the test piece shall be at least twice the width of an individual core element (e. g. two tube diameters plus two web thicknesses) and the test pieces shall have a symmetrical cross-sectional area as shown in figure 2.

In test pieces with cavities perpendicular to the length, the loading head shall be located directly above a web.

Dimensions in millimeters

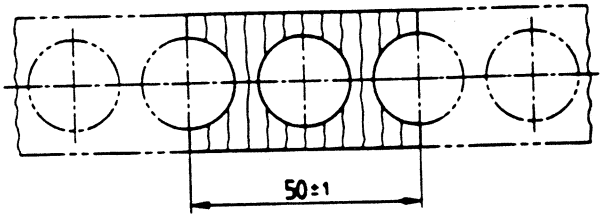


Figure 2: Cross-section of tubular boards.

The length l_2 shall be 20 times the nominal thickness plus 50 mm, with a maximum length of 1050 mm and a minimum length of 150 mm.

If the deflection of the test piece is large but rupture (failure) does not occur, the distance between supports shall be reduced for testing the bending strength. The test report shall include the distance between supports at which failing tests were conducted. If this procedure needs to be adopted, a new set of test pieces shall be used.

Plywood test pieces shall be free of visible strength-reducing characteristics.

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 the test piece.

6 Procedure

6.1 Measure the width and thickness of each test piece according to EN 325 at the following points:

- the thickness at the intersection of the diagonals,
- the width at the mid-length.

6.2 Adjust the distance between the centres of the supports, to within 1 mm of 20 times the nominal thickness of the panel, but not less than 100 mm and not more than 1000 mm. Measure the distance between the centres of the supports to the nearest 0,5 mm.

6.3 Place the test piece flat on the supports, with its longitudinal axis at right angles to those of the supports with the centre point under the load (figure 1).

6.4 The load shall be applied at a constant rate of cross-head movement throughout the test. The rate of loading shall be adjusted so that the maximum load is reached within (60 ± 30) s.

Measure the deflection in the middle of the test piece (below the loading head) to an accuracy of 0,1 mm and plot this value against the corresponding loads measured to an accuracy of 1 % of the measured value. If deflection is determined by incremental readings, at least 6 pairs of readings shall be used.

6.5 Record the maximum load to an accuracy of 1 % of the measured value.

6.6 Carry out tests on two groups of test pieces according to the two directions of the board, i. e. in the longitudinal and transverse directions. Within each group, test half of the test pieces with the 'top face' upwards and half with the 'bottom face' upwards.

7 Expression of results

7.1 Modulus of elasticity

7.1.1 The modulus of elasticity E_m (in N/mm^2), of each test piece, is calculated from the formula:

$$E_m = \frac{l_1^3 (F_2 - F_1)}{4\, b\, t^3 (a_2 - a_1)}$$

where:

l_1 is the distance between the centres of the supports, in millimeters;

b is the width of the test piece, in millimeters;

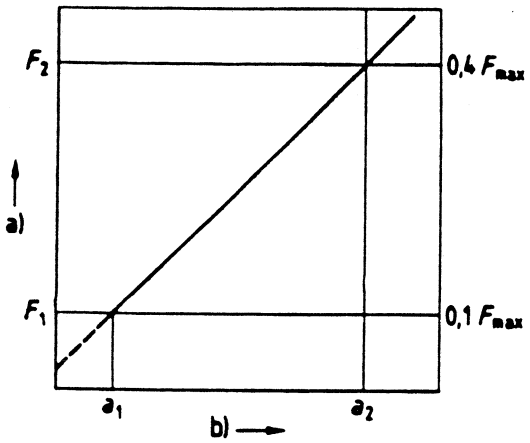
t is the thickness of the test piece, in millimeters;

$F_2 - F_1$ is the increment of load on the straight line portion of the load-deflection curve, (figure 3) in N. F_1 shall be approximately 10 % and F_2 shall be approximately 40 % of the maximum load;

$a_2 - a_1$ is the increment of deflection at the mid-length of the test piece (corresponding to $F_2 - F_1$).

The modulus of elasticity for each test piece shall be expressed to three significant figures.

7.1.2 The modulus of elasticity for each group of test pieces taken from the same board (6.6) is the arithmetic mean of the moduli of elasticity of the appropriate test pieces, expressed to three significant figures.



a) load F
d) deflection a

Figure 3: Load-deflection curve within the range of elastic deformation

7.2 Bending strength

7.2.1 The bending strength f_m (in N/mm^2), of each test piece, is calculated from the formula:

$$f_m = \frac{3\ F_{max}\ l_1}{2\ b\ t^2}$$

where:

F_{max} is the maximum load, in newtons;

l_1, b, and t are in millimeters as defined in 7.1.1.

The bending strength of each test piece shall be expressed to three significant figures.

7.2.2 The bending strength for each group of test pieces taken from the same board (6.6) is the arithmetic mean of the bending strengths of the appropriate test pieces, expressed to three significant figures.

8 Test report

As described in EN 326-1.