SLOVENSKI STANDARD
SIST EN 789:1996

01-avgust-1996

Lesene konstrukcije - Preskusni postopki - Ugotavljanje mehanskih lastnosti lesnih plošč

Timber structures - Test methods - Determination of mechanical properties of wood based panels

Holzbauwerke - Prüfverfahren - Bestimmung der mechanischen Eigenschaften von Holzbauwerkstoffen

Structures en bois - Méthodes d'essai - Détermination des propriétés mécaniques des panneaux a base de bois

Ta slovenski standard je istoveten z: **EN 789:1995**

ICS:

79.060.01	Lesne plošče na splošno	Wood-based panels in general
91.080.20	Lesene konstrukcije	Timber structures

SIST EN 789:1996 **en**

EUROPEAN STANDARD

NORME EUROPÉENNE

EUROPÄISCHE NORM

EN 789

December 1995

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English version

Timber structures - Test methods - Determination of mechanical properties of wood based panels

Structures en bois - Méthodes d'essai - Détermination des propriétés mécaniques des panneaux à base de bois

Holzbauwerke - Prüfverfahren - Bestimmung der mechanischen Eigenschaften von Holzbauwerkstoffen

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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 has been prepared by the Technical Committee CEN/TC 124 "Timber Structures" of which the secretariat is held by DS.

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of an identical text or by endorsement, at the latest by June 1996, and conflicting national standards shall be withdrawn at the latest by June 1996 .

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 and United Kingdom.

1 Scope

This standard specifies test methods for determining some mechanical properties of commercial wood-based panel products for use in load-bearing timber structures. These properties are intended for the calculation of characteristic values for use in obtaining material design values.

For each type and grade of panel product, as defined for example in an EN wood based panel standard, it is necessary to determine characteristic values of mechanical properties to enable it to be used for structural purposes. This standard details the necessary testing which may only need to be carried out once for each product, unless there is a reason to suspect a significant change has occurred in the properties of the product.

This standard is not intended to be used for quality control testing, for which smaller test pieces than specified herein, are adequate.

Due to the limited experience in use with the tests, the test methods for panel and planar shear are included in Annexes B and C (normative).

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
EN 325	Wood based panels - Determination of dimensions of test pieces
EN 1058	Wood based panels - Determination of characteristic values of mechanical properties and density

3 Definitions

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

3.1 specimen: Piece of the panel from which a test piece will be fabricated.

3.2 test piece: Specimen or aggregate of parts from a sample fabricated to the size and shape required for testing.

4 Symbols

A full cross-sectional area, equal to bt, in square millimetres;

b measured width of test piece, in millimetres;

E modulus of elasticity, in newtons per square millimetre;

EA direct stiffness, in newtons;

EI bending stiffness, in newtons times square millimetres;

F load, in newtons;

f strength, in newtons per square millimetre;

G shear modulus of rigidity, in newtons per square millimetre;

I second moment of area, equal to $bt^3/12$, in millimetres to the fourth power;

l length of test piece, in millimetres;

l_1 gauge length, in millimetres;

l_2 distance between an inner load point and the nearest support, in millimetres;

M moment, in newton millimetres;

t measured thickness of test piece, in millimetres;

t_1 measured thickness of panel being tested, in millimetres;

u deflection or deformation, in millimetres;

W section modulus, equal to $bt^2/6$, in cubic millimetres.

Subscripts applied to loads, capacities, strengths, stiffness, and moduli of elasticity:

c compression

m bending

max maximum

p panel shear

r planar shear

t tension

5 Sampling

5.1 Sampling of panels

All panels in a sample shall be of the same type, grade, thickness range and composition or lay-up.

The method of sampling and the number of panels required is given in EN 1058.

5.2 Sampling of specimens

The specimens for each type of test in each direction shall not be from the same position in different panels of the same sample and shall not number more than one from each panel. For compression test pieces, see Annex A (normative). The position of the specimens within the panels shall be selected to ensure an unbiased sample.

NOTE: An example of a cutting schedule based on a sample of four panels, each with a minimum area of 1200 mm × 2400 mm, is given in figure 1.

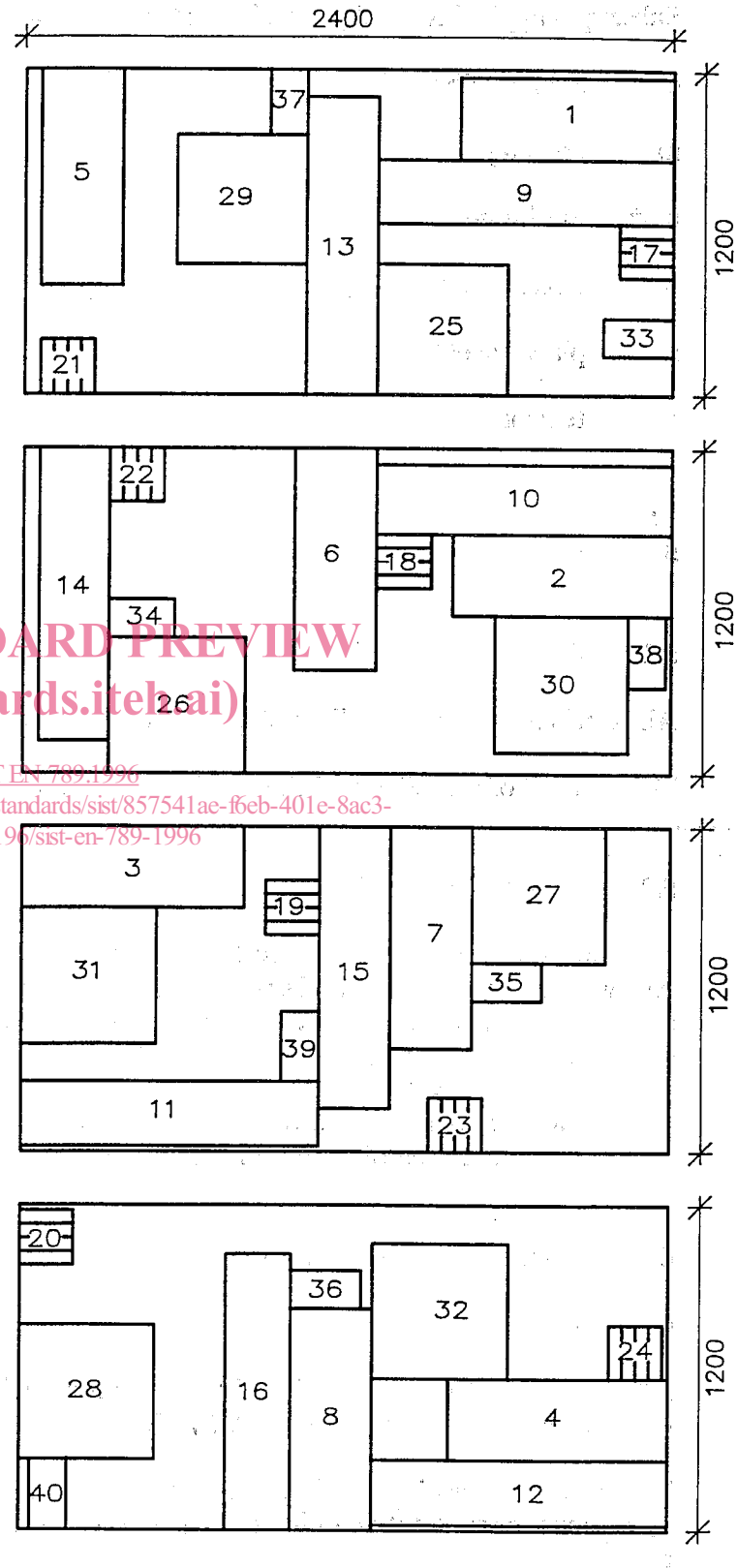
6 Preparation of test pieces

6.1 Conditioning

All test pieces shall be conditioned to constant mass in an atmosphere of relative humidity (65 ± 5) % and temperature (20 ± 2) °C.

The constant mass is considered to have been 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.

TEST	SPECIMEN NUMBERS
Bending	
longitudinal	1 to 4
lateral	5 to 8
Tension	
longitudinal	9 to 12
lateral	13 to 16
Compression	
longitudinal	17 to 20
lateral	21 to 24
Panel shear	
longitudinal	25 to 28
lateral	29 to 32
Planar shear	
longitudinal	33 to 36
lateral	37 to 40



Sizes in millimetres

Figure 1: Example of a cutting schedule

If the conditions of testing are not the same as those in the conditioning chamber, tests shall be undertaken immediately after the test pieces have been removed from the conditioning chamber.

NOTE: The test methods specified in this standard may also be used in other testing climates.

6.2 Dimensions of test pieces

6.2.1 Method of measurement

The dimensions shall be determined in accordance with EN 325.

6.2.2 Measurements to be taken

The thickness of the test pieces shall be measured at four points, two on each edge 80 mm from mid-length, but 25 mm in the case of compression test pieces, and the average thickness t recorded. The width of the test pieces shall be measured at two points, generally 80 mm from mid-length, but 25 mm in the case of compression test pieces, and the average width b recorded.

NOTE: If the thicknesses of individual plies or layers in plywood or composite panels are required, then each should be measured to the nearest 0,1 mm at the four edges of the test piece, and averaged.

6.3 Moisture content

6.3.1 Method of measurement

The moisture content shall be determined in accordance with EN 322.

6.3.2 Measurements to be taken

The moisture content shall be determined from at least one test piece per panel and measured at the time of testing.

6.4 Density

6.4.1 Method of measurement

The density shall be determined in accordance with EN 323.

6.4.2 Measurements to be taken

The density shall be determined from at least one test piece per panel and measured at the time of testing.

7 Bending properties

7.1 Test piece

The test piece shall be rectangular in cross-section.

The depth of the test piece shall be equal to the thickness of the panel and the width shall be (300 ± 5) mm, but see also 7.3 NOTE.

The length of the test piece will depend on the nominal thickness of the panel, see figure 2.

7.2 Loading equipment

The loading equipment shall be capable of measuring the load to an accuracy of 1 %.

NOTE: Since the test piece may twist under load, the loading equipment should be appropriately chosen.

7.3 Loading method

The application of the loads shall be as shown in figure 2 with the load and reaction forces applied by rollers of (30 ± 1) mm diameter. The distance between the load points and the supports shall be 16 times the nominal thickness, but not more than 400 mm and not less than 240 mm with an accuracy of ± 1 mm.

NOTE: Large deflections may occur when test pieces with small bending stiffness are tested to failure thus alternative test arrangements may be required. In general the test configuration described in this section is suitable for a test piece with a thickness greater than 9 mm (corresponding to a bending stiffness per unit width of about 300 kN mm²/mm). Smaller thicknesses may be tested by using smaller diameter rollers and proportionally reducing the distances between them.

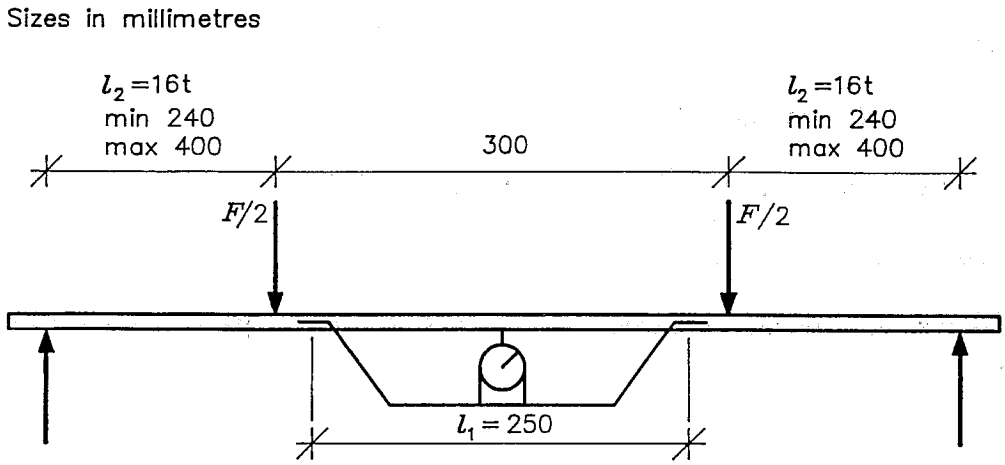


Figure 2: Arrangement for bending test

7.4 Test procedure

7.4.1 Rate of application of load

Load F shall be applied at a continuous rate of loading adjusted so that the maximum load is reached within (300 ± 120) s, and with a mean value of about 300 s for a sample.

7.4.2 Measurement of length and deformation

The lengths l_1 and l_2, see figure 2, shall be measured to the nearest 1 mm. The deflection of the test piece shall be measured midway between two points on the axis of the test piece located in the zone of uniform moment. The distance between the two points (gauge length) shall be not less than 250 mm and the points shall be spaced as far apart as possible, consistent with maintaining adequate clearance between the gauges and the loading equipment.

NOTE: For thicknesses of 9 mm or less, the 250 mm gauge length may be proportionally reduced.

The deflection over the gauge length shall be measured to the nearest 0,01 mm.

7.5 Expression of results

7.5.1 Modulus of elasticity and bending stiffness

The bending modulus of elasticity of the test piece shall be calculated from the following formula:

$$E_m = \frac{(F_2 - F_1)\, l_1^2\, l_2}{16\,(u_2 - u_1)\, I}$$

The bending stiffness of the test piece shall be calculated from the following formula:

$$E_m I = \frac{(F_2 - F_1)\, l_1^2\, l_2}{16\,(u_2 - u_1)}$$

where:

$F_2 - F_1$ is the increment of load on the straight line portion of the load-deflection curve, see figure 3. F_1 shall be approximately 10 % and F_2 shall be approximately 40 % of the maximum load F_{max}.

$u_2 - u_1$ is the increment of deflection corresponding to $F_2 - F_1$, see figure 3.

Both the modulus of elasticity and stiffness shall be calculated to three significant figures.