SLOVENSKI STANDARD
SIST EN 1058:1996

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Lesne plošče - Ugotavljanje karakterističnih vrednosti mehanskih lastnosti in gostote

Wood-based panels - Determination of characteristics values of mechanical properties and density

Holzwerkstoffe - Bestimmung der charakteristischen Werte der mechanischen Eigenschaften und der Rohdichte

Panneaux a base de bois - Détermination des valeurs caractéristiques des propriétés mécaniques et de la masse volumique

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English version

Wood-based panels - Determination of characteristic values of mechanical properties and density

Panneaux à base de bois - Détermination des valeurs caractéristiques des propriétés mécaniques et de la masse volumique

Holzwerkstoffe - Bestimmung der charakteristischen Werte der mechanischen Eigenschaften und der Rohdichte

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of an identical text or by endorsement, at the latest by January 1996, and conflicting national standards shall be withdrawn at the latest by January 1996.

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 the United Kingdom.

Introduction

This draft proposes methods of calculation for determining the characteristic values of mechanical properties and density of wood-based panels. It has been produced following the format as EN 384 "Structural timber - Determination of characteristic values of mechanical properties and density".

Whilst total accuracy of characteristic values of any defined population is an aim, it is recognised that this is not achievable. The major aim of the procedures given in this Standard is to produce characteristic values that are comparable in terms of the populations they represent.

Structural size test data should be determined from tests using the test methods outlined in EN 789.

Characteristic values for established products have been evaluated by CEN/TC 112.

This Standard covers the stages of population definition, sampling, testing and analysis of data in the determination of characteristic values.

1 Scope

This European Standard specifies methods of calculation for determining characteristic values of mechanical properties and density for defined populations of wood-based panel products for structural purposes.

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

3 Definitions

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

3.1 characteristic value: Value of a material property which is defined as a fractile of the distribution of that property within the total population of that material.

For all strength properties and for density, this fractile is the fifth percentile. For stiffness properties, two different characteristic values can be used: the fifth percentile and the mean value.

NOTE: In 6.3.4, a method is given for estimating the fifth percentile from a limited number of tests. This method is designed for use within a safety system where the partial coefficient for materials is kept constant and does not vary as a function of the coefficient of variation. Since the method aims at achieving a constant level of safety, the actual level of confidence for the estimate is not constant. Thus, the results are not directly comparable with more traditional estimates of the fifth percentile.

3.2 panel: Piece of wood-based sheet material large enough to permit the cutting of test pieces.

3.3 reference population: Wood-based panels for which the characteristic values are relevant.

3.4 production site: Any single press line.

3.5 sample: Number of test pieces of identical size and from one population.

3.6 test piece: Piece of material cut or fabricated to the size required for testing.

3.7 lay-up: Composition of wood-based panel.

3.8 shift: Continuous period of production by the same group of workers.

4 Symbols

E modulus of elasticity in newtons per square millimetre;

E_k characteristic value of modulus of elasticity, in newtons per square millimetre;

E_{05} fifth percentile of modulus of elasticity, in newtons per square millimetre;

f strength, in newtons per square millimetre;

f_k characteristic value of strength, in newtons per square millimetre;

f_{05} fifth percentile of any strength property, in newtons per square millimetre;

i value in the range from 1 to n;

k statistical factor, see table 1;

k_n statistical factor, see table 1;

$m(E)$ mean value of modulus of elasticity, in newtons per square millimetre;

$m(f)$ mean value of any strength property, in newtons per square millimetre;

$m(x)$ mean value (the variable is given in parenthesis);

$m(\rho)$ mean value of density, in kilograms per cubic metre;

n number of test results;

$s(x)$ standard deviation (the variable is given in parenthesis);

x variable;

x_{05} fifth percentile of the variable;

$\delta(x)$ coefficient of variation (the variable is given in parentheses);

ρ density, in kilograms per cubic metre;

ρ_k characteristic value of density, in kilograms per cubic metre;

ρ_{05} fifth percentile of density, in kilograms per cubic metre.

5 Reference population

The reference population is defined by parameters such as type and manufacturing process, thickness, grade, lay-up and quality classification and is consistent with the material that is or can

be supplied commercially and is capable of being identified at all stages of production, supply and in service.

6 Characteristic values of mechanical properties and density

6.1 Sampling

A total of at least 32 panels of the same type, grade, thickness range and/or lay-up shall be sampled in an unbiased way from the production sites. Where there are fewer than 8 production sites, then the total number of panels shall be obtained by taking a maximum of 4 panels from each shift at each site.

Sampling of test pieces from panels shall be in accordance with the procedures given in EN 789. The number of test pieces in each sample shall not be less than the total number of panels.

6.2 Testing

Testing shall be carried out in accordance with EN 789.

6.3 Analysis of data

6.3.1 The mean value is calculated from the equation

$$m(x) = \frac{\sum_{i=1}^{n} x_i}{n}$$

6.3.2 The standard deviation is calculated from the equation

$$s(x) = \sqrt{\frac{\sum_{i=1}^{n} (x_i - m(x))^2}{(n-1)}}$$

6.3.3 The coefficient of variation is calculated from the equation

$$\delta(x) = \frac{s(x)}{m(x)}$$

6.3.4 The fifth percentile is calculated from

$$x_{05} = k_n \, m(x)$$

where

$$k_n = \exp\left[-k\ \delta(x) + 0{,}15\right]$$

The factor k depends on the number n of test results, see table 1.

The factor k_n depends on the number n of test results and the value of $\delta(x)$, see table 1.

$\delta(x)$ shall not be taken less than 0,10.

Table 1: Values of k and k_n

		Number of test results n						
	$\delta(x)$	32	36	40	60	80	100	∞
k	-	3,10	3,07	3,04	2,95	2,91	2,88	2,65
k_n	0,10	0,852	0,855	0,857	0,865	0,868	0,871	0,891
	0,12	0,801	0,804	0,807	0,815	0,819	0,822	0,845
	0,14	0,753	0,756	0,759	0,769	0,773	0,776	0,802
	0,16	0,708	0,711	0,714	0,725	0,729	0,733	0,760
	0,18	0,665	0,669	0,672	0,683	0,688	0,692	0,721
	0,20	0,625	0,629	0,633	0,644	0,649	0,653	0,684
	0,22	0,587	0,591	0,595	0,607	0,613	0,617	0,649
	0,24	0,552	0,556	0,560	0,572	0,578	0,582	0,615
	0,26	0,519	0,523	0,527	0,540	0,545	0,549	0,583
	0,28	0,488	0,492	0,496	0,509	0,514	0,519	0,553
	0,30	0,458	0,463	0,467	0,480	0,485	0,490	0,525

6.4 Strength properties

The characteristic strength is defined as the fifth percentile

$$f_k = f_{05} = k_n\, m(f)$$

for k_n, see table 1.

6.5 Modulus of elasticity

The characteristic modulus of elasticity E_k is defined as the fifth percentile E_{05} or the mean value $m(E)$:

$$E_{05} = k_n\, m(E)$$