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Konstrukcijski les - Trdnostni razredi

Structural timber - Strength classes

Bauholz für tragende Zwecke - Festigkeitsklassen

Bois de structure - Classes de résistance

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Structural timber - Strength classes

Bois de structure - Classes de résistance

Bauholz für tragende Zwecke - Festigkeitsklassen

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Foreword

This document (EN 338:2009) has been prepared by Technical Committee CEN/TC 124 “Timber structures”, the secretariat of which is held by SFS.

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of an identical text or by endorsement, at the latest by April 2010, and conflicting national standards shall be withdrawn at the latest by April 2010.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. CEN [and/or CENELEC] shall not be held responsible for identifying any or all such patent rights.

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Introduction

This European Standard has additional strength classes which are more suitable to the characteristic values of temperate hardwoods. It also has modified characteristic values for the softwood classes for shear strength and tension strength perpendicular to grain. The equations given for these two properties in Annex A have been modified accordingly.

Due to variations in the type and quality of timber available, the variety of end uses and the size of production output of the local timber industry, many different combinations of species and strength grade exist with different strength properties, which therefore complicate the design and specification of timber structures.

A strength class system groups together grades and species with similar strength properties thus making them interchangeable. This then permits an engineer to specify a chosen strength class and use the characteristic strength values of that class in design calculations.

Advantages of the strength class system are:

a) Additional species/grades can be incorporated into the system at any time without affecting existing specifications for structural timber.

b) At the time of carrying out design calculations, an engineer need not be aware of the costs and availability of alternative species and grades. He can simply design using the strength, stiffness and density values of a particular class and then specify that class; he can then use the tenders to select the most suitable and economic species/grade on offer. Note that, where a particular species is not acceptable (e.g. for reasons of durability) for a project, the specification needs to make this clear.

c) Suppliers can offer their material to meet more specifications than would be possible if species and grades were specified.

1 Scope

This European Standard establishes a system of strength classes for general use in structural codes.

It gives characteristic strength and stiffness properties and density values for each class and the rules for the allocation of timber populations (i.e. combinations of species, source and grade) to the classes.

This standard is applicable to all softwood and hardwood timber for structural use.

2 Normative references

The following referenced documents are indispensable for the application of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

EN 384, *Structural timber – Determination of characteristic values of mechanical properties and density*

EN 14081 (all parts), *Timber structures – Strength graded structural timber with rectangular cross section*

3 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

3.1
timber population
timber for which the characteristic values are relevant

NOTE The timber population is defined by parameters such as species or species grouping (combination of species), source and strength grade.

4 Symbols and abbreviations

$E_{0,mean}$ mean characteristic value of modulus of elasticity parallel to grain (in kN/mm^2)

$E_{0,05}$ 5-percentile characteristic value of modulus of elasticity parallel to grain (in kN/mm^2)

$E_{90,mean}$ mean characteristic value of modulus of elasticity perpendicular to grain (in kN/mm^2)

$f_{c,0,k}$ characteristic value of compressive strength parallel to grain (in N/mm^2)

$f_{c,90,k}$ characteristic value of compressive strength perpendicular to grain (in N/mm^2)

$f_{m,k}$ characteristic value of bending strength (in N/mm^2)

$f_{t,0,k}$ characteristic value of tensile strength parallel to grain (in N/mm^2)

$f_{t,90,k}$ characteristic value of tensile strength perpendicular to grain (in N/mm^2)

$f_{v,k}$ characteristic value of shear strength (in N/mm^2)

G_{mean} mean characteristic value of shear modulus (in kN/mm^2)

ρ_k characteristic value of density (in kg/m^3)

ρ_{mean} mean value of density (in kg/m^3)

5 Classification of structural timber

This standard provides for a number of strength classes, each designated by a number indicating the value of bending strength in N/mm².

The characteristic values of strength, stiffness and density for the strength classes are given in Table 1.

Table 1 — Strength classes - Characteristic values

		Softwood species												Hardwood species							
		C14	C16	C18	C20	C22	C24	C27	C30	C35	C40	C45	C50	D18	D24	D30	D35	D40	D50	D60	D70
Strength properties (in N/mm^2)																					
Bending	$f_{m,k}$	14	16	18	20	22	24	27	30	35	40	45	50	18	24	30	35	40	50	60	70
Tension parallel	$f_{t,0,k}$	8	10	11	12	13	14	16	18	21	24	27	30	11	14	18	21	24	30	36	42
Tension perpendicular	$f_{t,90,k}$	0,4	0,4	0,4	0,4	0,4	0,4	0,4	0,4	0,4	0,4	0,4	0,4	0,6	0,6	0,6	0,6	0,6	0,6	0,6	0,6
Compression parallel	$f_{c,0,k}$	16	17	18	19	20	21	22	23	25	26	27	29	18	21	23	25	26	29	32	34
Compression perpendicular	$f_{c,90,k}$	2,0	2,2	2,2	2,3	2,4	2,5	2,6	2,7	2,8	2,9	3,1	3,2	7,5	7,8	8,0	8,1	8,3	9,3	10,5	13,5
Shear	$f_{v,k}$	3,0	3,2	3,4	3,6	3,8	4,0	4,0	4,0	4,0	4,0	4,0	4,0	3,4	4,0	4,0	4,0	4,0	4,0	4,5	5,0
Stiffness properties (in kN/mm^2)																					
Mean modulus of elasticity parallel	$E_{0,mean}$	7	8	9	9,5	10	11	11,5	12	13	14	15	16	9,5	10	11	12	13	14	17	20
5 % modulus of elasticity parallel	$E_{0,05}$	4,7	5,4	6,0	6,4	6,7	7,4	7,7	8,0	8,7	9,4	10,0	10,7	8	8,5	9,2	10,1	10,9	11,8	14,3	16,8
Mean modulus of elasticity perpendicular	$E_{90,mean}$	0,23	0,27	0,30	0,32	0,33	0,37	0,38	0,40	0,43	0,47	0,50	0,53	0,63	0,67	0,73	0,80	0,86	0,93	1,13	1,33
Mean shear modulus	G_{mean}	0,44	0,5	0,56	0,59	0,63	0,69	0,72	0,75	0,81	0,88	0,94	1,00	0,59	0,62	0,69	0,75	0,81	0,88	1,06	1,25
Density (in kg/m^3)																					
Density	ρ_k	290	310	320	330	340	350	370	380	400	420	440	460	475	485	530	540	550	620	700	900
Mean density	ρ_{mean}	350	370	380	390	410	420	450	460	480	500	520	550	570	580	640	650	660	750	840	1080

NOTE 1 Values given above for tension strength, compression strength, shear strength, 5 % modulus of elasticity, mean modulus of elasticity perpendicular to grain and mean shear modulus, have been calculated using the equations given in Annex A.

NOTE 2 The tabulated properties are compatible with timber at a moisture content consistent with a temperature of 20 °C and a relative humidity of 65 %.

NOTE 3 Timber conforming to classes C45 and C50 may not be readily available.

NOTE 4 Characteristic values for shear strength are given for timber without fissures, according to EN 408. The effect of fissures should be covered in design codes.