



SLOVENSKI STANDARD

oSIST prEN 338:2013

01-oktober-2013

Konstruktivski les - Trdnostni razredi

Structural timber - Strength classes

Bauholz für tragende Zwecke - Festigkeitsklassen

Bois de structure - Classes de résistance

Ta slovenski standard je istoveten z: **prEN 338 rev**

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ICS:

79.040	Les, hlodovina in žagan les	Wood, sawlogs and sawn timber
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English Version

Structural timber - Strength classes

Bois de structure - Classes de résistance

Bauholz für tragende Zwecke - Festigkeitsklassen

This draft European Standard is submitted to CEN members for enquiry. It has been drawn up by the Technical Committee CEN/TC 124.

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Foreword

This document (prEN 338:2013) has been prepared by Technical Committee CEN/TC 124 “Timber structures”, the secretariat of which is held by AFNOR.

This document is currently submitted to the CEN Enquiry.

This document will supersede EN 338:2009.

Compared to EN 338:2009, the following modifications have been made:

- new table of strength classes for softwood species based on tension tests;
- extension with new classes in the table of strength classes for hardwood species based on edgewise bending tests;
- modification of some characteristic values for strength, stiffness and density.

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Introduction

This European Standard has additional strength classes for structural timber mainly loaded in tension.

1 Scope

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

It gives characteristic strength and stiffness properties and density values for each class to which EN 14081-1 refers.

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

2 Normative references

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. 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*

EN 14358, *Timber structures – Calculation of characteristic 5-percentile values and acceptance criteria for a sample*

3 Terms and definitions

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

3.1 population

timber for which the characteristic values are relevant

Note 1 to entry: The population is defined by parameters such as species or combination of species, source and strength grade.

4 Symbols and abbreviations

$E_{m,0,mean}$	mean characteristic value of modulus of elasticity in bending parallel to grain (in kN/mm ²);
$E_{t,0,mean}$	mean characteristic value of modulus of elasticity in tension parallel to grain (in kN/mm ²);
$E_{m,0,k}$	5-percentile characteristic value of modulus of elasticity in bending parallel to grain (in kN/mm ²);
$E_{t,0,k}$	5-percentile characteristic value of modulus of elasticity in tension parallel to grain (in kN/mm ²);
$E_{m,90,mean}$	mean characteristic value of modulus of elasticity in bending perpendicular to grain (in kN/mm ²);
$E_{t,90,mean}$	mean characteristic value of modulus of elasticity in tension 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 the edgewise bending or tension strength in N/mm².

For softwood species based on edgewise bending tests, the characteristic values of strength, stiffness and density for the strength classes are given in Table 1.

For softwood species based on tension tests, the characteristic values of strength, stiffness and density for the strength classes are given in Table 2.

For hardwood species based on edgewise bending tests, the characteristic values of strength, stiffness and density for the strength classes are given in Table 3.

The most common used strength classes in Europe are printed in bold.

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Table 1 — Strength classes for softwood based on edgewise bending tests – strength, stiffness and density values

	Class	C14	C16	C18	C20	C22	C24	C27	C30	C35	C40	C45	C50
Strength properties in N/mm²													
Bending	$f_{m,0,k}$	14	16	18	20	22	24	27	30	35	40	45	50
Tension parallel	$f_{t,0,k}$	8	10	11	12	13	14	16	18	21	24	27	30
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
Compression parallel	$f_{c,0,k}$	16	17	18	19	20	21	22	23	25	27	28	30
Compression perpendicular	$f_{c,90,k}$	2,0	2,2	2,2	2,3	2,4	2,5	2,5	2,7	2,7	2,8	2,9	3,0
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
Stiffness properties in kN/mm²													
Mean modulus of elasticity parallel bending	$E_{m,0,mean}$	7,0	8,0	9,0	9,5	10,0	11,0	11,5	12,0	13,0	14,0	15,0	16,0
Characteristic modulus of elasticity parallel bending	$E_{m,0,k}$	4,7	5,4	6,0	6,4	6,7	7,4	7,7	8,0	8,7	9,4	10,1	10,7
Mean modulus of elasticity perpendicular	$E_{m,90,mean}$	0,23	0,27	0,30	0,32	0,33	0,37	0,38	0,40	0,43	0,47	0,50	0,53
Mean shear modulus	G_{mean}	0,44	0,50	0,56	0,59	0,63	0,69	0,72	0,75	0,81	0,88	0,94	1,00
Density in kg/m³													
Characteristic. density	ρ_k	290	310	320	330	340	350	360	380	390	400	410	430
Mean density	ρ_{mean}	350	370	380	400	410	420	430	460	470	480	490	520
NOTE 1	Values given above for tension strength, compression strength, shear strength, char. modulus of elasticity in bending, mean modulus of elasticity perpendicular to grain and mean shear modulus have been calculated using the equations given in EN 384.												
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 %, which corresponds to a moisture content of 12% for most species.												
NOTE 3	Characteristic values for shear strength are given for timber without fissures, according to EN 408.												
NOTE 4	These classes may also be used for hardwoods with similar strength profiles such as e.g. poplar or chestnut.												

Table 2 — Strength classes for softwood based on tension tests – strength, stiffness and density values

	Class	CT 8	CT 9	CT 10	CT 11	CT 12	CT 13	CT 14	CT 14,5	CT 15	CT 16	CT 18	CT 21	CT 22	CT 24	CT 26	CT 27	CT 28	CT 30
Strength properties in N/mm²																			
Bending	$f_{m,0,k}$	10	11	13	14	15	16	18	18	19	20	23	26	28	30	33	34	35	38
Tension parallel	$f_{t,0,k}$	8	9	10	11	12	13	14	14,5	15	16	18	21	22	24	26	27	28	30
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	0,4	0,4	0,4	0,4	0,4	0,4
Compression parallel	$f_{c,0,k}$	16	17	17	18	19	20	21	21	21	22	23	25	26	27	28	29	29	30
Compression perpendicular	$f_{c,90,k}$	2,0	2,1	2,2	2,2	2,3	2,4	2,5	2,5	2,5	2,6	2,7	2,7	2,7	2,8	2,9	2,9	2,9	3,0
Shear	$f_{v,k}$	2,8	3,0	3,2	3,4	3,6	3,8	4,0	4,0	4,0	4,0	4,0	4,0	4,0	4,0	4,0	4,0	4,0	4,0
Stiffness properties in kN/mm²																			
Mean modulus of elasticity parallel tension	$E_{t,0,mean}$	7,0	7,5	8,0	9,0	9,5	10,0	11,0	11,0	11,5	11,5	12,0	13,0	13,0	13,5	14,0	15,0	15,0	15,5
Characteristic modulus of elasticity parallel tension	$E_{t,0,k}$	4,7	5,0	5,4	6,0	6,4	6,7	7,4	7,4	7,7	7,7	8,0	8,7	8,7	9,0	9,4	10,1	10,1	10,4
Mean modulus of elasticity perpendicular	$E_{t,90,mean}$	0,23	0,25	0,27	0,30	0,32	0,33	0,37	0,37	0,38	0,38	0,40	0,43	0,43	0,45	0,47	0,50	0,50	0,52
Mean shear modulus	G_{mean}	0,44	0,47	0,50	0,56	0,59	0,63	0,69	0,69	0,72	0,72	0,75	0,81	0,81	0,84	0,88	0,94	0,94	0,97
Density in kg/m³																			
Characteristic. density	ρ_k	290	300	310	320	330	340	350	350	360	370	380	390	390	400	410	410	420	430
Mean density	ρ_{mean}	350	360	370	380	400	410	420	420	430	440	460	470	470	480	490	490	500	520
NOTE 1	CT classes are identical with T classes given in EN 14080.																		
NOTE 2	Values given above for bending strength, compression strength, shear strength, char. modulus of elasticity in tension, mean modulus of elasticity perpendicular to grain and mean shear modulus have been calculated using the equations given in EN 384.																		
NOTE 3	The tabulated properties are compatible with timber at a moisture content consistent with a temperature of 20 °C and a relative humidity of 65 %, which corresponds to a moisture content of 12% for most species.																		
NOTE 4	Characteristic values for shear strength are given for timber without fissures, according to EN 408.																		
NOTE 5	These classes may also be used for hardwoods with similar strength profiles such as e.g. poplar or chestnut.																		

Table 3 — Strength classes for hardwoods based on edgewise bending tests – strength, stiffness and density values

	Class	D18	D24	D27	D30	D35	D40	D45	D50	D55	D60	D65	D70	D75	D80
Strength properties in N/mm²															
Bending	$f_{m,0,k}$	18	24	27	30	35	40	45	50	55	60	65	70	75	80
Tension parallel	$f_{t,0,k}$	11	14	16	18	21	24	27	30	33	36	39	42	45	48
Tension perpendicular	$f_{t,90,k}$	0,6	0,6	0,6	0,6	0,6	0,6	0,6	0,6	0,6	0,6	0,6	0,6	0,6	0,6
Compression parallel	$f_{c,0,k}$	18	21	22	23	25	27	28	30	31	33	34	35	36	38
Compression perpendicular	$f_{c,90,k}$	4,8	4,9	5,1	5,3	5,4	5,5	5,8	6,2	6,6	7,0	8,0	9,0	9,0	9,0
Shear	$f_{v,k}$	3,5	3,7	3,8	3,9	4,1	4,2	4,4	4,5	4,7	4,8	5,0	5,0	5,0	5,0
Stiffness properties in kN/mm²															
Mean modulus of elasticity parallel bending	$E_{m,0,mean}$	9,5	10,0	10,5	11,0	12,0	13,0	13,5	14,0	15,5	17,0	18,5	20,0	22,0	24,0
Characteristic modulus of elasticity parallel bending	$E_{m,0,k}$	8,0	8,4	8,8	9,2	10,1	10,9	11,3	11,8	13,0	14,3	15,5	16,8	18,5	20,2
Mean modulus of elasticity perpendicular	$E_{m,90,mean}$	0,64	0,67	0,70	0,74	0,80	0,87	0,90	0,94	1,04	1,14	1,24	1,34	1,47	1,61
Mean shear modulus	G_{mean}	0,59	0,63	0,66	0,69	0,75	0,81	0,84	0,88	0,97	1,06	1,16	1,25	1,38	1,50
Density in kg/m³															
Characteristic density	ρ_k	475	485	510	530	540	550	580	620	660	700	800	900	900	900
Mean density	ρ_{mean}	570	580	610	640	650	660	700	740	790	840	960	1080	1080	1080
NOTE 1	Values given above for tension strength, compression strength, shear strength, char. modulus of elasticity in bending, mean modulus of elasticity perpendicular to grain and mean shear modulus, have been calculated using the equations given in EN 384.														
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 %, which corresponds to a moisture content of 12% for most species.														
NOTE 3	Characteristic values for shear strength are given for timber without fissures, according to EN 408..														