SLOVENSKI STANDARD
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Wood poles for overhead lines - Determination of characteristic values

Holzmaste für Freileitungen - Bestimmung von charakteristischen Werten

Poteaux en bois pour lignes aériennes - Détermination des valeurs caractéristiques

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29.240.20	Daljnovodi	Power transmission and distribution lines
79.080	Polizdelki iz lesa	Semi-manufactures of timber

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English version

Wood poles for overhead lines - Determination of characteristic values

Poteaux en bois pour lignes aériennes - Détermination des valeurs caractéristiques

Holzmaste für Freileitungen - Bestimmung von charakteristischen Werten

This European Standard was approved by CEN on 21 October 2001.

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EUROPEAN COMMITTEE FOR STANDARDIZATION
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EN 12511:2001 (E)

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Foreword

This European Standard has been prepared by Technical Committee CEN/TC 124 "Structural timber", the secretariat of which 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of an identical text or by endorsement, at the latest by June 2002, and conflicting national standards shall be withdrawn at the latest by June 2002.

According to the CEN/CENELEC Internal Regulations, the national standards organizations of the following countries are bound to implement this European Standard: Austria, Belgium, Czech Republic, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Luxembourg, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland and the United Kingdom.

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EN 12511:2001 (E)

Introduction

This standard is one of five standards covering requirements for visual or machine grading, test methods, determination of characteristic values, methods of specifying durability and sizes.

This standard has been drafted on the assumption that the design requirements for transmission and telecommunication poles will be left to the end-buyer and are not covered by Eurocode 5, which is for the design of buildings and civil engineering structures.

This standard is for initially determining the characteristic values for a given population of poles, and additionally when there is a reason to suspect that the characteristic values for a population have changed.

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1 Scope

This European Standard specifies the methods for determining characteristic values for bending strength and modulus of elasticity, of any population of wood poles. It is not intended for routine quality control.

This standard covers only single poles under cantilever or compression loading. For example, this standard does not cover poles used as beams.

The provision of poles for use in any overhead line or cable infrastructure shall take into account a range of factors not covered by this standard which will necessitate the specification by the end user of complementary and synonymous attributes to those defined in this standard. This refers to requirements for a number of factors including safety, overhead plant, handling, fittings, installation machinery and working practices including climbing.

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 (including amendments).

EN 12479, *Wood poles for overhead lines - Sizes - Methods of measurement and permissible deviations.*

prEN 12509, *Wood poles for overhead lines - Test methods - Determination of elasticity, bending strength, density and moisture.*

EN 12510, *Wood poles for overhead lines - Strength grading criteria*

3 Terms and definitions

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

3.1
characteristic value
value that corresponds to the 5 % fractile of the statistical distribution of strength or the mean value of modulus of elasticity

3.2
fibre saturation point (fsp)
state of a piece of timber when the cell walls are saturated with moisture but no moisture exists in the cell cavities

3.3
pole
long round timber for use in a free standing application

3.4
population
a group of poles defined by having the same parameters of species, source and grade

3.5
sample
number of test poles from one population

3.6
standard size poles
poles of a size 9 m to 10 m long and 180 mm to 220 mm diameter at 1,5 m from the butt end, used for the determination of characteristic values

4 Symbols and abbreviations

E	modulus of elasticity, in newtons per square millimetre
E_{mean}	mean value of modulus of elasticity parallel to grain
f_m	bending strength, in newtons per square millimetre
$f_{m,k}$	characteristic value of bending strength, in newtons per square millimetre
$f_{m,05}$	sample fifth percentile of bending strength, in newtons per square millimetre
k	statistical factor
m	mean value (the variable is given in parentheses)
$m(E)$	sample mean values of modulus of elasticity, in newtons per square millimetre
$m(f_m)$	sample mean value of bending strength, in newtons per square millimetre
$m(f_{m,05})$	mean of $f_{m,05}$ values
n	number of test poles in a sample
s	standard deviation (the variable is given in parentheses)
$s(E)$	sample standard deviation of modulus of elasticity, in newtons per square millimetre
$s(f_m)$	sample standard deviation of bending strength, in newtons per square millimetre

5 Requirements for determination of characteristic values

5.1 General

Characteristic values for poles shall be determined for moisture content levels equivalent to the fibre saturation point (fsp) for each species. Poles for testing shall be conditioned to the fibre saturation point or greater. However, tests can be carried out at other levels of moisture content if sufficient data exist to adjust the results to the fibre saturation point.

NOTE   Results from tests on poles with moisture contents higher than the fibre saturation point will be similar and are acceptable.

Characteristic values for poles shall be determined after any mechanical processing prior to treatment (e.g. incising). Poles to be tested for characteristic values shall be tested in their final condition prior to preservation. Durable poles, used without preservative treatment, shall be tested in their ready to use condition.

The characteristic values shall be determined for poles of a stated population (species, source and grade) and of the standard size.

If it is evident from tests that mechanical properties vary with pole size, then mechanical properties for sizes of pole other than standard size may be determined by applying factors, supported by test evidence, to the characteristic values.

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Sampling, testing and the calculation of characteristic values shall be repeated for each population if there is evidence to suggest that the characteristic values for the population are incorrect.

5.2 Sampling

Several samples of poles shall be selected from the population to represent the range of strength reducing characteristics permitted by the grade and variations within the growth region. The number of samples shall depend upon the size of the growth region and any known or suspected differences in the mechanical properties of poles obtained from different areas of that growth region. In particular the pole taper shall be representative of the range used in service.

For the purposes of determining characteristic values all poles in a sample shall be of the same size in accordance with EN 12479 and of the same species and grade in accordance with EN 12510.

The number of poles in each sample shall not be less than 40.

6 Testing

6.1 General

Testing shall be carried out on standard size poles in accordance with prEN 12509 with the ground line at 1,5 m from the butt end. The characteristic values of bending strength and modulus of elasticity are calculated from the test results using a statistical factor "k" found from Figure 1. This factor takes into account the size of the smallest sample, the number of samples and the nominal area of the forest from which the samples have been selected.

6.2 Bending strength

For each sample a 5-percentile value $f_{m,05}$ shall be obtained from the equation :

$$f_{m,05} = m(f_m) - 1,65\ s(f_m)$$

where

$m(f_m)$ is the mean value of the test results, and

$s(f_m)$ is the standard deviation of the test results

The characteristic value $f_{m,k}$ is then found from :

$$f_{m,k} = k \cdot m(f_{m,05})$$

where

$m(f_{m,05})$ is the mean, weighted according to sample size of the $f_{m,05}$ values for each sample. If $m(f_{m,05})$ is greater than the lowest sample value of $f_{m,05}$ times 1,2 then either the population shall be redefined to eliminate the lowest value, or $m(f_{m,05})$ shall be given the value of 1,2 times the lowest value of $f_{m,05}$.

The value of k is found from Figure 1.

6.3 Modulus of elasticity

The sample mean value of modulus of elasticity $m(E)$ shall be calculated from the equation:

$$m(E) = \frac{\sum E_i}{n}$$