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Structural timber — Wood poles for overhead lines

National foreword

This British Standard is the UK implementation of EN 14229:2010. It supersedes BS EN 12465:2001, BS EN 12479:2002, BS EN 12509:2001, BS EN 12510:2002, and BS EN 12511:2002, which are withdrawn.

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Foreword

This document (EN 14229:2010) has been prepared by Technical Committee CEN/TC 124 “Timber structures”, the secretariat of which is held by AFNOR.

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of an identical text or by endorsement, at the latest by April 2011, and conflicting national standards shall be withdrawn at the latest by April 2011.

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.

This document supersedes EN 12465:2001, EN 12479:2001, EN 12509:2001, EN 12510:2001, EN 12511:2001.

This document has been prepared under a mandate given to CEN by the European Commission and the European Free Trade Association, and supports essential requirements of EU Directive(s).

For relationship with EU Directive(s), see informative Annex ZA, which is an integral part of this document.

According to the CEN/CENELEC Internal Regulations, the national standards organizations of the following countries are bound to implement this European Standard: Austria, Belgium, Bulgaria, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, Switzerland and the United Kingdom.

Introduction

Poles for overhead lines are not covered by EN 1995-1-1 (i.e. Eurocode 5), which is for the design of buildings and civil engineering structures. The supplier is always responsible that all products supplied are in conformity with the requirements of this European Standard and any other specification he is provided with. This European Standard is for the initial determination of the characteristic values for a given population of wood poles (i.e. initial type testing), and additional determination when there is a reason to suspect that the characteristic values for a population have reduced. As far as empirical characteristic values are existing they can be used. Annex E presents some typical minimum characteristic values for wood poles. Furthermore, this standard provides also for requirements on the factory production control with production tolerances to enable the manufacturer of this population of wood poles to be in conformity with the declared characteristic values, derived from the initial type testing.

This European Standard recognises that there are many different visual strength grading rules for timber in use in Europe. These have come into existence to allow for:

— different species or groups of species;

— geographic origin;

— different dimensional requirements;

— varying requirements for different uses;

— the quality of material available;

— historic influences or traditions.

Because of the diversity of existing standards for wood poles for overhead lines in use in different Member States it is currently impossible to lay down a single set of acceptable visual grading rules for all Member States.

This European Standard therefore gives the basic principles to be followed when drawing up regional, national, local or buyer requirements for some characteristics and sets limits for others.

In laying down visual grading rules, two main factors are relevant:

— they clearly define and limit the additional characteristics in poles so that there is a very high confidence that poles supplied meet the required characteristic strength value;

— the rules and the text can be easily understood and be suitable for implementation by grading personnel.

This European Standard is also concerned with the durability characteristics of wood poles for overhead power and telecommunication lines. It assumes that all such poles are constructed from round timber in which the finished product comprises either a central core of heartwood surrounded by a zone of sapwood or the heartwood only.

NOTE Some timber (e.g. abies alba and picea abies) do not allow differentiation between heartwood and sapwood. EN 351-1 specifies how such timber should be treated when preservation is required. For such species there may be different requirements for the incised zone and other parts of the pole.

1 Scope

This European Standard covers requirements for single untreated or preservative treated wood poles for overhead lines under cantilever or compression loading (it does not cover poles used as beams). It covers test methods, determination of characteristic values and methods of specifying durability and sizes. It also establishes principles for visual grading.

This European Standard applies to both softwood and hardwood poles.

This European Standard specifies the evaluation of conformity requirements and the marking of wood poles.

This European Standard does not specify wood poles treated against fire to improve their fire performance.

This European Standard does not quantify the service life that may be expected from a wood pole.

NOTE The service life of a wood pole depends on its geographical location, the associated climate of its service environment and either the natural durability of the heartwood of the species selected, or the combination between selection of species, preservative type, and requirements of retention and any incised zones.

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 212, *Wood preservatives — General guidance on sampling and preparation for analysis of wood preservatives and treated timber*

EN 252, *Field test method for determining the relative protective effectiveness of a wood preservative in ground contact*

EN 350-1, *Durability of wood and wood-based products — Natural durability of solid wood — Part 1: Guide to the principles of testing and classification of the natural durability of wood*

EN 350-2, *Durability of wood and wood-based products — Natural durability of solid wood — Part 2: Guide to natural durability and treatability of selected wood species of importance in Europe*

EN 351-1:2007, *Durability of wood and wood-based products — Preservative-treated solid wood — Part 1: Classification of preservative penetration and retention*

EN 351-2:2007, *Durability of wood and wood-based products — Preservative-treated solid wood — Part 2: Guidance on sampling for the analysis of preservative-treated wood*

EN 599-1, *Durability of wood and wood-based products — Efficacy of preventive wood preservatives as determined by biological tests — Part 1: Specification according to use class*

EN 13183-1, *Moisture content of a piece of sawn timber — Part 1: Determination by oven dry method*

EN ISO 3166-1, *Codes for the representation of names of countries and their subdivisions — Part 1: Country codes (ISO 3166-1:2006)*

EN ISO 9001:2008, *Quality management systems — Requirements (ISO 9001:2008)*

ISO 2859-1, *Sampling procedures for inspection by attributes — Part 1: Sampling schemes indexed by acceptable quality limit (AQL) for lot-by-lot inspection*

3 Terms and definitions

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

3.1
bark pocket
bark that is partly or wholly enclosed in the wood

3.2
characteristic value
value that corresponds to the 5 % fractile of the statistical distribution of strength or the mean value of modulus of elasticity

3.3
charge
all the wood treated together in one treatment at one time

3.4
crack
separation of wood fibres across the grain

NOTE Cracks may be due to internal strains resulting from unequal longitudinal shrinkage, or the fibres being crinkled by compression or other external forces.

3.5
decay
decomposition of wood by fungi or other micro-organisms resulting in softening, progressive loss of mass and strength, and often a change of texture and colour

3.6
direct testing
testing of the preservative treatment achieved by the direct measurement of the penetration and retention of preservative

3.7
double sweep
sweep characterized by two or more bends in one or several planes

3.8
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

3.9
fissure
longitudinal separation of fibres

3.10
grain detector
device for detecting the angle of grain in timber

3.11
growth rate
mean number of growth rings per 25 mm

3.12
heart shake
radial end shake originating at the pith

3.13
incised zone
area of the lateral surface of the pole which has undergone an incising process as an aid to securing deeper and more uniform penetration of preservative

NOTE The minimum limit of the incised zone should be 400 mm above and 400 mm below the specified ground line for the pole in service.

3.14
included sapwood
presence in the heartwood of a complete or incomplete ring having the colour and the properties of sapwood

3.15
indirect testing
testing of the preservative treatment achieved by measurement of a property found to exhibit a correlation between itself and the penetration and retention of preservative

3.16
knot
portion of a branch embedded in wood

3.17
knot cluster
knots located so that no grain recovery is evident between adjacent knots

3.18
knot diameter
dimension of the knot measured on the surface of the pole and perpendicular to the axis of the pole

NOTE The diameter takes the entire knot into account, excluding the sapwood.

3.19
length
distance from the pole butt to the pole tip

3.20
maximum diameter
maximum diameter of the pole at the section of measurement

3.21
minimum diameter
minimum diameter of the pole at the section of measurement

3.22
moisture content
ratio of the mass of the quantity of water in a material to the mass of the dry material

3.23
nominal diameter
a) theoretical diameter for poles with 5 % or less ovality;

b) minimum diameter for poles with greater than 5 % ovality

3.24
ovality
difference between the maximum and minimum diameter at a cross section expressed as a percentage of the minimum diameter

3.25
pith
innermost part of the pole

3.26
pole
long round timber for use in a free standing application

3.27
pole butt
lowermost point of the thicker end of the pole

3.28
pole tip
uppermost point of the narrow end of the pole

3.29
population
group of poles defined by having the same species, source and grade

3.30
rind gall
surface wound that has been partially enclosed by the growth of a tree

3.31
ring shake
fissure following the line of a growth ring

3.32
sample
one or more poles taken from a single population

3.33
sampling unit
single preservative-treated pole taken from a charge

3.34
scribe
cranked rod with a swivel handle and a needle at the tip, set to a slight trailing angle

NOTE Used as a grain detector by pressing the needle into the timber and drawing it across the surface in the apparent direction of the grain.

3.35
section of maximum stress
section of pole where the diameter equals 1,5 × diameter at point of application of load, if this section is above ground line or otherwise the actual ground line section

3.36
short crook (local deflection)
natural deviation of the axis of the pole occurring on a length less than 1,5 m

3.37
single sweep
sweep characterised by one bend only

3.38
slope of grain
divergence of the direction of the fibres from the longitudinal axis of the piece

3.39
standard size pole
pole of a size 8 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

3.40
star shake
two or more heart shakes

3.41
sweep
deviation of the longitudinal axis of round timber from a straight line

3.42
taper
gradual reduction in diameter of a stem along its height or round timber along its length

3.43
theoretical diameter
diameter of a circle with the same circumference as the actual circumference at the section of measurement

4 Symbols and abbreviations

d_g nominal diameter at assumed ground-line, in millimetres

d_q nominal diameter at point of load application, in millimetres

d_{max} nominal diameter at section of maximum stress, in millimetres

E modulus of elasticity parallel to grain in bending, in newtons per square millimetre

f_m bending strength – maximum stress at assumed ground line or point of maximum stress if this is above the assumed ground line, in newtons per square millimetre

I_q second moment of area of cross section at point of load application, in N/mm^4

l pole length measured from butt to tip, in millimetres

l_g distance from butt to assumed ground-line, in millimetres

l_{max} distance from butt to section of maximum stress or ground line, whichever is the greater, in millimetres

l_q distance from tip to position of applied load, in millimetres

Q applied load, in newtons

s_a-s_0 movement of load application point parallel to longitudinal axis of the pole during testing, in millimetres (see Figure 1)

t_a-t_0 deflection at point of load application, in millimetres (see Figure C.1)

E_{mean} mean value of modulus of elasticity parallel to grain, 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), in newtons per square millimetre
$m(E)$	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, in newtons per square millimetre
n	number of test poles in a sample
s	standard deviation (the variable is given in parentheses), in newtons per square millimetre
$s(E)$	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 General requirements

5.1 Species

The species used for wood poles shall be declared. The species commonly used with their names and marking codes are listed in Table 1.

Where other species than those given in Table 1 are used they shall also conform to this European Standard and shall be marked with the code, which consists of the first letter of species name and as many letters of the second word of species name as are necessary to avoid confusion.

NOTE Common names of the species are different depending upon language version.

Table 1 — Species commonly used for wood poles and their marking codes

Botanical species	Common name	Marking code
Abies alba	Fir	AA
Abies pectinata	Fir	AP
Larix species	Larch	LE
Picea abies	Spruce	PA
Picea sitchensis	Sitka spruce	SS
Pinus laricio	Corsican pine	PL
Pinus nigra	Corsican / Austrian pine / Black pine	PN
Pinus pinaster	Maritime pine	PP
Pinus sylvestris	Scots pine / Redwood	PS
Pinus uncinata	Mountain pine	PU
Pseudotsuga menziesii	Douglas fir	PM

5.2 Felling and wood preparation

5.2.1 Tree felling

The trees shall be felled when the rising sap is low, except for timber, which is to be treated by a sap displacement process. If necessary the trees can be felled when the sap is high provided the necessary measures are taken to avoid pre-treatment decay or attack by insects.

5.2.2 Handling of wood

The method of handling shall avoid any damage that could alter the mechanical performance and durability of the wood pole, as well as the suitability of the wood pole for preservative treatment.

5.2.3 Mechanical pre-treatments

Where wood poles are mechanically pre-treated before preservation, e.g. through incising, testing in accordance with Clause 6 shall be carried out after the mechanical pre-treatment.

5.3 Sizes and permissible deviations

The size of the wood poles, specified by the overall length, the nominal diameter at 1,5 m from the butt and the nominal diameter at the tip, measured in accordance with 6.1, shall be declared. The permissible deviations shall be:

— length: (-1 / +2) %;

— diameter: (-0 / +40) mm, unless otherwise declared by the manufacturer.

NOTE A list of commonly used wood pole sizes (minimum nominal diameter at 1,5 m from the butt and length) is given in Annex A.

5.4 Bending strength and modulus of elasticity

Either the maximum top load and deflection of the wood pole or its characteristic bending strength and modulus of elasticity combined with the minimum diameter at 1,5 m from the butt and the minimum diameter at the tip, determined in accordance with Annexes C and D shall be declared.

The declared characteristic values shall include quantitative limits for the additional characteristics determined according to 5.5.

NOTE Typical minimum characteristic values for wood poles are presented in Annex E.

5.5 Additional characteristics

5.5.1 Knots, knotholes and knot clusters

The maximum dimension of knots, knotholes and knot clusters shall be measured in the following manner (see also Figure 1):

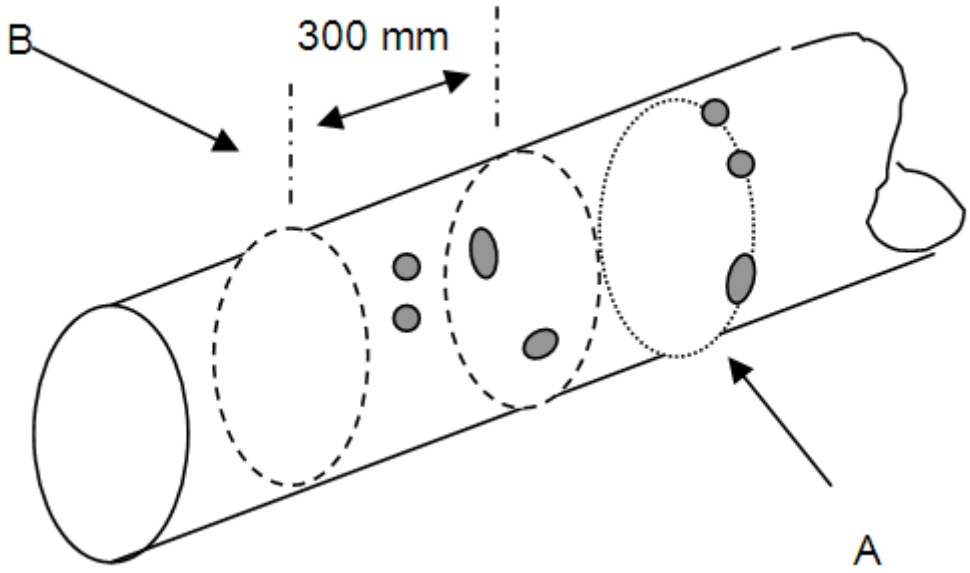
a) individual knots or knot clusters – maximum diameter of knots or knot clusters expressed as a factor of the circumference of the wood pole at the point where the knot occurs;

and

b) multiple knots, etc. – maximum sum of all the knot diameters in any 300 mm length of the wood pole, expressed as a factor of the circumference of the wood pole at the mid point of the 300 mm length (e.g. factor = knot diameter in mm/circumference of pole at cross section in millimetres).

The measurement of the individual knot or knot clusters shall be according to 6.2.

NOTE Different limitations on knot sizes may be specified for different portions of the wood pole, e.g. the top third of poles over 13 m length could have different knot limitations from the rest of the pole.



Key

A Case 1) Individual knots or knot clusters

B Case 2) Multiple knots in any 300 mm length of the wood pole

Figure 1 — Measurement of knots

5.5.2 Slope of grain

The slope of grain relative to the longitudinal axis shall be measured according to 6.3. There shall be no significant changes in the slope of grain.

5.5.3 Heartwood

For hardwood poles, the minimum area of heartwood, when measured at the butt, shall be declared.

5.5.4 Rate of growth

The rate of growth shall be declared as the minimum number of growth rings per 25 mm, when measured in accordance with 6.4 (i.e. maximum growth rate).

5.5.5 Straightness

Single sweep shall be permitted to the extent that the longitudinal axis of the wood pole remains within a distance of 1 % of the pole length from a straight line drawn from the centre of the tip to the centre of the pole 1,5 m from the butt.

Double sweep or short crook shall be permitted to the extent that a straight line from the centre of the top to the centre of the wood pole 1,5 m from the butt remains within the wood pole.

Where double sweep and short crook exist, these shall be declared.

5.5.6 Bark pockets and rind galls

Bark pockets and rind galls shall be permitted without limitation in the first 1 m of length from the butt. Above the first 1 m length from the butt bark pockets and rind galls shall be measured according to 6.5. Depth, position and number shall not exceed those given for mechanical damage specified in 5.5.7. They shall be specified by length, width and depth, expressed as a percentage of the nominal diameter of the wood pole at that point.

5.5.7 Mechanical damage

Mechanical damage shall not extend to a depth of the wood pole that reduces the diameter by more than 5 % of the diameter at any cross section, when measured in accordance with 6.6. No more than two occurrences of mechanical damage shall be permitted and no part of these shall be less than 500 mm apart.

5.5.8 Ring and star shake

The tip shall be free from ring shake or star shakes with five or more points. At the butt, one complete ring or one star shake shall be acceptable, provided that not more than two points extend to within 5 mm from the wood pole circumference. If they extend to the circumference they shall not extend along the wood pole more than 500 mm from the butt.

5.5.9 Fissures

Seasoning fissures along the grain of the wood pole are expected and may not be recognised as defects providing they do not have a depth greater than half the diameter at one point along the wood pole or does not exceed 50 % of the length of the wood pole, when measured according to 6.7.

5.5.10 Sources

Wood poles shall not be manufactured from trees subjected to snow breakage, frost damage, windfall or from forests damaged by fire.

5.5.11 Decay and insects

Wood poles shall be sound and free from decay and attack by insects. Minor insect holes shall be acceptable providing these are, either, not larger than 1,5 mm in diameter and do not exceed 5 in number, or not larger than 1,0 mm in diameter and do not exceed 20 in number, evenly distributed in any 100 mm length of the wood pole.

5.5.12 Included sapwood

No included sapwood in heartwood shall be permitted in hardwood wood poles.

5.5.13 Cracks

Cracks across the wood pole and the grain shall not be permitted.

5.5.14 Other criteria

Circumstances of specific or regional use of wood poles may call for additional criteria and limits to be declared. These shall only be criteria which affect the strength.

5.6 Untreated wood poles

Untreated wood poles may be used in service if the amount of sapwood present is such that its loss would not compromise the integrity of the pole during its service life, and the heartwood has sufficient natural durability.

The natural durability class to wood-destroying fungi of the heartwood of a wood pole shall be declared by reference to the system defined in EN 350-1. Species in Classes 1 and 2 (i.e. very durable and durable to wood destroying organisms) and species in Classes D and M (i.e. durable and moderately durable to insects), respectively, may be specified for wood poles used without preservative treatment.

The natural durability class shall be established either:

a) by testing the wood species concerned according to the principles laid down in EN 350-1; or

b) by reference to EN 350-2, where wood species are listed as complying with the various classes of natural durability to wood-destroying organisms (i.e. fungi, Anobium, Hylotrupes and termites). Timber species with a natural durability classification that includes a range (e.g. "4-5") shall be regarded as having a natural resistance associated with the larger quoted number.

5.7 Preservative treated wood poles

5.7.1 General

Where the loss of sapwood would compromise the integrity of the wood pole during its service life preservative treatment is normally required in order to provide the poles with sufficient enhanced durability.

Wood poles shall be inspected after they have been dressed and not more than one month prior to preservative treatment.

The wood poles shall be free from features, which would prevent a proper application of preservative and thus impair the function of the preservative-treated wood poles when in service.

All dressing, notching, pre-cutting and boring of the wood pole shall be completed before preservative treatment. Prior to preservative treatment the moisture content of the wood pole shall be at a level appropriate to the wood preservative and method of treatment used.

Preservative treatment shall be defined in terms of depth of lateral penetration of preservative into the treated wood pole and retention of preservative within that treated zone according to the requirements of EN 351-1. For the purposes of verifying compliance with EN 351-1, a charge shall be considered.

The preservative treatment used shall not compromise the performance of the wood pole in service.

NOTE Preservation of wood by mechanical and structural means may be considered.

5.7.2 Requirements for wood preservatives

Wood preservatives used shall conform to the performance requirements of Use Class 4 preservatives as defined in EN 599-1 and shall be declared. For the purposes of this European Standard, determination of compliance with the performance requirements of EN 599-1 shall include data from the field test in EN 252 and any of the additional local tests given in EN 599-1 applicable to the place of use of the product.

5.7.3 Penetration requirement

The penetration requirement shall be defined in terms of the penetration classes listed in EN 351-1. Following completion of the preservation process, treated poles shall meet the requirements of the selected penetration class of EN 351-1.

5.7.4 Retention requirement

Following completion of the preservation process, the retention requirement specified by the user for treated wood poles shall be equal to or greater than the critical value for End Use Class 4 of the preservative used (see EN 559-1). This critical value shall be calculated from the prescribed biological tests defined in EN 599-1 including the field test in EN 252.

Multiples greater than one may be applied to the critical value to specify higher retentions as a means of increasing the service life. In the case of established preservatives where a critical value has not yet been determined, the retention shall be specified using service experience as its basis.

5.7.5 Tolerances for preservative-treated charge

5.7.5.1 Penetration tolerances

Sampling for penetration shall be as detailed in 7.3.4.2.2 and shall be subject to an acceptable quality level (AQL) of 10 % using inspection level II (see EN 351-2:2007, Table 1). However, a lower percentage AQL may be declared.

5.7.5.2 Retention tolerances

The mean retention in the complete analytical zone (see EN 351-1) shall be equal to or greater than the retention requirement specified according to 5.7.4.

6 Test methods

6.1 Length and diameter

Length of the wood pole shall be measured using a tape measure. Maximum and minimum diameters shall be measured using callipers. Alternatively, the theoretical diameter may be calculated from the circumference measured by using a tape measure.

All measurements shall be made when the wood pole is at or above fibre saturation point, determined in accordance with 6.8.

Where one or both ends of the wood pole are not cut square, the minimum length shall be recorded.

The taper of wood poles covered by this European Standard is expected to be between 6 mm and 16 mm per metre length.

6.2 Knots and knot clusters

The dimension of a knot or knot cluster shall be measured as the diameter of a knot measured on the surface of the pole and perpendicular to the axis of the pole. Knot clusters shall be treated as a single knot.

6.3 Slope of grain

The slope of grain shall be measured over a minimum 1 m length of the wood pole.

EXAMPLE A slope of 1 in 8 represents 1/8 m (i.e. 125 mm) deviation over a 1 m length along the axis of the pole.

The grain direction of the wood pole shall be determined by one of the following methods from which the slope of grain shall be calculated either:

a) by taking a line parallel to the surface fissures; or

b) by the use of a grain detector (scribe).

6.4 Rate of growth

Rate of growth shall be measured at either the tip or butt of the wood pole and expressed as the mean number of growth rings per 25 mm. The measurements shall be made over a radial line, as long as possible, commencing 50 mm from the pith. For wood poles that have a theoretical diameter of less than 150 mm, measurement shall be made over a radial line as long as possible commencing from the circumference.

6.5 Bark pockets and rind galls

The dimensions of each bark pocket and rind gall shall be measured as the overall length, width at the widest point and depth at the deepest point.

6.6 Mechanical damage

The wood pole diameter on which the measurement of the damage is based shall be calculated on the nominal diameter at the cross section where the damage occurs. To determine the nominal diameter, the nominal diameter of the sound wood pole immediately above and below the damage shall be measured and averaged. The minimum diameter of the damaged cross section shall be measured and the reduction in diameter determined.

6.7 Fissures

The depth of fissures shall be measured by inserting a 0,2 mm feeler gauge as far as possible into the fissure.

6.8 Determination of moisture content

6.8.1 For untreated wood poles, the moisture content of test specimens shall be determined in accordance with the procedure of EN 13183-1 on a disc of timber cut from the wood pole. The disc shall be of full cross-section, free from knots and resin pockets and shall be at least 50 mm in thickness.

6.8.2 In the case of preservative treated wood poles, the determination of moisture content using the above method shall be restricted to material cut from untreated areas. If the moisture content of treated material is required then methods appropriate to the specific preservative treatment shall be used. The presence or otherwise of treatment in the specimens shall be recorded. Moisture content shall be determined in accordance with EN 212.

6.8.3 In the case of ultimate strength tests, the disc shall be cut as closely as possible to the fracture.

6.8.4 For determining the moisture content of a pole prior to treatment or test the procedures given in EN 13183-1 shall be applied to borings taken in accordance with Annex B. The boring sample used for determination of moisture content shall include the full depth of sapwood or the innermost 75 mm of sapwood, whichever is the lesser. Alternative methods of measurement, such as electrical resistance moisture meters in accordance with EN 13183-2, may be used provided that it can be demonstrated that the measurements taken relate to measurements taken in accordance with the above method.

7 Evaluation of conformity

7.1 General

The conformity of wood poles for overhead lines with the requirements of this European Standard and with the declared performances (i.e. values, classes) for the stated characteristics of the poles shall be demonstrated by:

— initial type testing;

— factory production control by the manufacturer, including product assessment.

For the purposes of this European Standard, initial type testing also covers the evaluation of performance by calculation or visual assessment of the wood pole. Tests performed as a part of factory production control of existing production may also be used for initial type testing purposes as long as they use the same test or assessment methods described in this European Standard.

7.2 Initial type testing (ITT)

Initial type testing of the wood pole shall be performed to show conformity with this European Standard. Tests previously performed in accordance with the provisions of this European Standard (i.e. same product, characteristic(s), test method, sampling procedure, system of attestation of conformity, etc.) may be taken into account for the purpose of ITT. In addition, the initial type testing shall be performed at the beginning of the production of a new type of wood pole or at the beginning of a new method of production (where this may affect the declared performance characteristic(s) of the pole).

All characteristics in 5.1, 5.2, 5.3, 5.4 and 5.5, including on durability aspects (see 5.6 or 5.7, as relevant), shall be subject to the initial type testing, where they are relevant for the wood poles in question.

Whenever a change occurs in the wood pole, the raw material or supplier of the components, or the production process, which would have significant impact on one or more of the characteristics, the initial type testing shall be repeated for the appropriate characteristic(s).

Sample sizes for the initial type testing shall be in accordance with Annex D.

Initial type testing reports shall be held by the manufacturer for at least ten years after the date of last production of the poles to which they relate.

7.3 Factory production control (FPC)

7.3.1 General

The manufacturer shall establish, document and maintain an FPC system to ensure that the wood poles placed on the market conform with the declared performance characteristics. The FPC system shall consist of procedures, regular inspections and tests and/or assessments and the use of the results to control raw and other incoming materials or components used for the pole, equipment, the production process and the pole itself.

All the elements, requirements and provisions adopted by the manufacturer shall be documented in a systematic manner in the form of written policies and procedures. This production control system documentation shall ensure a common understanding of conformity evaluation and enable the achievement of the required material or component characteristics and the effective operation of the production control system to be checked.

Factory production control therefore brings together operational techniques and all measures allowing maintenance and control of the conformity of the material or component with its technical specifications. Its implementation may be achieved by controls and tests on measuring equipment, raw materials and constituents, processes, machines and manufacturing equipment and finished components, including material properties in components, and by making use of the results thus obtained.

The FPC system shall fulfil the requirements as described in the following clauses of EN ISO 9001:2008, where applicable:

— 4.2 (except 4.2.1, a));

— 5.1, e), 5.5.1, 5.5.2;

— Clause 6;

— 7.1 (except 7.1, a)), 7.2.3, c), 7.4, 7.5, 7.6;

— 8.2.3, 8.2.4, 8.3, 8.5.2.

The FPC system may be part of a quality management system, e.g. in accordance with EN ISO 9001:2008.

The results of inspections, tests or assessments requiring action shall be recorded, as shall any action taken. The action to be taken when control values or criteria are not met shall be recorded and retained for the period specified in the manufacturer's FPC procedures.

The specifications of all incoming raw materials and components shall be documented, and the inspection scheme for ensuring their conformity shall be recorded in the manufacturer's FPC documentation.

7.3.2 Product specific requirements

The FPC system shall:

— be specific to the needs of this European Standard; and

— ensure that the wood poles placed on the market conform with this European Standard.

7.3.3 FPC for untreated products

In order to ensure consistent compliance with the initially declared performances of untreated wood poles, a factory production control system shall be operated in conformity with 7.3.1 and 7.3.2.

7.3.4 FPC for preservative treated products

7.3.4.1 General

In order to ensure consistent quality in the preservative treatment of wood poles, a factory production control system shall be operated in conformity with 7.3.1, 7.3.2 and Clause 7 (i.e. FPC) of EN 351-1:2007. Such a system shall include the option of using direct or indirect testing methods. Indirect methods may be used provided that a correlation is established between the results obtained by indirect method and those on the direct method. The relationship and how it was determined shall be recorded in the FPC documentation.

7.3.4.2 Frequency and sampling for direct testing

7.3.4.2.1 Frequency

Where direct testing methods are used to assess quality of preservative treatment, such methods shall be carried out on every charge of wood poles.

7.3.4.2.2 Sampling for direct testing

The number of preservative-treated wood poles to be sampled (i.e. sampling units) in a charge shall be calculated according to ISO 2859-1 (see EN 351-2 for general information on sample size) and to the inspection level detailed in 5.7.5.1. Sampling units shall be selected at random from a charge immediately after appropriate post-treatment conditioning, so that all wood poles within a charge have an equal chance of being included in the sample.

7.3.4.2.3 Selection of test samples from sampling unit

Where penetration and retention characteristics can be determined from the same test sample, at least one test sample shall be taken from each sampling unit. Where this is not possible, a minimum of two test samples shall be taken from each sampling unit. Test samples shall be taken from clear, straight-grained wood, away

from splits, checks or other defects and at least 100 mm from knots in the longitudinal direction. Each test sample shall be taken from a zone between 1 m and 4 m from the butt end of the wood pole.

A scheme for sampling preservative-treated wood poles, to allow determination of compliance with the requirements of 5.7.5.1 and 5.7.5.2, is described in Annex B.

NOTE Suggested methods of sampling wood poles are described in EN 351-2.

7.3.4.3 Frequency of indirect testing

Where a safe relationship has been established between both the penetration and retention requirements given in 5.7.3 and 5.7.4, together with their tolerances given in 5.7.5 and other characteristics associated with the treated wood poles (e.g. specific quantifiable parameters of the treatment process) the latter may be used to determine the quality compliance of preservative treatment on a charge basis.

The validity of the established safe relationship shall be verified at least every six months by carrying out both direct and indirect testing on the same charge of treated wood poles.

7.3.5 Initial inspection of factory and of FPC

Initial inspection of factory and of FPC shall generally be carried out when the production is already running and the FPC is already in practice. It is, however, possible that the initial inspection of factory and of FPC is carried out before the production is already running and/or before the FPC is already in practice.

The following shall be assessed:

a) the FPC-documentation; and

b) the factory.

In the initial assessment of the factory and FPC it shall be verified:

c) that all resources necessary for the achievement of the product characteristics required by this European Standard are or will be available; and

d) that the FPC-procedures in accordance with the FPC-documentation are or will be implemented and followed in practice; and

e) that the product complies or will comply with the initial type testing samples, for which compliance with this European Standard has been verified.

All factories of the manufacturer where, for the product being evaluated, final assembling and/or final testing is performed, shall be visited to verify compliance with this standard. One visit may cover one or more products, production lines and/or production processes. If the FPC system covers more than one product, production line or production process, and if it is verified that the general requirements are fulfilled, the assessment of these general requirements does not need to be repeated when assessing the product-specific requirements for another product.

Assessments previously performed in accordance with the provisions of this standard may be taken into account providing that they were made to the same system of attestation of conformity on the same product or products of similar design, construction and functionality, such that the results may be considered applicable to the product in question.

NOTE Same system of attestation of conformity means inspection of FPC by an independent third party under the control of a product certification body.

All assessments and their results shall be documented in a report.

7.3.6 Continuous surveillance

A continuous surveillance, assessment and approval of factory production control shall be carried out at a maximum period of two years otherwise whenever there are significant changes in the production process including impregnation process at the manufacturer.

NOTE Significant change is any measure related to a wood pole, which consequence is or is going to modify the declared performances of its stated characteristics at CE marking for more than it is allowed by this European Standard.

If a fundamental breakdown in the FPC is found and reported, this period may be reduced back to a maximum of six months.

All assessments and their results shall be documented in a report.

8 Marking

Each wood pole shall be marked with any or all of the following information or the information provided in the accompanying documentation:

a) length of pole (in metres) (see 5.3);

b) nominal diameter at 1,5 m from the butt (in millimetres), or size code (see 5.3);

c) gauge or depth mark at 3 m from the butt (or as agreed between buyer and manufacturer);

d) species and origin designated by code letters (country code shall be in accordance with EN ISO 3166-1) (see 5.1);

e) last two digits of the year of preservation (where applicable);

f) natural durability class (if untreated), determined by testing or reference to EN 350-2 (see 5.6);

g) preservative (designated by its reference code (where applicable)) penetration class (see 5.7.3) and retention (see 5.7.4);

h) code of the manufacturer (where applicable);

i) buyer specification against which the wood pole is supplied (where applicable);

j) reference to this European Standard;

k) the maximum top load and deflection or the characteristic bending strength combined with the minimum diameter at 1,5 m from the butt and the minimum diameter at the tip;

l) straightness parameters;

m) visual characteristics;

n) limits and additional criteria on specific or regional use.

NOTE 1 Information on e) and g) are only required if the poles have been treated with a preservative.

NOTE 2 Where ZA.3 covers the same information as this clause, the requirements of this clause are met.

The above information shall be in a form that can readily be interpreted by utility staff working from ground level.

Annex A
(informative)

Commonly used sizes for wood poles

NOTE See 5.3.

Length m	**Minimum nominal diameter (at 1,5 m from butt)** mm													
6	120	130	140	150	160	170								
7	130	140	150	160	170	180	190	200	210					
8	140	150	160	170	180	190	200	210	220					
9	150	160	170	180	190	200	210	220	230	240	250	260	270	280
10	160	170	180	190	200	210	220	230	240	250	260	270	280	290
11	170	180	190	200	210	220	230	240	250	260	270	280	290	300
12	190	200	210	220	230	240	250	260	270	280	290	300	310	320
13	210	220	230	240	250	260	270	280	290	300	310	320	330	340
14		230	240	250	260	270	280	290	300	310	320	330	340	350
15		250	260	270	280	290	300	310	320	330	340	350	360	
16		260	270	280	290	300	310	320	330	340	350	360	370	
17		280	290	300	310	320	330	340	350	360	370	380		
18		300	320	340	360	380	400	420						
19		330	350	370	390	410	430							
20		340	360	380	400	420	440							
21		350	370	390	410	430	450							
22		370	390	410	430	450								
23		400	420	440	460	480								
24		420	440	460	480	500								

Annex B
(normative)

Scheme for sampling preservative-treated wood poles

NOTE See 6.8.4 and 7.3.4.2.2.

B.1 Method by taking borings

B.1.1 General

Borings shall be taken with a sharp increment borer (e.g. Mattson borer), which extracts a core of minimum diameter 4 mm.

If the wood poles have been incised, borings shall be taken at a point midway between adjacent incisions.

At the selected point on the surface of each pole (see 7.3.4.2.3) the borer shall be held at right angles to the grain direction and directed towards the pith. The borer shall penetrate each pole to a greater depth than the penetration being measured.

After removal of the borings, borer holes shall be promptly plugged with a tight-fitting wooden plug treated with preservative in a similar way to the poles themselves.

One boring shall be taken from each wood pole where both penetration and retention determinations can be completed using one boring. However, two borings shall be taken from each pole (i.e. one boring for penetration and one for retention determinations) where this cannot be achieved.

B.1.2 Examination of borings

B.1.2.1 Penetration of preservative

Differentiation of heartwood and sapwood, and the limit of penetration of the preservative, may be apparent because of colour differences. Where this is not possible, the application of physical or chemical agents shall be necessary to reveal the sapwood zone and the penetration of the preservative chemicals.

B.1.2.2 Retention of preservative

The complete analytical zone associated with the selected penetration class as defined in EN 351-1 shall be separated from each boring. These shall be combined into a single sample and converted to a form suitable for quantitative chemical analysis and thus analysed.

B.2 Method by taking a cross section

Determination of lateral penetration a complete cross-section test sample shall be obtained from the sampling unit by making two saw cuts completely through the test sample beyond the extend of axial penetration 10 mm apart and perpendicular to the longitudinal axis of the pole.

Cross-sections selected for the determination of retention shall be cut to include only the analytical zone. However, for round wood cross-sections a sector shall be removed and the required analytical zone taken from the sector. A 10° sector shall be adequate.

Annex C
(normative)

Test method for wood pole characteristics

NOTE See 5.4 and D.3.1.

C.1 Principle

The bottom section of the wood pole under test shall be rigidly clamped up to 1,5 m from the butt or the assumed position of the ground line. A load shall be applied 150 mm from the tip of the pole in a direction perpendicular to the original axis of the pole.

NOTE As the direction of loading imposed on the wood pole in practice is not known, it is important that the value of f_m determined relates to the apparent weakest direction of the pole. A procedure for determining the direction of test is given in C.4.

C.2 Preparation

Prior to testing the following data shall be measured and recorded:

a) length of the pole in accordance with 5.3;

b) the circumference at 0,5 m intervals from butt to tip, measured to an accuracy of ± 1 %, and including the following positions:

   1) butt;

   2) point of application of the test load;

   3) 1,5 m from the butt or the assumed ground-line;

   4) tip;

c) the location and size of any additional characteristics as defined in 5.5, including those in the following list, shall be recorded for the purpose of later verification that the poles tested for the determination of characteristic values are representative of the true population:

   1) decay and insects (see 5.5.11);

   2) straightness (see 5.5.5);

   3) knots (see 5.5.1);

   4) mechanical damage (see 5.5.7);

   5) slope of grain (see 5.5.2);

   6) thickness of sapwood;

   7) in barks and rind galls (see 5.5.6);

8) fissures (see 5.5.9);

9) ring and star shakes (see 5.5.8).

C.3 Apparatus

C.3.1 Two pairs of clamps, capable of rigidly restraining the section of wood pole below the assumed position of ground-line during testing.

Each of these clamps shall be faced with a pair of timber shoes of at least 500 mm in length and shaped to fit approximately to the curvature of the wood pole under test. The clamping pressure applied to the wood pole shall allow it to be rigidly clamped but shall not cause damage to the wood pole.

C.3.2 Loading mechanism, capable of applying a measured load at a position 150 mm from the tip of the pole in a direction perpendicular to the original centre line of the pole.

The angle between the applied load and the original centre line of the poles shall be maintained at (90 ± 3)°. One means of achieving this is described in C.7.

C.3.3 Load-monitoring device, capable of measuring and continuously recording the load applied to an accuracy of ± 1 % of actual reading.

C.3.4 Device for measuring and recording the deflection at the point of load application to accuracy of ± 1 % of actual reading.

C.3.5 Device for continuously measuring the distance between the clamping position (assumed ground line) and the load application point in a direction parallel to the original axis of the pole to an accuracy of ± 1 % of actual reading.

C.4 Procedure

C.4.1 The direction of test shall be determined before test by gently rolling the test pole on supports at the butt and tip to identify its "natural rest" position. The direction of test shall be such that the underside of the test pole in its "natural rest" position shall be in tension.

C.4.2 The test pole shall be positioned in the rig and clamped over the section of the test pole below the assumed ground-line (see C.1). The clamping pressure applied to the pole shall allow it to be rigidly clamped but shall not cause damage to the timber.

C.4.3 The load shall be applied to a point near the tip of the test pole and a series of at least 30 pairs of load and corresponding deflection measurements shall be obtained at a constant rate of increase of load up to a load level of approximately 30 % of the predicted maximum load capacity of the wood pole. This load shall be reached within (90 ± 30) s. If this load level exceeds the linear section of the load versus deflection curve, then that test pole shall be rejected and the load level shall be reduced for subsequent tests.

C.4.4 Load may then be removed and reapplied at a constant rate of increase so that failure occurs within (300 ± 120) s or loading may continue to failure within the same total time period. The position and type of failure shall be recorded.

C.4.5 Maximum stress points shall be calculated at the ground line cross section or at the cross section where the diameter is 1,5 times the diameter of the cross section at the load application point subject to that cross section being above the ground line.

C.4.6 After testing, the moisture content shall be determined for samples cut from close to the position of failure and values determined in accordance with 6.8. The location, type of specimens and method used shall be recorded.

C.5 Results

C5.1 The calculations shall be made taking the theory of linear elasticity as a basis.

C.5.2 A value of modulus of elasticity (E) shall be calculated according to the following equation:

$$E = \frac{Q(l - l_g - l_q - (s_a - s_0))^3 d_q{}^3}{3I_q(t_a - t_0)d_g{}^3} \quad \text{(C.1)}$$

The symbols in the above equation are shown in Figure C.1 and Clause 4.

NOTE For the above equation to apply the following assumptions have been made:

a) the wood pole is circular in cross section along its length;

b) the wood pole has a linear taper between the ground line and the point of load application;

c) the magnitude of deflection is small relative to the pole geometry, such that second order effects can be ignored;

d) the wood pole has a constant and uniform modulus of elasticity.

C.5.3 The bending strength (f_m) of the wood pole shall be calculated according to the following equation:

$$f_m = \frac{32Q(l - l_{max} - l_q - (s_a - s_0))}{\pi d_{max}{}^3} \quad \text{(C.2)}$$

For the above equation, the Note in C.5.2 applies.

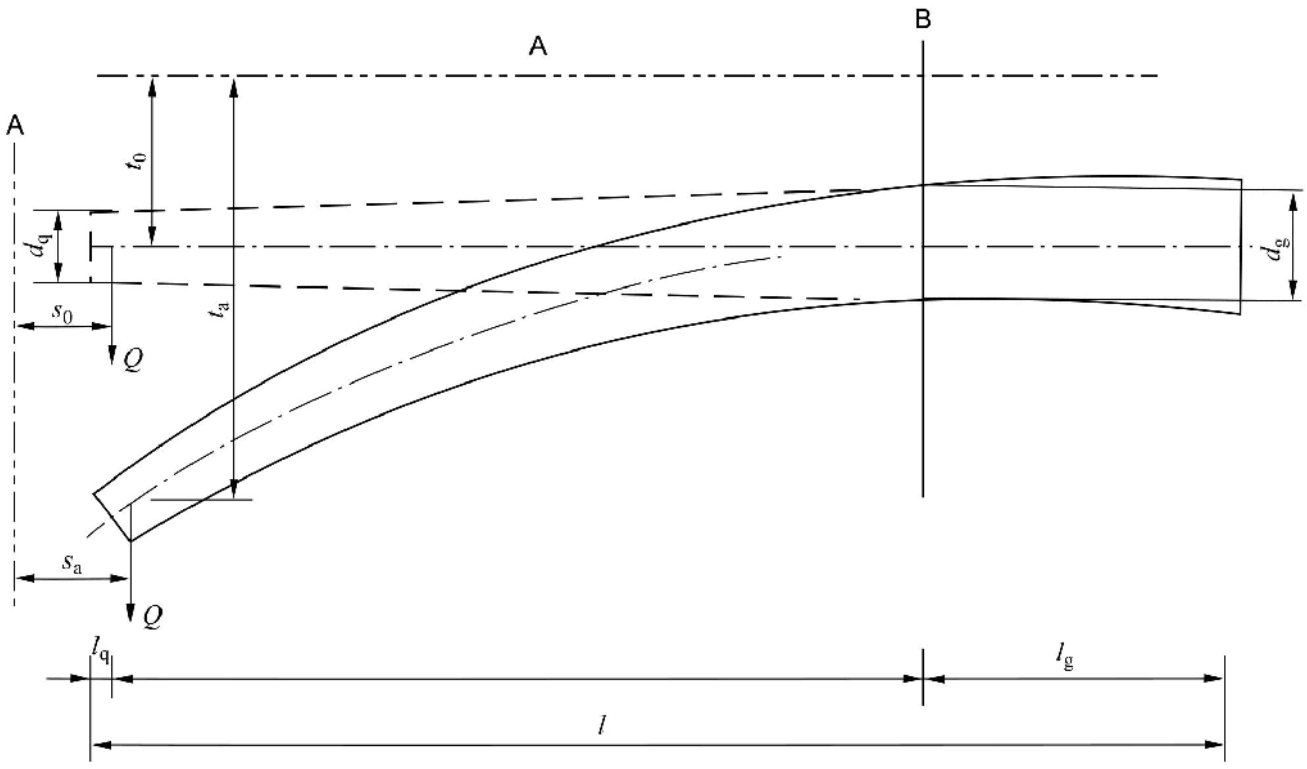


Figure C.1 — Symbols used in bending strength and modulus of elasticity calculations

C.6 Test report

C.6.1 General

The test report shall contain details of the test material, the test procedure and the test results as described in C.6.2 to C.6.4.

C.6.2 Test material

The following information shall be reported:

a) species;

b) length;

c) butt nominal diameter;

d) nominal diameter 1,5 m from butt, or at the assumed ground line;

e) nominal diameter at load point;

f) tip nominal diameter;

g) assumed ground-line position;

h) moisture content;

i) type of preservation, process used and penetration where applicable;

j) sampling procedure;

k) location and size of additional characteristics within 300 mm either side of the failure zone;

l) geographical region of pole population tested;

m) maximum growth rate (i.e. minimum number of rings per 25 mm);

n) ovality at points of nominal diameter measurement.

C.6.3 Test procedure

The following information shall be recorded:

a) description of the test or similar equipment used;

b) any other information that may have influenced the test results.

C.6.4 Test results

The following information shall be recorded:

a) maximum load applied;

b) bending strength;

c) position of section of maximum stress;

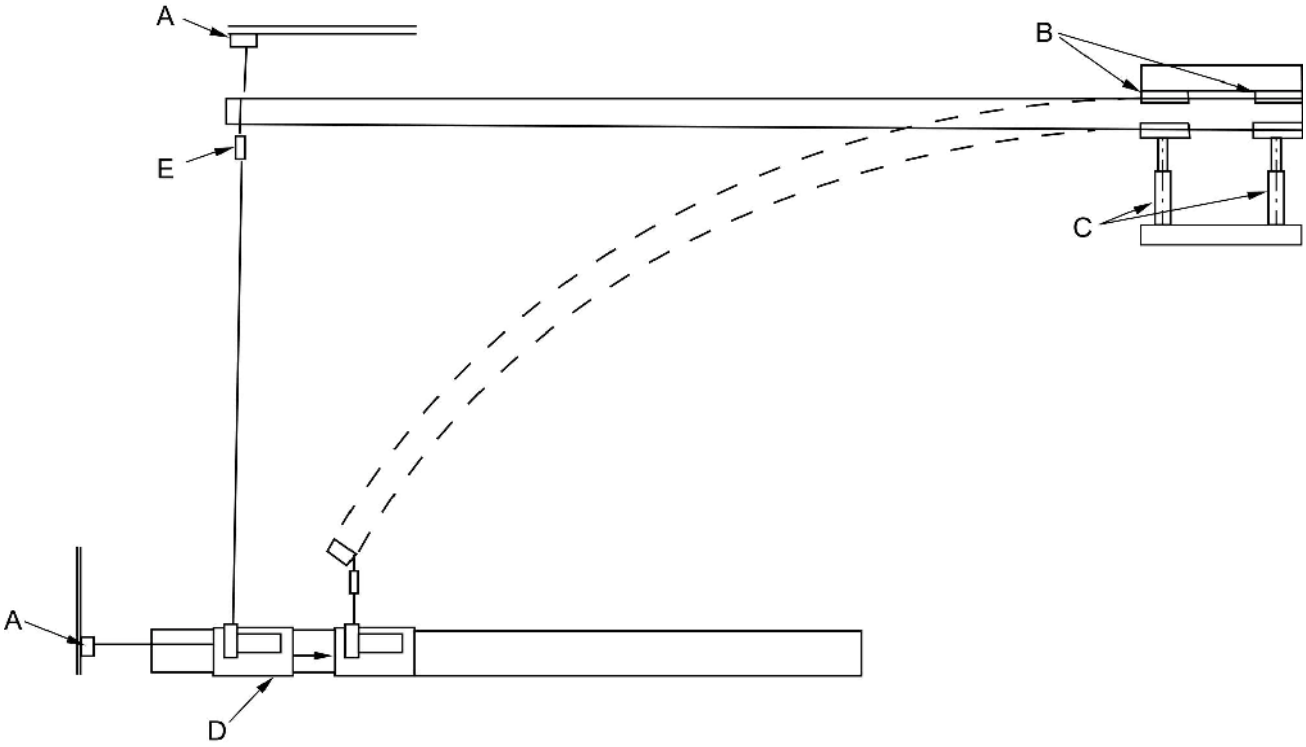
d) mode of failure;

e) modulus of elasticity;

f) any other relevant information that may influence the results.

C.7 Example of suitable cantilever bending test method

A cable and winch system with the winch mounted on a low-friction trolley so that it is free to move as the pole deflects is one means to physically execute the test method. A typical arrangement is shown diagrammatically in Figure C.2.



Key

A deflection measuring device

B contoured shoes

C clamping cylinders

D trolley mounted winch

E load measuring device

Figure C.2 — Typical bending test arrangement

Annex D
(normative)

Determination of characteristic values

NOTE See 5.4 and 7.2.

D.1 General

Characteristic values for wood poles shall be determined for moisture content levels equivalent to the fibre saturation point (fsp) for each species. Wood 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 on characteristic values from tests on wood poles with moisture contents higher than the fibre saturation point are similar and acceptable.

Characteristic values for wood poles shall be determined after any mechanical processing prior to treatment (e.g. incising). Wood poles to be tested for characteristic values shall be tested in their final condition prior to preservation. Durable wood 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 the results of mechanical characteristics vary with wood pole size, then mechanical characteristics for sizes of pole other than standard size shall be determined by applying factors, supported by test evidence, to the characteristic values.

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 lower.

D.2 Sampling

Several samples of wood poles shall be selected from the population to represent the range of additional 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 characteristics of wood 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 5.3 and of the same species in accordance with 5.1.

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

D.3 Testing

D.3.1 General

Testing shall be carried out on standard size poles in accordance with 6.8 and Annex C with the ground line at 1,5 m from the butt end. The characteristic values of bending strength and modulus of elasticity shall be

calculated from the test results using a statistical factor "*k*" found from Figure D.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.

The use of alternative non-destructive test techniques shall be allowed where sufficient test data exist to prove a satisfactory correlation to the results of the destructive test techniques described within 6.8 and Annex C.

D.3.2 Bending strength

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

$$f_{m,05} = m(f_m) - 1{,}65 \times s(f_m) \quad \text{(D.1)}$$

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 of bending strength ($f_{m,k}$) is then found from:

$$f_{m,k} = k \times m(f_{m,05}) \quad \text{(D.2)}$$

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 statistical value of *k* is found from Figure D.1.

D.3.3 Modulus of elasticity

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

$$m(E) = \frac{\sum E_i}{n} \quad \text{(D.3)}$$

where

E_i is the value of modulus of elasticity in the range 1 to n (in newtons per square millimetre).

The characteristic value of modulus of elasticity E_{mean} shall be calculated from the equation:

$$E_{mean} = \frac{\sum m(E)_j n_j}{\sum n_j} \quad \text{(D.4)}$$

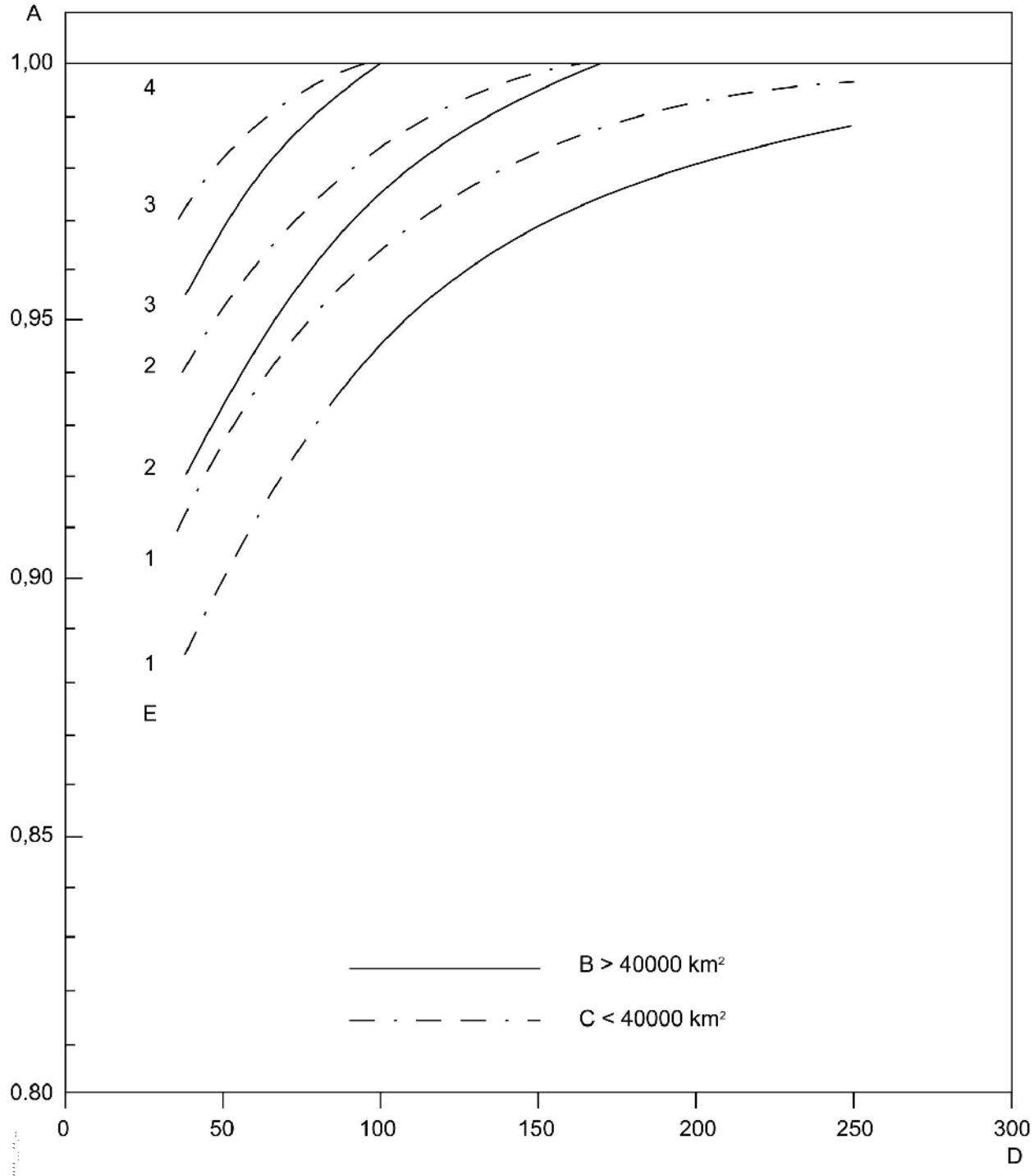
where

n_j is the number of specimens in sample j;

$m(E)_j$ is the mean value of modulus of elasticity for sample j (in newtons per square millimetre).

D.3.4 Test report

A written report giving details of the population, sampling, testing, analytical procedure and calculations shall be prepared for consideration for inclusion of each population.



Key

A value of statistical factor *k*

B large forest

C small forest

D size of smallest sample

E number of samples

Figure D.1 — The effect of the number of poles and samples on statistical factor *k*

Annex E
(informative)

Typical minimum characteristic values for wood poles

NOTE See Introduction and 5.4.

Table E.1 — Typical minimum characteristic values for wood poles

Botanical species	Common name	Marking code	Bending strength N/mm^2	Modulus of elasticity N/mm^2
Abies alba	Fir	AA	31,0	8 000
Abies pectinata	Fir	AP		
Larix species	Larch	LE		
Picea abies	Spruce	PA	31,00 (45,57)	8 000
Picea sitchensis	Sitka spruce	SS	(31,9)	8 972
Pinus laricio	Corsican pine	PL		
Pinus pinaster	Maritime pine	PP	(30,0)	9 000
Pinus sylvestris	Scots pine / Redwood	PS	31,00 (48,97)	8 000
Pinus uncinata	Mountain pine	PU		
Pseudotsuga menziesii	Douglas fir	PM	(34,1)	10 795
Pinus nigra	Corsican / Austrian pine / Black pine	PN	(50,1)	10 000

NOTE 1 Other characteristic values than those presented in this annex may be declared by the manufacturer but should be supported by tests undertaken in accordance with the requirements of 5.4.

NOTE 2 For informative purposes the associated sample mean value of bending strength $m(f_m)$ given in this annex in parenthesis.

Annex ZA
(informative)

Clauses of this European Standard addressing the provisions of the EU Construction Products Directive

ZA.1 Scope and relevant characteristics

This European Standard has been prepared under Mandate M/112 "Structural timber products and ancillaries" given to CEN by the European Commission and the European Free Trade Association.

The clauses of this European Standard shown in this annex meet the requirements of the mandate given under the EU Construction Products Directive (89/106/EEC).

Compliance with these clauses confers a presumption of fitness of the construction product covered by this annex for their intended use indicated herein; reference shall be made to the information accompanying the CE marking.

WARNING — Other requirements and other EU Directives not affecting the fitness for intended use may be applicable to the construction product falling within the scope of this European Standard.

NOTE 1 In addition to any specific clauses relating to dangerous substances contained in this European Standard, there may be other requirements applicable to the products falling within its scope (e.g. transposed European legislation and national laws, regulations and administrative provisions). In order to meet the provisions of the EU Construction Products Directive, these requirements need also to be complied with, when and where they apply.

NOTE 2 An informative database of European and national provisions on dangerous substances is available at the Construction web site on EUROPA (accessed through http://ec.europa.eu/enterprise/sectors/construction/documents/dangerous-substances/legislation/index_en.htm).

This annex establishes the conditions for the CE marking of wood poles for overhead lines.

The scope of this annex is defined by Table ZA.1 and is the same as Clause 1 of this European Standard.

Table ZA.1 — Relevant clauses

Construction product: Wood poles **Intended use:** Overhead lines			
Essential characteristics	**Requirement clauses in this European Standard**	**Levels and/or classes**	**Notes**
Bending strength	5.4	–	tested according to Annex C and calculated and declared according to D.3.2 as characteristic value, $f_{m,05}$, (in newtons per square millimetres) or deflection (in millimetres) and load (in kilonewtons)
Modulus of elasticity/ Compressive strength	5.4	–	tested according to Annex C and calculated and declared according to D.3.3 as characteristic value, E_{mean}, (in newtons per square millimetres) or deflection (in millimetres) and load (in kilonewtons)
Release of dangerous substances	–	–	see Notes 1 and 2 in ZA.1
Durability (treated against biological attack), as:			
- retention	5.7.4	–	tested according to EN 351-2:2007, Clause 4, and declared according to EN 351-1:2007, Clause 5, as retention class
- penetration	5.7.3	–	tested according to EN 351-2:2007, Clause 4, and declared according to EN 351-1:2007, Clause 5, as penetration class (P7 / P8)
- type of preservative	5.7.2	–	type used declared
- durability class	5.7.2	–	declared as Use class 4
Durability (non-treated against biological attack), as:			
- natural durability	5.6	–	tested according to EN 350-1 and referring to EN 350-2 and declared as natural durability class D/ M

The requirement on a certain characteristic is not applicable in those Member States where there are no regulatory requirements on that characteristic for the intended end use of the product. In this case, manufacturers placing their products on the market of these Member States are not obliged to determine nor declare the performance of their products with regard to this characteristic and the option "No performance determined" (NPD) in the information accompanying the CE marking (see ZA.3) may be used. The NPD option may not be used, however, where the characteristic is subject to a threshold level.

ZA.2 Procedure for attestation of conformity of wood poles for overhead lines

ZA.2.1 System of attestation of conformity

The system of attestation of conformity of wood poles for overhead lines indicated in Table ZA.1, in accordance with the Decision of the Commission 97/176/EC of 1997-02-17 (*see OJEU L73 of 1997-03-14*) as

amended by 2001/569/EC of 2001-01-08 (*see OJEU L209 of 2001-08-02*), as given in Annex III of the mandate for "Structural timber products and ancillaries", is shown in Table ZA.2 for the indicated intended use.

Table ZA.2 — System of attestation of conformity

Product	Intended use	Attestation of conformity system
Wood poles	Overhead lines	2+
System 2+: See Directive 89/106/EEC (CPD) Annex III.2.(ii), first possibility, including certification of the factory production control by an notified body on the basis of initial inspection of factory and of factory production control as well as of continuous surveillance, assessment and approval of factory production control.		

The attestation of conformity of wood poles in Table ZA.1 shall be according to the evaluation of conformity procedures indicated in Table ZA.3 resulting from application of the clauses of this European Standard indicated therein.

Table ZA.3 — Assignment of evaluation of conformity tasks for wood poles under system 2+

Tasks			Content of the task	Evaluation of conformity clauses to apply
Tasks under the responsibility of the manufacturer	Factory production control (FPC)		Parameters related to characteristics of Table ZA.1, which performance to be declared for the relevant intended use	7.3.1 to 7.3.5
	Initial type testing by the manufacturer		Characteristics of Table ZA.1, which performance to be declared for the relevant intended use	7.2
	Certification of FPC by the FPC certification body on the basis of	Initial inspection of factory and of FPC	Parameters related to characteristics of Table ZA.1, which performance to be declared for the relevant intended use	7.3.5
		Continuous surveillance, assessment and approval of FPC	Parameters related to characteristics of Table ZA.1, which performance to be declared for the relevant intended use, in particular bending strength and modulus of elasticity	7.3.6

ZA.2.2 EC certificate of conformity and EC declaration of conformity

When compliance with the conditions of this annex is achieved, and once the notified body has drawn up the certificate mentioned below, the manufacturer or his agent established in the EEA shall draw up and retain a declaration of conformity (i.e. EC declaration of conformity), which entitles the manufacturer to affix the CE marking. This declaration shall include:

— name and address of the manufacturer, or his authorised representative established in the EEA, and the place of production;

NOTE 1 The manufacturer may also be the person responsible for placing the product onto the EEA market, if he takes responsibility for CE marking.

— description of the product (type, identification, use, etc.), and a copy of the information accompanying the CE marking;

NOTE 2 Where some of the information required for the declaration is already given in the CE marking, it does not need to be repeated.

— provisions to which the product conforms (i.e. Annex ZA of this EN), and a reference to the ITT report(s) and factory production control records (if appropriate);

— particular conditions applicable to the use of the product (e.g. provisions for use under certain conditions);

— the number of the accompanying EC certificate of conformity of the factory production control, and FPC records, where applicable;

— name of, and position held by, the person empowered to sign the declaration on behalf of the manufacturer or his authorised representative.

The declaration shall be accompanied by an EC certificate of conformity of the factory production control, drawn up by the notified body, which shall contain, in addition to the information above, the following:

— name and address of the notified body;

— the number of the EC certificate of conformity;

— conditions of validity of the certificate, where applicable;

— name of, and position held by, the person empowered to sign the certificate.

The above mentioned declaration and certificate shall be presented in the language or languages accepted in the Member State in which the product is intended to be used.

ZA.3 CE marking and labelling

The manufacturer or his authorised representative established within the EEA is responsible for the affixing of the CE marking. The CE-marking symbol to affix shall be in accordance with Directive 93/68/EEC. The following information shall accompany the CE-marking symbol shown on the wood pole or, when not possible, given in its accompanying commercial documents, e.g. a delivery note:

a) identification number of the notified FPC certification body;

b) name or identifying mark of the manufacturer (see Note 1 in ZA.2.2);

NOTE 1 Registered address of the manufacturer may also be added.

c) the last two digits of the year in which the marking was affixed;

d) number of the EC certificate of conformity of FPC;

e) reference to this European Standard and the year of its publication (i.e. EN 14229:2010);

f) description of the product:

1) generic name and intended use: wood pole for overhead lines;

2) dimensions: length (m) and nominal diameters (mm) or size code;

3) species and country code;

4) preservative type (if applicable);

g) performances relating to the following essential characteristics of wood poles, listed in Table ZA.1, which are to be declared and presented as "Pass" for pass/fail requirements or as "No performance determined" (i.e. NPD) where this is relevant:

1) bending strength: characteristic value (N/mm^2) or deflection (in mm) and load (in kN);

2) modulus of elasticity/compressive strength: characteristic value (N/mm^2) or deflection (mm) and load (kN);

3) release of dangerous substances: see Notes 1 and 2 in ZA.1 (if applicable);

4) durability: treated against biological attack (if applicable):

i) retention: class (in kilograms per cubic metre);

ii) penetration: class in accordance with EN 351-1;

iii) type of preservative: type used declared;

iv) durability class: declared as Use class 4;

5) durability: non-treated against biological attack (if applicable):

i) natural durability: class D/M.

Figure ZA.1 gives an example of a simplified CE marking to be shown on the wood pole or on a label attached on it.

CE 01234	*CE-conformity marking symbol given in Directive 93/68/EEC* *Identification number of the notified FPC certification body*
AnyCo Ltd 11 01234-CPD-00234	*Name or identifying mark of the manufacturer* *NOTE Registered address of the manufacturer may be added.* *Last two digits of the year in which the CE marking was affixed* *Number of the EC certificate of conformity*
EN 14229:2010	*Number of European Standard and the year of its publication*

Figure ZA.1 — Example of the simplified CE marking to be shown on the wood pole or on a label attached to it

Figure ZA.2 gives an example of the complete CE marking to be given in the documents, accompanying the wood pole.

CE 01234	*CE-conformity marking symbol given in Directive 93/68/EEC* *Identification number of the notified FPC certification body*
AnyCo Ltd 11 01234-CPD-00234	*Name or identifying mark of the manufacturer* *NOTE Registered address of the manufacturer may be added.* *Last two digits of the year in which the CE-marking was affixed* *Number of the EC certificate of conformity*
EN 14229:2010 Wood pole for overhead lines	*Number of European Standard and the year of its publication* *Description of the product and its intended use*
Bending strength: 53,8 N/mm^2	*Performances of the mandated essential characteristics*
Modulus of elasticity / Compressive strength: 10 400 N/mm^2	
Release of dangerous substances: NPD	
Durability (treated against biological attack)	
- retention class: 185 kg/m^3	
- penetration class: NP5	
- durability class: Use class 4	
- preservative type: Creosote	

Figure ZA.2 — Example of the complete CE marking to be given in the documents, accompanying the wood pole

In addition to any specific information relating to dangerous substances shown above, the product should also be accompanied, when and where required and in the appropriate form, by documentation listing any other legislation on dangerous substances for which compliance is claimed, together with any information required by that legislation.

NOTE 2 European legislation without national derogations need not be mentioned.

NOTE 3 Affixing the CE marking symbol means, if a product is subject to more than one directive that it complies with all applicable directives.

Bibliography

EN 12465, *Wood poles for overhead lines — Durability requirements*

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

EN 12509, *Timber poles for overhead lines — Test methods — Determination of modulus of elasticity, bending strength, density and moisture content*

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

EN 12511, *Wood poles for overhead lines — Determination of characteristic values*

EN 13183-2, *Moisture content of a piece of sawn timber — Part 2: Estimation by electrical resistance method*

EN 1995-1-1, *Eurocode 5: Design of timber structures — Part 1-1: General — Common rules and rules for buildings*

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