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SOUTH AFRICAN NATIONAL STANDARD

Eucalyptus poles, cross-arms and spacers for power distribution and communications systems

WARNING
This document references other
documents normatively.

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Table of changes

Change No.	Date	Scope

Foreword

This South African standard was prepared by National Committee SABS/TC 218/SC 03, *Timber preservation – Material and physical requirements*, in accordance with procedures of the South African Bureau of Standards, in compliance with annex 3 of the WTO/TBT agreement.

This document was approved for publication in May 2019.

This document supersedes SANS 754:2015 (edition 5.1).

Annexes A, C, E, G, H, I and J form an integral part of this document. Annexes B, D, F and K are for information only.

Compliance with this document cannot confer immunity from legal obligations.

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Eucalyptus poles, cross-arms and spacers for power distribution and communications systems

1 Scope

This standard specifies the requirements for eucalyptus poles, grown in Southern Africa, and that are intended to be used as upright supports for communications systems, and as upright supports, cross-arms and spacers (in five-pole structures) for power distribution lines.

2 Normative references

The following referenced 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. Information on currently valid national and international standards can be obtained from the South African Bureau of Standards.

SANS 506, *Timber preservative – Alkaline-copper-quaternary type.*

SANS 616, *Wood-preserving creosote mixtures and coal-tar mixtures.*

SANS 673, *Mixtures of copper-chromium-arsenic compounds for timber preservation.*

SANS 1288, *Preservative treated timber.*

SANS 1920, *Mixtures of copper azole compounds for timber preservation.*

SANS 3575/ISO 3575, *Continuous hot-dip zinc-coated carbon steel sheet of commercial and drawing qualities.*

SANS 5984, *Moisture content of timber and timber products (oven dry method).*

SANS 5985, *Moisture content of timber (extraction method).*

SANS 5986, *Moisture content of timber (electric moisture-meter method).*

SANS 5987, *Depth of penetration of preservative and detection and depth of sapwood in timber.*

SANS 6000, *Heartwood detection in timber of the Eucalyptus species.*

SANS 10005, *The preservative treatment of timber.*

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3 Terms and definitions

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

3.1

acceptable

acceptable to the authority administering this standard, or to the parties concluding the purchase contract, as relevant

3.2

air seasoning

method whereby poles are dried using air and where the ambient air temperature is not more than 60 °C, either in the open or under cover

3.3

approved

approved by the authority administering this standard

3.4

butt

thick end of a pole or cross-arm

3.5

centre

part of a pole, cross-arm or spacer that consists of the first year's growth

3.6

core

cylindrical piece of wood extracted by means of an increment borer

3.7

crook

natural curvature that extends over not more than 2 m of the length of a pole, cross-arm or spacer

3.8

cross-arm

pole that is used in a horizontal or near-horizontal position in a structure for the support of power distribution lines, but that is not intended to be used in contact with the ground

3.9

diameter class

for a given nominal top diameter, in millimetres, the set of all integral diameter values that exceed or are equal to the given diameter but are less than the next higher value

3.10

diameter tape

graduated tape by means of which the effective diameter can be read direct when the tape is placed round a pole, cross-arm or spacer

3.11

end check

separation along the grain of the wood and across the annual rings, and that occurs at the end of a pole, cross-arm or spacer

3.12

eucalyptus

timber derived from trees of the genus *Eucalyptus* grown in Southern Africa

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3.13

gaining

slab-gaining

removal of timber to a specified depth (measured radially) from the top end of a pole, resulting in a planar area on the surface of the pole that extends from the top end of the pole for a specified length, is parallel to the general longitudinal axis, is free from unacceptable undulations, and terminates, at the bottom, in a bevel

3.14

gum pocket

cavity that contains or has contained an accumulation of gum

3.15

gum vein

ribbon of gum between growth rings

3.16

increment borer

auger-like instrument with a hollow bit, used to extract cores from wood

3.17

kiln drying

method whereby poles are dried by using heated air in compartment or progressive-type kilns

3.18

kino

gum usually found in eucalyptus and leguminous trees

3.19

knot cluster

three (or more) knots so close together that the deflected wood layers envelop the entire group

3.20

mechanical damage

defect caused by mechanical means and that has an adverse effect on the aesthetic appearance, the treated sapwood, or the inherent strength of the pole, cross-arm or spacer

3.21

post-treatment defect

defect that has developed after treatment and that results in the exposure of untreated wood, but is not classified as mechanical damage

3.22

ring shake

complete separation of the wood fibres that appears as an arc or as a complete circle, that occurs between the annual rings, and that is a natural defect that could be present in some trees

3.23

solid penetration

presence of preservative (when relevant, as evidenced by an acceptable chemical test) in all or in a specified portion (as relevant) of the sapwood to an extent that causes complete coloration of that area of the sapwood, except that one band of untreated timber to a maximum of 2 mm in depth will be allowed within the area

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3.24

spacer block

piece of timber that is used as a spacer between poles and cross-arms, but that is not intended to be used in contact with the ground

3.25

spirality

spiral grain

natural deviation of the grain from straightness along the longitudinal axis of the pole

3.26

splinter-pulling

formation of hollows in normal wood at the butt of a pole, caused by long needle-like splinters, during felling

3.27

surface check

separation along the grain of the wood and across the annual rings but not extending to the end of a pole, cross-arm or spacer

3.28

sweep

natural curvature that extends over more than 2 m of the length of a pole or cross-arm

3.29

theoretical ground line

TGL

point at the given ground line, 1 500 mm \pm 25 mm (if not given) above the nearest point of the butt of a pole

3.30

treated

impregnated with an acceptable preservative

3.31

volume

<actual> mean of the cross-sectional areas, in square metres, of the two ends of a pole, cross-arm or spacer, multiplied by its length, in metres

4 Requirements

4.1 Type of product

The product shall be poles, cross-arms or spacers, as required in accordance with annex A.

4.2 Species of timber

All poles, cross-arms and spacers shall be of eucalyptus species of acceptable quality and capable of complying with the requirements of this standard. Information on known and preferred species are given in annex B.

4.3 Strength

When so required in accordance with see annex A, for proof testing or verification, by the inspection body or purchaser, and after all machining has been completed, poles (except streetlight poles) and cross arms shall be tested in accordance with 5.1.1. Each pole and cross-arm shall be capable of

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withstanding, without showing any signs of failure, a force F calculated in accordance with the appropriate formula given in annex C. The force F corresponds to a mean fibre stress (in bending) of 63 MPa. Each pole or cross-arm that is tested shall be marked by the supplier with an additional tag that displays the individual test number of each pole or cross-arm. The tag shall be applied to the butt of the pole or cross-arm.

NOTE 1 The calculated mean fibre stress of 63 MPa is based on the minimum top diameter in the class.

NOTE 2 Spacers need not be strength tested.

NOTE 3 See annex D for modulus of elasticity (MOE).

4.4 Freedom from defects

4.4.1 Sapwood

When determined in accordance with 5.3.1, the minimum radial width of the sapwood in a pole, cross-arm or spacer shall be at least the minimum radial penetration of preservative as given in SANS 1288. Sapwood shall not have been removed to such an extent that the remaining width of sapwood is less than the specified minimum radial penetration of preservative.

4.4.2 Decay

Before poles, cross-arms and spacers are preservative treated (see 4.9.1), they shall have been found to be free from decay and from live fungal fruiting bodies.

NOTE At cross-over contact points, surface softening of depth not exceeding 5 mm is not regarded as decay.

4.4.3 Gum (kino) veins

Gum veins shall be permitted, provided that

- a) the relevant requirements for depth of penetration of preservative are complied with, and
- b) the poles and cross-arms are tested and found to comply with the requirements of 4.3.

4.4.4 Gum pockets

Gum pockets shall be permitted, provided that

- a) The depth of a pocket, measured radially, does not exceed 15 mm.
- b) The required penetration of preservative is achieved.
- c) In the basal 2 m length of a pole, the distance or sum of the distances that the gum pocket(s) extends around the circumference of the pole, does not exceed 20 % of the circumference of the pole at the position of the lowest pocket.
- d) The penetration of preservative below the gum pocket complies with the relevant requirements for penetration given in 4.9.6. The surface may be drilled to improve penetration of the preservative beyond permissible gum pockets, provided that the diameter of the drilled holes does not exceed 3 mm, and the distance between centres is at least 25 mm. Plugging of the holes is not necessary.

4.4.5 Insect damage

4.4.5.1 Poles, cross-arms and spacers shall be generally free from insect damage, but the following shall be permitted:

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- a) scoring or channelling (or both), of depth not exceeding 3 mm, on the surface of a pole, cross-arm or spacer;
- b) not more than five barkborer (*Cerambycidae*) holes in any 1 m length of a pole or cross-arm, provided that the holes are tightly plugged (after treatment) with an acceptable treated wooden dowel; and
- c) not more than 20 pinhole borer (*Ambrosia*) holes, identified in accordance with annex E, in any 1 m length of a pole or cross-arm.

4.4.5.2 Damage caused by *Lyctus* borer, identified in accordance with annex E, shall not be permitted.

4.4.6 Ring shakes

There shall be no ring shakes in spacers. Poles and cross-arms may have ring shakes (identified in accordance with 5.3.7), provided that there are no more than one at the butt and one at the top end, and not within 50 mm of the periphery.

4.4.7 Spirality; spiral grain

When measured in accordance with 5.3.8, spiral grain shall be permitted, provided that, in the case of poles and cross-arms, it does not exceed 1,0 turn in any 3,0 m of the length of a pole or cross-arm, and pro rata for poles and cross-arms of length less than 3,0 m.

NOTE Poles are prone to twist, and those to be fitted with a cross-arm should, before installation, be allowed to attain the equilibrium moisture content of the area where they are to be used.

4.4.8 Mechanical damage

Any deleterious effect of mechanical damage shall not exceed that of a permissible defect.

4.4.9 Crook and sweep

4.4.9.1 General

There shall be no combination of crook and sweep, or more than one crook or sweep in a pole or cross-arm. These restrictions do not apply to spacers.

4.4.9.2 Cross-arms of length less than 6,0 m

When measured in accordance with 5.3.6.1, crook and sweep, expressed in millimetres, shall not exceed 15 times the numerical value, in metres, of the length L of the cross-arm.

4.4.9.3 Cross-arms of length at least 6,0 m

When measured in accordance with 5.3.6.2, crook or sweep shall be such that a straight line connecting the midpoint at the top of a cross-arm with the midpoint at the butt of the cross-arm does not lie outside the surface of the cross-arm at any intermediate point.

4.4.9.4 Poles of length at least 6,0 m

When measured in accordance with 5.3.6.3, crook or sweep shall be such that a straight line connecting the midpoint at the top of a pole with

- a) the midpoint at the theoretical ground line (TGL), or
- b) the midpoint at the butt (see annex A),

does not lie outside the surface of the pole at any intermediate point.

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4.4.10 Taper

4.4.10.1 The taper in a pole or cross-arm from top to butt shall not exceed 10 mm/m of length of the pole or cross-arm.

4.4.10.2 This requirement represents an upper limit and should not be confused with the tapers of 3 mm/m assumed in 4.5.3, 5 mm/m assumed in C.2 and C.3, or 7 mm/m in table F.1 in annex F.

4.4.10.3 Spacers shall be evenly tapered.

4.4.11 Maximum permissible defects

Unless higher maxima are required and approved in accordance with annex A, the defects in poles, cross-arms and spacers, measured in accordance with 5.3 after binding (see annex G), shall not exceed the permissible maxima given in table 1.

4.4.12 Cross-fractures

All poles shall be free from cross-fracture.

4.5 Dimensions

4.5.1 Spacers

The dimensions of spacers shall be as required in accordance with annex A.

4.5.2 Length of poles and cross-arms

The length of a pole or cross-arm, measured in accordance with 5.4.2, shall be as required in accordance with annex A, subject to a tolerance of ± 75 mm for poles and ± 25 mm for cross-arms.

NOTE All distances (for example holes, and binding) should be measured from the level of the lowest part of the top or from the level of the highest part of the butt (see 5.4.2), whichever is applicable.

4.5.3 Diameter of poles and cross-arms

When measured in accordance with 5.4.3,

- a) the top diameter of a pole or cross-arm, which could vary between the minimum and the maximum of any particular diameter class, shall be at least equal to the minimum required value in accordance with annex A, which shall preferably be one of the values given in, appropriate to the required length, and
- b) the diameter of a pole at the TGL shall be at least that calculated from the minimum top diameter of the class, based on a taper of 3 mm per metre of length of the pole.

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Table 1 — Maximum permissible defects

1	2	3
Description of defect	Permissible maximum	
	Poles	Cross-arms
Checks		
a) End checks ^a		
1) Number ^b		
Top	4	3
Butt	4	3
2) Length (as it appears on the surface)		
Top	2 × top dia.	2 × top dia.
Butt	5 × butt dia.	2 × butt dia.
3) Width		
i) Top		
If top dia. does not exceed 180 mm:	1/10 dia. or 15 mm (whichever is less)	6 mm
If top dia. exceeds 180 mm:	1/10 dia. or 15 mm (whichever is less)	10 mm
ii) Butt		
If top dia. does not exceed 180 mm:		
Individual width	1/10 dia. or 25 mm (whichever is less)	1/10 dia. or 10 mm (whichever is less)
Sum of widths	50 mm	—
If top dia. exceeds 180 mm:		
Individual width	1/10 dia. or 25 mm (whichever is less)	1/10 dia. or 15 mm (whichever is less)
Sum of widths	50 mm	—
b) Surface checks		
1) Number ^c	3 at any cross section	3 at any cross section
2) Individual length	8 × dia. ^d	8 × dia. ^d
3) Individual width	15 mm	10 mm
4) Sum of widths	40 mm	25 mm
Knots and knot-holes larger than 10 mm (not applicable to a pole or cross-arm tested and found to comply with 4.3)		
a) Size of individual knots and knot-holes	1/6 circumference	1/6 circumference
b) Sum of sizes of knots in clusters in worst 150 mm of length	1/3 circumference	1/3 circumference
^a The number of end checks in spacers shall be limited to three per end, their length shall be a maximum of 1/4 of the length of the spacer, and their width shall be a maximum of 10 mm. ^b End checks that extend through the centre of an end and appear in two opposite positions of the periphery are regarded as two checks. ^c Provided that where three checks occur together at any cross section, the sum of their lengths shall not exceed half the length of the pole or cross-arm. ^d The diameter of the pole or cross-arm midway along the length of the check.		

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4.5.4 Ovality of poles and cross-arms

When measured in accordance with 5.4.2, the ovality of poles and cross-arms shall not exceed the following limits:

- a) in the case of poles, the difference between the largest and the smallest diameter at the top of a pole shall not exceed 20 mm in the case of a pole of nominal top diameter not exceeding 140 mm, and 25 mm in other cases; and
- b) in the case of cross-arms, the difference between the largest and the smallest diameter at the top and between the largest and the smallest diameter at the butt shall not exceed 20 mm in the case of a cross-arm of nominal top diameter not exceeding 140 mm, and 25 mm in other cases, except that in cross-arms of nominal length exceeding 9 m, the difference between the largest and the smallest diameter at the butt shall not exceed 50 mm.

4.6 Cut of ends

4.6.1 Poles

4.6.1.1 The ends of poles shall be free from steps and, when measured in accordance with 5.4.4, shall comply with the relevant requirements of 4.6.1.2 and 4.6.1.3. (See also figures 1 and 2.)

4.6.1.2 The cut at the top of poles shall be one of the following, as required in accordance with 5.4.4 and annex A:

- a) flat top cut : $90^\circ \pm 5^\circ$ to the longitudinal axis;
- b) slant top cut : $60^\circ \pm 5^\circ$ to the longitudinal axis; and
- c) gable top cut : $60^\circ \pm 5^\circ$ to the longitudinal axis.

4.6.1.3 The butt shall be cut square (to within 15°) to the longitudinal axis of the pole, and the total area of any hollows caused by splinter-pulling, when measured in accordance with 5.3.5, shall not exceed 10 % of the cross-sectional area of the butt.

4.6.2 Cross-arms and spacers

Both ends of cross-arms and spacers shall be free from steps and, when measured in accordance with 5.4.4, shall have an angle of cut of $90^\circ \pm 5^\circ$.

4.6.3 Binding and nail-plating

Poles, cross-arms and spacers shall be bound or nail-plated, as required in accordance with annex A, in accordance with the requirements of annex G.

4.7 Trimming and shaping

4.7.1 General

Shaping and cutting to size of poles, cross-arms and spacers shall have been carried out before preservative treatment.

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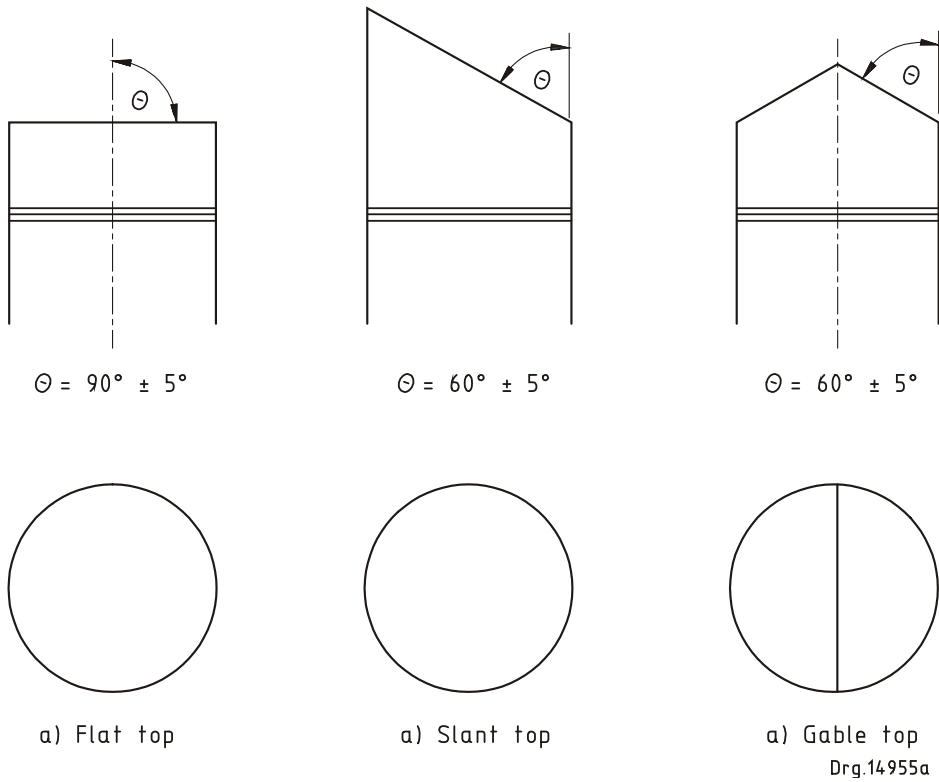


Figure 1 — Top cuts

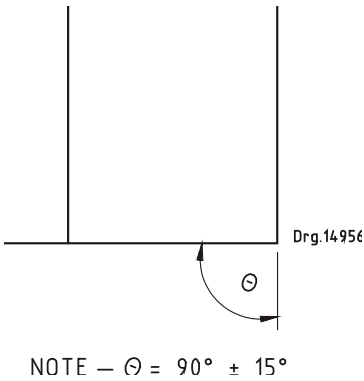


Figure 2 — Butt finish

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4.7.2 Bark

Poles, cross-arms and spacers shall be free from bark (outer and inner) that inhibits the penetration of the preservative.

4.7.3 Branches

Branches shall have been cut off neatly and flush with the bole before preservative treatment. (See also 4.4.1, 4.7.1 and 4.7.4.)

4.7.4 Swellings

Swellings damaged during the removal of bark or during the trimming of branches shall not be regarded as a defect, provided that the requirements of 4.4.1 are complied with.

4.7.5 Gaining of poles

4.7.5.1 Gaining shall be as required in accordance with annex A.

4.7.5.2 When end checks are present, the plane of the gain shall be such that the holes required in terms of 4.7.6 have the maximum support from adjacent solid timber.

4.7.6 Holes in poles

Holes in poles shall be as required in accordance with annex A) but should not be within 100 mm of an end.

4.8 Seasoning of poles

4.8.1 General

All poles and cross-arms shall be either air seasoned or kiln dried in accordance with 4.8.2 or 4.8.3, as required in accordance with annex A.

4.8.2 Air seasoning

All poles shall be stacked in open formation, on suitable skids so that the lowest timber of each stack is at least 300 mm above ground. Sufficient dunnage or cross timbers shall be used to distribute the total mass without imposing undue strain on the poles at the lower layers. The surface of the seasoning ground under and around the stacks shall be well drained and kept free from bark, shavings, grass and weeds. The seasoning yard should be in the open where air currents will circulate freely; should not be in a low, humid situation if it can be avoided; should have good drainage; and should be kept free from vegetation and debris, especially from wood already infected with decay. Extreme care shall be taken to insure that air seasoned poles do not have pre-treatment decay in them. All stacks are to be closed within 1 month.

Poles from the stacks may only be used when the moisture content of entire stack has been tested and deemed to comply with 4.9.1.

4.8.3 Kiln drying

The maximum time allowed from felling the tree until the pole is kiln dried shall be 4 months (120 days). All poles shall be treated within 1 month (30 days) after kiln drying to prevent the occurrence of latent fungal or insect attack. Where kiln drying is applied on eucalyptus poles, the maximum dry bulb shall be increased gradually and shall not exceed 85 °C during the entire period in the kiln.

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4.9 Preservative treatment

4.9.1 General

In addition to the requirements given in 4.9.2 to 4.9.5 (inclusive), the preservative treatment requirements and methods of determination specified in SANS 1288 shall apply.

4.9.2 Moisture content

Unless a higher value is required and approved in accordance with annex A, the average moisture content of poles, cross-arms and spacers at the time of treatment and determined in accordance with 5.5, shall not exceed 250 g/kg in the case of treatment with a class C or a class W preservative (see 4.9.4), but no individual pole, cross-arm or spacer shall have a moisture content that exceeds 280 g/kg.

4.9.3 Process

4.9.3.1 Preservative treatment shall be carried out in accordance with SANS 10005, except that in the case of creosote treatment the poles shall be kept in the creosote filled treatment vessel at the minimum temperature specified in SANS 616, and maintained for at least 1 h.

4.9.3.2 Each treatment plant shall be equipped with an electronic data recording unit that registers time, pressure and vacuum during each cycle of treatment. In the case of creosote treatment, the recorder shall also be able to register the temperature.

4.9.4 Preservatives

The preservative used shall be one of the following types, as required in accordance with annex A, and specified in SANS 10005:

- a) creosote or creosote mixtures that comply with the requirements of SANS 616;
- b) a solution of copper-chromium-arsenic compounds that complies with the requirements of SANS 673 and that has a total element concentration of not less than 14,6 g/L;

NOTE 1 Poles treated with copper-chromium-arsenic preservatives are normally not used for lines in rural areas since veld fires could cause afterglow. This does not apply to cross-arms.

NOTE 2 It is recommended that poles, cross-arms and spacer blocks freshly treated with copper-chromium-arsenic preservatives be open-air stacked for at least five days, to facilitate fixation.

- c) a solution of copper azole compounds that complies with the requirements of SANS 1920; or
- d) a solution of alkaline-copper-quaternary compounds that complies with the requirements of SANS 506.

4.9.5 Retention of preservative

When determined in accordance with 5.6, unless higher net retention values are required and approved in accordance with annex A, the average net retention of a charge shall be at least equal to the relevant value given for transmission and telephone poles in SANS 1288, appropriate to the hazard class required in accordance with annex A. (See also SANS 10005.)

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4.9.6 Penetration

4.9.6.1 Each pole treated in accordance with this standard shall be tested to determine compliance with the penetration requirements given in SANS 1288.

4.9.6.2 The depth of solid penetration of preservative, measured in accordance with 5.7, shall be at least equal to the value given for transmission and telephone poles in SANS 1288, appropriate to the hazard class required in accordance with annex A. Should a band of untreated timber fall within the required penetration area, the required depth of penetration shall be increased by the depth of the untreated band.

4.10 Post-treatment defects

There shall be no post-treatment defects (see 3.21) in any pole, cross-arm or spacer at the time of dispatch

5 Inspection and methods of test

5.1 General

5.1.1 Using one of the methods given in C.2 or C.3 as relevant, determine the strength of each pole or cross-arm in the sample (see H.2.2 for sampling) before subjecting it to the other appropriate tests.

5.1.2 If holes have been drilled in order to assess compliance of the timber (see H.2.3), poles and cross-arms may be returned to the lot after testing, provided that, immediately after the holes have been drilled and the timber inspected, the holes are filled with preservative at the recommended treating temperature and tightly plugged to their full depth with a completely penetrated preservative-treated pine dowel.

5.1.3 Measure the location of the holes on the gained surface.

5.2 Inspection

Visually examine and then measure (using the relevant methods given in 5.3 and 5.4) each pole, cross-arm or spacer, selected in accordance with H.2.2 of annex H, for compliance with the relevant requirements of 4.4 to 4.7 (inclusive).

5.3 Measurement of defects

5.3.1 Radial width of sapwood

Use SANS 5987, but, in the case of cross-arms and spacers, extract the test specimen(s) at the approximate midlength. Measure, to the nearest 1 mm, the radial width of sapwood in each test specimen and record the minimum of the results. When differentiation between sapwood and heartwood is not possible by visible colour difference, use an acceptable chemical test as specified in SANS 6000.

5.3.2 Gum pockets

Measure, to the nearest 1 mm, the maximum depth of a gum pocket as the deviation from the surface that the pole, cross-arm or spacer would have presented had it not been interrupted by the defect.

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5.3.3 Surface and end checks

Measure the length of a check to the nearest 10 mm and the width (at its widest point) to the nearest 1 mm. Take the length of the check as being the distance over which its width exceeds 3 mm, but in the bottom third of the length of a pole or cross-arm, take the length of the check as being the distance over which its width exceeds 5 mm. When checks run lengthways into each other but are broken by cross-bands of solid wood of width (measured across the grain) exceeding 5 mm and of depth such that there is no visible opening between the two checks, regard them as individual checks.

5.3.4 Knots, knot clusters, knot-holes and cavities

Take as the size of a knot its maximum dimension, measured to the nearest 5 mm and transverse to the length of the pole or cross-arm. If a knot is difficult to define or to outline, take as its limits those of the outer growth ring obviously belonging to the branch. Measure knot clusters, knot-holes and cavities resulting from knot-hole surrounds in the same way.

5.3.5 Splinter-pulling hollows

Take as the size of a splinter-pulling hollow the mean of its largest and smallest diameters (each measured to the nearest 5 mm and at right angles to the general grain direction) on its exposed face.

5.3.6 Crook and sweep

5.3.6.1 In the case of cross-arms of length less than 6,0 m, measure (to the nearest 5 mm) crook and sweep as the maximum distance between a straight line and the inner curve. Ensure that the straight line is between two points not more than 2 m apart in the case of crook and not less than 2 m apart in the case of sweep (see figure 3).

5.3.6.2 In the case of cross-arms of length at least 6,0 m, observe whether any part of a cross-arm crosses an imaginary straight line that connects the midpoint at the top with the midpoint at the butt (see figure 3).

5.3.6.3 In the case of poles of length at least 6,0 m, measure crook and sweep in accordance with one of the following methods, as required in accordance with annex A, by observing whether any part of the surface of a pole crosses an imaginary straight line that connects the midpoint at the top with

a) the midpoint at the butt (see figure 3), or

b) the midpoint at the TGL (see figure 3).

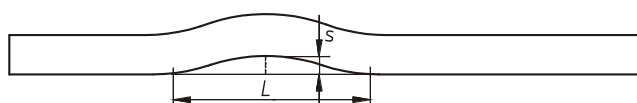
5.3.7 Ring shakes

Insert a feeler of thickness 2 mm (or a circular wire of diameter 2 mm) to its maximum extent into the separation. If the depth of insertion exceeds 500 mm, consider the separation to be a ring shake.

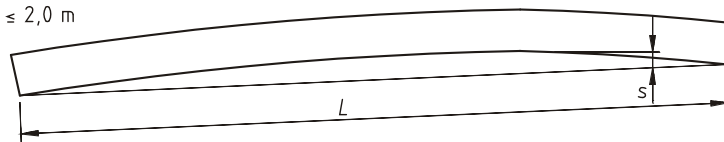
5.3.8 Spiral grain; spirality

Measure spiral grain as the extent of the spiral deviation as a full turn (and pro rata where relevant), from a marked point on the pole along the spiral line visible on the surface, over the full length of the pole. Assess whether the spirality limit given in 4.4.7 for the pole is exceeded or not.

- a) Cross-arms of length less than 6,0 m
Acceptable if $s \leq 15 L$ (s in millimetres, L in metres), all L



- 1) Crook : $L \leq 2,0$ m

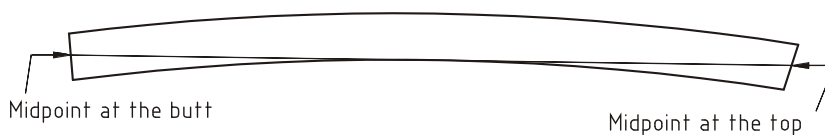


- 2) Sweep : $L \geq 2,0$ m

- b) Cross-arms and poles of length at least 6,0 m
Acceptable if straight line connecting midpoints at butt and top remains within cross-arm everywhere

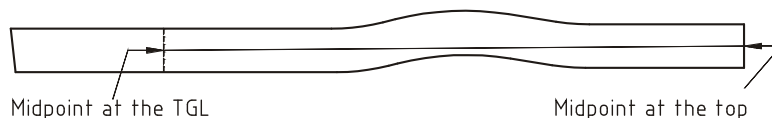


- 1) Crook

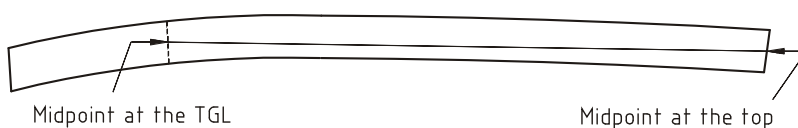


- 2) Sweep

- c) Poles of length at least 6,0 m
Acceptable if straight line connecting midpoints at TGL and top remains within pole everywhere



- 1) Crook



- 2) Sweep

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Figure 3 — Measurement of crook and sweep

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5.4 Dimensions and end cuts

5.4.1 General

Measure the length, diameter and squareness of ends of poles, cross-arms and spacers as given in 5.4.2 to 5.4.4 (inclusive).

5.4.2 Length

Take as the length of a pole or cross-arm the shortest distance (measured to the nearest 10 mm) between the level of the lowest part of the top and the level of the highest part of the butt.

5.4.3 Diameter

Measure diameters to the nearest 1 mm, using (except when measuring ovality of ends (see 4.5.4) a diameter tape. In the case of oval cross sections, measure the smallest diameter through the geometrical midpoint of the largest diameter.

5.4.4 End cuts

Measure the angle of cut of ends to the nearest degree.

5.5 Average moisture content at the time of preservative treatment

5.5.1 Position of testing

When moisture content is determined in accordance with 5.5.2 and 5.5.3, take the reading or sample at the approximate midlength of the pole, cross-arm or spacer with a tolerance of 10 % of the length of the unit in either longitudinal direction to a maximum of 500 mm, and above any knots or gum pockets that could influence the result.

5.5.2 Untreated poles and cross-arms

Determine the moisture content to the nearest 10 g/kg, using the electric moisture-meter method given in SANS 5986 or the oven-dry method given in SANS 5984. In cases of dispute, the oven-dry method shall be used.

NOTE In the case of poles, moisture content readings taken with an electric moisture meter and that exceed 280 g/kg should not be considered accurate; the oven-dry method should be used in such cases.

5.5.3 Poles and cross-arms treated with a class C preservative

Use the extraction method given in SANS 5985 to determine the moisture content to the nearest 10 g/kg.

5.6 Net retention

Use one of the methods given in SANS 1288 to determine the net retention.

5.7 Depth of penetration of preservative

5.7.1 Use the relevant method given in SANS 1288 to assess compliance with the requirements of 4.9.6 but, in the case of cross-arms and spacers, assess penetration at the approximate midlength and in the case of poles, assess penetration at a point 3 m from the butt.

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5.7.2 In cases where the penetration is less than the minimum value given in SANS 1288, but not less than 10 mm, an additional sample shall be taken on the opposite side of the pole or cross-arm. The pole shall be deemed to comply if the average of the two measurements is at least equal to the value given in SANS 1288.

5.7.3 When assessing for compliance with 4.4.3, 4.4.4(d) or 4.7.2, use the same method, but test

- a) at gum veins,
 - b) at gum pockets, or
 - c) where bark is at its maximum,
- respectively.

6 Marking

6.1 Method

Each pole, cross-arm and spacer shall be marked in a legible, indelible and permanent way by using one of the acceptable methods given in annex I, as required by the purchaser in accordance with annex A.

6.2 Position

6.2.1 Each pole, cross-arm and spacer shall be marked at a position as follows:

- a) poles of length exceeding 5 m: on the face 3,5 m \pm 50 mm from the butt;
- b) cross-arms and poles of length less than 5 m: at approximately midlength on the face of the pole; and
- c) spacers: on the thin end.

6.2.2 When strength testing is required (see 4.3), an additional round tag (see annex I), which displays the individual test number, shall be applied to the butt of each pole or cross-arm tested.

6.3 Information

6.3.1 Each pole and cross-arm shall bear the following minimum information:

- a) the identification mark of the plant at which the pole, cross-arm or spacer was produced;
- b) the month and year during which the pole, cross-arm or spacer was produced (for example 4/12 for April 2012);
- c) the hazard class, in accordance with SANS 1288 and SANS 10005;
- d) the species, i.e. E for eucalyptus poles;
- e) the length of the pole, in metres; and
- f) the minimum top diameter of the class.

6.3.2 In the case of spacers, 6.3.1(a) to (c) (inclusive) shall apply.

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6.3.3 Include additional information as required in accordance with annex A.

6.4 Colour coding of top diameters

When required in accordance with annex A, poles shall be marked in accordance with the requirements, and the colour code assigned for the different top diameter classes, as given in annex J.

7 Storage and handling

Guidelines on the handling and storage of treated poles and cross-arms are given in annex K.

Annex A
(normative)

Notes to purchasers

A.1 The following requirements shall be specified in tender invitations and in each order or contract:

- a) the type of product (see 4.1);
- b) whether strength testing of poles or cross-arms (as appropriate) is required, (see 4.3);
- c) the dimensions of spacers (see 4.5.1);
- d) the length of poles and cross-arms (see 4.5.2);
- e) the minimum top diameter of poles and cross-arms (see 4.5.3(a));
- f) the cut of the top ends of poles (see 4.6.1.2);
- g) whether poles, cross-arms and spacers are to be bound or anti-split nail-plated (see 4.6.3), and when relevant, the method to be used in the case of binding, and the class of zinc coating in the case of anti-split nail plating (see annex G);
- h) details of the gaining of poles (see 4.7.5.1);
- i) details of holes in poles (see 4.7.6);
- j) whether the poles or cross-arms are to be air seasoned or kiln dried (see 4.8.1);
- k) the type of preservative (see 4.9.4);
- l) the hazard class (see 4.9.5 and 4.9.6.2);
- m) whether additional information is required (see 6.3.3);
- n) whether, in poles of length at least 6,0 m, crook and sweep should be measured by using the imaginary straight line from the midpoint at the top to the midpoint at the butt, or to the midpoint at the TGL (see 5.3.6.3);
- o) the method of marking to be used (see 6.1 and annex I); and
- p) whether colour coding of different top diameter classes is required (see 6.4) and the quantity of poles to be colour coded.

A.2 The following requirements may be specified by the purchaser but shall be approved by the authority administering this standard:

- a) the maximum permissible defects, if less stringent than those given in table 1 (see 4.4.11);
- b) the moisture content at the time of preservative treatment, if higher than as specified (see 4.9.2); and
- d) the net retention values, if higher than as specified (see 4.9.5).

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Annex B
(informative)

Known and preferred eucalyptus species

The species given in table B.1 are the known and preferred species regarded as suitable to produce poles and cross arms complying with this standard.

Table B.1 — Species of timber

1	2
Species of timber	
Botanical name	Standard name
<i>Eucalyptus cloeziana</i>	Cloeziana
<i>Eucalyptus dunnii</i>	Dunnii
<i>Eucalyptus grandis</i>	Saligna
<i>Eucalyptus grandis/saligna</i> hybrids	Saligna
<i>Corymbia maculata</i>	Maculata
<i>Eucalyptus maideni</i>	Maideni
<i>Eucalyptus microcorys</i>	Microcorys
<i>Eucalyptus paniculata</i>	Paniculata
<i>Eucalyptus saligna</i>	Saligna

Annex C (normative)

Bending strength (MOR) for poles and cross-arms

C.1 Strength values for poles and cross-arms

The mean bending strength of eucalyptus species specified in this standard is 63 MPa.

C.2 Cantilever loading test for poles 6 m and longer

C.2.1 Apparatus

C.2.1.1 Crib, capable of securing the pole under test from the butt end to the TGL, and that will

- a) ensure no significant movement of the clamped butt during a test, and
- b) prevent any rotational movement of the pole.

C.2.1.2 Wooden saddles, or similar suitable clamping devices (to secure the pole in the crib), of curvature that suits the diameter of the pole under test, and that will not damage the pole during the test.

C.2.1.3 Winch, or similar device, of suitable capacity and preferably motor-driven, that is capable of applying force to the pole under test, the force being applied horizontally and at an average angle of approximately 90° to the pole, through a cable of such a length that, during a test, the angle varies between slightly less than and slightly more than 90°.

NOTE The position of the crib relative to the winch has to be altered for varying lengths of poles under test.

C.2.1.4 Force indicator or recorder, calibrated to indicate or record (as relevant), to within 2,5 %, the actual force applied to the pole.

C.2.2 Procedure

C.2.2.1 Using the wooden saddles, securely clamp the butt of the pole in the crib, over a distance of 1,5 m ± 25 mm from the butt end. If the pole displays crook or sweep, ensure that the concave side of the crook or sweep faces towards the winch. Secure the cable to the pole at a position 600 mm ± 25 mm or 100 mm ± 25 mm, as relevant (see C.2.3), from the top end, and so position and secure the crib or winch (or both), that the angle between the axis of the pole and the cable is slightly less than 90°.

C.2.2.2 Take up the slack and, without jerking the pole, apply force (gradually and at as uniform a rate as possible) until the force reaches the appropriate value of F , calculated using the formula given in C.2.3. Then stop the test and release the force.

C.2.2.3 Consider the pole to be defective if any visible sign of failure was noted during the test.

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C.2.3 Calculation

Calculate the value of F as follows:

$$F = \frac{\sigma \times D^3}{10,2 \times L_1}$$

where

F is the force, in newtons, required to cause a mean fibre stress in cantilever loading of 63 MPa;

σ is the mean fibre stress, i.e. 63 MPa;

D is the minimum diameter, in millimetres, of the pole or cross-arm at the TGL (i.e. 1 500 mm from the butt end), based on the specified minimum top diameter and a taper of 5 mm per metre of length;

L_1 is the distance, in millimetres, between the TGL and 600 mm from the top end in the case of poles and cross-arms of length at least 6,0 m, and between the TGL and 100 mm from the top end in other cases.

C.3 Midpoint loading test for poles and cross-arms shorter than 6 m

C.3.1 Apparatus

C.3.1.1 Two suitable anchorages, that

- a) will not damage the pole/cross-arm during the test, and
- b) are such that the distance between them can be adjusted to the appropriate test span, i.e. the length of the pole/cross-arm under test, minus 600 mm or minus 200 mm, as relevant (see C.3.3).

C.3.1.2 Suitable force applicator, that is positioned centrally between the anchorages, for example

- a) either a hydraulic or a pneumatic ram of adequate capacity and stroke, that has a pressure foot of radius such as to fit the diameter at midlength of the pole/cross-arm under test and that will not damage the pole/cross-arm during the test, or
- b) a suitable winch and cable.

C.3.1.3 Force indicator or recorder, calibrated to indicate or record (as relevant), to within 2,5 %, the actual force applied to the pole/cross-arm.

C.3.2 Procedure

C.3.2.1 So position the pole/cross-arm under test in the apparatus that the anchorages secure the pole/cross-arm at positions $300 \text{ mm} \pm 25 \text{ mm}$ or $100 \text{ mm} \pm 25 \text{ mm}$ (as relevant) from its ends and that, if the pole/cross-arm displays crook or sweep, the concave side of the crook/sweep faces towards the ram or the convex side of the crook/sweep faces towards the winch, as appropriate.

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C.3.2.2 If a winch and cable is used, take up the slack and, without jerking the pole/cross-arm, apply force to the midlength point of the pole/cross-arm. If a ram is used, extend the ram (without impacting the pole/cross-arm) until it touches the midlength point of the pole/cross-arm. In each case, increase the force (gradually and at as uniform a rate as possible) until it reaches the appropriate value of F , calculated using the formula given in C.3.3. Then stop the test and release the force.

C.3.2.3 Consider the pole/cross-arm to be defective if any visible sign of failure was noted during the test.

C.3.2.4 If the force is applied in any plane other than the horizontal and vertical plane upward, a correction factor shall be applied to force F .

C.3.3 Calculation

Calculate the value of F as follows:

$$F = \frac{\sigma \times \pi \times D^3}{8 \times L_2}$$

where

F is the force, in newtons, required to cause a mean fibre stress in midpoint loading of 63 MPa;

σ is the mean fibre stress, i.e. 63 MPa;

D is the diameter of the pole or cross-arm at midlength point, in millimetres, based on the specified minimum top diameter and a taper of 5 mm per metre of length;

L_2 is the distance, in millimetres, between 300 mm from the top end and 300 mm from the butt end in the case of poles and cross-arms of length at least 6,0 m, and between 100 mm from the top end and 100 mm from the butt end in other cases.

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Annex D

(informative)

Modulus of elasticity

D.1 General

Calculate the modulus of elasticity (MOE) E for a pole or cross-arm tested in accordance with annex C, using the formula given in D.2 or D.3. In addition to the steps given in annex C, measure and record the increment in deflection δ as well as the increment in load P . Take the average value for E for eucalyptus poles and cross-arms as 11 000 MPa.

D.2 For cantilever testing

Calculate the MOE as follows:

$$E = \frac{k PL^3}{\delta D_A^4}$$

where

E is the MOE, in megapascals;

k is a constant, derived from the ratio between diameters at the point of clamping, D_B , and the point of load application, D_A (see table D.1);

P is the force applied, in newtons;

L is the distance (the test span), in millimetres, between the point of clamping and the point of load application;

δ is the deflection, in millimetres.

D.3 For midpoint testing

Calculate the MOE as follows:

$$E = \frac{PL^3}{2,36 D^4 \delta}$$

where

E is the MOE, in megapascals;

P is the force applied, in newtons;

L is the distance (the test span), in millimetres, between supports;

D is the diameter at the midpoint, in millimetres;

δ is the deflection, in millimetres.

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Table D.1 — Constant related to the ratio between diameters at the point of clamping and the point of load application

1	2
D_B/D_A	k
1,000	6,79
1,025	6,31
1,050	5,87
1,075	5,47
1,100	5,10
1,125	4,77
1,150	4,47
1,175	4,19
1,200	3,93
1,225	3,69
1,250	3,48
1,275	3,28
1,300	3,09
1,325	2,92
1,350	2,76
1,375	2,61
1,400	2,47
1,425	2,35
1,450	2,23
1,475	2,11
1,500	2,01
1,525	1,91
1,550	1,82
1,575	1,74
1,600	1,66
1,625	1,58
1,650	1,51
1,675	1,44
1,700	1,38
1,725	1,32
1,750	1,27
1,775	1,21
1,800	1,16
1,825	1,11
1,850	1,07
1,875	1,03
1,900	0,99
1,925	0,95
1,950	0,92
1,975	0,88
2,000	0,85

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Annex E

(normative)

Insect damage

E.1 General

Discriminate between pinhole borer (*Ambrosia*) and powder-post (*Lyctus*) damage as given in E.2 and E.3.

E.2 Visual examination

In untreated poles and cross-arms, the periphery of pinhole borer (*Ambrosia*) entrance/exit holes will normally be black and the holes will not be filled with frass, whereas the periphery of exit holes of powder-post (*Lyctus*) will normally be white and the holes will be filled with frass.

E.3 Increment borer method

E.3.1 Take increment borings from the greater of two holes and 20 % of the holes present in the infested area. Then take a further two increment borings at a distance of 15 mm to 25 mm away from any two of the initial borings, in the longitudinal direction of the exit hole.

E.3.2 In the case of pinhole borer (*Ambrosia*) damage, the extracted core will be solid timber (except for the radial entrance/exit hole(s)) and will usually have several short galleries transverse to the grain. These holes will normally be black and without frass in poles and cross-arms that are untreated or that have been treated with creosote or a mixture of creosote and waxy oil, and dark green and without frass in poles and cross-arms that have been treated with a mixture of copper-chromium-arsenic compounds.

E.3.3 In the case of powder-post (*Lyctus*) damage, the extracted core will show absence of solid timber, and the radial exit hole and galleries in the direction of the grain will be white and filled with frass in poles and cross-arms that are untreated, but black and filled with frass in poles and cross-arms that with frass in poles and cross-arms that have been treated with a mixture of have been treated with creosote or a mixture of creosote and waxy oil, or dark green and filled copper-chromium-arsenic compounds.

E.3.4 If the attack is severe, the head of the extracted core (i.e. the part that extends approximately 3 mm inwards from the surface of the pole or cross-arm) will usually become detached from the rest of the core.

Annex F (informative)

Average volumes of poles and cross-arms

F.1 The volumes of poles and cross-arms are given as information only.

F.2 Measure all the diameters at each end of the load and calculate the volume of poles/cross-arms by using the following approximate formula:

$$V = \frac{L [2 n \left(\sum x^2 \right) + (\sum x)^2]}{7,6409 \ n \times 10^6}$$

where

V is the total volume, in cubic metres (m³), of poles/cross-arms in the load;

L is the average length, in metres (m), of the poles/cross-arms in the load;

n is the total number of diameters measured at both thick and thin ends;

x is an individual diameter, in millimetres (mm), measured in a random direction.

F.3 Table F.1 gives dimensions and corresponding volumes of poles and cross-arms.

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Table F.1 — Dimensions and corresponding volumes for poles and cross-arms

1	2	3
Length	Minimum top diameter	Volume
m	mm	m ³
1,5	80	0,0107
1,5	100	0,0156
1,5	120	0,0216
1,5	140	0,0284
1,5	160	0,0362
2,0	80	0,0148
2,0	100	0,0215
2,0	120	0,0295
2,0	140	0,0387
2,0	160	0,0492
2,5	80	0,0191
2,5	100	0,0277
2,5	120	0,0378
2,5	140	0,0495
2,5	160	0,0627
3,0	100	0,0342
3,0	120	0,0465
3,0	140	0,0607
3,0	160	0,0768
3,0	180	0,0947
3,5	100	0,0411
3,5	120	0,0566
3,5	140	0,0724
3,5	160	0,0913
4,5	100	0,0559
4,5	120	0,0751
4,5	140	0,0971
4,5	160	0,1219
4,5	180	0,1496
5,0	80	0,0454
5,0	100	0,0638
5,0	120	0,0854
5,0	140	0,1102
5,0	160	0,1381
5,0	180	0,1691
6,0	80	0,0581
6,0	100	0,0809
6,0	120	0,1075
6,0	140	0,1378
6,0	160	0,1719
6,0	180	0,2098

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Table F.1 (*continued*)

1	2	3
Length	Minimum top diameter	Volume
m	mm	m ³
7,0	80	0,0721
7,0	100	0,0995
7,0	120	0,1312
7,0	140	0,1674
7,0	160	0,2080
7,0	180	0,2530
8,0	80	0,0875
8,0	100	0,1197
8,0	120	0,1569
8,0	140	0,1991
8,0	160	0,2463
8,0	180	0,2986
9,0	120	0,1844
9,0	140	0,2329
9,0	160	0,2870
9,0	180	0,3468
10,0	140	0,2688
10,0	160	0,3301
10,0	180	0,3976
10,0	200	0,4714
11,0	140	0,3070
11,0	160	0,3756
11,0	180	0,4511
11,0	200	0,5335
11,0	220	0,6228
12,0	140	0,3474
12,0	160	0,4236
12,0	180	0,5073
12,0	200	0,5985
12,0	220	0,6973
13,0	140	0,3902
13,0	160	0,4742
13,0	180	0,5663
13,0	200	0,6665
13,0	220	0,7750

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Table F.1 (*concluded*)

1	2	3
Length	Minimum top diameter	Volume
m	mm	m ³
14,0	160	0,5274
14,0	180	0,6281
14,0	200	0,7376
14,0	220	0,8559
15,0	160	0,5832
15,0	180	0,6928
15,0	200	0,8119
15,0	220	0,9402
16,0	160	0,6418
16,0	180	0,7605
16,0	200	0,8891
16,0	220	1,0279
18,0	160	0,7675
18,0	180	0,9049
18,0	200	1,0536
NOTE To ensure compliance with retention requirements and to reduce the possibility of under treatment, a taper of 7 mm/m has been accepted as the norm for volume calculations.		

Annex G (normative)

Methods of binding and nail-plating

G.1 General

G.1.1 Both ends of a pole, cross-arm or spacer shall be bound or nail-plated in accordance with annex A.

G.1.2 The minimum coating thickness on the galvanized nails, staples and wire used for binding shall be as follows:

- a) nails and wire: 25 µm; and
- b) staples: 10 µm.

G.1.3 Binding shall be carried out before preservative treatment.

G.2 Methods of binding

G.2.1 Staples

Each staple shall be of length at least 38 mm, of galvanized mild steel wire of diameter at least 4 mm, and shall be so driven slantwise across the binding wires that there is an offset of at least 3 mm between the points of the staple, measured on the surface of the pole or cross-arm and at right angles to its longitudinal axis.

G.2.2 Nailing and stapling

Nailing-and-stapling binding at the end of a pole, cross-arm or spacer shall consist of 4,5 turns of galvanized mild steel wire, of diameter at least 2,5 mm, tightly wound and firmly secured at each of its ends, through closed loops, by galvanized wire nails of diameter at least 3 mm and of length at least 38 mm. Each band of wire shall also be stapled at two positions, one approximately diametrically opposite the other and at right angles to the wire nails.

G.2.3 "Farmer's knot"

"Farmer's knot" binding at the end of a pole, cross-arm or spacer shall consist of four turns of galvanized mild steel wire, of diameter at least 2,5 mm, wound, double-twisted into a tight knot that rests flush against the surface of the pole, cross-arm or spacer, and then stapled at two positions. The first staple shall be applied on the knot and the second staple approximately diametrically opposite the first staple.

G.2.4 Loop tensioning

Loop tensioning binding at the end of a pole, cross-arm or spacer shall consist of galvanized mild steel wire of diameter at least 2,5 mm, shaped in the form of a hairpin, wound twice (to give four strands) around the pole, cross-arm or spacer, the loose ends being drawn through the loop (head of the hairpin), tensioned, bent back through 180°, and stapled to the pole, cross-arm or spacer at a point as close as possible to the loop. Excess wire at the free ends shall be cut off and the cut ends doubled back neatly alongside the staple. The four strands of wire shall be stapled to the pole, cross-arm or spacer block at two positions: the first staple shall be applied on the loop and the second staple approximately diametrically opposite the first staple.

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G.3 Position

Binding should be positioned at least 100 mm from the end of a pole, cross-arm or spacer, and at least 50 mm from the nearest hole.

G.4 Nail-plating

NOTE Anti-split nail plates can only be considered for flat or slant end cuts, either at the top end of a pole or at the ends of cross-arms and spacers.

G.4.1 Construction

A anti-split nail plate shall

- a) be made of steel,
- b) have a zinc coating of class Z275 or Z450, as required in accordance with annex A, that complies with the requirements of SANS 3575,
- c) be of thickness at least 1,2 mm and have a punched nail length of at least 14 mm,
- d) be of such a size that the area covered by the anti-split nail plate is at least 70 % of the area of the applicable pole end,
- e) have a minimum number of 3 nails per 10 cm²,
- f) be such that no nail will be closer than 4 mm from the edge of the anti-split nail plate,
- g) be such that the nails of the anti-split nail plate will be evenly spaced over the entire area of the anti-split nail plate, and
- h) be such as to be acceptable.

G.4.2 Securing of anti-split nail plates

An anti-split nail plate shall be secured as follows:

- a) the method of securing an anti-split nail plate shall be such as to be acceptable;
- b) each nail shall be fully embedded in the pole end and no nail shall be bent; and
- c) an anti-split nail plate shall be so positioned in the middle of a cut end that its edges do not protrude over the round faces of the timber.

Annex H (normative)

Quality verification of eucalyptus poles, cross-arms and spacers

H.1 Quality verification

H.1.1 When a purchaser requires ongoing verification of the quality of eucalyptus poles, cross-arms and spacers, it is suggested that, instead of concentrating solely on evaluation of the final product, he also direct his attention to the manufacturer's quality system. In this connection it should be noted that SANS 9001 covers the provisions of an integrated quality system.

H.1.2 If no information about the implementation of quality control or testing during manufacture is available to help in assessing the quality of a lot, and a purchaser wishes to establish, by inspection and testing of samples of the final product, whether a lot of the product complies with this standard, use the sampling plan given in H.2.2. It shall be noted that such a sampling plan applies to the final product only.

H.2 Assessment of compliance with this standard

H.2.1 Definitions

H.2.1.1

acceptable quality level

AQL

maximum percentage defective product units that, for purposes of sampling inspection, can be considered satisfactory as a process average

H.2.1.2

defective

eucalyptus pole, cross-arm or spacer that fails in one or more respects to comply with the relevant requirements of this standard

H.2.1.3

lot

not less than 50 and not more than 3 200 poles or cross-arms that have the same type of binding, are of the same nominal dimensions, and have been treated to the same retention with the same class of preservative, from one manufacturer, and submitted at any one time for inspection and testing

H.2.2 Sampling

H.2.2.1 General

The sampling procedure in H.2.2.2, based on an acceptable quality level (AQL) of 4, shall be applied in determining whether a lot complies with the requirements of this standard. The samples so taken shall be deemed to represent the lot for the respective properties.

H.2.2.2 Sample for inspection

After checking the lot for compliance with clause 6 and annex C, take at random from the lot the number of poles, cross-arms and spacers given in column 2 of table H.1, relative to the appropriate lot size given in column 1.

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H.2.2.3 Sample for testing

From the sample taken in accordance with H.2.2.2, take at random the appropriate number of poles, cross-arms or spacers given in column 4 of table H.1.

Table H.1 — Sample sizes

1	2	3	4	5
Lot size, poles, cross-arms or spacers	Sample for inspection		Sample for testing	
	Sample size, poles, cross-arms or spacers	Acceptance number	Sample size, poles, cross-arms or spacers	Acceptance number ^a
50 – 150	20	2	8	0
151 – 500	50	5	13	1
501 – 1 200	80	7	20	1
1 201 – 3 200	125	10	32	2
^a Applicable only to penetration, to the moisture content of poles and to the moisture content of cross-arms and spacers not treated with a mixture of copper-chromium-arsenic compounds, copper azole compounds, or alkaline-copper-quaternary compounds.				

H.2.3 Criteria for compliance

After establishing compliance with the relevant requirements given in 4.2, 4.7.1 and 4.9.3 to 4.9.5 (inclusive) and, in the case of units treated with a mixture of copper-chromium-arsenic compounds, copper azole compounds, or alkaline-copper-quaternary compounds (see 4.9.4(b), (c) or (d)), the lot shall be deemed to comply with the requirements of this standard if

- a) on inspection of the sample taken in accordance with H.2.2.2 for compliance with the requirements for freedom from defects (see 4.4), dimensions (see 4.5), cut of ends (see 4.6), and trimming and shaping (see 4.7), the number of defectives found does not exceed the relevant acceptance number given in column 3 of table H.1, and
- b) on testing of the sample taken in accordance with H.2.2.3,
 - 1) for compliance with the requirements for penetration (see 4.9.6), and moisture content (see 4.9.2), the number of defectives found does not exceed the relevant acceptance number given in column 5 of table H.1, and
 - 2) the moisture content of the permissible defective(s) is in no case more than 280 g/kg, and
 - 3) no defective is found in respect of strength (see 4.3).

Annex I
(normative)

Methods of marking

I.1 General

In addition to the requirements given in I.2 and I.3, the following requirements shall be complied with when using either round or square tags:

- a) the tags shall be either galvanized mild steel or aluminium;
- b) galvanized mild steel tags shall be at least 0,5 mm in thickness and aluminium tags shall be at least 0,9 mm in thickness;
- c) the letters and figures shall be at least 3,5 mm in size;
- d) the coatings on the galvanized mild steel tags shall comply with the requirements for class Z275 of SANS 3575; and
- e) the coatings on the nails shall have a galvanizing thickness of at least 25 µm.

I.2 Round identification tags

I.2.1 Round identification tags shall be at least 25 mm in diameter.

I.2.2 Each tag shall be attached by means of a galvanized nail of at least 30 mm in length and at least 2,5 mm in diameter, and in the case of face marking, recessed in the face of the pole, cross-arm or spacer to be flush with the surface.

I.3 Rectangular identification tags

I.3.1 The dimensions of the rectangular identification tags shall be at least 75 mm × 55 mm.

I.3.2 Each tag shall be attached, at each corner, by means of a galvanized nail of at least 30 mm in length and at least 2,5 mm in diameter.

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Annex J
(normative)

Colour coding of poles and cross-arms

When colour coding is required in accordance with annex A (see 6.4), it shall be done in accordance with table J.1.

Table J.1 — Colour coding of top diameter classes

1	2
Top (thin end) diameter class mm	Colour code
80 to 99,999	Green
100 to 119,999	Orange
120 to 139,999	Red
140 to 159,999	Blue
160 to 179,999	Yellow
180 to 199,999	White
200 to 219,999	Purple
220 to 239,999	Green

Annex K (informative)

Handling and storage of treated poles and cross-arms

K.1 Poles and cross-arms will generally only give the projected service life if a long period of storage before installation is avoided.

Adequate time should be allowed to attain the equilibrium moisture of the area where they are to be used.

K.2 Storage in a horizontal position combined with exposure to direct sunlight causes degradation of creosoted timber and, in addition, creosotes tend to migrate because of gravitational forces, thereby reducing the amount of creosote on the upper side of the pole or cross-arm.

In such conditions, temperatures of as high as 60 °C have been recorded on creosoted poles; poles and cross-arms will also tend to develop checks (surface checks) if left so exposed for long periods of time and should therefore be shaded with shade cloth or kept under a roof. If, however, they have been exposed for such long periods, it is good practice from an appearance point of view to rinse them in a treatment vessel.

K.3 Poles should be cross-stacked for a maximum period of six months, at least 300 mm above the ground. If they have to be stacked for longer, they should be close-stacked, under cover, in a north-south direction, and, after six months, rotated 180°. The area beneath the stack should be clear of grass and debris, to reduce the risk of fire.

Care should be taken not to drop poles and cross-arms, especially those that have been treated with a mixture of copper-chromium-arsenic compounds and are still wet, since cross-fractures, which might not be clearly visible, could be caused by careless handling.

Mechanical damage beyond the limits of 4.4.8 (cross-cut, sharpening, cross-fracture owing to off-loading practices, hammering, etc.) at any stage is not acceptable.

Handling equipment should be used in such a manner that the surface of the pole or cross-arm is not damaged. Damaged poles and cross-arms should not be used, since their service life will be reduced.

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Bibliography

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