

ICS 79.080; 91.090

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SABS
457-3*

**This standard references other standards*

Edition 6

2000

(As amended 2002)

SOUTH AFRICAN STANDARD

Specification

Wooden poles, droppers, guardrail posts and spacer blocks

Part 3: Hardwood species

Consolidated edition incorporating amendment No. 1 : 20 September 2002

SABS 457-3

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(As amended 2002)

Amendments incorporated since the publication of SABS 457-3:2000

| Amdt No. | Date | Scope |
|-----------------|-------------|---|
| 1 | 2002-09-20 | Has been amended to change the definitions of "lot", "solid penetration" and "top diameter" and to change the method of measurement of top diameters. |

ICS 79.080; 91.090

SABS 457-3
Ed. 6

SOUTH AFRICAN BUREAU OF STANDARDS

SPECIFICATION

**WOODEN POLES, DROPPERS,
GUARDRAIL POSTS AND SPACER BLOCKS**

PART 3: HARDWOOD SPECIES

Obtainable from the

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0001

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Notice

This part of SABS 457 was approved in accordance with SABS procedures on 18 December 2000.



Manufacturers producing wooden poles, droppers, guardrail posts and spacer blocks to this part of SABS 457 may, under a mark permit issued by the SABS, apply the certification mark as illustrated above to the commodity as evidence to the purchaser that the commodity has been preservative-treated in accordance with this part of SABS 457 and that compliance with its requirements is ensured by tests and inspections carried out by the SABS.

NOTE 1 In terms of the Standards Act, 1993 (Act 29 of 1993), it is a punishable offence for any person other than a mark permit holder to apply a certification mark to a commodity or to refer to the SABS or any of its standards in a manner likely to create the impression that the commodity has been approved by the SABS. Furthermore, no person shall claim or declare that he or any other person complied with an SABS standard unless

- a) such claim or declaration is true and accurate in all material respects, and
- b) the identity of the person on whose authority such claim or declaration is made, is clear.

NOTE 2 It is recommended that authorities who wish to incorporate any part of this part of SABS 457 into any legislation in the manner intended by section 31 of the Act consult the SABS regarding the implications.

This part of SABS 457 will be revised when necessary in order to keep abreast of progress. Comment will be welcome and will be considered when this part of SABS 457 is revised.

Foreword

Edition 6 of SABS 457-3 cancels and replaces SABS 457-1:1994 (edition 5, in part) and SABS 457-3:1994 (edition 5).

SABS 457 consists of the following parts under the general title *Wooden poles, droppers, guardrail posts and spacer blocks*:

Part 1: General requirements. (Withdrawn; the information originally contained in SABS 457-1 has been incorporated in SABS 457-2 and SABS 457-3, as applicable.)

Part 2: Softwood species.

Part 3: Hardwood species.

Annexes A, B, E, G, I, J and K form an integral part of this part of SABS 457. Annexes C, D, F and H are for information only.

Attention is drawn to the normative references given in clause 2 of this standard. These references are indispensable for the application of this standard.

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Introduction

Different species of timber vary in natural durability. Practical experience has shown which species have the longest life in their untreated state under normal conditions. Even if these species are readily obtainable, their use is not always economical or practicable. The use of timber properly treated with timber preservatives suited to the specific purpose is of great importance in prolonging the service life and thus putting available supplies of timber to the maximum use.

In order to provide as wide a range of treated poles, droppers, guardrail posts and spacer blocks as possible, provision has been made for the use of a variety of timber preservatives divided into three classes (see SABS 05).

Timber treated with creosote or a mixture of creosote and waxy oils suffer less damage from grass fires than does untreated timber (which present a serious fire hazard). After re-drying, timber treated with a mixture of copper-chromium-arsenic compounds is, owing to "afterglow", more susceptible to damage by fire than is timber treated with creosote or a mixture of creosote and waxy oil.

Users of poles, droppers and guardrail posts will realize the difficulty of prescribing and working to precise requirements for a natural product such as timber, especially when it is used in the round form in which it grows. Treated timber should neither be cross-cut nor be sawn lengthways because untreated wood will be exposed to fungal and insect attack. Where fabrication takes place after treatment, the exposed wood must be liberally coated with the same type of preservative at the recommended treating temperature and, in the event of drilling, a post-hole treater must be used.

The grading in this part of SABS 457 is based on the assumption that the poles, droppers, guardrail posts and spacer blocks are to be used in the dimensions in which they were graded. Conversion of any kind after preservative treatment will reduce the expected service life.

This part of SABS 457 applies to the condition of the timber at the time of despatch and does not cover deterioration brought about during transportation and storage.

Units will generally give the projected service life only if a long period of storage before installation is avoided.

Temperatures as high as 60 °C have been recorded on a creosoted pole lying on the ground and exposed to direct sunlight. Because water-borne preservative-treated units will tend to develop checks and splits if left exposed to the sun for long periods, they should be used as soon as possible after treatment.

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 unit. Where long periods of storage of creosoted units are unavoidable, these units should be close-stacked clear of the ground and under a waterproof cover that also provides protection against the sun.

This part of SABS 457 should be read and applied in conjunction with current Government regulations concerning the combating and the prevention of the spread of certain timber-attacking insects in proclaimed areas.

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AgrEvo SA (Pty) Ltd
Alternative Structures
Coastchem (Pty) Ltd
CSIR Fire Engineering Sciences – Boutek
Department of Labour
Department of Public Works
Department of Water Affairs and Forestry
Dolphin Bay Petro Chemicals CC
Eskom
Hans Merensky Holdings (Pty) Ltd
Khulani Timber Industries (Pty) Ltd
LCS Timber Solutions
Mintroad Sawmills (Pty) Ltd
Northern Cape Department of Transport
Oranje Koöp Bpk
Overland Inspection Services (Pty) Ltd
Preschem Africa CC
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SAFCOL
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South African Lumber Miller's Association
South African Wood Preservers Association
Standards Association of Zimbabwe
Suprachem (Pty) Ltd
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Timberlife CC
Treated Timber Products (Pty) Ltd
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Wooden poles, droppers, guardrail posts and spacer blocks

Part 3: Hardwood species

1 Scope

This part of SABS 457 specifies requirements for preservative-treated hardwood structural poles, agricultural poles, fencing poles, round droppers, guardrail posts and spacer blocks. The poles are intended for the erection of fences and vine trellises, for general use in orchards and for structural purposes. The droppers are intended for fencing. The posts and spacer blocks are intended for the erection of steel guardrails at the sides of roads.

Timber used in ground contact and exterior above ground contact, should have an expected life span of at least 20 years when treated in accordance with the requirements applicable to the exposure classes (see tables 3 and 4). Timber treated for interior above ground exposure class should have an expected life span equal to that of the structure it is used in.

NOTE Except under the certification mark scheme, assessment of compliance with the requirements of 6.2 to 6.6 (inclusive) and, except in the case of units treated with creosote or a creosote and waxy oil mixture, 4.4, requires special agreement between the supplier and the purchaser.

2 Normative references

The following standards contain provisions which, through reference in this text, constitute provisions of this part of SABS 457. All standards are subject to revision and, since any reference to a standard is deemed to be a reference to the latest edition of that standard, parties to agreements based on this part of SABS 457 are encouraged to take steps to ensure the use of the most recent edition of the standards indicated below. Information on currently valid national and international standards may be obtained from the South African Bureau of Standards.

ISO 2859-1, *Sampling procedures for inspection by attributes – Part 1: Sampling plans indexed by acceptable quality level (AQL) for lot-by-lot inspection.*

SABS 280, *Hole location in fencing posts and droppers.*

SABS 05, *The preservative treatment of timber.*

SABS ISO 3575, *Continuous hot-dip zinc-coated carbon steel sheet of commercial, lock-forming and drawing qualities.*

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SABS SM 967, *Retention of preservative in timber (volume method)*.

SABS SM 985, *Moisture content of timber (extraction method)*.

SABS SM 986, *Moisture content of timber (electric moisture-meter method)*.

SABS SM 987, *Depth of penetration of preservative and detection and depth of sapwood in timber*.

SABS SM 988, *Retention of preservative in timber (sample method)*.

SABS SM 989, *Retention of preservative in timber (weighbridge method)*.

SABS SM 995, *Retention of boron in timber (colorimetric test)*.

SABS SM 1000, *Heartwood detection in timber of the Eucalyptus species*.

SABS SM 1238, *Retention of boron in timber (analytical method)*.

SABS SM 1303, *Depth of penetration of borate preservatives in timber*.

3 Definitions

For the purposes of this part of SABS 457, the following definitions apply:

3.1

acceptable

in relation to the certification mark, acceptable to the South African Bureau of Standards

3.2

agricultural pole

a pole used in orchards and vineyards

3.3

approved

approved by the South African Bureau of Standards

3.4

butt

the thick end of a pole, guardrail post or round dropper

3.5

centre

the part of a pole, guardrail post or round dropper that consists of the first year's growth

3.6

class C preservatives

coal tar creosote and timber preservatives that have a coal tar creosote basis

3.7

class O preservatives

timber preservative solutions of organic compounds in organic solvents

3.8

class W preservatives

water-borne timber preservatives

3.9

core

a cylindrical piece of wood extracted by means of an increment borer

3.10

crook

a natural curvature or kink that extends over not more than one-quarter of the length of a pole, guardrail post or round dropper (see figure 2)

3.11

defective

a unit that fails in one or more respects to comply with the relevant requirements of this part of SABS 457

3.12

diameter class

the class as defined by means of the permissible minimum and maximum values of the top diameter of a pole, guardrail post or round dropper

3.13

effective length

in the case of a structural pole, the total length of the pole; in other cases, 75 % of the length of a pole, measured from its thin end

3.14

end check

a separation along the grain of the wood and across the annual rings, and that occurs at the end of a pole, guardrail post or round dropper

3.15

eucalyptus

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

3.16

face check

a separation along the grain of the wood and across the annual rings, but not extending to the end of a pole, guardrail post or round dropper

3.17

fencing pole

a pole used as an upright or straining pole, that does not exceed 3,6 m in length

3.18

fencing rail

a pole, not in contact with the ground, used as a rail in fencing

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3.19

guardrail post

a post intended for the erection of steel guardrails at the side of a road

3.20

gum pocket

a cavity that contains or has contained gum

3.21

gum vein (kino)

a ribbon of gum between growth rings

3.22

increment borer

an auger-like instrument that has a hollow bit used to extract cores from wood

3.23

knot group

three (or more) knots so close together that they all fall within any 150 mm length of a pole

3.24

lot

not less than 50 and not more than 10 000 units of the same type, the same botanical group (i.e. eucalyptus), the same nominal dimensions or length and top diameter class (as relevant), and treated with the same type preservative, from one manufacturer, submitted at any one time for inspection and testing

Amdt 1

3.25

mechanical damage

a defect caused by mechanical means, by excessive charring or by other means

3.26

pole

a structural, agricultural or fencing pole

3.27

post-treatment defect

a defect that has developed after treatment and that results in the exposure of untreated wood

3.28

reverse crook

crook in two directions in one plane

3.29

reverse sweep

sweep in two directions in one plane

3.30

ring shake

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

3.31

round dropper

a short length of round timber that is intended for use as a support in fences and that has a top diameter of between 25 mm and 50 mm

3.32

seasoning end-check

a check that appears on an end of a pole, guardrail post or round dropper, as a result of seasoning, and that follows an annual ring

3.33

slab-gaining

the removal of timber to a specified depth (measured radially) from the top end of a guardrail post, resulting in an area on the face of the post that lies in one plane, extends from the end of the post for a specified length, is parallel to the general longitudinal axis of the post, is free from unacceptable undulations, and terminates, at the bottom, in a bevel (see figure 1)

3.34

solid penetration

presence of preservative (where relevant, as indicated by an acceptable chemical test) in all or in a specified portion (as relevant) of the sapwood, to an extent that causes at least 50% coloration of that area of the sapwood and is uniformly distributed throughout the area

Amdt 1

3.35

spacer block

a piece of timber that is used as a spacer between the guardrail posts and steel guardrails at the side of a road

3.36

spiral grain

an arrangement of the wood elements in which they follow a spiral course round the stem

3.37

structural pole

a pole used for structural purposes, for example, buildings, bridges, jetties, etc.

3.38

sweep

a natural curvature that extends over more than one-quarter of the length of a pole, guardrail post or round dropper (see figure 3)

3.39

theoretical ground line

TGL

the position that is 25 % of the length of a pole or guardrail post from the butt, with a maximum of 1 m

3.40

top diameter

the diameter at the thin end of a pole, guardrail post or round dropper, as measured with a diameter tape or a linear tape

Amdt 1

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3.41

treated/treatment

impregnated/impregnation with an acceptable preservative

3.42

unit

a pole, guardrail post, dropper or spacer block

3.43

volume (actual)

the mean of the cross-sectional areas, in square metres, of the two ends of a pole, guardrail post, dropper or spacer block, multiplied by its length, in metres

4 Requirements

4.1 Type of unit

The unit shall be of one of the following types, as required (see (a) of annex A):

a) poles, classified as

- 1) a structural pole,
- 2) an agricultural pole, or
- 3) a fencing pole;

b) guardrail posts;

c) round droppers; and

d) spacer blocks.

4.2 Species of timber

Units shall be manufactured from the hardwood species given in table 1.

Table 1 — Type of unit and hardwood species

| 1 | 2 | 3 |
|--|---|---|
| Type of unit | Hardwood species | |
| | Botanical name | Standard name |
| Structural poles Agricultural poles | <i>Eucalyptus cloeziana</i> <i>Eucalyptus grandis</i> <i>Eucalyptus grandis/saligna hybrids</i> <i>Eucalyptus maculata</i> <i>Eucalyptus maideni</i> <i>Eucalyptus microcorys</i> <i>Eucalyptus nitens</i> <i>Eucalyptus paniculata</i> <i>Eucalyptus saligna</i> | Cloeziana Saligna Saligna Maculata Maideni Microcorys Nitens Paniculata Saligna |
| Fencing poles Guardrail posts ^a Spacer blocks Round droppers | All hardwood species | |
| NOTE Hardwoods should be sufficiently permeable to obtain the specified preservative retention and penetration. The species should also not be known to suffer from any undue after-treatment problems such as splitting or cracking, for example <i>Acacia mearnsii</i> (wattle). | | |
| ^a High density hardwoods, for example <i>Eucalyptus cloeziana</i> , should not be used for guardrail posts. | | |

4.3 Strength

When strength testing is required (see (b) of annex A), each structural pole and agricultural pole tested in accordance with annex B shall be capable of withstanding, without showing any signs of failure, a force calculated in accordance with the appropriate formula given in B.3. The force *F* corresponds to a minimum fibre stress (in bending) of 34,0 MPa.

NOTE The modulus of elasticity (MOE) of a pole can be determined in accordance with annex C.

4.4 Moisture content

4.4.1 Before preservative treatment

The moisture content of units before preservative treatment, determined in accordance with 7.6.1, shall not exceed the following:

- a) if the units are to be treated with a class W, type WCCA preservative: 300 g/kg;
- b) if the units are to be treated with a class C preservative: 300 g/kg;
- c) if the units are to be treated with a class O preservative: 250 g/kg;
- d) if the units are to be treated with a class W, type WB preservative,
 - 1) by using the diffusion or pressure process: no limitation; or
 - 2) by using the gas-phase process: 100 g/kg.

NOTE The mean annual equilibrium moisture content of timber is given in annex D.

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4.4.2 After preservative treatment

The moisture content of units, determined in accordance with 7.6.2, after preservative treatment with class C or class O preservatives, shall not exceed the requirement given in 4.4.1(b) or 4.4.1(c).

4.5 Freedom from defects

4.5.1 General

All product shall comply with the requirements given in 4.5.2 to 4.5.14.

4.5.2 Radial width of sapwood

The minimum radial width, determined in accordance with 7.2.1, of the sapwood in a pole, guardrail post or round dropper shall be at least the appropriate value for preservative penetration given in column 7 of tables 3 and 4.

4.5.3 Decay

Units shall be free from decay (except in knots) and from live fungal fruiting bodies.

4.5.4 Ring shakes

There may be one complete ring shake, identified in accordance with 7.2.2, at the butt of poles or guardrail posts but not within 25 mm of the periphery.

NOTE Seasoning-end checks that follow the annual rings should not be confused with ring shakes.

4.5.5 Face checks

When measured in accordance with 7.2.3, face checks shall not exceed the appropriate of the values given in table 2.

4.5.6 End checks

When measured in accordance with 7.2.4, end checks shall not exceed the appropriate of the values given in table 2.

4.5.7 Cross-fracture

Structural poles and agricultural poles shall be free from cross-fracture.

4.5.8 Post-treatment defects

There shall be no post-treatment defects.

4.5.9 Mechanical damage

Mechanical damage is permitted in units other than structural poles and spacer blocks, provided that it complies with the requirements given in table 2, and that a penetration of at least 5 mm is achieved.

4.5.10 Crook and sweep

4.5.10.1 General

There shall be no reverse crook, reverse sweep, or crook and sweep in more than one plane. Any crook and sweep in units other than spacer blocks shall be as in 4.5.10.2 and 4.5.10.3.

4.5.10.2 Crook

When measured in accordance with 7.2.6, crook shall not exceed the appropriate value given in table 2.

4.5.10.3 Sweep

When measured in accordance with 7.2.7, sweep shall not exceed the appropriate value given in table 2.

4.5.11 Maximum permissible defects

4.5.11.1 General

The maximum permissible defects in units shall be limited as in 4.5.11.2 and 4.5.11.3.

4.5.11.2 Poles, guardrail posts and round droppers

The defects in poles, guardrail posts and round droppers, measured in accordance with 7.2, shall not exceed a combination of the appropriate maximums given in table 2.

4.5.11.3 Spacer blocks

Spacer blocks shall be free from loose knots, splits and shakes.

NOTE Uncontrolled redrying after treatment with a class W preservative can affect the dimensions of certain defects, for example checks can then exceed the permissible maximum, and bow, twist and splits can develop.

4.5.12 Gum veins (kino)

Gum veins in poles and guardrail posts shall be allowed, provided that the required depth of penetration of preservative (see 6.7) is achieved.

4.5.13 Gum pockets

Gum pockets shall be allowed in poles, guardrail posts and round droppers, provided that:

- a) in the case of round droppers, at least 5 mm penetration is achieved; and
- b) in the case of poles and guardrail posts, the required penetration (see tables 3 and 4) is achieved in the bottom third of the pole or post, with a maximum 1,5 m from the butt.

The surface (before treatment) may be drilled to improve penetration beyond a permissible gum pocket, provided that the diameters of the drilled holes do not exceed 3 mm, and the distance between centres is at least 25 mm. Plugging of holes is not required.

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4.5.14 Insect damage

NOTE See also annex E.

Poles, guardrail posts and round droppers shall be free from insect damage other than the following:

- a) scoring or channelling (or both) by bark-boring insects is permitted provided that the requirements for penetration beyond the damage are complied with; and
- b) pinhole (*Ambrosia*) damage, determined in accordance with annex E, shall be permitted, provided that, in any 1 m length of a round pole or guardrail post, not more than 20 holes are present and that in any 1 m length of a round dropper, not more than 10 holes are present.

4.6 Trimming

4.6.1 General

Shaping, removal of bark and branches and cutting to size shall have been carried out before preservative treatment. Each unit shall be neatly trimmed.

4.6.2 Bark

Units shall be free from bark (outer and inner) that inhibits the penetration and influences the retention of preservatives.

4.6.3 Gaining

Guardrail posts shall be slab-gained (see also 3.33 and figure 1 of this part of SABS 457) on one face and, when so required (see (c) of annex A), on opposite faces, to a depth of not less than 15 mm and not more than 50 mm. The length of the gain, measured from the top of the dome or roofing cut (as relevant), shall be 400 mm \pm 10 mm.

When end checks are present, the plane(s) of the gain(s) shall be such that the bolt hole required in terms of 4.7.3 has the maximum support from adjacent solid timber.

Table 2 — Maximum permissible defects in poles, guardrail posts and round droppers

| 1 Description of defect | 2 | | 3 Permissible maximum | | 4 |
|---|--|---|--------------------------|--|-------------------------|
| | Structural poles and agricultural poles | Fencing poles and guardrail posts | Round droppers | | |
| Knots (other than loose knots) | | | | | |
| a) single: individual size | ¼ circumference at point where the knot occurs | ¼ circumference at point where knot occurs | 20 mm | | |
| b) groups: sum of sizes in any 150 mm length ^a | — | ½ circumference at midpoint of the 150 mm length ^a | None | | |
| Loose knots, knot-holes, and knot cavities | | | | | |
| a) single: individual size | ½ circumference at point where the defect occurs | ¼ circumference at point where the defect occurs | 15 mm | | |
| b) groups: sum of sizes in any 150 mm length ^a | — | ½ circumference at midpoint of the 150 mm length ^a | None | | |
| Checks^b of depth not exceeding half of the average midlength diameter^c) | | | | | |
| a) end checks | | | | | |
| 1) number | 4 | 4 | 4 | | 4 |
| 2) width | 1/10 diam. ^c | 1/10 diam. ^c | 1/10 diam. ^c | | 1/10 diam. ^c |
| 3) length | | | | | |
| i) top | 200 mm or 2½ x top diam., whichever is greater | 200 mm or 2½ x top diam., whichever is greater | 250 mm | | 250 mm |
| ii) butt | 300 mm or 5 x butt diam., whichever is greater ^d | 300 mm or 5 x butt diam., whichever is greater ^d | 250 mm | | 250 mm |
| b) face checks | | | | | |
| 1) number | Not limited | Not limited | 1 ^e | | 1 ^e |
| 2) width | ½ diam. ^c | ½ diam. ^c | 1/10 diam. ^c | | 1/10 diam. ^c |
| 3) length | ¾ length of pole or post | ¾ length of pole or post | ¾ length of dropper | | ¾ length of dropper |
| Crook | 20 mm | 25 mm | 30 mm | | |
| Sweep | length > 5 m: 50 mm length ≤ 5 m: 10 mm/m | 10 mm/m | 20 mm/m | | |
| Mechanical damage (area allowed) | None | Top ⅓ of the pole | Top ⅓ of the dropper | | |
| Depth | | 10 mm. max ^f | 5 mm. max ^f | | |
| Spiral grain | 1½ turns per pole or post of length not exceeding 3 m. 1 turn per pole and post of length exceeding 3 m. | Not limited | Not limited | | |
| <p>^a Applicable to all hardwood species except eucalyptus species. ^b Other than checks of width less than 3 mm or of length less than 100 mm, which shall be disregarded. ^c The diameter of the pole, post or dropper, as relevant, midway along the check. ^d The maximum length of a single end check that occurs in either the top or the butt may exceed the relevant maximum, but shall not exceed ¾ of the length of the pole or post, as relevant. ^e Checks of length less than 60 % of the length of the dropper shall be disregarded. ^f Provided that a preservative penetration of at least 5 mm is achieved (see 4.5.8).</p> | | | | | |

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4.7 Holes and grooves

4.7.1 General

If holes and grooves are required, they shall have been drilled before preservative treatment.

4.7.2 Poles and round droppers

When poles or round droppers (or both) with drilled holes or grooves are required (see (d) of annex A), the size and location of the holes or grooves shall be as required. In the case of fencing poles and droppers, the holes shall be located in accordance with SABS 280.

4.7.3 Guardrail posts

One hole of diameter $19 \text{ mm } \begin{smallmatrix} +2 \\ 0 \end{smallmatrix}$ mm shall be drilled through each post at the approximate geometrical centre of, and approximately perpendicular to, the face(s) of the gain(s).

4.7.4 Spacer blocks

One hole of diameter $19 \text{ mm } \begin{smallmatrix} +2 \\ 0 \end{smallmatrix}$ mm shall be drilled through each spacer block or component of a spacer block (as relevant), perpendicular to and, unless otherwise required (see (e) of annex A), at the approximate geometrical centre of the face. (See figure 1.)

4.8 Dimensions and squareness of ends

4.8.1 Units treated with a class W preservative

In the case of units treated with a class W preservative, if the top diameter is measured when the moisture content exceeds 300 g/kg, an additional tolerance of +5 % of the upper limit for the appropriate top diameter class shall be allowed.

4.8.2 Units other than spacer blocks

The dimensions (top diameter and length) of units other than spacer blocks, as measured in accordance with 7.3, subject to a tolerance of ± 2 mm, shall be as required (see (f) in annex A). In the case of droppers, the minus tolerance shall apply to not more than 25 % of the droppers in a lot. The actual length of units other than spacer blocks shall not differ from the nominal value by more than 40 mm. (See annex F for typical top diameter classes.)

4.8.3 Spacer blocks

The dimensions of spacer blocks shall be as required (see (g) of annex A), subject to a tolerance of ± 2 mm on each dimension. Spacer blocks shall be a pole slabbed on two opposite faces or sawn timber, with a minimum face width of 100 mm, and may consist of one or more components (see figure 1).

4.8.4 Squareness of ends and finish

4.8.4.1 Poles and round droppers

Both ends of poles and round droppers shall be cut square (to within 15°) to their general longitudinal axis.

4.8.4.2 Guardrail posts

Unless otherwise required (see (h) of annex A), the top end of each guardrail post shall be domed or shall have a single roofing cut that is such that the angle subtended by the cut and the plane of the gain (the longer gain in the case of guardrail posts that are slab-gained on opposite faces) is $70^{\circ} \pm 5^{\circ}$ (see figure 1). The butt end of each guardrail post shall be cut square (to within 15°) to its longitudinal axis.

4.8.4.3 Spacer blocks

Both ends of spacer blocks and components of spacer blocks shall be cut square (to within 15°) to their general longitudinal axis. At least 75 % of the area of each drilled face (see 4.7.4) shall be free from wane.

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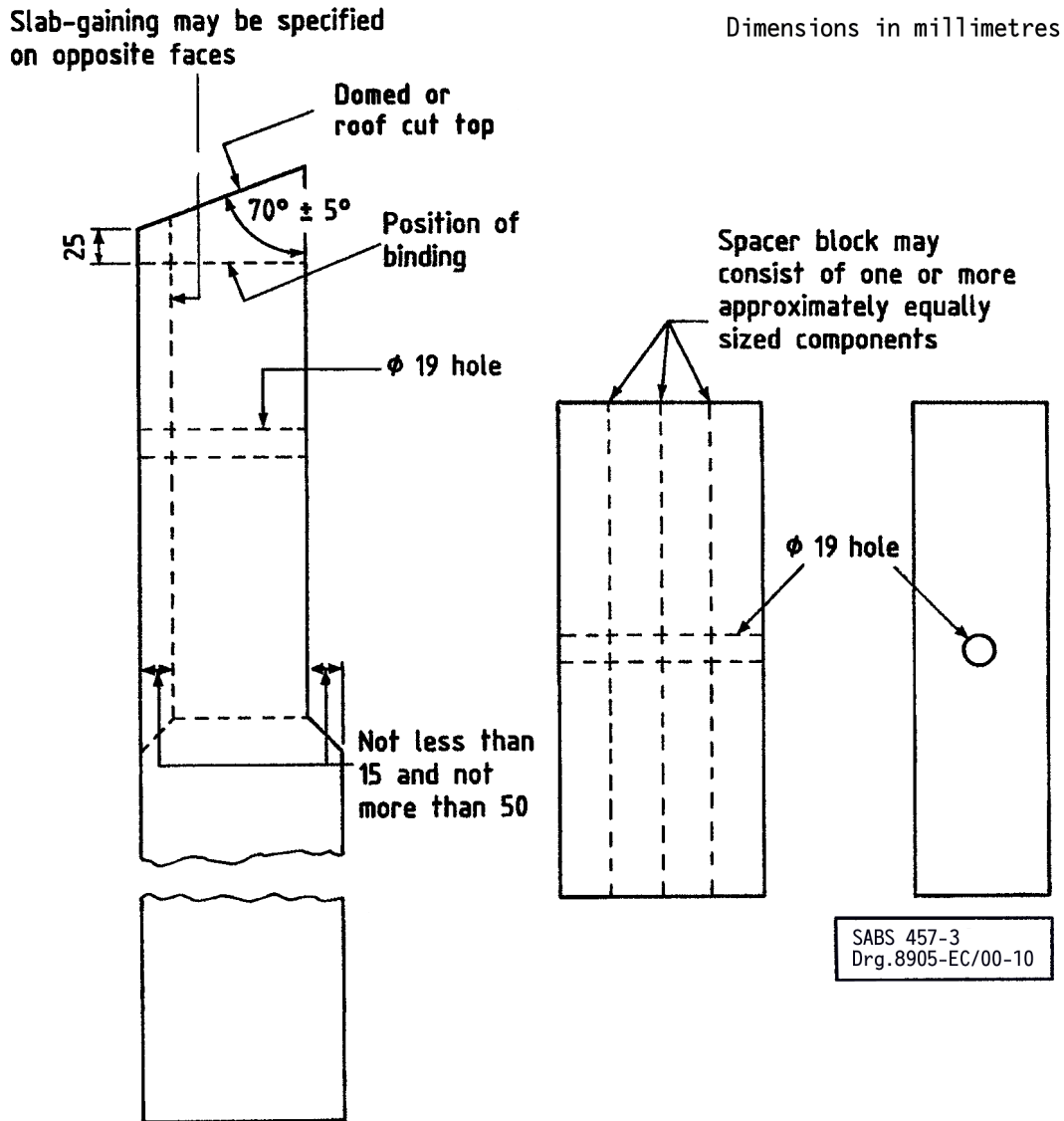


Figure 1 — Typical post and spacer block

5 Binding and nail-plating

5.1 General

All poles and posts, as specified in 5.2 and 5.3, that are treated with a class W preservative, shall be bound or nail-plated. In the case of structural poles of hazard classes H2 and H3 treated with class W preservatives, that are supplied to a non-end-user (e.g. a timber merchant), the poles shall be bound or nail-plated but, if the poles are supplied to an end-user, the treater shall, if so required by the purchaser, supply binding or nail-plates separately, with specific instructions on how and when to apply binding or nail-plates.

Binding and nail-plating of poles or guardrail posts shall be in accordance with one of the methods given in annex G.

5.2 Poles

Both ends of each pole of top diameter exceeding 75 mm, shall be bound or nail-plated.

5.3 Posts

Both ends of each guardrail post, and at least the top end of each guardrail post treated with a class C preservative, shall be bound or nail-plated.

NOTE Drying defects will occur during the reduction in moisture content from 300 g/kg down to equilibrium moisture content. Binding and nail-plating will inhibit excessive end-splitting and it is recommended that binding or nail-plating should be replaced when removed.

6 Preservative treatment

6.1 General

The preservative treatment requirements in 6.2 to 6.7 shall apply.

6.2 Moisture content

See 4.4.

6.3 Mixing of species and units in charges

6.3.1 Species

Except as allowed in 6.3.2.2, softwood and hardwood species shall not be treated in the same charge.

6.3.2 Diameter classes

6.3.2.1 Except as allowed in 6.3.2.2, poles or guardrail posts (or both) shall not be mixed with round droppers in the same charge. The following poles or guardrail posts (or both) may be mixed in one charge:

- a) any two successive top diameter classes; and
- b) any top diameter classes that exceed 100 mm.

6.3.2.2 Diameter classes and species may be mixed in one charge if the weighbridge method for determination of retention is used by determining the mass and volume separately for each group of units of the same diameter class and of the same species.

6.3.3 Spacer blocks

Spacer blocks may be treated in the same charge as poles or guardrail posts (or both) but not in the same charge as droppers.

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6.4 Treatment process

Unless otherwise required (see (i) of annex A), treatment shall be carried out in accordance with SABS 05 to achieve the requirements for retention and penetration.

6.5 Preservative

- | Preservatives are classified in SABS 05. The preservative used shall be one of the types listed in SABS 05, as required (see (j) of annex A). **Amdt 1**

6.6 Retention of preservative

The average net retention of a charge, determined in accordance with 7.4, shall be at least equal to the appropriate value given in column 6 of tables 3 and 4.

6.7 Penetration

The depth of solid penetration of the sapwood, determined in accordance with 7.5, shall be at least equal to the value given in column 7 of tables 3 and 4.

Table 3 — Retention and penetration requirements for hardwood structural poles and agricultural poles

| 1 | 2 | 3 | 4 | 5 | 6 | 7 |
|-----------------|-----------------------|--|--|--|---|-------------------------------------|
| Hazard class | Exposure class | Timber application | End use | Preservative type | Minimum average net retention kg/m ³ | Minimum preservative penetration mm |
| H6 | Marine | Timber that is constantly or periodically in contact with estuarine or sea water and is therefore subject to marine borer attack | Piling ^a ; retaining walls, slipways, groynes, jetties, walkways | CCA plus Creosote | 24 plus 200 | 50 |
| H5 | Fresh water | Timber that is constantly or periodically in contact with fresh water and heavy wet soils | Agricultural poles, poles under flood irrigation, bridges, piling ^a , slipways, groynes, jetties, walkways | CCA or Creosote | 16 or 130 | 20 |
| H4 | Ground contact | Timber that is in direct contact with the ground (for piling and livestock purposes) ^a | Agricultural poles, landscaping structures, playground structures, building; car ports, pergolas, vine and orchard trellises | CCA or Creosote | 12 or 100 | 13 |
| H3 ^b | Exterior above ground | Timber that is not in contact with the ground but will be exposed to leaching and weathering | Landscaping structures, playground structures, building; car ports, pergolas, vine and orchard trellises | CCA or Creosote | 8 or 80 | 13 |
| H2 ^b | Internal | Timber that is used under a roof, is not in contact with the ground and will not be exposed to leaching and weathering | Building structures Roof trusses | CCA or Creosote or TBTOL ^c or Borate ^c (boric acid equivalent) | 8 or 80 or 1 or 5 | 13 |

^a Due to preservative treatment requirements, all piling that are to be used in direct contact with the ground or that will be constantly or periodically in contact with fresh water or heavy wet soils (or both), shall be treated and marked in accordance with hazard class H5. All piling that will be in contact with estuarine or sea water shall be treated and marked in accordance with hazard class H6.

^b All poles of length not exceeding 3,6 m (nominal) shall be treated and marked in accordance with H4.

^c Timber treated with TBTOL or borate may be used under H3 conditions, provided that it is continuously protected by a suitable well-maintained coating.

Amdt 1

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Table 4 — Retention and penetration requirements for hardwood fencing poles, round droppers, guardrail posts and spacerblocks

| 1 | 2 | 3 | 4 | 5 | 6 | 7 |
|-----------------|-----------------------|--|---|-----------------------|---|--------------------------------------|
| Hazard class | Exposure class | Timber application | End use | Preservative type | Minimum average net retention kg/m ³ | Minimum preservative penetration mm |
| H5 | Fresh water | Timber that is constantly or periodically in contact with fresh water and heavy wet soils | Poles for livestock pens / retaining walls ^a Fencing | CCA or Creosote | 16 or 130 | 20 |
| H4 | Ground contact | Timber that is in direct contact with the ground | Poles for livestock pens / retaining walls ^a Fencing Guardrail posts | CCA or Creosote | 12 or 100 | 13 Complete sapwood |
| H3 ^b | Exterior above ground | Timber that is not in contact with the ground but will be exposed to leaching and weathering | Fencing rails Spacer blocks ^c Round droppers | CCA or Creosote | 8 or 80 | 13 Complete sapwood 10 |

Amdt 1

^a Due to preservative treatment requirements, all poles for use in livestock pens/retaining walls, that are to be used in direct contact with the ground or that will be constantly or periodically in contact with fresh water or heavy wet soils (or both), shall be treated and marked in accordance with hazard class H5.
^b All poles of length not exceeding 3,6 m (nominal) shall be treated and marked in accordance with H4.
^c Spacer blocks: full penetration even with lower retention.

7 Inspection and methods of test

NOTE If holes were drilled for assessment of their compliance with this part of SABS 457, poles, guardrail posts, round droppers and spacer blocks may be returned to the lot after testing, provided that, immediately after the holes have been drilled, they are filled with preservative at the recommended treating temperature and tightly plugged to their full depth with an acceptably treated dowel.

7.1 Inspection

Visually examine and then measure (using the relevant methods given in 7.2 and 7.3) each sample taken in accordance with J.2 (see annex J) for compliance with the relevant requirements given in 4.5 to 4.8 (inclusive).

7.2 Measurement of defects

7.2.1 Radial width of sapwood

Use SABS SM 987 but, in the case of round droppers, extract the test specimen at the approximate midlength. Measure, to the nearest 1 mm, the width of the 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 such as SABS SM 1000.

7.2.2 Ring shakes

Insert a feeler of thickness 1 mm (or a circular wire of diameter 1 mm) to its maximum extent into the separation. If the depth of insertion is at least 50 mm, consider the separation to be a ring shake.

7.2.3 Face checks

Measure the length of face checks to the nearest 10 mm, measure the width (at its widest point) and the depth to the nearest 1 mm. When checks run lengthwise 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.

7.2.4 End checks

Measure the length of end checks to the nearest 10 mm and measure the width (at its widest point) to the nearest 1 mm.

7.2.5 Knots, knot-holes and cavities

Take as the size of a knot the maximum dimension of the knot, measured to the nearest 5 mm and transverse to the length of the pole, guardrail post or round dropper. Measure knot-holes and cavities that result from knot-hole surrounds in the same manner.

7.2.6 Crook

Measure, to the nearest 5 mm, crook as the maximum deviation from a straight line between two points, not more than one-quarter of the length, that are on the inner surface of the curve (see figure 2).

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7.2.7 Sweep

7.2.7.1 Fencing poles and guardrail posts of length less than or equal to 5 m (excluding structural poles, agricultural poles and round droppers)

Measure, to the nearest 5 mm, sweep as the maximum deviation from a straight line between two points, at least one-quarter of the length apart, that are on the inner surface of the curve (see figure 3(a)).

7.2.7.2 Poles of length exceeding 5 m (including structural poles, agricultural poles and round droppers of all lengths)

Measure, to the nearest 5 mm, sweep as the maximum deviation from a straight line taken over its full length (see figure 3(b)).

7.3 Dimensions

Measure the dimensions of poles, guardrail posts, round droppers and spacer blocks as follows:

- | a) **top diameter** (poles, guardrail posts and round droppers): measure, using either a diameter tape or a linear tape, to the nearest 1 mm, the diameter of the top of the unit. In the case of a dispute, a diameter tape shall be used; **Amdt 1**
- | b) **cross-sectional dimensions** (spacer blocks): measure each dimension to the nearest 1 mm;
- | c) **length**: measure the length to the nearest 1 mm in the case of spacer blocks, and to the nearest 10 mm in other cases; and
- | d) **squareness of ends**: measure, to the nearest degree, the squareness of ends and when relevant, the angle of roofing cuts on guardrail posts.

7.4 Net retention

Use SABS SM 988 or, provided that the requirements of 6.3.2 are met, SABS SM 967 or SABS SM 989. The average net retention of one load in a charge may be taken as the average net retention of that charge, provided that

- a) the requirements of 6.3.2 are met, and
- b) the average net retention is determined in accordance with the volumes, for each diameter class in the charge, as given in annex K.

In the case of borate treatment, use SABS SM 995 or SABS SM 1238.

NOTE When relevant, each load in a charge may be considered as a separate charge, provided that the average net retention of each load is determined.

7.5 Depth of penetration of preservative

Use the relevant method given in SABS SM 987 to assess compliance with the requirements of 6.6 but, in the case of round droppers, assess the penetration at an approximately midlength position, and in the case of spacer blocks, assess the penetration at a position where sapwood is at its maximum. If compliance with 4.5.12, 4.5.13 and 4.6.2 of this part of SABS 457 has to be assessed, use the same

method, but test poles, guardrail posts and round droppers where sapwood is at its minimum, and at the gum veins, gum pockets, and where bark is at its maximum, as relevant. In the case of borate treatment use SABS SM 1303.

7.6 Moisture content

7.6.1 Untreated units

Compliance with the requirements for moisture content as given in 4.4.1 shall be determined, to the nearest 10 g/kg of each pole, guardrail post, round dropper or spacer block (as relevant). In the case of untreated units, use the electric moisture-meter method given in SABS SM 986, except that the readings should be taken at a depth of half the radius, with a maximum of 30 mm.

7.6.2 Treated units

Moisture content after preservative treatment as given in 4.4.2 shall be determined, to the nearest 10 g/kg of each pole, post, dropper or spacer block (as relevant), as follows:

- a) in the case of units treated with a class C preservative, use the extraction method given in SABS SM 985; and
- b) in the case of units treated with a class O preservative, use the electric moisture-meter method given in SABS SM 986, except that the readings should be taken at a depth of half the radius with a maximum of 30 mm.

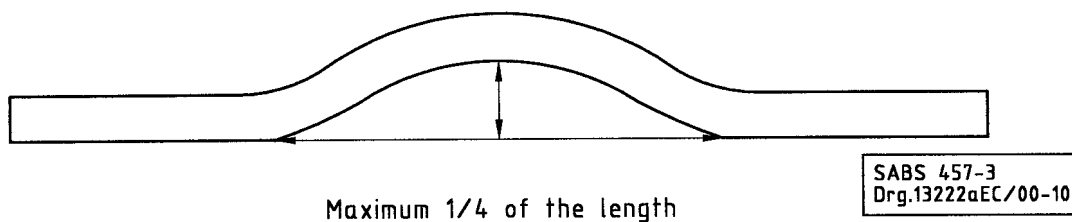


Figure 2 — Measurement of crook

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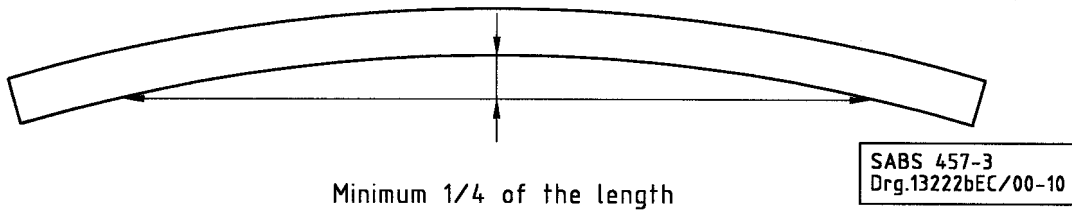


Figure 3(a) — Fencing poles and guardrail posts of length less than or equal to 5 m (excluding structural poles, agricultural poles and round droppers)

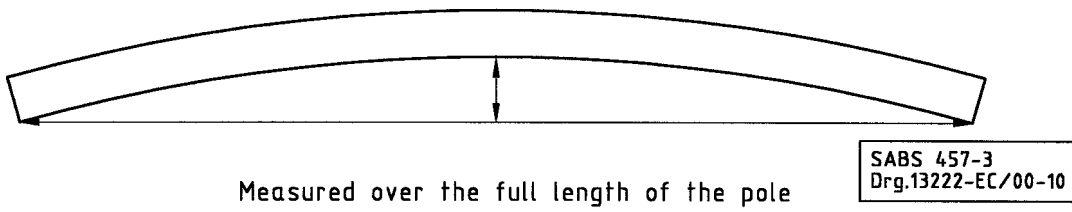


Figure 3(b) — Poles of length exceeding 5 m (including structural poles, agricultural poles and round droppers of all lengths)

Figure 3 — Measurement of sweep

8 Marking

8.1 General

Marking shall be legible, indelible, permanent and such as to be acceptable. (Acceptable methods are given in annex H.)

8.2 Position of marking

8.2.1 Poles and guardrail posts

Every pole and guardrail post of length exceeding 0,5 m, shall be marked. In the case of poles and guardrail posts of length not exceeding 0,5 m, only 5 % of the lot need to be marked. The top end is preferred, but the butt end may be used for marking in cases where the top end is not easily reached. Face marking may also be used, in which case the mark shall be at the appropriate midlength and recessed.

8.2.2 Round droppers

One dropper in each bundle of droppers shall be marked on one end, and in the case of a consignment of loose droppers, at least 10 % shall be marked.

8.2.3 Spacer blocks

Marking shall appear on a label securely attached to at least one spacer block in every bundle.

8.3 Marking information

The marking shall give the following information:

- a) the identification mark of the plant at which the unit was treated;
- b) the last two digits of the year during which the unit was treated (for example 00 for 2000);
- c) the SABS specification number, i.e. 457;
- d) the hazard class, for example H3 (see tables 3 and 4 of this part of SABS 457); and
- e) in the case of poles and guardrail posts, the type of pole, i.e. an S for structural poles and agricultural poles, an F for fencing poles and a P for guardrail posts.

8.4 Colour coding of top diameter classes

When required (see (k) of annex A), poles shall be marked with the colour code assigned for the different top diameter classes as given in annex I.

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Annex A

(normative)

Notes to purchasers

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

- a) the type of preservative-treated product (see 4.1);
- b) whether strength testing of structural poles and agricultural poles is required (see 4.3);
- c) when relevant, that guardrail posts are to be slab-gained on opposite faces (see 4.6.3);
- d) in the case of poles and round droppers, the size and locations of any holes or grooves that are required (see 4.7.2);
- e) the position of the holes in spacer blocks, if other than as specified (see 4.7.4);
- f) the nominal length and, in the case of poles, guardrail posts and round droppers, the top diameter class (see 4.8.2 and annex F);
- g) the dimensions of spacer blocks, if other than as specified (see 4.8.3);
- h) the finish of top ends of guardrail posts, if other than as specified (see 4.8.4.2);
- i) the treatment process, if other than as specified (see 6.4);
- | j) the type of preservative (see 6.5); and **Amdt 1**
- k) whether colour coding of different top diameter classes is required (see 8.4) and the quantity of poles to be colour coded.

Annex B

(normative)

Strength test for poles — Midpoint loading test

B.1 Apparatus

B.1.1 Two suitable anchorages, that

- a) will not damage the pole 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 under test minus 600 mm or minus 200 mm, as relevant (see B.3).

B.1.2 Suitable force applicator, that is positioned centrally between the anchorages, for example:

- a) either an hydraulic or 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 under test and that will not damage the pole during the test; or
- b) a suitable winch and cable.

B.1.3 Force indicator or recorder, calibrated to indicate or record (as relevant), to within 2,5 %, the actual force applied to the pole.

B.2 Procedure

B.2.1 So position the pole under test in the apparatus that the anchorages secure the pole at positions 300 mm ± 25 mm or 100 mm ± 25 mm (as relevant) from its ends and that, if the pole displays crook or sweep, the concave side of the crook or sweep faces towards the ram or the convex side of the crook or sweep faces towards the winch, as appropriate.

B.2.2 If a winch and cable is used, take up the slack and, without jerking the pole, apply force to the midlength point of the pole. If the ram is used, extend the ram (without impacting the pole) until it touches the midlength point of the pole. 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 B.3. Then stop the test and release the force.

B.2.3 Consider the pole to be defective if any visible sign of failure was noted during the test.

NOTE If the force is applied in any plane other than the horizontal and vertical plane upward, a correction factor has to be applied to force F . The correction factor applicable to any specific case is obtainable from the Timber Division of the South African Bureau of Standards.

B.3 Calculation

The test force F is calculated as follows:

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

where

- F is the force required to cause a fibre stress in midpoint loading of 34 MPa, in kilonewtons;
- σ is the relevant fibre stress, i.e. 34 MPa;
- D is the diameter of the pole at midlength point, in millimetres, based on the specified minimum top diameter and a taper of 5 mm per metre of length; and
- 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 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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Table B.1 — Dimensions and strength values for hardwood poles

| 1 | 2 | 3 | 4 |
|--------|----------------------|---|--|
| Length | Minimum top diameter | Minimum diameter at midpoint ^a | Force required to cause a fibre stress of 34 MPa |
| m | mm | mm | Midpoint loading ^b kN |
| 1,2 | 50 | 53 | 1,99 |
| 1,2 | 75 | 78 | 6,34 |
| 1,2 | 100 | 103 | 14,59 |
| 1,2 | 125 | 128 | 28,00 |
| 1,2 | 150 | 153 | 47,82 |
| 1,2 | 175 | 178 | 75,30 |
| 1,5 | 50 | 53,75 | 1,59 |
| 1,5 | 75 | 78,75 | 5,02 |
| 1,5 | 100 | 103,75 | 11,47 |
| 1,5 | 125 | 128,75 | 21,92 |
| 1,5 | 150 | 153,75 | 37,33 |
| 1,5 | 175 | 178,75 | 58,66 |
| 1,8 | 50 | 54,5 | 1,35 |
| 1,8 | 75 | 79,5 | 4,19 |
| 1,8 | 100 | 104,5 | 9,52 |
| 1,8 | 125 | 129,5 | 18,12 |
| 1,8 | 150 | 154,5 | 30,78 |
| 1,8 | 175 | 179,5 | 48,26 |
| 2,0 | 50 | 55 | 1,23 |
| 2,0 | 75 | 80 | 3,80 |
| 2,0 | 100 | 105 | 8,59 |
| 2,0 | 125 | 130 | 16,30 |
| 2,0 | 150 | 155 | 27,62 |
| 2,0 | 175 | 180 | 43,26 |
| 2,1 | 50 | 55,25 | 1,19 |
| 2,1 | 75 | 80,25 | 3,36 |
| 2,1 | 100 | 105,25 | 8,19 |
| 2,1 | 125 | 130,25 | 15,53 |
| 2,1 | 150 | 155,25 | 26,30 |
| 2,1 | 175 | 180,25 | 41,15 |
| 2,4 | 50 | 56 | 1,07 |
| 2,4 | 75 | 81 | 3,23 |
| 2,4 | 100 | 106 | 7,23 |
| 2,4 | 125 | 131 | 13,64 |
| 2,4 | 150 | 156 | 23,04 |
| 2,4 | 175 | 181 | 35,99 |
| 2,7 | 50 | 56,75 | 0,98 |
| 2,7 | 75 | 81,75 | 2,92 |
| 2,7 | 100 | 106,75 | 6,50 |
| 2,7 | 125 | 131,75 | 12,21 |
| 2,7 | 150 | 156,75 | 20,57 |
| 2,7 | 175 | 181,75 | 32,06 |
| 3,0 | 50 | 57,5 | 0,91 |
| 3,0 | 75 | 82,5 | 2,69 |
| 3,0 | 100 | 107,5 | 5,92 |
| 3,0 | 125 | 132,5 | 11,09 |
| 3,0 | 150 | 157,5 | 18,63 |
| 3,0 | 175 | 182,5 | 28,98 |

Table B.1 (continued)

| 1 | 2 | 3 | 4 |
|--------|----------------------|---|--|
| Length | Minimum top diameter | Minimum diameter at midpoint ^a | Force required to cause a fibre stress of 34 MPa |
| m | mm | mm | Midpoint loading ^b kN |
| 3,6 | 50 | 59 | 0,81 |
| 3,6 | 75 | 84 | 2,33 |
| 3,6 | 100 | 109 | 5,09 |
| 3,6 | 125 | 134 | 9,45 |
| 3,6 | 150 | 159 | 15,79 |
| 3,6 | 175 | 184 | 24,46 |
| 3,9 | 50 | 59,75 | 0,77 |
| 3,9 | 75 | 84,75 | 2,20 |
| 3,9 | 100 | 109,75 | 4,77 |
| 3,9 | 125 | 134,75 | 8,83 |
| 3,9 | 150 | 159,75 | 14,71 |
| 3,9 | 175 | 184,75 | 22,76 |
| 4,2 | 50 | 60,5 | 0,74 |
| 4,2 | 75 | 85,5 | 2,09 |
| 4,2 | 100 | 110,5 | 4,50 |
| 4,2 | 125 | 135,5 | 8,30 |
| 4,2 | 150 | 160,5 | 13,80 |
| 4,2 | 175 | 185,5 | 21,31 |
| 4,8 | 50 | 62 | 0,69 |
| 4,8 | 75 | 87 | 1,91 |
| 4,8 | 100 | 112 | 4,08 |
| 4,8 | 125 | 137 | 7,46 |
| 4,8 | 150 | 162 | 12,34 |
| 4,8 | 175 | 187 | 18,98 |
| 5,4 | 50 | 63,5 | 0,66 |
| 5,4 | 75 | 88,5 | 1,78 |
| 5,4 | 100 | 113,5 | 3,75 |
| 5,4 | 125 | 138,5 | 6,82 |
| 5,4 | 150 | 163,5 | 11,22 |
| 5,4 | 175 | 188,5 | 17,20 |
| 6,0 | 50 | 65 | 0,68 |
| 6,0 | 75 | 90 | 1,80 |
| 6,0 | 100 | 115 | 3,76 |
| 6,0 | 125 | 140 | 6,78 |
| 6,0 | 150 | 165 | 11,11 |
| 6,0 | 175 | 190 | 16,96 |
| 6,6 | 50 | 66,5 | 0,65 |
| 6,6 | 75 | 91,5 | 1,70 |
| 6,6 | 100 | 116,5 | 3,52 |
| 6,6 | 125 | 141,5 | 6,30 |
| 6,6 | 150 | 166,5 | 10,27 |
| 6,6 | 175 | 191,5 | 15,63 |
| 7,2 | 50 | 68 | 0,64 |
| 7,2 | 75 | 93 | 1,63 |
| 7,2 | 100 | 118 | 3,32 |
| 7,2 | 125 | 143 | 5,92 |
| 7,2 | 150 | 168 | 9,59 |
| 7,2 | 175 | 193 | 14,54 |

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Table B.1 (concluded)

| 1 | 2 | 3 | 4 |
|-----------------|--------------------------------|---|--|
| Length m | Minimum top diameter mm | Minimum diameter at midpoint ^a mm | Force required to cause a fibre stress of 34 MPa |
| | | | Midpoint loading ^b kN |
| 7,8 | 50 | 69,5 | 0,62 |
| 7,8 | 75 | 94,5 | 1,56 |
| 7,8 | 100 | 119,5 | 3,16 |
| 7,8 | 125 | 144,5 | 5,60 |
| 7,8 | 150 | 169,5 | 9,03 |
| 7,8 | 175 | 194,5 | 13,64 |
| 8,4 | 50 | 71 | 0,61 |
| 8,4 | 75 | 96 | 1,51 |
| 8,4 | 100 | 121 | 3,03 |
| 8,4 | 125 | 146 | 5,33 |
| 8,4 | 150 | 171 | 8,56 |
| 8,4 | 175 | 196 | 12,89 |
| 9,0 | 50 | 72,5 | 0,61 |
| 9,0 | 75 | 97,5 | 1,47 |
| 9,0 | 100 | 122,5 | 2,92 |
| 9,0 | 125 | 147,5 | 5,10 |
| 9,0 | 150 | 172,5 | 8,16 |
| 9,0 | 175 | 197,5 | 12,25 |
| 9,6 | 50 | 74 | 0,60 |
| 9,6 | 75 | 99 | 1,44 |
| 9,6 | 100 | 124 | 2,83 |
| 9,6 | 125 | 149 | 4,91 |
| 9,6 | 150 | 174 | 7,82 |
| 9,6 | 175 | 199 | 11,69 |
| 10,2 | 50 | 75,5 | 0,60 |
| 10,2 | 75 | 100,5 | 1,41 |
| 10,2 | 100 | 125,5 | 2,75 |
| 10,2 | 125 | 150,5 | 4,74 |
| 10,2 | 150 | 175,5 | 7,52 |
| 10,2 | 175 | 200,5 | 11,21 |
| 10,8 | 50 | 77 | 0,60 |
| 10,8 | 75 | 102 | 1,39 |
| 10,8 | 100 | 127 | 2,68 |
| 10,8 | 125 | 152 | 4,60 |
| 10,8 | 150 | 177 | 7,26 |
| 10,8 | 175 | 202 | 10,79 |
| 11,4 | 50 | 78,5 | 0,60 |
| 11,4 | 75 | 103,5 | 1,37 |
| 11,4 | 100 | 128,5 | 2,62 |
| 11,4 | 125 | 153,5 | 4,47 |
| 11,4 | 150 | 178,5 | 7,03 |
| 11,4 | 175 | 203,5 | 10,42 |
| 12,0 | 50 | 80 | 0,60 |
| 12,0 | 75 | 105 | 1,36 |
| 12,0 | 100 | 130 | 2,57 |
| 12,0 | 125 | 155 | 4,36 |
| 12,0 | 150 | 180 | 6,83 |
| 12,0 | 175 | 205 | 10,09 |

^a Based on the minimum top diameter given in column 2 and a taper of 5 mm per metre of length.

^b Calculated using the formula given in B.3.

Annex C
(informative)

Modulus of elasticity (MOE)

Calculate the modulus of elasticity E by using the formula given below (see SABS 0163-1 and SABS 0163-2). The average value for E for hardwood poles falling within the requirements of this part of SABS 457 can be taken as 10 000 MPa.

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

where

E is the modulus of elasticity (for midpoint), in megapascals;

F is the force, in newtons;

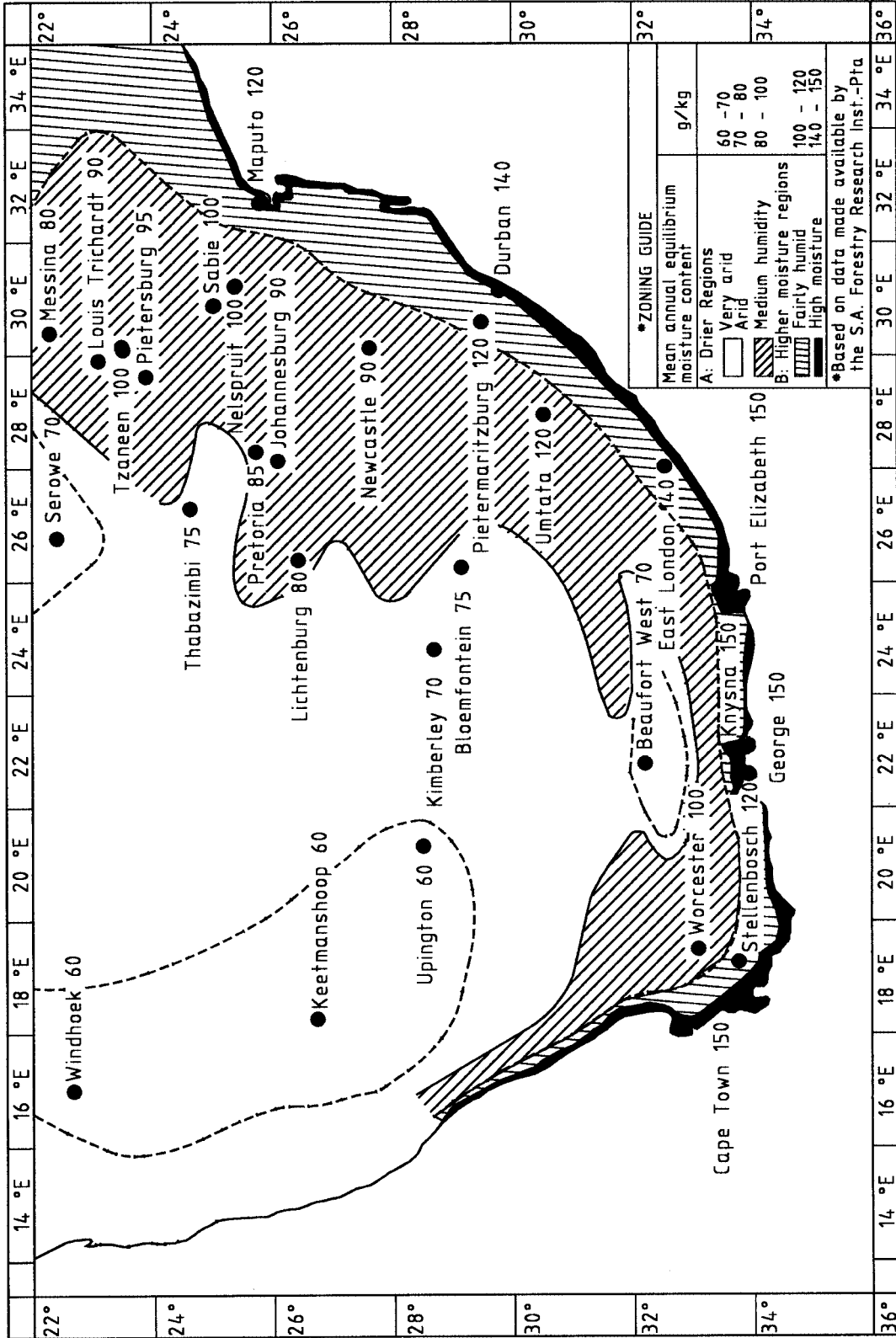
L is the distance between the two supports, in millimetres;

D is the diameter at the midpoint, in millimetres; and

δ is the deflection, in millimetres.

Annex D
(informative)

Mean annual equilibrium moisture content of timber



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Annex E (normative)

Insect damage

E.1 Identification of source of damage

Discriminate between pinhole (*Ambrosia*) and powder-post (*Lyctus*) damage by visual examination or the increment borer method.

E.2 Visual examination

In untreated poles, guardrail posts and round droppers, the periphery of pinhole (*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

Take increment borings from the greater of two holes or 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 case of pinhole (*Ambrosia*) damage, the extracted core will disclose solid timber (except for the radial entrance/exit hole(s)) and, usually, several short galleries transverse to the grain. These holes will normally be black and without frass in poles, guardrail posts and round droppers 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, guardrail posts and round droppers that have been treated with copper-chromium-arsenic compounds.

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 filled with frass and will be white in untreated poles, guardrail posts and round droppers; black in poles, guardrail posts and round droppers that have been treated with creosote or a mixture of creosote and waxy oil, and dark green in poles, guardrail posts and round droppers that have been treated with copper-chromium-arsenic compounds.

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, guardrail post or round dropper) will usually become detached from the rest of the core.

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Annex F
(informative)

Typical top diameter classes and lengths

F.1 Top diameter classes

F.1.1 General

The typical diameter classes in F.1.2 to F.1.4 are given for information only (see 4.8.2).

F.1.2 Poles

50 mm to 74 mm, 75 mm to 99 mm, 100 mm to 124 mm, 125 mm to 149 mm, 150 mm to 174 mm, 175 mm to 199 mm.

F.1.3 Guardrail posts

145 mm to 174 mm, 175 mm to 199 mm, or 200 mm to 230 mm.

F.1.4 Round droppers

25 mm to 31 mm or 32 mm to 50 mm.

F.2 Length

F.2.1 General

The typical lengths in F.2.2 to F.2.4 are given for information only.

F.2.2 Posts

1,8 m.

F.2.3 Droppers

0,9 m; 1,1 m, 1,2 m, 1,35 m, 1,4 m, 1,5 m, 1,8 m, 2,1 m, and 2,4 m.

F.2.4 Poles

1,2 m, 1,5 m, 1,8 m, 2,0 m, 2,1 m, 2,4 m, 2,7 m, 3,0 m, 3,6 m, 3,9 m, 4,2 m, 4,8 m, 5,4 m, 6,0 m, 6,6 m, 7,2 m, 7,8 m, 8,4 m, 9,0 m, 9,6 m, 10,2 m, 10,8 m, 11,4 m, and 12 m.

Annex G

(normative)

Methods of binding and nail-plating

G.1 Coatings

The coatings on the galvanized nails, staples, and wire used for binding shall comply with the following:

- a) nails: a minimum galvanizing thickness of 25 μm ;
- b) staples: a minimum galvanizing thickness of 10 μm ; and
- c) wire: a minimum galvanizing thickness of 25 μm .

G.2 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 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 post at right angles to its longitudinal axis.

G.3 Methods of binding

G.3.1 Nailing and stapling

The binding at an end shall consist of four and a half turns of galvanized mild steel wire, of diameter at least 2,5 mm, tightly wound round the pole or post and firmly secured at each end, 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.

G.3.2 "Farmer's knot"

The binding at an end shall consist of four turns of galvanized mild steel wire, of diameter at least 2,5 mm, wound round the pole or post, double-twisted into a tight knot that rests flush against the surface of the pole or post, and then stapled at two positions, one approximately diametrically opposite the other.

G.3.3 Loop tensioning

The binding at an end shall consist of doubled galvanized mild steel wire, of diameter at least 2,5 mm, shaped to the form of a hairpin, twisted twice (to give four strands) around the pole or post, the loose ends being drawn through the loop (head of the hairpin), tensioned, bent back through 180°, and stapled to the pole or post 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 or post at a position approximately diametrically opposite that of the loop.

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G.4 Location of binding

G.4.1 Poles

Binding shall be a minimum of 100 mm from the end of a pole or at least 50 mm from the nearest hole which should not be within 150 mm of the end of a pole.

G.4.2 Guardrail posts

Binding at the top shall be located 25 mm \pm 2 mm below the lowest point of the bevel of the roofing cut or dome, as relevant.

G.5 Nail plating

G.5.1 Construction

A nail plate shall

- a) be made of steel,
- b) have a zinc coating that complies with the requirements for a coating of class Z275 of SABS ISO 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 nail plate is at least 35 % of the area of the applicable pole or post end.

G.5.2 Securing of nail plates

Each nail shall be fully embedded in the pole end and no bending of nails shall be allowed. A nail plate shall be so positioned in the middle of a pole or post end that its edges do not protrude over the faces of the timber.

Annex H (informative)

Marking methods

H.1 Mild steel and aluminium identification tags

H.1.1 All tags should be of diameter at least 25 mm. The mild steel tag should be of thickness at least 0,5 mm and be galvanized. The aluminium tag should be of thickness at least 0,9 mm.

H.1.2 Each tag should be attached by means of a skirt of thickness at least 5 mm or a galvanized nail of length at least 30 mm and diameter at least 2,5 mm.

H.1.3 Letters and figures should be of height at least 3,5 mm.

H.1.4 The coatings on the galvanized mild steel tags and nails should comply with the following:

- a) mild steel tags should be galvanized to comply with the requirements for class Z275 of SABS ISO 3575; and
- b) nails should have a galvanizing thickness of at least 25 µm.

H.2 Branding

The letter height, after branding, should be at least 8 mm, with the branding width and depth at least 1 mm.

Annex I (normative)

Colour coding

When colour coding is required (see 8.4 and (k) of annex A), it shall be done in accordance with table I.1.

Table I.1 — Colour coding of top diameter classes

| 1 | 2 |
|-------------------------------------|-------------|
| Top (thin end) diameter class mm | Colour code |
| 50 to 74 | Red |
| 75 to 99 | Yellow |
| 100 to 124 | Blue |
| 125 to 149 | White |
| 150 to 174 | Orange |
| 174 to 199 | Green |

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Annex J
(normative)

**Quality verification of wooden poles, round droppers,
guardrail posts and spacer blocks**

J.1 Quality verification

J.1.1 When a purchaser requires ongoing verification of the quality of the wooden poles, round droppers, guardrail posts and spacer blocks, it is suggested that, instead of concentrating solely on the evaluation of the final product, he also direct his attention to the manufacturer's quality system. In this connection it should be noted that SABS ISO 9001, SABS ISO 9002 and SABS ISO 9003 cover the provision of an integrated quality system.

J.1.2 If the units do not bear the certification mark and 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 the standard, use the sampling plan given in J.2. It must be noted that such a sampling plan applies to the final product only.

J.2 Sampling

J.2.1 General

The following sampling procedure shall be applied in determining whether a lot complies with the requirements of this part of SABS 457. The samples so taken shall be deemed to represent the lot for the respective properties.

J.2.2 Sample for inspection

After checking for compliance with clauses 5 and 7, take at random from the lot the number of units shown in column 2 of table J.1, relative to the appropriate lot size shown in column 1, taking, in the case of round droppers and spacer blocks, the units from as many bundles in the lot as is practicable.

J.2.3 Sample for testing

From the lot (or, after it has been inspected, from the sample taken in accordance with J.2.2) take at random the appropriate number of units shown in column 5 of table J.1.

Table J.1 — Sample sizes^a

| 1 | 2 | 3 | 4 | 5 | 6 |
|-----------------|---|-----------------------|------------|---------------------------|--|
| Lot size, units | Sample for inspection and dimensional checks, units | Acceptance number for | | Sample for testing, units | Acceptance number for penetration and (when relevant) moisture content |
| | | Defects | Dimensions | | |
| 50 – 150 | 20 | 2 | 3 | 8 | 1 |
| 151 – 500 | 50 | 5 | 7 | 13 | 1 |
| 501 – 1 200 | 80 | 7 | 10 | 20 | 2 |
| 1 201 – 3 200 | 125 | 10 | 14 | 32 | 3 |
| 3 201 – 10 000 | 200 | 14 | 21 | 32 | 3 |

^a Sample sizes are based on ISO 2859-1.

J.3 Criteria of compliance

The lot shall be deemed to comply with the requirements of this part of SABS 457 (other than those given in 6.3 to 6.6) if

- a) on inspection of the sample taken in accordance with J.2.2 for compliance with the requirements for freedom from defects (see 4.5) and dimensions (see 4.8) the number of defectives found does not exceed the appropriate acceptance number shown in columns 3 and 4 respectively of table J.1; and
- b) on testing of the sample taken in accordance with J.2.3
 - 1) for compliance with the requirements for penetration (see 6.7) and, in the case of units treated with creosote or a mixture of creosote and waxy oil, for moisture content (see 4.4), the number of defectives found does not exceed the appropriate acceptance number shown in column 6 of table J.1; and
 - 2) no defective is found in respect of the requirements of 4.6 and, when applicable 4.7.

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Annex K
(normative)

Average volumes of hardwood poles, round droppers and guardrail posts

K.1 These volumes for hardwood poles, round droppers and guardrail posts are given to assist in the calculation of retention requirements.

K.2 To calculate the actual volume of poles on a trolley, use the formula given below:

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

where

V is the volume, in cubic metres;

L is the length, in metres;

n is the number of diameters; and

x is the diameter of both top and butt ends of poles, guardrail posts or round droppers, added in any sequence, in millimetres.

K.3 Tables K.1 to K.3 give the average volumes of hardwood poles, round droppers and guardrail posts.

NOTE The volumes for hardwood units are calculated on the average of the actual diameter of the class, for example 50 mm to 74,999 mm, and a taper of 7 mm/m.

Table K.1 — Average volumes of round hardwood poles

| 1 | 2 | 3 | 4 | 5 | 6 | 7 |
|----------------|--|----------|------------|------------|------------|------------|
| Nominal length | Volume m ³ | | | | | |
| | Top (thin end) diameter class, 25 mm mm | | | | | |
| m | 50 to 74 | 75 to 99 | 100 to 124 | 125 to 149 | 150 to 174 | 175 to 199 |
| 1,2 | 0,004 2 | 0,007 9 | 0,012 8 | 0,018 9 | 0,026 2 | 0,034 6 |
| 1,5 | 0,005 4 | 0,010 1 | 0,016 3 | 0,024 0 | 0,033 2 | 0,043 8 |
| 1,8 | 0,006 7 | 0,012 4 | 0,020 0 | 0,029 2 | 0,040 3 | 0,053 1 |
| 2,0 | 0,007 6 | 0,014 0 | 0,022 4 | 0,032 8 | 0,045 1 | 0,059 4 |
| 2,1 | 0,008 0 | 0,014 8 | 0,023 7 | 0,034 6 | 0,047 6 | 0,062 6 |
| 2,4 | 0,009 5 | 0,017 3 | 0,027 6 | 0,040 1 | 0,055 1 | 0,072 3 |
| 2,7 | 0,011 0 | 0,019 9 | 0,031 5 | 0,045 8 | 0,062 7 | 0,082 3 |
| 3,0 | 0,012 6 | 0,022 6 | 0,035 6 | 0,051 6 | 0,070 5 | 0,092 4 |
| 3,6 | 0,015 9 | 0,028 3 | 0,044 2 | 0,063 7 | 0,086 7 | 0,113 2 |
| 3,9 | 0,017 8 | 0,031 3 | 0,048 7 | 0,070 0 | 0,095 0 | 0,123 9 |
| 4,2 | 0,019 7 | 0,034 5 | 0,053 4 | 0,076 4 | 0,103 6 | 0,134 9 |
| 4,8 | 0,023 7 | 0,041 0 | 0,063 0 | 0,089 8 | 0,121 2 | 0,157 3 |
| 5,4 | 0,028 1 | 0,048 0 | 0,073 2 | 0,103 7 | 0,139 6 | 0,180 7 |
| 6,0 | 0,032 9 | 0,055 5 | 0,084 0 | 0,118 4 | 0,158 7 | 0,204 9 |
| 6,6 | 0,038 0 | 0,063 4 | 0,095 3 | 0,133 7 | 0,178 6 | 0,229 9 |
| 7,2 | 0,043 5 | 0,071 8 | 0,107 2 | 0,149 7 | 0,199 2 | 0,255 8 |
| 7,8 | 0,049 4 | 0,080 7 | 0,119 7 | 0,166 4 | 0,220 7 | 0,282 7 |
| 8,4 | 0,055 7 | 0,090 2 | 0,132 8 | 0,183 8 | 0,242 9 | 0,310 4 |
| 9,0 | 0,062 5 | 0,100 1 | 0,146 6 | 0,201 9 | 0,266 0 | 0,339 0 |
| 9,6 | 0,069 6 | 0,110 6 | 0,160 9 | 0,220 7 | 0,289 9 | 0,368 6 |
| 10,2 | 0,077 3 | 0,121 6 | 0,175 9 | 0,240 3 | 0,314 7 | 0,399 1 |
| 10,8 | 0,085 3 | 0,133 2 | 0,191 6 | 0,260 7 | 0,340 3 | 0,430 6 |
| 11,4 | 0,093 9 | 0,145 3 | 0,208 0 | 0,281 8 | 0,366 8 | 0,463 0 |
| 12,0 | 0,102 9 | 0,158 1 | 0,225 0 | 0,303 7 | 0,394 1 | 0,496 4 |

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Table K.2 — Average volumes of round hardwood droppers of top diameter class 30 mm to 50 mm

| 1 | 2 | 3 |
|----------------|--------------------------|----------|
| Nominal length | Volume m ³ | |
| | Top diameter class mm | |
| | 25 to 31 | 32 to 50 |
| m | | |
| 0,9 | 0,000 71 | 0,001 38 |
| 1,1 | 0,000 90 | 0,001 74 |
| 1,2 | 0,001 01 | 0,001 93 |
| 1,35 | 0,001 17 | 0,002 22 |
| 1,4 | 0,001 23 | 0,002 32 |
| 1,5 | 0,001 34 | 0,002 52 |
| 1,8 | 0,001 71 | 0,003 16 |
| 2,1 | 0,002 12 | 0,003 86 |
| 2,4 | 0,002 57 | 0,004 60 |

Table K.3 — Average volume of hardwood guardrail posts

| 1 | 2 | 3 | 4 |
|----------------|--------------------------|------------|------------|
| Nominal length | Volume m ³ | | |
| | Top diameter class mm | | |
| | 145 to 174 | 175 to 199 | 200 to 230 |
| m | | | |
| 1,8 | 0,039 1 | 0,053 1 | 0,069 2 |

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