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Wood poles for power and telecommunication lines — Specification

Rwanda Standards Board

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In order to match with technological development and to keep continuous progress in industries, Standards are subject to periodic review. Users shall ascertain that they are in possession of the latest edition

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Contents

Page

Foreword

Rwanda Standards are prepared by Technical Committees and approved by Rwanda Standards Board (RSB) Board of Directors in accordance with the procedures of RSB, in compliance with Annex 3 of the WTO/TBT agreement on the preparation, adoption and application of standards.

The main task of technical committees is to prepare national standards. Final Draft Rwanda Standards adopted by Technical committees are ratified by members of RSB Board of Directors for publication and gazettment as Rwanda Standards.

RS307: 2016 was prepared by Technical Committee RSB/TC 010, *Electrical and electronics engineering*.

In the preparation of this standard, reference was made to the following standard (s):

1) KS 516: 2008Wood poles for power and telecommunication lines – Specification

2) SABS 754: 2010:Eucalyptus poles, cross-arms and spacers for power distribution and communications systems

The assistance derived from the above source is hereby acknowledged with thanks.

Committee membership

The following organizations were represented on the Technical Committee on Electrical and electronics engineering (RSB/TC 010) in the preparation of this standard.

Paragraph of participants

Rwanda Standards Board(RSB) – Secretariat

Wood poles for power and telecommunication lines — Specification

1 Scope

This standard specifies requirements for wood poles for power transmission, distribution and telecommunication overhead lines.

2 Normative references

The following referenced documents are indispensable for the application of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

RS EAC 166: 2000, Wood poles for power and telecommunication lines — *Specification*

3 Terms and definitions

For the purposes of this standard, the following terms and definitions apply / the terms and definitions given in RS EAC 166: 2000 and the following apply.

3.1

Butt

The thick end of a pole

3.2

Crook

Natural curvature that extends over not more than 2 m of the length of a pole

3.3

Reverse crook

Crook in two directions in one plane

3.4

Defective pole

A pole which fails in one or more respects to comply with the relevant requirements of the specification

3.5

End check

Separation along the grain of the wood and across the growth rings and occurring at the end of the pole

3.6

Surface check

Separation along the grain of the wood and across the growth rings but not extending to the end of the pole

3.7

Ring shake

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

3.8

Knot cluster

Group of three or more closely associated knots

3.9

Unsound knot

Know which is not solid across the face usually as a result of decay and/or a knot showing signs of separation from the surrounding wood such that it is unlikely to retain its place

3.10

Post treatment defect

Defect that has developed after treatment and that results in exposure of untreated wood

3.11

Sweep

Natural curvature that extends over more than 2 m of the length of a pole

3.12

Reverse sweep

Sweep in two directions in one place

4 Species of wood

Poles shall be of any species of wood as shown in Table 1

Table 1 — Species of wood

Standard or trade name	Scientific name	Other names
Iron bark	Eucalyptus paniculata	Gum or Eucalyptus
Spotted Gum	Eucalyptus citriodora (corymbiacitiodora) or Eucalyptus maculate (corymbia maculate)	Lemon Scented Gum or Eucalyptus
Tallow wood	Eucalyptus microcorys	Spotted Gum or eucalyptus blue gum
Blue gum	Eucalyptus globulus	
Regnanssaligna gum	Eucalyptus regnans	Giant gum (mountain ash)
	Eucalyptus saligna	Blue gum (saligna gum)
	Eucalyptus grandis	River Red Gum

5 Felling

The tress shall be cut as close to the ground level as possible. The ends shall be sawn to give a flat section and branches shall be dressed down flush with the trunk. The poles shall then be stacked in open crib formation on flat clear ground.

6 Moisture content

The average moisture content of individual poles shall not exceed 25 % at the time of treatment or at the time of measurement of any growth seasoning defects.

7 Defects

Poles shall be generally of sound wood, free form decay, insect attack, rot pockets and any damages caused by handling and processing that would affect the strength of the pole. The growth and seasoning defects shall be limited to the requirements as set out below.

7.1 Knots

The diameter of any single sound knot shall not exceed 1/6 of the circumference and the sum of the diameters of all sound knots in any 500 mm portion shall not exceed ¼ of the circumference at that average cross-section..

7.2 Unsound knots

The allowable diameter of any unsound or combined diameters of a group of unsound knots shall not exceed one half of the allowances given for sound knots.

7.3 Spiral grain

Spirality of grain shall not exceed one complete turn when measured over any 6 length of the pole.

7.4 End check

The number running from the pith to the outer surface of the pole shall not exceed 4 in number. The length shall not exceed 2 times the butt diameter at the butt and 1 times top diameter at the top.

7.5 Surface check

The maximum width of any surface check shall not exceed 15 mm and the maximum length of any surface check, measured over the distance for which the width of the surface check exceeds 4 mm shall not exceed six times the average diameter of the pole.

7.6 Ring shakes

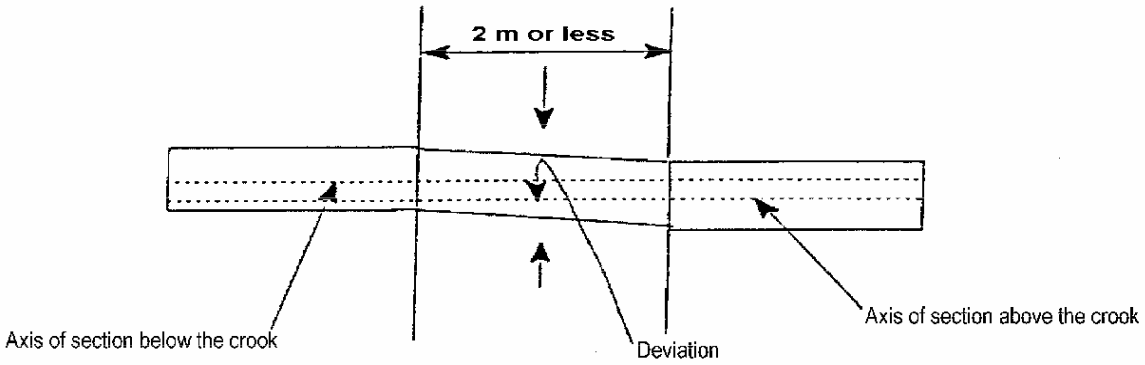
The tip shall be free from ring shakes but one ring shake not exceeding 1/3 of the circumference of the butt of the pole shall be permitted at the butt provided that no part extends to within 50 mm of the periphery.

8 Straightness

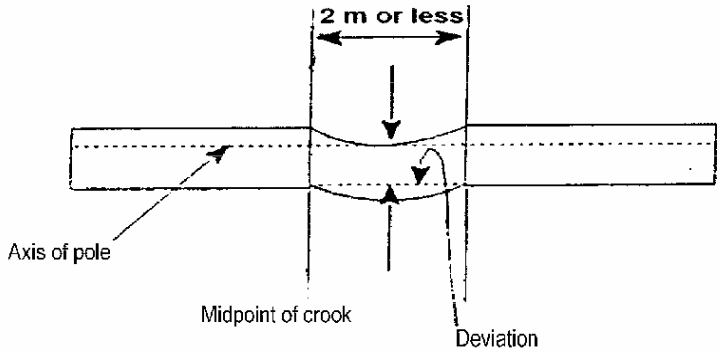
8.1 A straight line from the centre of the butt to the centre of the tip shall lie entirely within the body of the pole.

8.1 Poles shall be free from crooks that deviate more than 75 mm from straightness in any 2 m, length see Figure 1.

Case 1 – Where the reference axis are approximately parallel.



Case 2 – Where axis of sections above and below the crook coincide or are practically coincided.



Case 3 – Where axis of section above and below the crook is not parallel or coincident with axis below the crook.

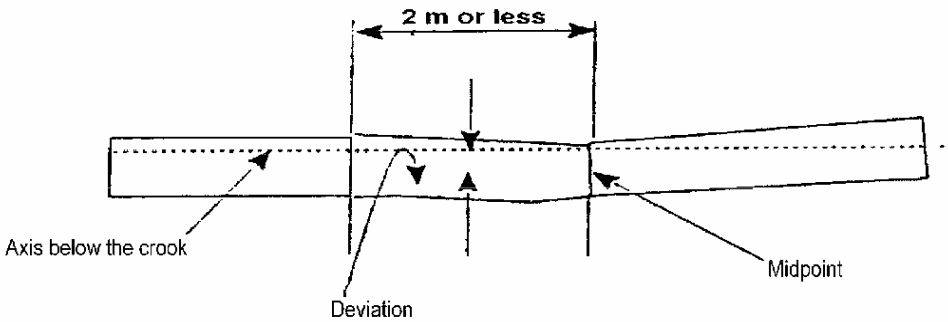


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Table 2 — Pole groundline from butt

Overall length of the pole	Theoretical ground line (TGL) from

(m)	butt (m)
Up to and including 7.0 7.1-9.0 9.1-12.0 12.1 and above	 1.2 1.5 1.8 2.0

10 Length

10.1 The length shall be measured between the extreme ends of a pole to the nearest 10 mm.

10.2 Tolerances on ordered length shall be ± 1% of the length of the pole.

11 Diameter

The diameter of a pole shall be measured at the top and at the mark representing groundline and shall be as given in Table A.1. The maximum difference between the major and minor axes at the top of the pole shall not exceed 25 mm for all poles up to 125 mm top diameter and 35 mm for poles of larger to diameter.

12 Banding and nail plates

12.1 Banding

Each end of each pole shall be banded by not less than one band of galvanised mild steelstrapping, of width not less than 19 mm and thickness not less than 0.9 mm. The strapping is to be firmly tensioned into position by the use of a suitable strapping machine capable of applying a tensile force of not less than one half of the ultimate tensile strength of the strapping being used. Each band is to be nailed to the pole at two diametrically opposed positions, using galvanised clout nails of not less than 3 mm diameter and length not less than 38mm.

12.1.1 Banding position

The bands are to be applied not more than 100 mm away from the end of each pole.

12.1.2 Time of banding

After seasoning and dressing of the poles and prior to preservative treatment

12.2 Nail plates

Nailplatesshallbeusedonlyforflatorslantendcuts,eitheratthetopofthepoleorattheendsofcross-arms and spacers. The nail plate shall be made of steel and have a zinc coating that complies with the requirements of KS 592. The plate shall have a minimum thickness of 1.2 mm and have a minimum nail length of 14 mm. The size of the plate will be such that the area covered by the plate is at least 60 % of the area of applicable pole end.

12.2.1 Security of plate

Each nail shall be fully embedded in the pole end and no nail shall be bent. The nail plate shall be so positioned in the middle of a cut end that its edges do not protrude over the round face of the timber.

13 Strength

The strength of eucalyptus poles shall be determined as provided for in Annex A.

14 Preservation

The strength of eucalyptus poles shall be determined as provided for in Annex A.

14.1 Thepolesshallhaveaminimumsapwoodthicknessof15mmasobservedateachendofpole.

14.1 The poles shall be treated as per KS 516: 2008. The retention shall be measured as specific sapwood retention.

15 Marking

15.1 Eachpoleshallbelegiblyandindeliblymarkedwiththefollowinginformation.

a) manufacturer’s name or trademark;

b) date oftreatment;

c) the number of this RwandaStandard;

d) length ofpole;

e) diameterclass;

f) hazardclass;

g) species ofpole;

h) method oftreatment.

15.2 Themarkingshallbeplaced3.5mfromthebuttofthepole.

Annex A
(normative)

Design data for the strength of poles unstayed and stayed

A.1 Loads

The ultimate average load (i.e. excluding the safety factors) eucalyptus poles may be obtained from Table A1. For other sizes of poles the loads should be calculated individually.

The loads given in Table A.1 are based on the following material properties for eucalyptus wood:

Mean ultimate bending strength 62.9 N/mm^2

Mean modulus of elasticity 10646 N/mm^2

NOTE The strength values have been derived from tests on small clear specimens tested in the green condition and modified for pole – small clear strength relationships. The coefficients of variation for the two strength values are 17.9 % and 26.5 % respectively.

A.2 Apparatus

A.2.1 Crib, capable of securing the pole under test from the butt end to the ground line and that will ensure nosignificantmovementoftheclampedbuttduringatestandpreventanyrotationalmovementofthepole.

A.2.2 Clamping device, 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 duringtest.

A.2.3 Winch, or of suitable capacity and preferably motor driven, that is capable of applying forcetothepoleundertest,theforcebeingappliedhorizontallyandatanaverageangleofapproximately90^o to the pole, through a cable of such a length that during the test, the angle varies between slightly less than and slightly more than 90 ^{o}.

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

A.3.4 Force indicator or recorder, calibrated to indicate or record (as relevant), to within 2.5 %, the actual force applied to thepole.

A.3 Procedure

A.3.1 Using the clamping device, securely clamp the butt of the pole in the crib, at the theoretical ground line (TGL) of the pole as per Table 2. 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 and at a position 600mm ± 25 mm or

100 ± 25 mm, as relevant (see A.4), from the top end, and so position and secure the crib or winch (orboth) that the angle between the axis of the pole and the cable is slightly less than 90°.

A.3.2 Take up the slack and without jerking the pole, apply force gradually and at as uniform a rate as possible till the pole fails. Then stop the test and release the force.

A.3.3 Record the value at failure. Record the distance at which the pole failed (Distance from the TGL), any defects(physicalorotherwise)atthepointoffailureandthediameterofpoleatthat point.

A.4 Apparatus

Calculate the value of *F* as follows:

$$F = \frac{\sigma \times D3}{10.2 \times L}$$

Table A.1 — Dimensions and strength values for poles

1	2	3	4	5
Length	**Minimum** top **diameter**	**Minimum diameter** at **theoretical Ground line**	**Forcerequiredtocauseafiber stress of55MPa**	
			Cantilever loading	**Midpoint loading**
m	**mm**	**mm**	**kN**	**kN**
2.0	80	82.5	7.57	7.37
2.0	100	102.5	14.52	13.89
2.0	120	122.5	24.78	23.44
2.0	140	142.5	39.01	36.58
2.0	160	162.5	57.84	53.90
2.5	80	85	3.68	6.03
2.5	100	105	6.94	11.26
2.5	120	125	11.70	18.90
2.5	140	145	18.27	29.38
2.5	160	165	26.91	43.15
3.0	100	107.5	4.78	9.58
3.0	120	127.5	7.98	15.99
3.0	140	147.5	12.36	24.75
3.0	160	167.5	18.10	36.25
3.0	180	187.5	25.39	50.85
3.5	100	110	3.78	8.42
3.5	120	130	6.24	13.97
3.5	140	150	9.58	21.54
3.5	160	170	13.94	31.45
4.5	100	115	2.83	6.92

4.5	120	135	4.57	11.36
4.5	140	155	6.92	17.38
4.5	160	175	9.97	25.23
4.5	180	195	13.79	35.14
6.0	80	102.5	1.49	3.43
6.0	100	122.5	2.54	6.08
6.0	120	142.5	4.00	9.84
6.0	140	162.5	5.93	14.89
6.0	160	182.5	8.40	21.44
6.0	180	202.5	11.48	29.66
7.0	80	107.5	1.37	3.13
7.0	100	127.5	2.28	5.47
7.0	120	147.5	3.53	8.77
7.0	140	167.5	5.17	13.19
7.0	160	187.5	7.25	18.87
7.0	180	207.5	9.83	26.00
8.0	80	112.5	1.30	2.92
8.0	100	132.5	2.13	5.04
8.0	120	152.5	3.24	8.01
8.0	140	172.5	4.69	11.96
8.0	160	192.5	6.52	17.02
8.0	180	212.5	8.77	23.35
9.0	120	157.5	3.05	7.44
9.0	140	177.5	4.37	11.03
9.0	160	197.5	6.02	15.63
9.0	180	217.5	8.04	21.35
10.0	140	182.5	4.15	10.32
10.0	160	202.5	5.67	14.55
10.0	180	222.5	7.52	19.80
10.0	200	242.5	9.73	26.17
11.0	140	187.5	3.99	9.76
11.0	160	207.5	5.41	13.69
11.0	180	227.5	7.13	18.55
11.0	200	247.5	9.19	24.45
11.0	220	267.5	11.60	31.49
12.0	140	192.5	3.89	9.31
12.0	160	212.5	5.23	13.00
12.0	180	232.5	6.85	17.55
12.0	200	252.5	8.77	23.05
12.0	220	272.5	11.02	29.60
13.0	140	197.5	3.81	8.94
13.0	160	217.5	5.09	12.42
13.0	180	237.5	6.63	16.71

13.0	200	257.5	8.45	21.89
13.0	220	277.5	10.57	28.04
14.0	160	222.5	4.99	11.95
14.0	180	242.5	6.46	16.02
14.0	200	262.5	8.20	20.92
14.0	220	282.5	10.22	26.73
15.0	160	227.5	4.92	11.55
15.0	180	247.5	6.34	15.43
15.0	200	267.5	8.00	20.09
15.0	220	287.5	9.93	25.61
16.0	160	232.5	4.88	11.22
16.0	180	252.5	6.24	14.93
16.0	200	272.5	7.85	19.39
16.0	220	292.5	9.71	24.65
18.0	160	242.5	4.84	10.69
18.0	180	262.5	6.13	14.14
18.0	200	282.5	7.65	18.25

Bibliography

[1] KS 516: 2008 Wood poles for power and telecommunication lines – Specification

[2] SABS 754: 2010: Eucalyptus poles, cross-arms and spacers for power distribution and communications systems

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