



BSI Standards Publication

Round and sawn timber - Methods of measurements

Part 3: Features and biological degradations

National foreword

This British Standard is the UK implementation of EN 1309-3:2018. It supersedes BS EN 1311:1997 and BS EN 1310:1997, which are withdrawn.

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ICS 79.040

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Partie 3 : Singularités et altérations biologiques

Rund- und Schnittholz - Meßmethode - Teil 3:
Merkmale und von Schädlingsbefall

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European foreword

This document (EN 1309-3:2018) has been prepared by Technical Committee CEN/TC 175 “Round and sawn timber”, the secretariat of which is held by AFNOR.

This European Standard shall be given the status of a national standard, either by publication of an identical text or by endorsement, at the latest by July 2018, and conflicting national standards shall be withdrawn at the latest by July 2018.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. CEN shall not be held responsible for identifying any or all such patent rights.

This document supersedes [EN 1310:1997](#) and [EN 1311:1997](#).

This standard is one of a series, and covers methods of measurement for round timber and sawn timber.

Other standards in this series are:

- [EN 1309-1](#) Round and sawn timber - Method of measurement of dimensions – Part 1: Sawn timber
- [EN 1309-2](#) Round and sawn timber - Method of measurement of dimensions – Part 2: Round timber

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1 Scope

This European Standard specifies the methodology for measurement of features – in relation to wood structure, biological agencies and other damage – taken into account in the visual grading:

- a) for appearance – of sawn, processed and round timber;
- b) for serviceability – of sawn and processed timber (identified in [EN 1611-1](#) as the integrity of the timber).

When the standard is applied the methodology of measurement used shall be stated.

It is not applicable to structural timber for which strength grading in accordance with [EN 14081-1](#) is required.

This standard applies to hardwood and softwood sawn timber, both square edged and un-edged, to processed timber and to round timber.

It does not apply to tropical timber.

2 Normative references

The following 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.

EN 844 (all parts), *Round and sawn timber — Terminology*

[EN 1611-1](#), *Sawn timber — Appearance grading of softwoods — Part 1: European spruces, firs, pines and Douglas firs*

[EN 14081-1](#), *Timber structures — Strength graded structural timber with rectangular cross section — Part 1: General requirements*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in EN 844 apply.

4 Symbols

d	size, in millimetres;
a	width on the minor axis, in millimetres;
b	width on the major axis, in millimetres;
n_{max}	maximum permitted number of knots;
d_1, d_2, \dots, d_n	sizes of the individual knots, in millimetres;
d_{max}	maximum permitted size of a knot, in millimetres.

5 Sawn and processed timber

5.1 Knots

5.1.1 General

For the purposes of this standard, knots in sawn timber are classified according to their shape, size and position. Size is derived from the formulae given below and expressed in millimetres or as a percentage

of a dimension of the surface where the knot occurs. The following symbols are used in the formulae, with suffixes as required:

d is the size, in millimetres;

a is the width on the minor axis, in millimetres;

b is the width on the major axis, in millimetres.

Methodology for measurement of knots for the assessment of appearance is set out in [5.1.2](#). For assessment of serviceability, an alternative methodology for measurement of knots is given in [Annex A](#).

NOTE For strength grading of structural timber, refer to [EN 14081-1](#).

5.1.2 Appearance assessment methodology

5.1.2.1 General

Consider each knot individually, except for 'cat's paw'.

Measure knots on a part or all the surface of the face(s) or the edge(s) as specified by the grading rule used. In the case of a knot with bark on its perimeter, the measurement of the knot shall include the bark.

[Figures 1](#) to [6](#) show the categories of knots that shall be measured. Each figure is accompanied by the corresponding formula that is generally the arithmetic average of the minor axis (a) and major axis (b) of the knot ($d = (a + b)/2$). Measure the width on each axis and derive the size from the formula.

For each grade, the maximum size and number of knots per piece or per unit measure is stated in the grading standards / grading rules.

A larger number of smaller knots may be permitted provided their cumulative measure does not exceed the maximum knot size multiplied by the number permitted within a grade, which can be expressed as:

$$\sum_{1}^{n} d \leq n_{max} \times d_{max} \quad (1)$$

where

n_{max} is the maximum permitted number of knots;

d_1, d_2, \dots, d_n are the sizes of the individual knots, in millimetres;

d_{max} is the maximum permitted size of a knot, in millimetres.

Where a grading standard permits the use of such cumulative measurement it will be stated in the grading standard.

5.1.2.2 Round knot

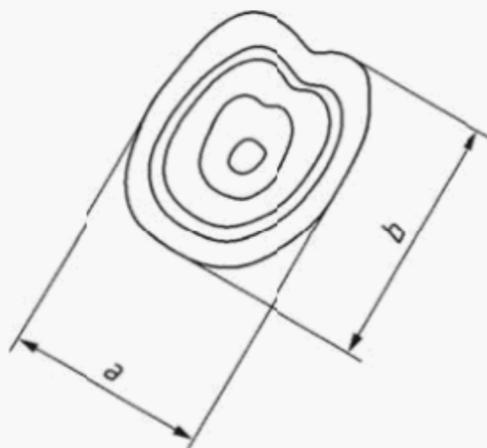


Figure 1 — Round knot

Formula:

$$d = \frac{a+b}{2} \quad (2)$$

5.1.2.3 Oval knot

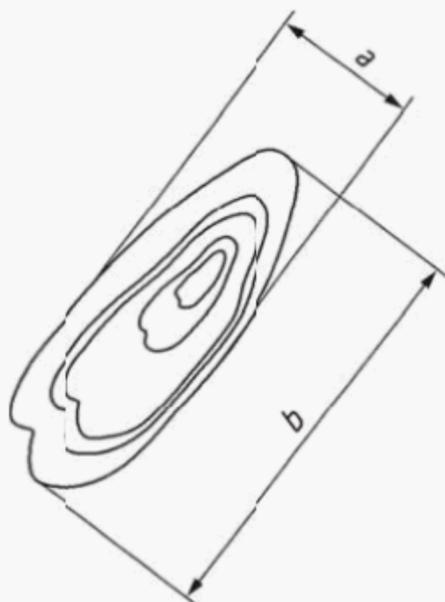
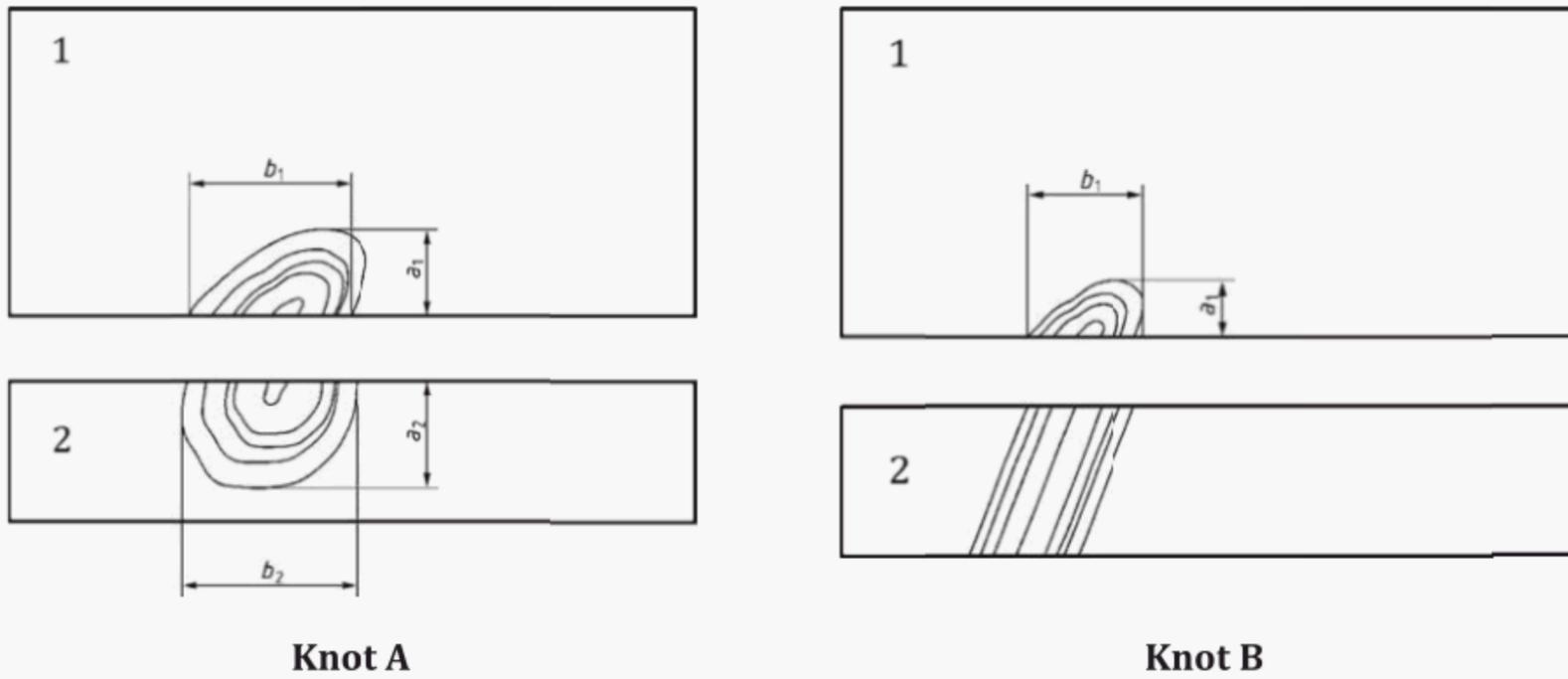


Figure 2 — Oval knot

Formula:

$$d = \frac{a+b}{2} \quad (3)$$

5.1.2.4 Arris knot



Key
 1 On faces
 2 On edges (Knot B: not measured, record its presence)

Figure 3 — Arris knot

Formula:

on face (Knot A and Knot B):

$$d = a_1 \tag{4}$$

on edge (Knot A):

$$d = a_2 \tag{5}$$

5.1.2.5 Spike knot (Oval knot with maximum to minimum ratio exceeding 4)

Depending on the grading rule used,

- a) measure as oval knot, or
- b) not measured, record its presence.

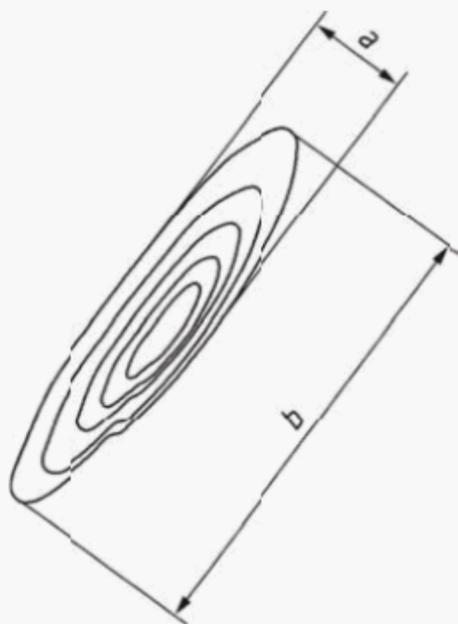


Figure 4 — Spike knot

5.1.2.6 Splay knot

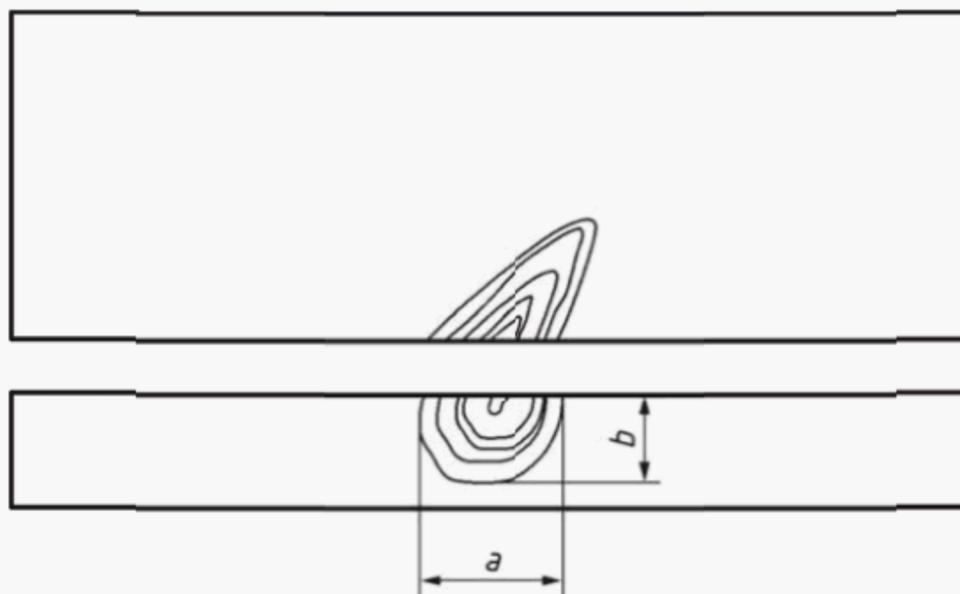


Figure 5 — Splay knot

Depending on the grading rule used,

- a) measure on the edge only and use the formula:

$$d = \frac{a + b}{2}$$

(6)

or

- b) not measured, record its presence.

5.1.2.7 Branched knot

Depending on the grading rule used,

- a) not measured, record its presence, or
b) record the number of knots in a unit of length.

Where a branched knot opens on the edge, measure according to [5.1.2.6](#).

5.1.2.8 Knot cluster

Measure the individual knots.

5.1.2.9 Cat's paw

Measure the total size of the knot cluster.

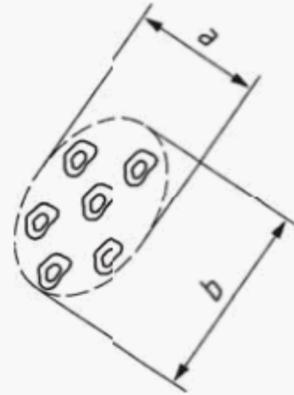


Figure 6 — Cat's paw

Formula:

$$d = \frac{a + b}{2} \quad (7)$$

5.2 Resin pocket

Depending on the grading rule used,

- measure the major axis of the resin pocket, expressed in millimetres. If more than one, also record their number per metre length of the piece or for the full length of the piece; or
- not measured, record its presence.

5.3 Reaction wood

Depending on the grading rule used,

- measure the length and/or the width of a rectangle that encloses it, expressed in centimetres or as a percentage of the length and/or the width of the surface (face or edge) being considered. Where there are two or more areas of reaction wood, each shall be measured as before, and the respective dimensions totalled; or
- not measured, record its presence.

5.4 Grain

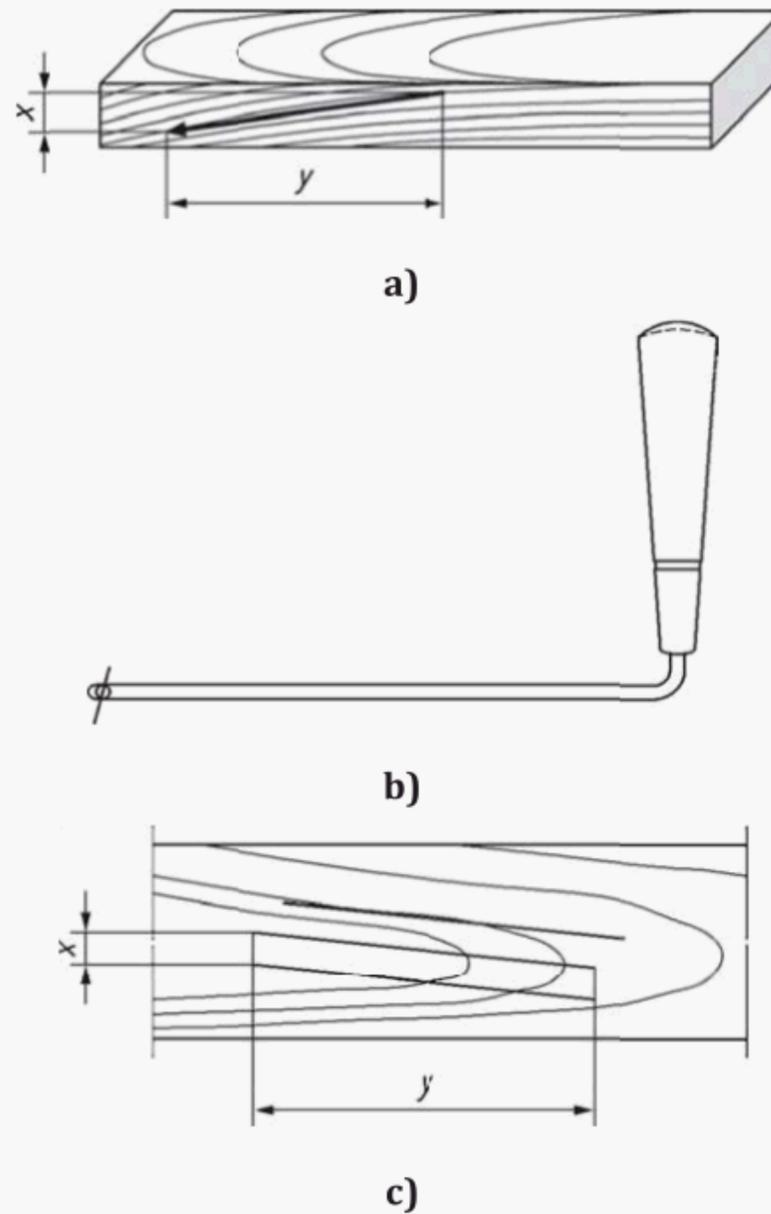
5.4.1 Slope of grain

Use a scribe to determine slope of grain (see Figure 7.a).

A scribe is shown in Figure 7.b. It consists of a cranked rod with a swivel handle at one end, a needle set to a slight trailing angle at the other.

If the scribe is drawn along the piece of timber in the apparent direction of the grain, applying sufficient but not excessive pressure, it will scribe a line that shows accurately the direction of grain.

To check, it is recommended to draw several adjacent lines, with the direction of pull diverging slightly to the left and to the right; the scribe should still follow the correct direction, (see Figure 7.c).



Key

- a) Determination of slope of grain on the edge of piece
- b) Scribe
- c) Use of a scribe

Figure 7 — Determination of slope of grain

Express the result as a percentage, using the formula:

$$\frac{x}{y} \times 100 \quad (8)$$

where

- x is the deviation of the grain, in millimetres;
- y is the length over which the measurement is taken, in millimetres.

5.4.2 Spiral, interlocked grain

Not measured, record its presence.

5.4.3 Curly grain

Depending on the grading rule used,

- a) measure the length and/or the width of a rectangle that encloses it, expressed in centimetres or as a percentage of the length and/or the width of the surface (face or edge) being considered.

Where there are two or more areas of curly grain, each shall be measured as before, and the respective dimensions totalled, or

- b) not measured, record its presence.

5.5 Rate of growth

On one end of the piece, mark out the longest possible straight line normal to the growth rings. Count the number of growth rings along this line. Repeat at the other end of the piece. Disregard the portion, if any, within 25 mm of the pith. Divide the sum of the lengths of the two lines at the two ends by the total number of growth rings counted to obtain the rate of growth, expressed as the average width of the growth rings in millimetres (see [Figure 8](#)).

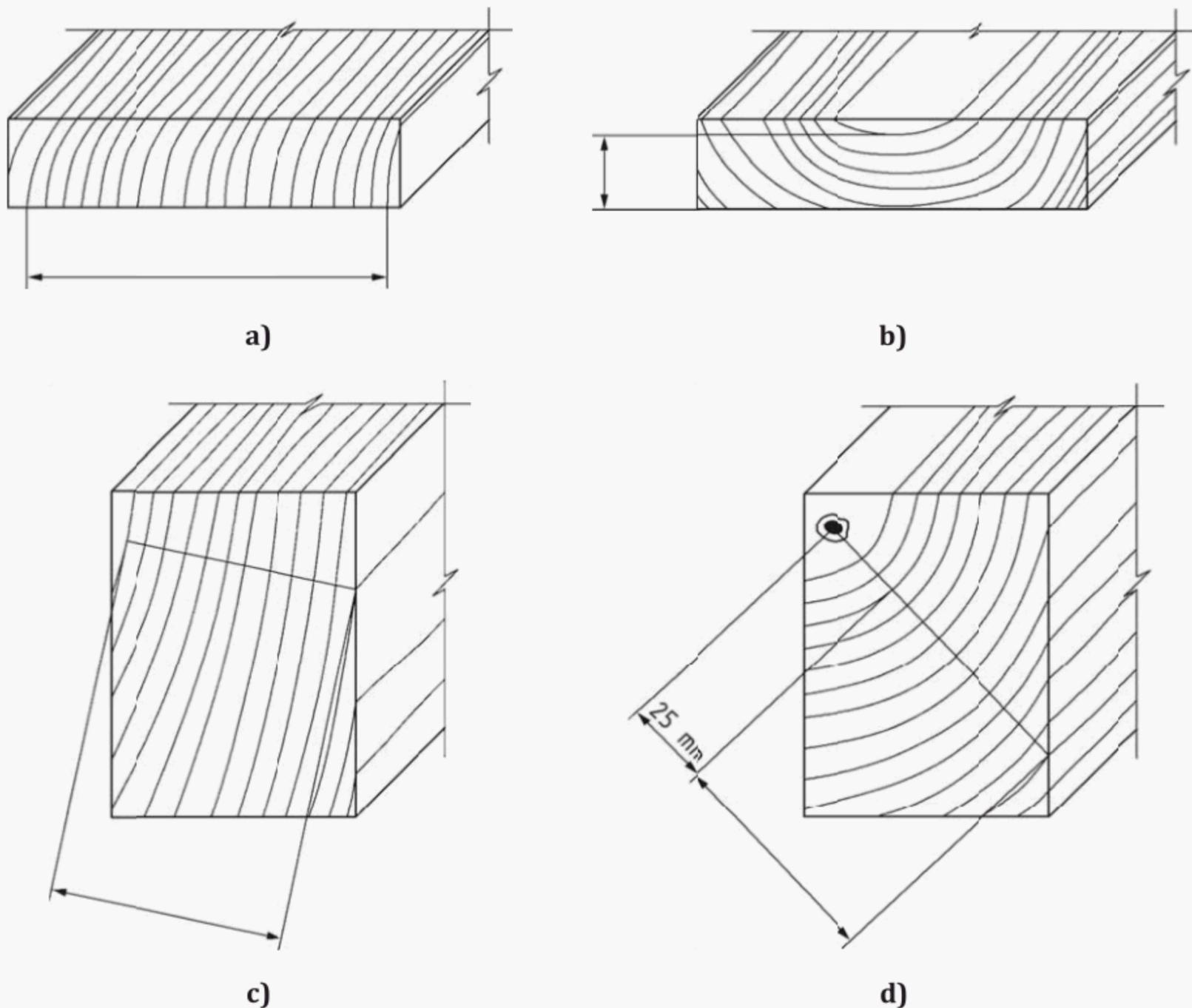


Figure 8 — Rate of growth

5.6 Bark pocket

Depending on the grading rules used,

- a) measure the length and width and express in centimetres,

Where there are two or more areas of bark pocket, each shall be measured as above, the respective dimensions totalled and expressed in centimetres or assess overall and express the total as a percentage of the surface being considered, or

- b) record the number of bark pockets over one metre length or over the entire piece, or
c) not measured, record its presence.

5.7 Sapwood

Depending on the grading rule used,

- a) find that portion of the surface (face or edge) being considered, where the sapwood is widest. Measure the width and express the result in millimetres or as a percentage of the width of the surface, or
b) not measured, record its presence.

5.8 Wane

Depending on the grading rule used,

- a) measure the length (c) of wane and express it in centimetres or as a percentage of the length. If wane shows on more than one part of the arris, add the different lengths (c_1, c_2, \dots, c_n), see [Figure 9](#),
b) measure the greatest width of the wane on the face or edge and express the result in millimetres, alternatively as a decimal fraction using the following formulae:

$$w_f = \frac{a - a_1}{a} \quad (9)$$

$$w_e = \frac{b - b_1}{b} \quad (10)$$

where

- w_f is the width of the wane on the face, as a decimal fraction;
 w_e is the width of the wane on the edge, as a decimal fraction;
 a is the full width of the face, in millimetres;
 a_1 is the width of the face when reduced by the wane, in millimetres;
 b is the full width of the edge, in millimetres;
 b_1 is the width of the edge when reduced by the wane, in millimetres, see [Figure 9](#);

or

- c) not measured, record its presence.

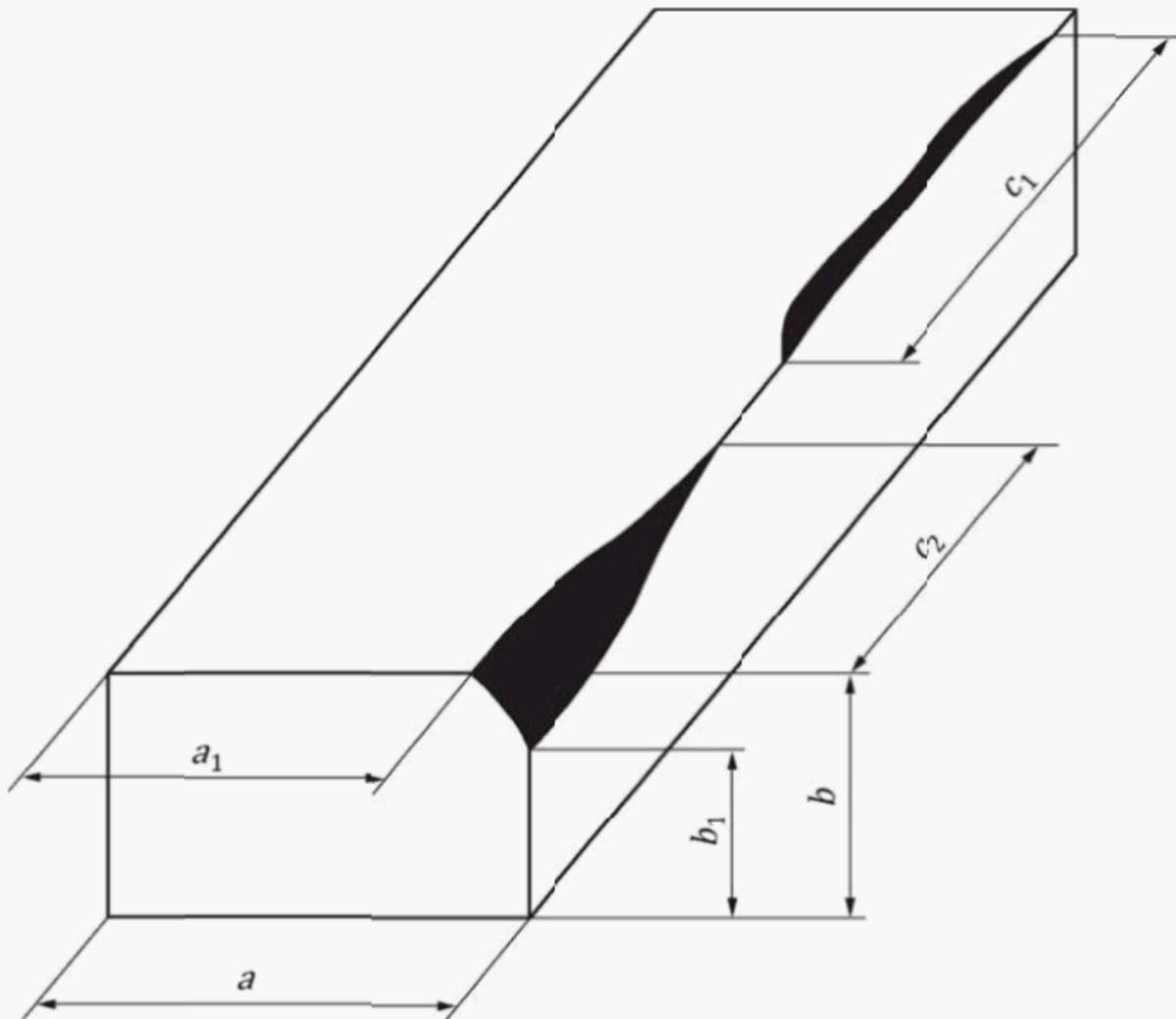


Figure 9 — Wane

5.9 Fissure

5.9.1 Face, edge and end shakes, splits

Depending on the grading rule used,

- measure its length by determining the distance between two lines normal to the longitudinal axis of the piece and passing through the ends of the fissure. For a cluster of fissures, measure the overall length of the cluster. If there are several fissures or clusters, total their length. Express the result in millimetres or as a percentage of the length of the piece; or
- not measured, record their presence.

5.9.2 Ring and heart shakes

If showing only at one or both ends of the piece, record their presence.

If showing on a face or edge, measure as in [5.9.1](#).

5.9.3 Checks

Depending on the grading rule used,

- measure the length and/or the width of the rectangle that encloses the portion where they occur, expressed in millimetres or as a percentage of the length and/or width of the surface (face or edge) being considered; or
- record their presence.

5.10 Warp

5.10.1 Bow and spring

Determine, with the aid of a straight edge, the distortion of the wood by:

- for pieces maximum 2 m long – measuring the maximum distance between the wood and the straight edge and expressing the result in millimetres;
- for pieces longer than 2 m – measuring, over the worst 2 m length, the maximum distance between the wood and the straight edge and expressing the result in millimetres (dimension w in [Figure 10](#) and dimension x in [Figure 11](#)).

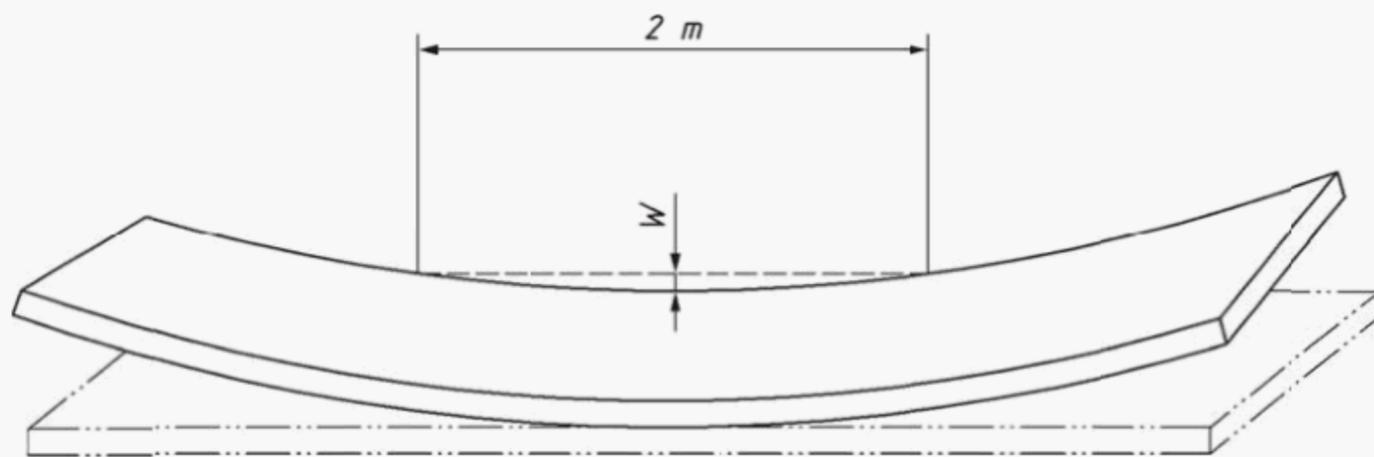


Figure 10 — Bow

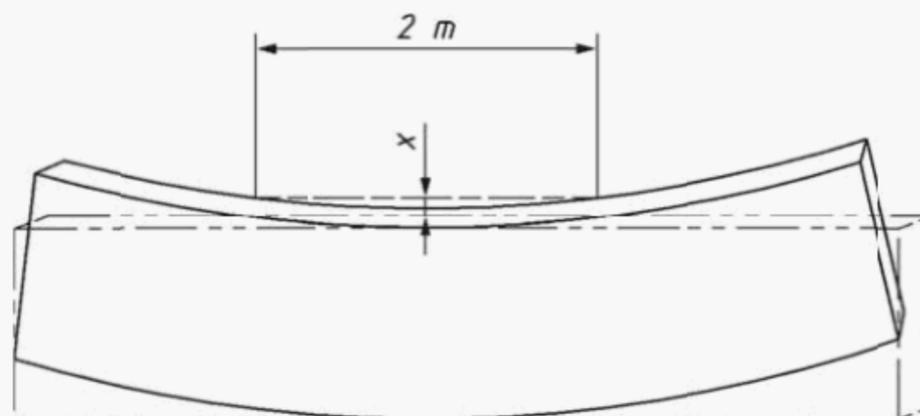


Figure 11 — Spring

5.10.2 Cup

Measure the maximum distortion in the width of the piece, expressed in millimetres or as a percentage of the width. See dimension z in [Figure 12](#).

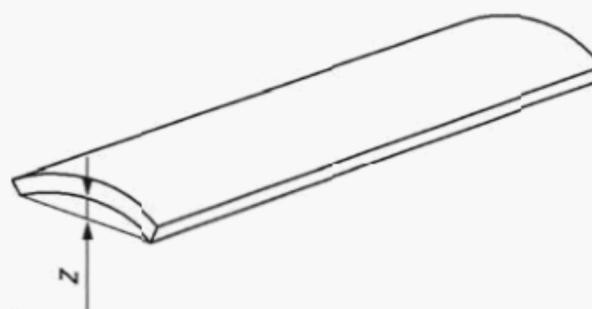


Figure 12 — Cup

5.10.3 Twist

Measure the maximum distortion of the surface over a representative 2 m length, expressed in millimetres or as a percentage of the length of the piece. See dimension *y* in [Figure 13](#).



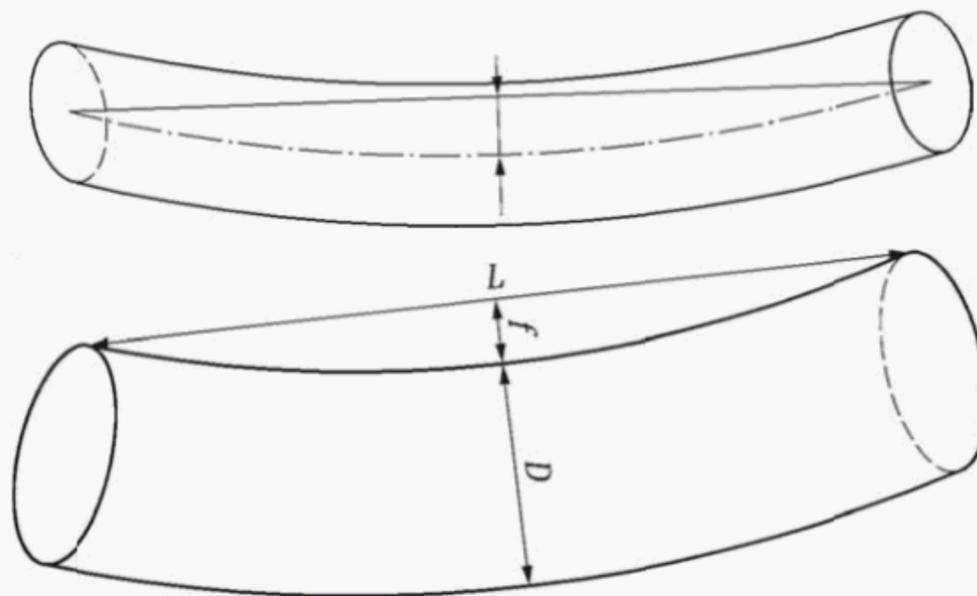
Figure 13 — Twist

6 Round timber

6.1 Features of the form of the log

6.1.1 Sweep

6.1.1.1 Simple sweep



Key

- a) Centre line measure
- b) Surface measure

Figure 14 — Simple sweep

If conditions permit, measure the sagitta – which is the maximum distance between the assessed concave centre line of the log and a straight line joining the centres of each end (see [Figure 14 a](#)).

If the above method is not possible, measure the maximum distance between the rounded concave surface and a straight line joining the innermost points of the end surfaces (see [Figure 14 b](#)).

Express the result as either:

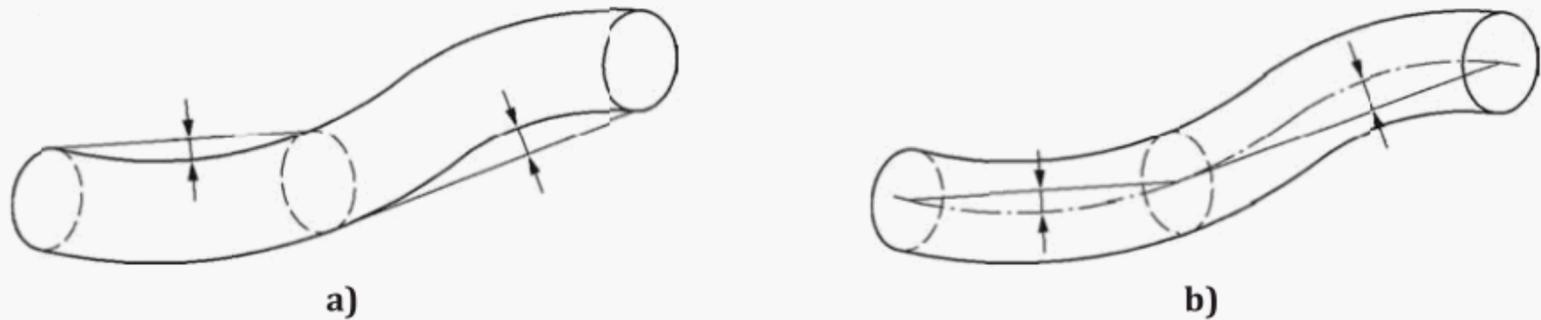
- the quotient of sagitta and the length of the log in centimetres per meter: $f(\text{cm}) / L(\text{m})$, or
- the ratio of sagitta and mid diameter in percent: $f(\text{cm}) / D(\text{cm}) \times 100$.

6.1.1.2 Multiple sweep

Divide the log with theoretical crosscut points into straight or simple sweep portions. Measure each portion as indicated (see [Figure 15](#) a) and 15 b)); express the results as for simple sweep.

Provide also a cumulative value of Sweep:

$$\text{Cumulative value of Sweep} = \frac{f_1}{L_1} + \frac{f_2}{L_2} \quad (11)$$



Key

- a) Centre line measure
- b) Surface measure

Figure 15 — Multiple sweep

6.1.2 Taper

Measure the diameter at each end, at least 5 cm from the ends (in the case of a butt log, 1 m from the larger end).

Express the result as a difference between the two diameters in centimetres per metre distance between the measuring points.

If an obvious reduction or increase of the diameter exists at the place(s) specified for measurement, measure at 5 cm from this place on the regular part of the round timber.

6.1.3 Ovality

At a point at least 1 m from the larger end, measure the largest and the smallest diameter. Express the result as the difference between the two diameters either in centimetres, or as a percentage of the largest diameter (See [Figure 16](#)).

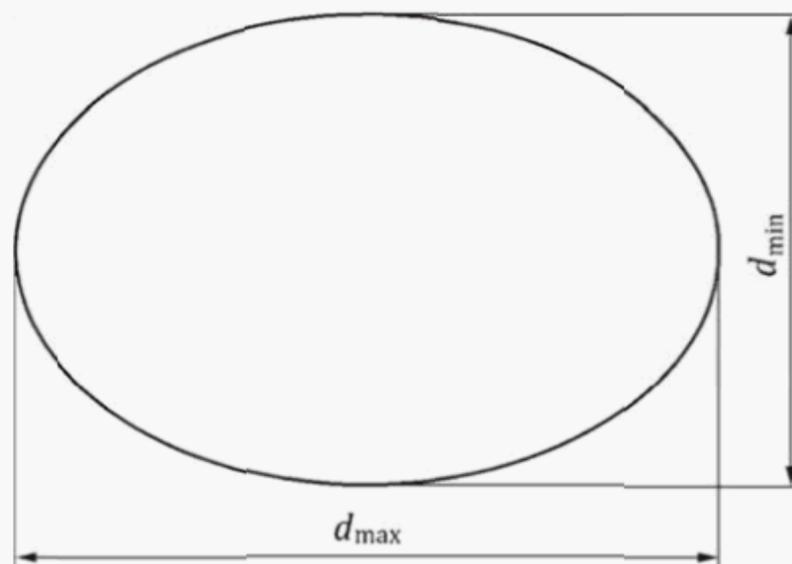


Figure 16 — Ovality

6.14 Rate of growth

Measure the length of the outer 75 % of a representative radius of both end surfaces of the log. Count the number of growth rings along this length at each end. Divide each length by the number of growth rings. Express the result in millimetres. Where there is clearly a distinct difference between the two ends, include both results (see Figure 17).

NOTE Depending on tree age and location of log within the tree, measuring only the smaller end of a log may not provide a true representation of the overall rate of growth.

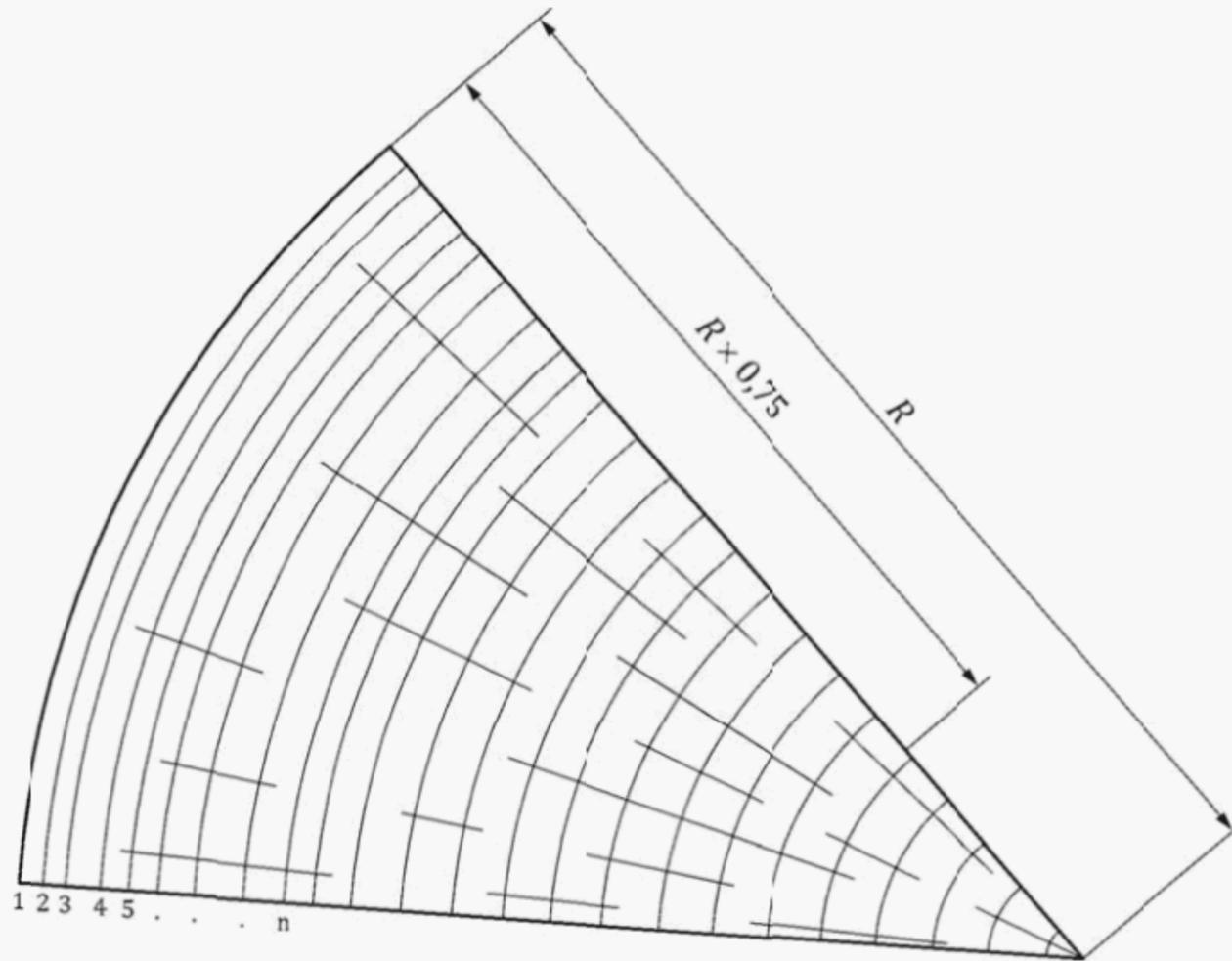


Figure 17 — Rate of growth

6.2 Features of the structure of the wood

6.2.1 Eccentric pith.

On one of the end faces, measure the distance between the pith and the geometric centre of the cross-section, expressed in centimetres or as a percentage of the diameter of the cross section (see Figure 18).

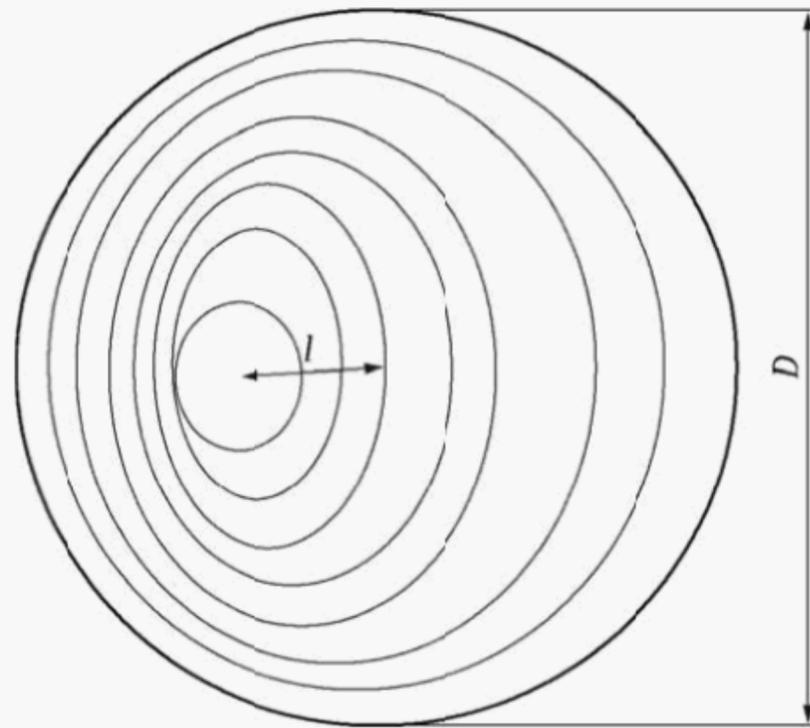


Figure 18 — Eccentric pith

6.2.2 Burl

Not measured, record its presence.

6.2.3 Buckles

Depending on the grading rule used:

- measure the maximum distance, a , [Figure 19](#), between the concave log surface and a straight line connecting the two most prominent/highest buckles, expressed in centimetres; or
- not measured, record its presence.

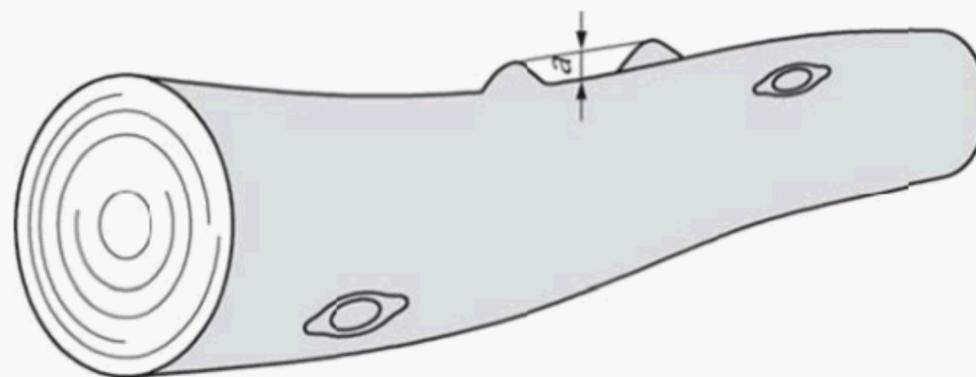
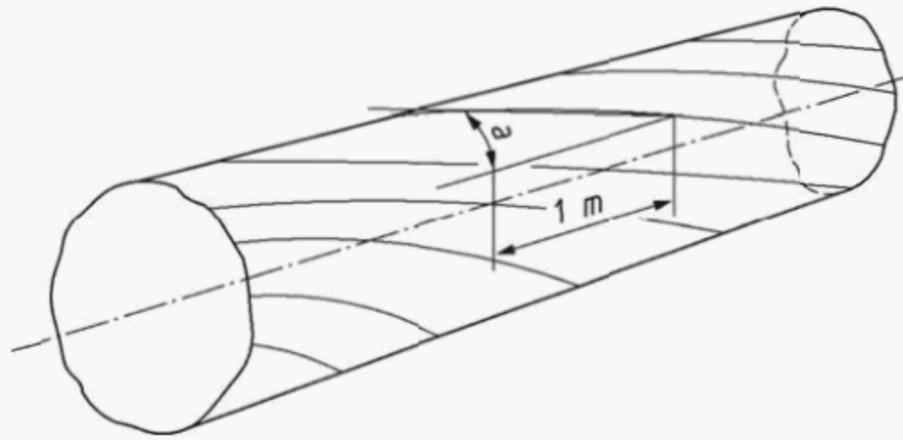


Figure 19 — Buckles

6.2.4 Spiral grain

Select a 1 m long portion of the curved surface that shows the largest slope of grain. In the case of a butt log, select a portion at least 1 m from the larger end. Measure the amount, by which the grain deviates from a line parallel to the axis of the log over a distance of 1 m. Express the result in centimetres per metre shown in [Figure 20](#) as a or as a percentage.



Key

a deviation of grain direction

Figure 20 — Spiral grain

6.2.5 Compression wood (reaction wood in softwood)

Measure the width of the reaction wood in radial direction (r).

Express the result as percentage of reaction wood in relation to the diameter (D) of the respective end surface of the log ($r: D$).

If the feature is interrupted the measurements shall be added up. The face diameter shall be determined without bark and for irregular cross-cuts out of two perpendicular measurements.

6.2.6 Double pith

Not measured, record its presence.

6.3 Sapwood

On one of the end faces, measure the width of sapwood in a radial direction at the point where it appears to be the widest. Express the result in millimetres or as a percentage of the diameter of the end face considered (see Figure 21).

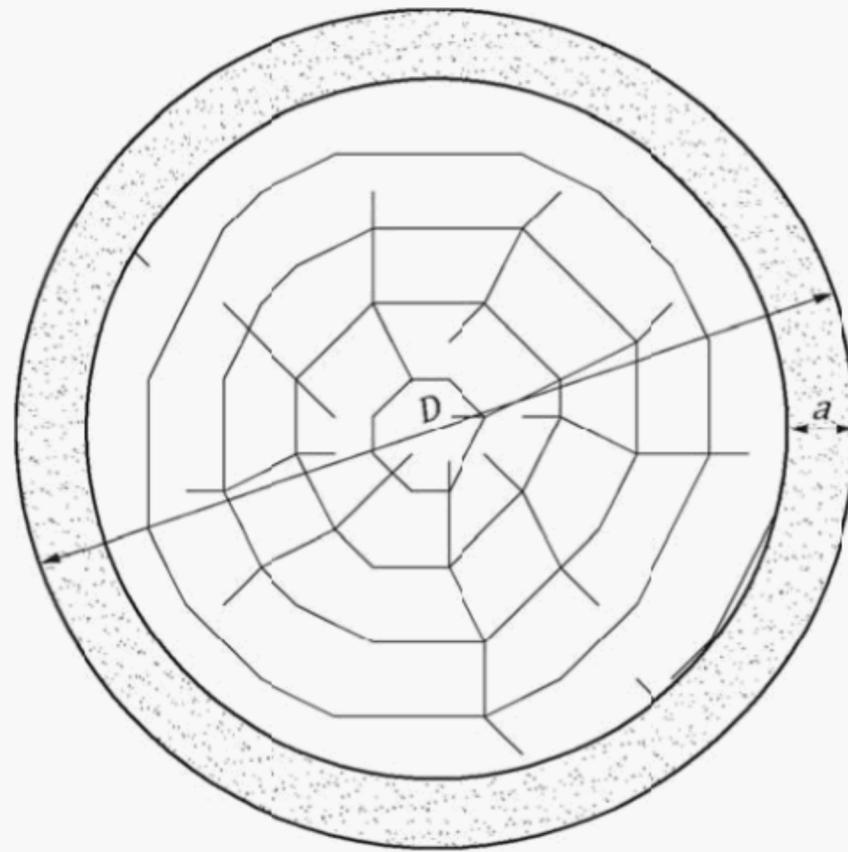


Figure 21 — Sapwood

6.4 Included sapwood

Not measured, record its presence.

6.5 False heartwood

At the end surface where the feature is best developed: Measure the diameter (d) of a circle surrounding the colouration.

Express the result as percentage of false heartwood (d) in relation to the diameter (D) of the respective end surface of the log ($d: D$).

The face diameter shall be determined without bark and for irregular cross-cuts out of two perpendicular measurements.

6.6 Knots

6.6.1 Uncovered knot

Measure, close to the curved surface of round timber, the smaller diameter of the knot. Express the result in centimetres (rounded). Disregard the surrounding callus (see figure 22).

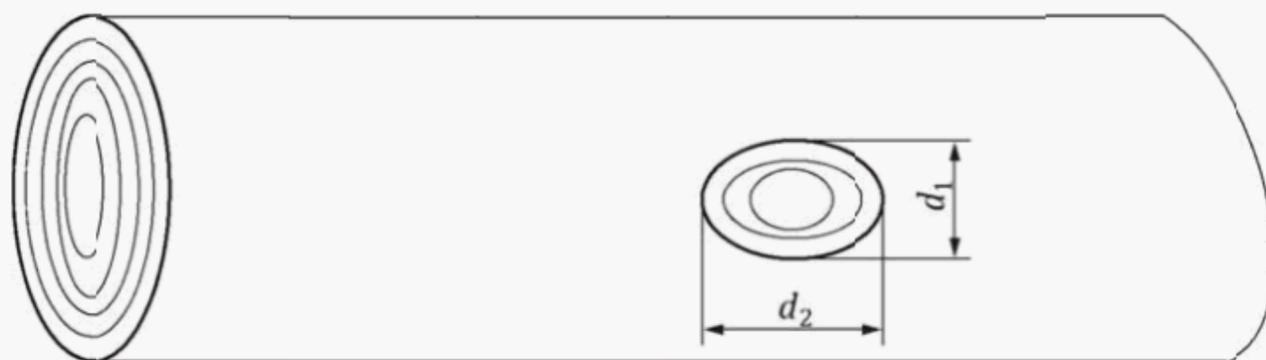


Figure 22 — Uncovered knot

6.6.2 Covered knot

6.6.2.1 In general

Not measured, record its presence.

6.6.2.2 Branch scar quotient (beech only)

Measure height and width of the branch scar in centimetres.

Express the result as ratio between branch scar height to branch scar width.

6.6.3 Epicormic shoot

Not measured, record its presence.

6.6.4 Rose

Depending on the grading rules used,

- a) measure the smaller diameter of the outer complete concentric ring, expressed in millimetres; or
- b) not measured, record its presence.

6.7 Cracks

6.7.1 Heart shake

Depending on the grading rule used,

- a) measure the length of the fissure visible on one end surface of round timber starting from the pith, expressed in millimetres, or
- b) not measured, record its presence.

6.7.2 Star shake

Depending on the grading rule used,

- a) measure the length of the longest fissure visible on the end surface of round timber starting from the pith, expressed in millimetres, or
- b) not measured, record its presence.

6.7.3 Ring shake

Depending on the grading rule used,

- a) measure the diameter of the circle of which the ring shake is an arc (see Figure 23), expressed as a percentage of the diameter of the cross section, or
- b) not measured, record its presence.

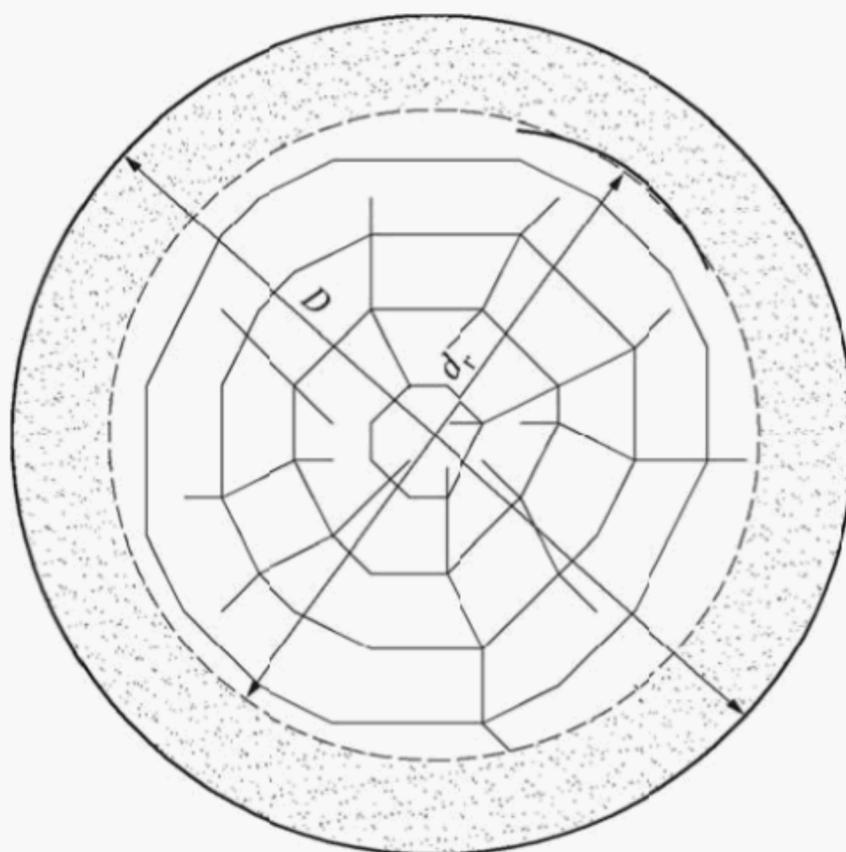


Figure 23 — Ring shake

6.7.4 Check, traversing crack

Not measured, record its presence.

6.7.5 Frost crack, lightning shake

Depending on the grading rule used,

- a) measure its length, expressed in centimetres or as a percentage of the length of round timber. If more than one, total their lengths, or
- b) not measured, record its presence.

6.7.6 Felling shake

Measure its length, expressed in centimetres or as a percentage of the length of round timber.

6.8 Biological degradation

6.8.1 Attack by insects

Depending on the grading rule used,

- a) note insect holes by their presence. Their diameter may be stated in millimetres, also the species of insect causing them; or
- b) state the degree of attack:
 - 1) if local, by the length of the affected area, expressed in centimetres or metres or as a percentage of the length of the round timber;
 - 2) if scattered, by the number of insect holes per metre length.

6.8.2 Fungal attack

6.8.2.1 Stain

Not measured, record its presence.

6.8.2.2 Rot

6.8.2.2.1 Sapwood rot and stain

Measure the maximum expansion of sapwood rot or stain (r) in radial direction at the top end surface.

6.8.2.2.2 Heartwood rot

Depending on the grading rule used,

- a) record its presence, or
- b) measure by stating the diameter of a circle enclosing the area affected, expressed in centimetres or as a percentage of the diameter of the end surface of the round timber.

6.8.3 Hollow

Depending on the grading rule used,

- a) record its presence, or
- b) measure by stating the diameter of a circle enclosing the area affected, expressed in centimetres or as a percentage of the diameter of the end surface of the round timber.

6.8.4 Other attack

Depending on the type of attack, the more appropriate method above described shall be applied. The method used shall be specified in the grading rules.

6.9 Other defects

6.9.1 Dry side

Depending on the grading rule used,

- a) measure the length of the portion where it occurs, expressed in metres to two decimal places, or as a percentage of the length of round timber or estimated height of the tree, or
- b) not measured, record its presence.

For round timber, it is recommended to record the distance between the larger end and the affected area. For trees, it is recommended to estimate visually the height above ground. Either to be expressed in metres to two decimal places.

6.9.2 Parasitic plant

Depending on the grading rule used,

- a) measure the length of the portion where it occurs, expressed in metres to two decimal places, or as a percentage of the length of round timber or estimated height of the tree, or
- b) not measured, record its presence.

For round timber, it is recommended to record the distance between the larger end and the affected area. For trees, it is recommended to estimate visually the height above ground. Either to be expressed in metres to two decimal places.

6.9.3 Carbonized wood

Depending on the grading rule used,

- a) measure the length of the portion where it occurs, expressed in metres to two decimal places, or as a percentage of the length of round timber or estimated height of the tree, or
- b) not measured, record its presence.

For round timber, it is recommended to record the distance between the larger end and the affected area. For trees, it is recommended to estimate visually the height above ground. Either to be expressed in metres to two decimal places.

6.9.4 Canker

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6.9.5 Bird peck

Not measured, record its presence.

6.10 Tapping cut

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- a) measure the length of the portion where it occurs, expressed in metres to two decimal places, or as a percentage of the length of round timber or estimated height of the tree, or
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For round timber, it is recommended to record the distance between the larger end and the affected area. For trees, it is recommended to estimate visually the height above ground. Either to be expressed in metres to two decimal places.

6.11 Foreign bodies

Not measured, record its presence.

6.12 Resin pocket

Depending on the grading rule used,

- a) measure the length of the chord which is connecting both ends of the resin pocket;
- b) not measured; count and record quantity.

For round timber, it is recommended to record the distance between the larger end and the affected area. For trees, it is recommended to estimate visually the height above ground. Either to be expressed in metres to two decimal places.

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