

NZS 3631:1988

NEW ZEALAND STANDARD

NEW ZEALAND
TIMBER GRADING RULES

Superseding NZS 3631:1978

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NZS 3631:1988

COMMITTEE REPRESENTATION

This Standard was prepared under the direction of the Building and Civil Engineering Divisional Committee (30/-) for the Standards Council, established under the Standards Act 1988.

The New Zealand National Timber Grading Rules Project Committee (36/19) was responsible for the preparation of this Standard and consisted of representatives of the following organizations:

- Building Research Association of New Zealand
- Housing Corporation of New Zealand
- Ministry of Works and Development
- New Zealand Forest Service
- New Zealand Institute of Building Inspectors
- New Zealand Timber Industry Federation
- C.J. Cavanagh by invitation
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AMENDMENTS

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RELATED DOCUMENTS

Reference is made in this Standard to the following:

NEW ZEALAND STANDARDS		Clause reference herein
NZS 3601:1973	Metric dimensions for timber	1.3.12 1.5.1.1 1.6.2
NZS 3602:1990	Code of practice for specifying timber and wood-based products for use in building	1.1
NZS 3603:1981	Code of practice for timber design	1.1.3

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FOREWORD

The National Grading Rules for New Zealand Building Timbers were first published in 1938. Since this time in line with SANZ policy to maintain the relevance of New Zealand Standards the grading rules have been revised six times.

This sixth revision is based on a draft produced by a New Zealand Forest Service working group, which drew on departmental and industry expertise in many fields including wood technology, current trade practices, speciality timbers and timber engineering. Some of the principal reasons for the revision are:

- to make provision for “managed (tended) radiata pine”
- to make provision for other timbers such as eucalypts, blackwood and black walnut
- to bring NZS 3631 into line with current trade practices
- to simplify the document and eliminate internal inconsistencies.

It should be recognized that the engineering grades require special selection and may not be available from stock. Framing grades on the other hand are generally available and suitable for domestic and light industrial uses and generally where load-sharing is a factor in construction. In the engineering and framing grades strength and stiffness are of primary concern, and

the rules are concerned mainly with defects which reduce the strength.

Appearance grades are used variously for finishing purposes in long lengths, for recovery of short lengths for factory use, and for utility purposes. In the appearance grades, the principal concern relates to defects and blemishes that may affect the drying and machining properties and the appearance of the timber in the dressed condition.

Minor technical changes where this issue differs from the A4 size of NZS 3631:1988 are indicated by a marginal line at the side of the text concerned.

NEW ZEALAND TIMBER GRADING RULES

Explanations to accompany revision of NZS 3631:1978 National Timber Grading Rules:

General

1. The grade categories have been changed from “framing”, “boards” and “engineering”. The new classification for grade categories is “appearance”, “structural” and “cuttings grades”. This is because the old distinction between framing and engineering grades is no longer valid now that strength values are being assigned to framing grades. Furthermore, “board grades” is no longer convenient as a category because timber is frequently graded for appearance, machinability or paintability.

2. The groupings of timber have been restructured as follows:

Group I: native softwoods

Group II: hardwoods (native, New Zealand grown exotic and imported)

Group III: exotic softwoods (New Zealand grown and imported).

There are a number of principles behind these changes:

(a) It is not the function of the National Timber Grading Rules to only supply rules for certain species and thereby limit the utility of those species which are not listed. It is the function

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of other Standards (in particular NZS 3602) to define which species can be used for which purposes.

- (b) It is necessary to provide rules for special purpose timbers such as New Zealand grown eucalypts, Australian blackwood, black walnut, etc.
 - (c) In view of the similarity in strengths and general properties that occurred within and between the old Groups IV and V, it was considered that this segregation of New Zealand grown exotic softwoods was not required.
 - (d) The new categories are simpler than the old ones.
 - (e) Groupings for species line up with similar moves in Australia.
3. Engineering grade has been changed from the surface measurement criteria to a knot area ratio basis, i.e., proportion of cross section occupied by the projected area of the defect, as used in defining the Building and Framing grades.
- (a) It will be easier to grade out, and will therefore probably be more commonly used than the present set of requirements.
 - (b) There is conformity in the Engineering grade's requirements between the groupings of timbers, and also compatibility between the Framing or Building grades within a Group and the Engineering grade within the same Group.

4. *In the Framing grades of exotic timbers knot groups or combinations were not previously covered, and in the native*

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Building grades a conservative approach was taken. It is therefore proposed that the approach outlined in the definition of "knot groups" be used for all structural grades. This also tallies with the approach to knot groups previously adopted in the Engineering grades.

5. *Engineering grade is deleted from Group I because it is not used.*

6. *The general description of usage and type of material given below each grade title under the heading "general" has been eliminated because it is not the function of the National Timber Grading Rules to detail the purposes for which a particular grade may be used. Furthermore, the limitations on defects as defined describe the quality.*

7. *The old Factory grades have been replaced with No. 1 Cuttings and No. 2 Cuttings grades, which will apply to all species. The No. 1 Cuttings is derived from FRI Bulletin No. 1 by I.D. Whiteside. The No. 2 Cuttings is approximately comparable to the Old factory grade of Exotic pines, but is now simpler and works on the same basis as the No. 1 Cuttings grade.*

8. *For the sake of clarity the phrase "(singly or in combination)" has been inserted after knot and hole provisions in many of the grades.*

9. *Appropriate alterations to definitions, clauses, and table 1 resulting from the above major changes have been made. For example the old 1.3.11 which relates to knot plugging has been deleted.*

Definitions

10. Some new definitions have been added, viz: “margin region”, “collapse”, “call dimension”, “compression failure”, “consignment”, “brittle heart”, “appearance grades”, “cuttings grades”, “hardwood”, “knot group”, “knot combination”, “occluded knot”, “resin streaks” and “softwoods”. The need for most of these is obvious. A definition of “consignment” was required because of difficulties encountered in grading disputes. Definitions for “hardwood” and “softwood” were included, for reasons of completeness of the document as individual species are no longer enumerated in the Groupings (i.e., Group I, II and III). The term “knot combination” was included for clarity and relates to some of the restrictions placed on groups of knots in certain grades, e.g., Dressing grade of the new Group III timbers.

11. The definition of “arris” has been deleted as the term is not used in the text.

12. Crook has been re-defined to be consistent with the definition of bow.

13. The definition of “defect” has been modified to make it more general.

14. The definition of “grain” has been simplified by deleting “relative to the main axis of the piece”.

15. The definition of “pinhole” has been rephrased slightly including an increase in the size of the maximum hole that is liable to occur.

16. The definition of “sound knot” has been modified to include the connotation that such a knot is free from insect attack as well as decay.

17. In the definition of “surface checks”, the word “mainly” has been deleted to make the definition more precise.

18. The definition of a “through shake” has been simplified, and standardized with the definition of a “split”.

19. The definition of “tight bark pocket” has been modified to improve readability.

20. The definition of “tight encased knot” has been modified by substituting the word “size” for the word “position” as one of the reasons a knot will be likely to remain fixed in position.

21. The term “tight pin knot” has been changed to “pin knot” as the word “tight” is superfluous. The definition of a “pin knot” has also been changed to make it explicit that it is an intergrown knot, (a connotation which the term in practice carries). In addition the words “indigenous grades” in the definition have been changed to “indigenous timbers” as this is more appropriate; and the phrase: “that will remain tight in the piece” is deleted because it is superfluous.

Clauses

22. New 1.1.1 has been re-worded to reflect the philosophy that compliance of a species to a particular grade does not imply its

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suitability for a given use: which is the function of other Standards such as NZS 3602 “Code of Practice for Specifying Timber and Wood-Based Products for Use in Buildings”.

23. Old 1.1.2 is eliminated because it should be possible to apply these rules to imported timbers, as is required in the NZ Standard NZS 3602:1975.

24. In 1.1.2 a cross reference to 1.3.10 has been made by adding: “but see 1.3.10”.

25. Under the new 1.3.4 the phrase “defined in this Standard but” has been inserted in the second sentence to avoid any misunderstanding.

26. Clause 1.3.8 has been changed to allow for inactive insect attack or decay which is confined entirely to the knots. It has also been reworded to improve its readability.

27. Clause 1.3.10 concerning removal of defects by dressing or gauging has been re-written to avoid possible misunderstanding or ambiguities.

28. In view of the re-organisation of timber groupings (see point 2 above), it is no longer practical to specify those individual timbers which can have a recognized heart quality. Therefore the new clause 1.3.11 has been written.

29. In the list of defects (see 1.4) a number of new defects have been added, corresponding to the newly defined defects, e.g., collapse.

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30. The old 5.3.2 (now 1.5.3.1) has been modified to make it clear that it is the projected area of the defect on the cross section that is assessed.

31. Appendix B of the old rules which covers knot plugging, has been deleted because knot plugging is not practised commercially.

32. Appendices C6 and C7 have been deleted. See new 1.1.1 ref to NZS 3602.

33. Collapse clauses have been inserted in various grades of the new Groups II and III.

34. A Clears grade for all groups of timber has been introduced, which apart from minor blemishes, provides a definite specification for timber clear on all four surfaces.

Groups I and II

35. In the new Group I and Group II timbers the Clears grades have been renamed as Premium grade because Clears was a misnomer in-as-much as some knots and bark pockets were allowed; and it was thought appropriate to distinguish the top grade of the new Group I and Group II timbers from the top grades of Group III timbers.

36. A number of small changes have been made to Premium grade in both Group I and Group II.

37. In Group I timbers Dressing A is deleted as it is not used. Dressing B is now simply Dressing grade. In the new Group II

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timbers, “Dressing A” and “Building A” are changed to “Dressing: and “Building” for obvious reasons. Similarly “Building A” of the new Group I has been changed to “Building” grade.

38. In Groups I and II the Building grades have been altered to provide some conformity in basic approach to other framing grades. In particular a cross-sectional area approach for knots and holes. In Group I timbers, the provision (c) for wane in Building grade has been deleted because it is superfluous and does not appear elsewhere.

39. Common grades for Group I and II timbers now become Box grades. This is for internal consistency, especially in the new Group II which covers both indigenous and exotic hardwoods.

40. For simplicity, the practice of permitted defects being related to the length of the piece has been deleted in the new Premium and Dressing grades of Group II timbers. The Dressing and Building grades of the new Group II are predominantly derived from the Dressing and Building A grades of the old Group III, although some provisions of the old Group II have been used instead in certain instances.

Group III

41. In the new Group III, Finishing grade has been deleted and Select A, and Select B have been inserted as replacements. The Finishing grade was deleted because it is virtually unavailable.

42. Select A and B are modifications of the proposed “No. 1 Clears” and “No. 2 Clears” grades for pruned radiata pine in FRI

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bulletin No. 1. The term “Select” was chosen rather than “Clears” because the wood is not in fact clear of defects, and confusion on this point is liable to arise.

43. Dressing grade of the new Group III is mainly derived from Dressing grade of the old Group IV (exotic pines) although a number of small changes have been made. The word “singly” has been inserted after “(a) 75 mm” in the requirements for “partially intergrown knots other than spike knots” in this grade. This is to avoid ambiguous interpretations.

44. In the Engineering grade of the new Group III timbers, no pith is allowed in pine timbers. No. 1 and No. 2 Framing grades of the new Group III are derived from the No. 1 and No. 2 Framing of the old Group IV (exotic pines).

45. In No. 1 and No. 2 Framing grades the requirement that the nailing edge be 75 % pith-free has been dropped. This will help simplify the pith provisions which are currently very complex. The strength reducing aspects of the presence of pith are covered by other provisions. Although framing timber is required to have reasonable nail holding ability, the size of the pith is restricted anyway and the value of having 75 % of the nailing edge pith-free has no logical basis.

NEW ZEALAND STANDARD

NEW ZEALAND TIMBER GRADING RULES

1

GENERAL PROVISIONS

1.1

Scope

1.1.1

This New Zealand Standard establishes visual grading rules for the selection of timber into quality classes. The four types of grades specified are: appearance grades, for finishing and other uses; cutting grades, for short clear lengths; structural grades, primarily for strength and stiffness; and box grades. For approval of species and grades for particular building applications refer to NZS 3602.

1.1.2

This Standard applies equally to green sawn, dried or machined timber. (See 1.3.10).

1.1.3

Structural grade shall be comprised of specially selected timber for use in designed timber construction as distinct from light timber frame construction for which specific design is not required. The permitted defects are limited with the intention of ensuring that each piece can be assigned the basic working stresses and moduli of elasticity given by NZS 3603 for the appropriate species and condition.

1.2

Definitions

1.2.1

In this Standard, unless inconsistent with the context:

BARK POCKET. A patch of bark partially or wholly enclosed in the wood. (See figures 1 and 6).

TIGHT BARK POCKET. A bark pocket in which the bark is firmly embedded in the surrounding wood.

BLACKHEART. An abnormal black or dark brown discolouration that may occur in the heartwood of certain timbers, not necessarily associated with decay.

BOW. A curvature from the plane of the face in the direction of the length. (See fig. 25.)

BRITTLE HEART. See compression failure.

CALL DIMENSION. The dimensions by which timber is referred to in commercial transactions. The actual dimensions of timber will often differ from the call dimensions because of the tolerances specified in NZS 3601:1973 depending on whether the timber is rough sawn, green gauged or dry dressed.

CHECK. A separation of the fibres along the grain forming a fissure, but not extending through the piece.

KNOT CHECK. A check occurring in a knot. (See fig. 2.)

SURFACE CHECK. A check confined to the surface of a piece.

COLLAPSE. A flattening or buckling of wood cells during drying which is seen as excessive and/or uneven shrinkage.

COMPRESSION FAILURE. A deformation or fracture of the fibres across the grain resulting from excessive compression parallel to the grain either by direct end compression or bending. It appears as a minute fracture running across the grain, the fibres being wrinkled by compression or broken transversely.

It is often difficult to detect until the timber has been machined.

“Brittle Heart” is wood characterized by brittleness caused by compression failure(s) in the fibres during growth. Brittle heart is mostly located in the heartwood.

CONSIGNMENT. A quantity of delivered timber of the same grade specified in the order.

CROOK. A curvature from the plane of the edge in the direction of length. (See fig. 26.)

CROSS SECTION. The width of the piece multiplied by its thickness.

CUP. A concave curvature across the grain, that is, across the width of the face. (See fig. 27.)

DECAY. Decomposition of wood by fungi.

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DEFECT. Any irregularity in timber that affects its appearance, strength, durability or “use”. (See also 1.4.)

NOTE. The early stages of decay in which disintegration has not proceeded far enough to destroy the structure of, or soften, the wood perceptibly.

EDGE. The narrow longitudinal surface at right angles to the face of a piece of timber.

FACE. The wide surface of a piece of timber.

GRADE. An established quality or use classification of timber.

APPEARANCE GRADES. Grades of timber for finishing and other uses determined basically from the appearance of the better face and edge.

BOX GRADE. The lowest grade of timber.

CUTTING GRADES. Grades capable of yielding clear cuttings.

STRUCTURAL GRADES. Grades of timber determined basically on the stiffness and strength of the piece.

GRAIN. The general direction of the fibres or wood elements.

RAISED GRAIN. A roughened condition of the surface of dressed timber in which some elements are raised above but not torn loose from the general surface.

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SLOPING GRAIN. An arrangement of fibres and other longitudinal elements at an angle to the longitudinal axis of the piece. (See figures 11 and 29).

WOOLLY GRAIN. Sawn elements frayed out in sawing or planing.

GUM POCKET. A cavity that contains or has contained gum. Applies only to hardwoods.

GUM STREAK. Fibre that is saturated with gum. Applies only to hardwoods.

HARDWOOD. Timber from trees belonging to the botanical group Angiosperms. Most hardwood trees are broad leaved. (Note – The term is a botanical term not necessarily related to the physical hardness of the wood.)

HEARTWOOD. The inner layers of the log which, in the growing tree, have ceased to contain living cells. Heartwood is generally darker in colour than sapwood.

HOLE. A hole extending partially or entirely through the piece and attributable to any cause.

PINHOLE. A hole not exceeding 2 mm diameter, usually darkly stained and not containing borer dust. The insects which make these holes do not attack or continue to work in timber once the surface has dried.

KAIKAKA. A form of decay in the standing totara tree which does not affect the durability of the converted wood in service.

KNOT. A section of a branch which is embedded in the wood of the tree trunk or of a larger branch.

DECAYED KNOT. A knot affected by or containing decay.

INTERGROWN KNOT. A knot that is wholly intergrown with fibres of the surrounding wood. (See fig. 3.)

KNOT COMBINATION (Appearance grades). Two or more knots (other than spike knots) occurring on one line drawn at right angles to the edge of the piece.

KNOT GROUP (Structural grades only). All knots intersected by one plane perpendicular to the length of the piece.

LOOSE KNOT. A knot that is loose or likely to become loose in drying or machining; generally includes any knot exceeding 15 mm diameter that is fully enclosed in bark. (See fig. 1.)

OCCLUDED KNOT. A discontinuous knot normally formed as a result of pruning and subsequent clearwood growth around the end of the branch stud. (See fig. 18.)

PARTIALLY INTERGROWN KNOT. A knot that has not more than half its perimeter separated from the surrounding wood by bark.

PIN KNOT. In native timbers, a sound intergrown knot not exceeding 15 mm in diameter.

SOUND KNOT. A knot that is free from decay or insect attack.

SPIKE KNOT. A branch cut longitudinally by the plane of the face and extending to the edge of the piece but also including knots that would have been spike knots had they not been occluded. (See figures 4 and 7.)

DOUBLE SPIKE KNOT. A pair of spike knots extending to opposite edges of the piece along the one line drawn at right angles to the edge of the piece. (See fig. 5.)

TIGHT ENCASED KNOT. A sound knot in which more than half its perimeter is surrounded by bark, but which is so fixed by growth or size that it will firmly retain its place in the piece. In general, knots exceeding 15 mm diameter require some degree of intergrowth to remain tight. (See figures 8 and 9.)

LENGTH. Unless otherwise specifically stated means the length of the piece.

MARGIN REGION. That region lying either side of the designated central region of the face (see fig. 20). (Engineering grade only.)

PITH. The central core of a stem consisting chiefly of parenchyma or soft tissue. (See fig. 5.)

RESIN POCKET. A cavity that contains or has contained resin. (See fig. 10.) Applies only to softwoods.

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RESIN STREAK. Fibre that is saturated with resin. Applies only to softwoods.

SAPWOOD. The living outer layers of the wood of a tree. Sapwood is generally lighter in colour than heartwood.

SHAKE. A partial or complete longitudinal separation between wood fibres due to causes other than drying and usually originating in the standing tree.

CLOSE SHAKE. A shake that is compactly filled with resin or gum, or in which the wood fibres are interlaced in contact.

SURFACE SHAKE. A shake that is visible only on one face of the piece.

THROUGH SHAKE. A shake extending through a piece of timber from one surface to another.

SIZE. In relation to knots and holes means the size as measured in accordance with 1.5.

SOFTWOOD. Most softwoods have needle-like leaves. The term softwood is a botanical term not necessarily related to the physical hardness of the wood.

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SPLIT. A lengthwise separation of wood fibres extending through a piece of timber from one surface to another.

STAIN. In wood, discolouration or variation from the natural colour due to chemical reaction, fungi, or other causes, but not associated with decay.

THICKNESS. Unless otherwise specifically stated, the call dimension representing the thickness of the piece.

TIMBER. Wood in a form suitable for construction or carpentry or joinery or for reconversion for manufacturing purposes.

TWIST. A spiral distortion along the length of a piece of timber. (See fig. 28.)

WANE. The presence of the original underbark surface with or without bark, on any face or edge of a piece of timber. (See fig. 24.)

WARP. Any variation from a flat surface. It may consist of bow, crook, cup, twist, or any combination of these. (See figures 25, 26, 27 and 28.)

WIDTH. Unless otherwise specifically stated, the call dimension representing the width of the piece.

1.3

Determination of grade

1.3.1

Timber shall be classified as shown in table 1, unless by agreement in accordance with Appendix A.

1.3.2

Appearance grades of timber, rough or surfaced two faces, shall unless otherwise specified, be determined from the better face and edge of the piece. In timber surfaced one face only, the surfaced face shall be regarded as the better face. Unless otherwise specified the reverse face may be one grade below the better face except in Select B grade of Group III timbers where the reverse face may be Merchantable grade. The order of grades in Group III timbers for the purpose of this provision is Clears, Select A, Select B, Dressing, Merchantable, and Box.

1.3.3

Defects in structural grades shall be considered in relation to their effect on the stiffness and strength of the piece. The grade shall be determined from an examination of both faces and both edges.

1.3.4

These rules prescribe the defects permitted in the poorest pieces admissible in each grade, and the maximum sizes of defects where applicable. Defects defined in this Standard but not specifically mentioned are not permitted.

1.3.5

All timber shall be graded in the full length supplied, unless otherwise specified.

Table 1

TIMBER CLASSIFICATION

Group	Recognized general grade categories			
	Appearance	Structural	Cuttings	Other
Group I: Native softwood	Clears Premium Dressing	Building	No. 1 Cuttings No. 2 Cuttings	Box
Group II: Hardwoods (Native, NZ grown exotic and imported)	Clears Premium Dressing	Engineering Building	No. 1 Cuttings No. 2 Cuttings	Box
Group III: Exotic Softwoods (NZ grown and imported)	Clears Select A Select B Dressing Merchantable	Engineering No. 1 Framing No. 2 framing	No. 1 Cuttings No. 2 Cuttings	Box

Note – For heart quality see 1.3.11.

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1.3.6

Defects occurring in combination shall be assessed according to their combined damaging effect upon the piece in the grade under consideration.

1.3.7

Where defects not prescribed in these grading rules or which cannot be clearly defined are encountered, they shall be permitted or restricted in the same fashion as the most similar defined defects.

1.3.8

No insect infestation or decay shall be permitted, except where specifically defined in the grades, provided that in freshly sawn green timber live insects which attack bark only and inactive insect attack or decay which is confined entirely to knots shall be permitted.

1.3.9

Warp shall not exceed the values given by tables 2, 3, 4 and 5 except as specifically permitted by the rules for particular grades.

1.3.10

Defects in rough sawn timber which can be reduced by dressing or gauging to bring them within prescribed limits for dry dressed or green gauged dimensions shall be permitted.

1.3.11

Heart quality may be specified in those species whose heartwood has desirable qualities and is easily distinguishable. Heart quality shall comprise 100 % heartwood.

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1.3.12

The dimensions of sawn timber shall be as given in NZS 3601; provided that for sizes not included in NZS 3601 the green sawn dimensions of timber shall be sufficient to yield the required dry dressed dimensions.

1.4

Defects

1.4.1

The commonly recognized defects occurring in timbers are:

Bark pocket	Pith
Blackheart	Raised grain
Brittle heart	Resin pocket
Check	Resin streak
Collapse	Shake
Compression failure	Sloping grain
Decay	Split
Dote	Stain
Gum pocket	Wane
Gum streak	Warp – including
Hole	bow, crook, cup and
Kaikaka	twist
Knot	Woolly grain
Pinhole	

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1.4.2

Definitions of defects shall be as given in 1.2.

1.4.3

Measurement of defects shall be as given in 1.5.

1.5

Measurement of defects

1.5.1

General

1.5.1.1

Where the measurement of defects is stated in terms of the width or thickness of the piece this shall be taken as the call dimension, either width or thickness as appropriate, as specified in NZS 3601. Except that for Engineering grade the dimensions for determining margin regions and defects shall be the actual dimensions.

1.5.1.2

Measurement of defects other than holes and knots shall be the same for all grades in all groups.

1.5.1.3

The methods of measurement given for knots shall apply also to holes, loose knots, decayed knots and knot combinations.

1.5.1.4

All measurements of knots shall include any bark present.

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1.5.1.5

Unless otherwise specified the number of allowable defects shall be unrestricted.

1.5.2

Knots in appearance grades

1.5.2.1

Knots in appearance grades shall be measured as follows:

Knots other than spike knots: As shown in fig. 13.

Spike knots: As shown in fig. 14.

1.5.3

Knots in structural grades

1.5.3.1

Knots in structural grades of all groups of timbers shall be assessed according to their projected area as a proportion of the cross section of the piece, as shown in figures 15, 16, 17, 18, 19, 20 and 21. For cases not covered by these figures the proportion shall be assessed by the grader in accordance with the same principles.

1.5.3.2

In Engineering grade knots or knot groups wholly or partially within the margin region shall be assessed as shown in fig. 21.

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Table 2
PERMITTED BOW (mm)

<i>Length (m)</i>	<i>Thickness (mm)</i>					
	<i>25</i>	<i>30</i>	<i>40</i>	<i>50</i>	<i>75</i>	<i>100</i>
1.8	15	15	10	10	5	5
2.1	25	20	15	10	10	5
2.4	30	25	20	15	10	10
2.7	40	30	25	20	15	10
3.0	45	40	30	25	15	10
3.3	55	45	35	30	20	15
3.6	65	55	40	35	25	15
3.9	80	65	50	40	25	20
4.2	90	75	55	45	30	25
4.5	105	90	65	55	35	25
4.8	120	100	75	60	40	30
5.1	135	115	85	70	45	35
5.4	150	125	95	75	50	40
5.7	170	140	105	85	55	40
6.0	185	155	115	95	65	45
6.6	225	190	140	115	75	55
7.2	270	225	170	135	90	70

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Table 3
PERMITTED CROOK (mm)

<i>Length (m)</i>	<i>Width (mm)</i>					
	<i>75</i>	<i>100</i>	<i>125</i>	<i>150</i>	<i>200</i>	<i>Over 200</i>
1.8	5	4	3	3	2	2
2.1	10	5	5	4	3	2
2.4	10	10	5	5	4	3
2.7	15	10	10	5	5	4
3.0	15	10	10	10	5	5
3.3	20	15	10	10	5	5
3.6	25	15	15	10	10	5
3.9	25	20	15	15	10	10
4.2	30	25	20	15	10	10
4.5	35	25	20	20	15	10
4.8	40	30	25	20	15	10
5.1	45	35	25	25	15	15
5.4	50	40	30	25	20	15
5.7	55	40	35	30	20	15
6.0	65	45	40	30	25	20
6.6	75	55	45	40	30	25
7.2	90	70	55	45	35	25

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Table 4
PERMITTED CUP (mm)

<i>Face width (mm)</i>	<i>Permitted cup (mm)</i>
75	1
100	1
125	2
150	2
200	3
225	4
250	5
300	6

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Table 5
PERMITTED TWIST PER 100 mm of WIDTH (mm)

<i>Length (m)</i>	<i>Thickness (mm)</i>					
	<i>25</i>	<i>30</i>	<i>40</i>	<i>50</i>	<i>75</i>	<i>100</i>
1.8	10	10	5	5	3	2
2.4	10	10	10	5	4	3
3.0	15	15	10	10	5	4
3.6	20	15	10	10	5	5
4.2	20	20	15	10	5	5
4.8	25	20	15	10	10	5
5.4	25	25	15	15	10	5
6.0	30	25	20	15	10	10
6.6	35	30	20	15	10	10
7.2	35	30	25	20	10	10

1.5.3.3

To calculate the defect area ratio for knot configurations not covered by figures a scale drawing of the projected defect profile based on the estimated position of the pith should be made. The area of the defect can be estimated from the scale diagram, and the defect area ratio determined by dividing the area of the defect by the area of the piece, based on dimensions in accordance with 1.5.1.1. The projected defect profile and estimated position of the pith should be based on conservative estimates where any doubt arises.

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1.5.4

Bark and resin pockets

1.5.4.1

Bark and resin pockets shall be measured as shown in fig. 22.

1.5.5

Sloping grain

1.5.5.1

The slope of the grain shall be measured as shown in fig. 23 and as described in Appendix C.

1.5.6

Wane

1.5.6.1

Wane shall be measured as shown in fig. 24.

1.5.7

Warp

1.5.7.1

Measurements of warp shall be made as follows and in such a manner that gravity does not affect the measurement:

Bow: As the maximum deviation of the face of a piece from a straight line joining the ends as shown in fig. 25. (See also 1.3.9 and table 2.)

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Crook: As the maximum deviation of the edge of a piece from a straight line joining the ends as shown in fig. 26. (See also 1.3.9 and table 3.)

Cup: As the maximum deviation of the face of a piece from a straight line joining the edges as shown in fig. 27. (See also 1.3.9 and table 4.)

Twist: By placing the piece so that three of its corners are in contact with a flat surface. The distance from the fourth corner to the flat surface shall be the measure of twist as shown in fig. 28. (See also 1.3.9 and table 5.)

1.6

Marketing

1.6.1

All timbers shall be marketed to the requirements of Appendix A.

2 GROUP I: NATIVE SOFTWOODS

2.1 Clears grade

2.1.1 *Permitted defects*

2.1.1.1 In any piece the following defects only shall be permitted:

Cup	as given by table 4
Resin streaks	(a) one
	(b) 5 mm wide
	(c) 100 mm long
Sloping grain	1 in 10
Stain	insufficient to impair a natural finish
Surface checks	(a) three
	(b) 0.5 mm wide
	(c) 50 mm long

2.2 Premium grade

2.2.1 *Permitted defects*

2.2.1.1 In any piece, the following defects shall be permitted on the better face and edge:

Pin knots	two
Resin streaks	(a) 5 mm wide
	(b) sum of lengths 300 mm
Sloping grain	1 in 10
Stain	insufficient to impair a natural finish
Surface checks	(a) three
	(b) 0.5 mm
	(c) 50 mm long
Warp:	
Bow	as given by table 2
Crook	as given by table 3
Cup	as given by table 4
Twist	as given by table 5

2.2.1.2 In accordance with 1.3.2 the reverse face and edge may contain defects permitted by 2.3.1 for Dressing grade except as follows:

Wane	5 mm on the face or edge
------------	--------------------------

2.3 Dressing grade

2.3.1 *Permitted defects*

2.3.1.1
The following defects shall be permitted on the better face and edge:

Close surface shake one-fifth of the length

Checks:

Knot checks 1 mm wide

Surface checks (a) 0.5 mm wide
(b) 100 mm long

Kaikaka flecks or streaks not affecting the wood tissue

Knots:

Intergrown and partially intergrown (singly or in combination) (a) 75 mm singly
(b) sum of sizes in any combination one-third of the width

Tight encased 15 mm

Resin streaks (a) 10 mm wide
(b) sum of lengths 300 mm

Sloping grain 1 in 10

Stain insufficient to impair a natural finish

Tight bark pockets (a) 6 mm wide
(b) sum of lengths 100 mm

Warp:

Bow as given by table 2

Crook as given by table 3

Cup as given by table 4

Twist as given by table 5

2.3.1.2

In accordance with 1.3.2 the reverse face and edge may contain any defects except as follows:

Wane 10 mm on the face or edge

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2.4

Building grade

2.4.1

Permitted defects

2.4.1.1

The following defects shall be permitted:

Bark or resin pockets	(a)	20 mm wide
	(b)	200 mm long
Checks	not restricted	
Holes and all knots except spike knots (singly or in groups)	(a)	in pieces not exceeding 150 mm wide: one-third of the cross section
	(b)	in pieces over 150 mm wide; one-quarter of the cross section
Kaikaka	(a)	pittings, depressions, or channels on the surface not exceeding 2 mm deep, holes on the end grain not exceeding 5 mm diameter, and
	(b)	20 mm apart

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Resin streaks:

On the face	(a)	one-fifth of the width
	(b)	one-third of the length
On the edge	(a)	one-fifth of the thickness
	(b)	one-third of the length

Shakes other than

through shakes	(a)	one-fifth of the length
	(b)	slope across the face 1 in 15

Sloping grain 1 in 8

Spike knots and double spike knots

one-quarter of the cross section

Splits and through

shakes	length equal to the width of the piece
--------------	--

Stain insufficient to obscure the grain

Wane	(a)	one-quarter of the width on the face
	(b)	one-quarter of the thickness on the edge

Warp:

Bow	as given by table 2
Crook	as given by table 3
Cup	not restricted
Twist	as given by table 5

Woolly or raised grain not restricted

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2.5

No. 1 Cuttings

2.5.1

Each piece must be capable of yielding cuttings of the quality defined in 2.5.2 and which are not less than:

- (a) 1.0 m long
- (b) 2.0 m of total cuttings
- (c) 70 % of the total length of the piece.

2.5.2

Each cutting may contain the following defects:

- Cup as given by table 4
- Resin streaks (a) one
(b) 5 mm wide
(c) 100 mm long
- Sloping grain not restricted
- Stain insufficient to impair a natural finish
- Surface checks (a) three
(b) 0.5 mm wide
(c) 50 mm long

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2.6

No. 2 Cuttings

2.6.1

Each piece must be capable of yielding cuttings of the quality defined in 2.6.2, and which are not less than:

- (a) 0.6 m long
- (b) 1.8 m of total cuttings
- (c) 70 % of the total length of the piece.

2.6.2

Each cutting may contain the following defects:

- Cup as given by table 4
- Resin streaks (a) one
(b) 5 mm wide
(c) 100 mm long
- Sloping grain not restricted
- Stain insufficient to impair a natural finish
- Surface checks (a) three
(b) 0.5 mm wide
(c) 50 mm long

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2.7

Box grade

2.7.1

Permitted defects

2.7.1.1

Any number of combination of defects shall be permitted provided that the piece shall hold together in the course of normal handling.

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3

GROUP II: HARDWOODS (NATIVE, NEW ZEALAND GROWN EXOTIC AND IMPORTED)

3.1

Clears grade

3.1.1

Permitted defects

3.1.1.1

In any piece the following defects only shall be permitted:

Cup as given by table 4

Gum streaks (a) one
(b) 5 mm wide
(c) 100 mm long

Sloping grain 1 in 10

Stain insufficient to impair a natural finish

Surface checks (a) three
(b) 0.5 mm wide
(c) 50 mm long

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3.2

Premium grade

3.2.1

Permitted defects

3.2.1.1

In any piece, the following defects shall be permitted on the better face and edge:

Collapse	insufficient to affect the dry-dressed dimensions
Gum streaks	(a) 5 mm wide (b) sum of lengths 300 mm
Pin knots	two
Sloping grain	1 in 10
Stain	insufficient to impair a natural finish
Surface checks	(a) three (b) 0.5 mm wide (c) 50 mm long

Warp:

Bow	as given by table 2
Crook	as given by table 3
Cup	as given by table 4
Twist	as given by table 5

3.2.1.2

In accordance with 1.3.2 the reverse face and edge may contain defects permitted by 3.3.1 for Dressing grade except as follows:

Wane	5 mm on the face or edge
------------	--------------------------

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3.3

Dressing grade

3.3.1

Permitted defects

3.3.1.1

In any piece the following defects shall be permitted on the better face and edge:

Blackheart	not restricted
Collapse	insufficient to affect the dry-dressed dimensions
Gum pocket	(a) 3 mm wide (b) sum of lengths 100 mm
Gum streaks	(a) 100 mm wide (b) sum of lengths 300 mm
Pin hole	four
Pin knots	not restricted
Sloping grain	1 in 10
Stain	insufficient to impair a natural finish
Surface checks	(a) three (b) 0.5 mm wide (c) 50 mm long
Tight bark pocket	(a) 6 mm wide (b) sum of lengths 100 mm

Warp:

Bow	as given by table 2
Crook	as given by table 3
Cup	as given by table 4
Twist	as given by table 5

Woolly or raised grain	5 % of surface area
------------------------------	---------------------

3.3.1.2

In accordance with 1.3.2 the reverse face and edge may contain any defects except as follows:

Wane	10 mm on the face or edge
------------	---------------------------

3.4

Engineering grade

3.4.1

Permitted defects

The defect limitations for Building grade shall apply to Engineering grade also. In addition to these requirements, the following restrictions shall also apply:

- (a) The projected area on the cross section of any knot, knot group or hole appearing partially or wholly within the margin region of the piece shall not occupy more than one-quarter of the margin cross-sectional area. (In the case of squared members, this restriction will apply to all four faces. See fig. 21.)
- (b) Sloping grain 1 in 10.

3.4.2

Branding

3.4.2.1

Each piece of Engineering grade shall be legibly branded on a face at one end of the piece and in letters not less than 10 mm high with "NZS 3631E" provided that by agreement between vendor and purchaser the brand may be omitted.

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3.5

Building grade

3.5.1

Permitted defects

3.5.1.1

The following defects shall be permitted:

Bark or resin pockets	(a)	20 mm wide
	(b)	200 mm long
Blackheart		not restricted
Checks		not restricted
Collapse		not restricted
Dote	(a)	one-eighth of the cross section
	(b)	600 mm long
Gum streaks		not restricted
Knots:		
Holes and all knots except spike knots (singly or in groups)	(a)	in pieces not exceeding 150 mm wide; one-third of the cross section
	(b)	in pieces exceeding 150 mm wide; one-quarter of the cross section
Spike knots		one-quarter of the cross section

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Pinhole		not restricted
Shakes other than through shakes	(a)	one-fifth of the length
	(b)	slope 1 in 15
Splits and through shakes		length equal to the width of the piece
Sloping grain		1 in 8
Stain		insufficient to obscure the grain
Wane	(a)	one-quarter of the width on the face
	(b)	one-quarter of the thickness on the edge
Warp:		
Bow		as given by table 2
Crook		as given by table 3
Cup		not restricted
Twist		as given by table 5
Woolly or raised grain		not restricted

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3.6

No. 1 Cuttings grade

3.6.1

Each piece must be capable of yielding cuttings of the quality defined in 3.6.2, and which are not less than:

- (a) 1.0 m long
- (b) 2.0 m of total cuttings
- (c) 70 % of the total length of the piece.

3.6.2

Each cutting may contain the following defects:

- Cup as given by table 4
- Gum streaks (a) one
(b) 5 mm wide
(c) 100 mm long
- Sloping grain not restricted
- Stain insufficient to impair a natural finish
- Surface checks (a) three
(b) 0.5 mm wide
(c) 50 mm long

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3.7

No. 2 Cuttings grade

3.7.1

Each piece must be capable of yielding cuttings of the quality defined in 3.7.2 which are not less than:

- (a) 0.6 m long
- (b) 1.8 m of total cuttings
- (c) 70 % of the total length of the piece.

3.7.2

Each cutting may contain the following defects:

- Cup as given in table 4
- Gum streaks (a) one
(b) 5 mm wide
(c) 100 mm long
- Sloping grain not restricted
- Stain insufficient to impair a natural finish
- Surface checks (a) three
(b) 0.5 mm wide
(c) 50 mm long

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3.8

Box grade

3.8.1

Permitted defects

3.8.1.1

Any number or combination of defects shall be permitted provided that the piece shall hold together in the course of normal handling.

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4

GROUP III: EXOTIC SOFTWOODS (NEW ZEALAND GROWN AND IMPORTED)

4.1

Clears grade

4.1.1

Permitted defects

4.1.1.1

In any piece the following defects only shall be permitted:

Cup as given by table 4

Resin streaks (a) one
(b) 5 mm wide
(c) 100 mm long

Sloping grain not restricted

Stain insufficient to impair a natural finish

Surface checks (a) three
(b) 0.5 mm wide
(c) 50 mm long

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4.2

Select A grade

4.2.1

Permitted defects

4.2.1.1

In any piece four or a combination of any four of the following defects shall be permitted on the better face and edge:

Bark or resin pockets (a) 3 mm wide
(b) 50 mm long

Knots:

Intergrown,
partially inter-
grown and tight
encased 10 mm wide

4.2.1.2

In addition to the defects permitted in 4.2.1.1, the following defects shall be permitted on the better face and edge:

Collapse insufficient to affect the dry-dressed dimensions

Resin streaks (a) one
(b) one-tenth of the width
(c) one-sixth of the length

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Sloping grain not restricted

Stain insufficient to impair a natural finish

Surface checks (a) 0.5 mm wide
(b) 50 mm long

Warp:

Bow as given by table 2
Crook as given by table 3
Cup as given by table 4
Twist as given by table 5

4.2.1.3

In accordance with 1.3.2 the reverse face and edge may contain defects permitted by 4.3.1 Select B grade except as follows:

Wane 5 mm

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4.3

Select B grade

4.3.1

Permitted defects

4.3.1.1

In any piece six or a combination of any six of the following defects shall be permitted on the better face and edge:

Bark and resin

- pockets (a) 6 mm wide
(b) 50 mm long

Knots:

- Intergrown,
partially inter-
grown and tight
encased 15 mm wide

4.3.1.2

In addition to the defects permitted in 4.3.1.1, the following defects shall be permitted on the better face and edge:

Collapse insufficient to affect the dry-dressed dimensions

- Resin streaks (a) one
(b) one-fifth of the width
(c) one-third of the length

Sloping grain not restricted

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Stain insufficient to impair a natural finish

- Surface checks (a) 0.5 mm wide
(b) 50 mm long

Warp:

- Bow as given by table 2
Crook as given by table 3
Cup as given by table 4
Twist as given by table 5

4.3.1.3

The reverse face or edge may contain the defects permitted by 4.5.1.1 for Merchantable grade except as follows:

Pith not permitted

Wane 10 mm

4.4

Dressing grade

4.4.1

Permitted defects

4.4.1.1

The following defects shall be permitted on the better face or edge:

Bark or resin pockets	(a)	6 mm wide
	(b)	50 mm long

Checks:

Knot checks 2 mm wide

Surface checks	(a)	1 mm wide
	(b)	100 mm long

Collapse	insufficient to affect dry-dressed dimensions
----------------	---

Knots:

Intergrown knots other than spike knots (singly or in combination)	(a)	75 mm (singly)
	(b)	sum of sizes in any combination half of the width of the piece

Intergrown sound double spike knots	(a)	25 mm wide
	(b)	projected length two-thirds of the piece

Intergrown sound spike knots	(a)	50 mm wide
	(b)	projected length half of the width of the piece

Partially inter-grown knots other than spike knots (singly or in combination)

	(a)	75 mm (singly)
	(b)	sum of sizes in any combination one-third of the width of the piece

Tight encased

knots	(a)	three
	(b)	15 mm

Resin streaks

	(a)	three
	(b)	one-fifth of the width
	(c)	one-third of the length

Sloping grain not restricted

Stain insufficient to impair a natural finish

Warp:

Bow	as given by table 2
Crook	as given by table 3
Cup	as given by table 4
Twist	as given by table 5

4.4.1.2

In accordance with 1.3.2, the reverse face or edge may contain

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the defects permitted by 4.5.1.1 for Merchantable grade, except as follows:

- | | | |
|------------|-----|------------------------|
| Pith | (a) | 6 mm wide |
| | (b) | length not restricted |
| Wane | (a) | 10 mm wide on the face |
| | (b) | 5 mm wide on the edge |

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4.5

Merchantable grade

4.5.1

Permitted defects

4.5.1.1

The following defects shall be permitted on the better face and edge:

- | | | |
|-----------------------------|-----|------------|
| Bark or resin pockets | (a) | 20 mm wide |
| | (b) | 50 mm long |

Checks:

Knot checks not restricted

Surface checks 100 mm long

Collapse not restricted

Holes, loose knots,
and decayed

- | | | |
|-------------|-----|-------|
| knots | (a) | 20 mm |
| | (b) | 40 mm |

- | | |
|------|------------------------------------|
| (i) | in pieces exceeding
150 mm wide |
| (ii) | 4 per length |

Knots:

Intergrown knots

other than spike

knots (singly or

in combination) (a) 100 mm (singly)

- | | |
|-----|--|
| (b) | sum of sizes in any
combination half of the
width of the piece |
|-----|--|

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Partially inter-grown knots other than spike knots (singly or in combination)	(a)	75 mm (singly)
	(b)	sum of sizes in any combination half of the width of the piece
Sound spike knots and sound double spike knots, intergrown or partially intergrown	(a)	50 mm wide
	(b)	projected length two-thirds of the width of the piece
Tight encased knots	(a)	20 mm
	(b)	75 mm or one-third of the width, whichever is less
	(i)	4 per length
Pith	(a)	12 mm wide
	(b)	10 % of length
Resin streaks	(a)	one-fifth the width
	(b)	one-third the length
Shakes other than through shakes	(a)	one-fifth the length
	(b)	slope across face 1 in 15

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Sloping grain	not restricted
Stain	insufficient to obscure the grain
Warp:	
Bow	as given by table 2
Crook	as given by table 3
Cup	as given by table 4
Twist	as given by table 5

4.5.1.2

In accordance with 1.3.2 the reverse face or edge may contain any defects except as follows:

Pith	12 mm wide
Wane	(a) 20 mm wide on the face
	(b) 10 mm wide on the edge

4.6 Engineering grade

4.6.1 *Permitted defects*

4.6.1.1
The defect limitations for No. 1 Framing grade shall apply to Engineering grade also. In addition to these requirements, the following restrictions shall apply.

- (a) Pith not permitted in *Pinus* species.
- (b) The projected area on the cross section of any knot, knot group or hole appearing partially or wholly within the margin region of the piece shall not occupy more than one quarter of the margin cross section area. (In the case of squared members, this restriction shall apply to all 4 faces. See fig. 21.)
- (c) Sloping grain not to exceed 1 in 10.

4.6.2 *Branding*

4.6.2.1
Each piece of Engineering grade shall be legibly branded on a face at one end of the piece and in letters not less than 10 mm high with “NZS 3631E” provided that by agreement between vendor and purchaser the brand may be omitted.

4.7 No. 1 Framing grade

4.7.1 *Permitted defects*

4.7.1.1
The following defects shall be permitted subject to 4.7.1.2:

- Bark or resin pockets (a) 20 mm wide
(b) 200 mm long
- Checks not restricted
- Collapse not restricted
- Holes and all knots
(singly or in groups) (a) in pieces not exceeding 150 mm wide: one-third of the cross section
(b) in pieces exceeding 150 mm wide: one-quarter of the cross section
- Spike knots and double spike knots one-quarter of the cross section

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Pith (Restricted in

Pinus species only) permitted up to 12 mm wide in the following sizes, except that short increases in width up to 18 mm over lengths up to 100 mm are also permitted:

- (a) thickness up to 50 mm
width over 50 mm and up to 100 mm
- (b) thickness up to 50 mm
width 200 mm and over
provided pith is contained
in the central half of the
width
- (c) thickness 75 mm and over
width 125 mm and over
i.e., pith is not permitted in
the following sizes:
50 x 50
75 x 75
100 x 75
100 x 100
125 x 50
150 x 50
175 x 50

Sloping grain 1 in 6

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Shakes other than

through shakes (a) one-fifth of the length
(b) slope across the face 1 in 15

Stain insufficient to obscure the grain

Wane (a) one-quarter of the width
on the face
(b) one-quarter of the
thickness on the edge

Warp:

Bow as given by table 2
Crook as given by table 3
Cup not restricted
Twist as given by table 5

4.7.1.2

Combinations of defects shall be limited as follows:

- (a) In pieces not exceeding 150 mm wide: one-third of the cross section
- (b) In pieces exceeding 150 mm wide: one-quarter of the cross section.

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4.8

No. 2 Framing grade

4.8.1

Permitted defects

4.8.1.1

The following defects shall be permitted subject to 4.8.1.2:

Bark or resin pockets	(a)	20 mm wide
	(b)	200 mm long
Checks		not restricted
Collapse		not restricted
Holes and all knots (singly or in groups)	(a)	in pieces not exceeding 150 mm wide: one-half of the cross section
	(b)	in pieces exceeding 150 mm wide: one-third of the cross section
Pith		not restricted
Shake other than through shake	(a)	one-fifth of the length
	(b)	slope across the face 1 in 15

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Sloping grain 1 in 6

Spike knots and
double spike
knots one-third of the cross section

Stain insufficient to obscure the grain

Wane (a) one-quarter of the width
on the face
(b) one-quarter of the
thickness on the edge

Warp:

Bow as given by table 2

Crook as given by table 3

Cup not restricted

Twist as given by table 5

4.8.1.2

Combinations of defects shall be limited as follows:

(a) In pieces not exceeding 150 mm wide: one-half of the cross
section

(b) In pieces exceeding 150 mm wide: one-third of the cross
section.

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4.9

No. 1 Cuttings grade

4.9.1

Each piece must be capable of yielding cuttings of the quality defined in 4.9.2, and which are not less than:

- (a) 1.0 m each
- (b) 2.0 m of total cuttings
- (c) 70 % of the total length of the piece.

4.9.2

Each cutting may contain the following defects:

- Cup as given by table 4
- Resin streaks (a) one
(b) 5 mm wide
(c) 100 mm long
- Sloping grain not restricted
- Stain insufficient to impair a natural finish
- Surface checks (a) 0.5 mm wide
(b) 50 mm long

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4.10

No. 2 Cutting grade

4.10.1

Each piece must be capable of yielding cuttings of the quality defined in 4.10.2, and which are not less than:

- (a) 0.6 m long
- (b) 1.8 m of total cuttings
- (c) 70 % of the total length of the piece.

4.10.2

Each cutting may contain the following defects:

- Cup as given by table 4
- Resin streaks (a) one
(b) 5 mm wide
(c) 100 mm long
- Sloping grain not restricted
- Stain insufficient to impair a natural finish
- Surface checks (a) 0.5 mm wide
(b) 50 mm long

4.11

Box grade

4.11.1

Permitted defects

4.11.1.1
Any number or combination of defects shall be permitted provided that the piece shall hold together in the course of normal handling.

APPENDIX A

MARKETING OF NEW ZEALAND TIMBERS

A1

Timbers for special purposes not specifically covered by these standard grading rules will be supplied as special orders, according to specification.

A2

A consignment of any grade of timber shall consist of a fair average of that grade and shall not be made up of an unfair proportion of the better or poorer pieces that would pass in that grade.

A3

Except for Engineering grade, a consignment of a grade of timber shall be considered as of the grade invoiced if, upon reinspection, 95 % thereof or more is found to be of the said grade, the material below the said grade to be accepted by the buyer as of its actual grade. Where degrades are in excess of 5 % of the consignment they shall be the property of the seller.

A4

Each piece in a consignment of Engineering grade timber shall be of the grade invoiced.

A5

After dispatch by the seller no changes in the conditions of timber attributable to transport, storage, or manufacture shall constitute cause for rejection.

A6

The basis of tally for all timber classified and graded under these rules shall be the call dimensions as given in NZS 3601.

APPENDIX B COLOUR MARKING OF TIMBER

B1

Timber producers sometimes use colour marking to identify Group III timbers graded to this Standard. When this is done, usually on one end of each piece, the colours used are:

Orange	Cutting grade
Chocolate	Select A grade
Green	Dressing grade
Purple	Merchantable grade
Black	No. 1 Framing grade
Yellow	No. 2 Framing grade
Silver	Engineering grade
Red	Box grade

Note – These colours are to be regarded as being for convenience only, and do not affect the requirements set out in this Standard.

B2

In addition, colour marking of green timber of beech species is strongly recommended to avoid problems arising from their distinct properties, particularly in drying. Such marking shall be of the following colours:

Hard beech	(<i>Nothofagus truncata</i>)	blue
Red beech	(<i>Nothofagus fusca</i>)	yellow
Silver beech	(<i>Nothofagus menziesii</i>)	silver

Such colour marking will almost certainly disappear after drying and machining.

APPENDIX C DETERMINATION OF SLOPE OF GRAIN

C1

Detection of slope of grain

C1.1

To ascertain the slope of grain in timber it is necessary to study both the faces and edges of the member over the whole of its length with due regard to both local and general deviations. (See fig. 29.)

C1.2

The direction of such features as the larger wood elements i.e. the vessels, and resin ducts provide a good indication of grain direction. If drying checks are present, these indicate slope of grain.

C1.3

Splinters prized out from the surface of the wood with the point of a pocket knife will also reveal the grain direction.

C1.4

Although the observation of growth rings may provide a guide to grain direction, it is by no means reliable. Growth ring direction parallel to the sides of a piece of timber does not necessarily imply straight grain.

C1.5

The slope of grain can be accurately determined by means of a swivel-handled scribe. (See fig. 30.)

C1.6

The needle set in the scribe is pressed into the woods and the scribe drawn along with a steady action in the apparent direction of the grain. The needle will form a groove following the true grain direction.

C1.7

In determining the slope of grain it should be measured over a distance sufficient to establish a general slope within the piece. Slight variations, i.e. where the grain deviates over less than half the surface can be disregarded. However, where the grain deviation is associated with a knot or knots, then it should be taken into account under the combination of defects given in 1.3.6.

NOTES

See figures on pp 82 – 112

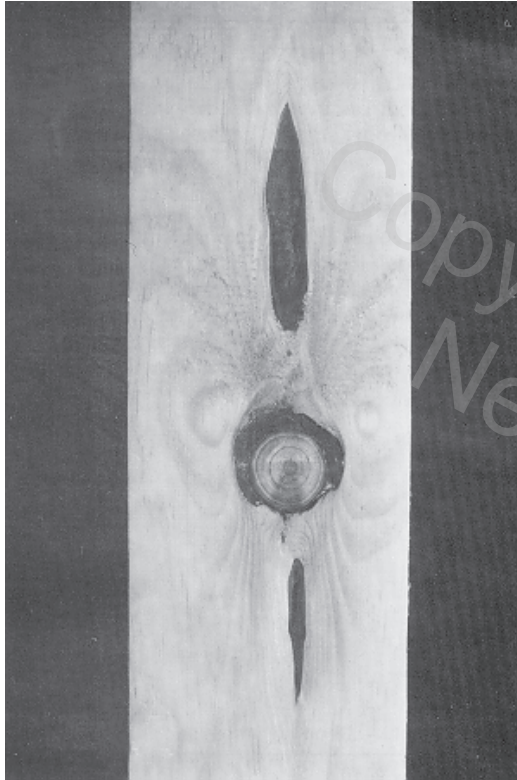


Fig. 1
BARK POCKET AND LOOSE KNOT

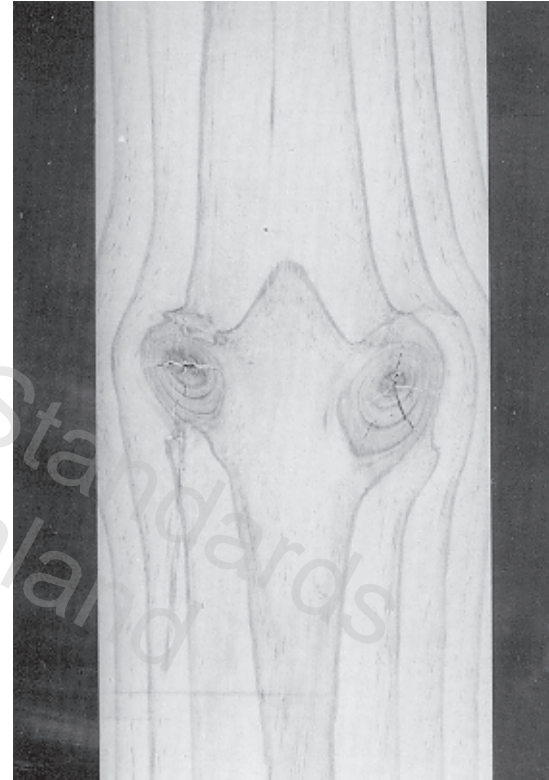


Fig. 2
KNOT CHECK



Fig. 3
KNOTS – INTERGROWN



Fig. 4
KNOTS – INTERGROWN SPIKE KNOT

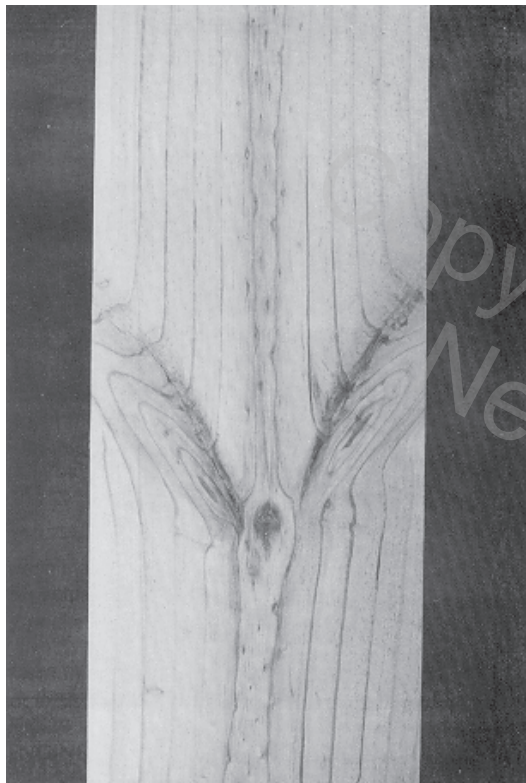


Fig. 5
KNOTS – INTERGROWN DOUBLE SPIKE
KNOT AND PITH



Fig. 6
KNOTS – PARTIALLY INTERGROWN KNOT
AND ASSOCIATED BARK POCKET



Fig. 7
KNOTS – PARTIALLY INTERGROWN SPIKE
KNOT AND PITH

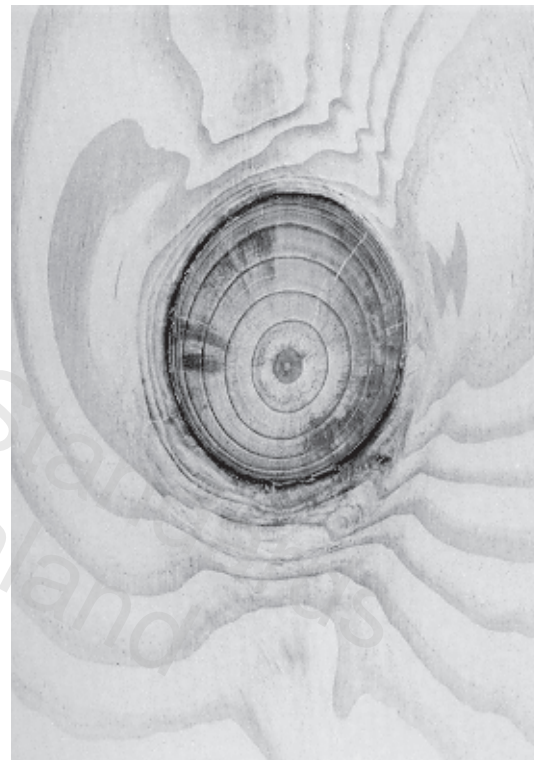


Fig. 8
KNOTS – TIGHT ENCASED – THIS KNOT
WILL REMAIN TIGHT IN THE PIECE
BECAUSE PART OF ITS PERIMETER IS
INTERGROWN



Fig. 9
KNOTS – TIGHT ENCASED – THIS KNOT WILL REMAIN TIGHT IN THE PIECE BECAUSE OF ITS SMALL SIZE (15 mm OR LESS)



Fig. 10
RESIN POCKET

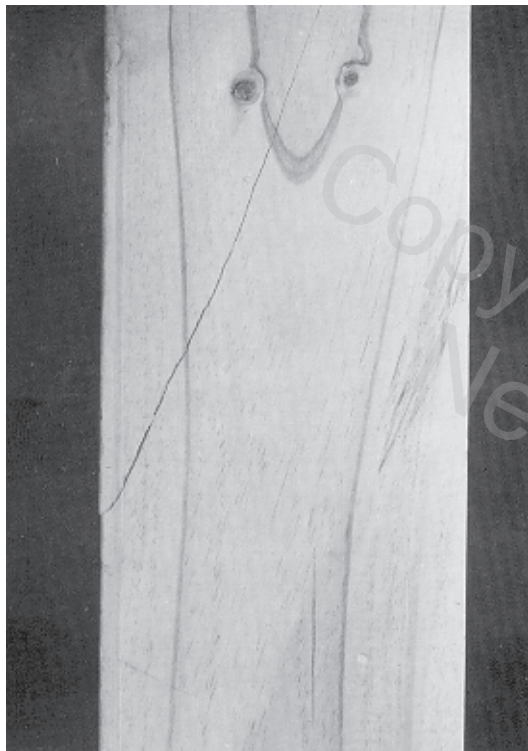
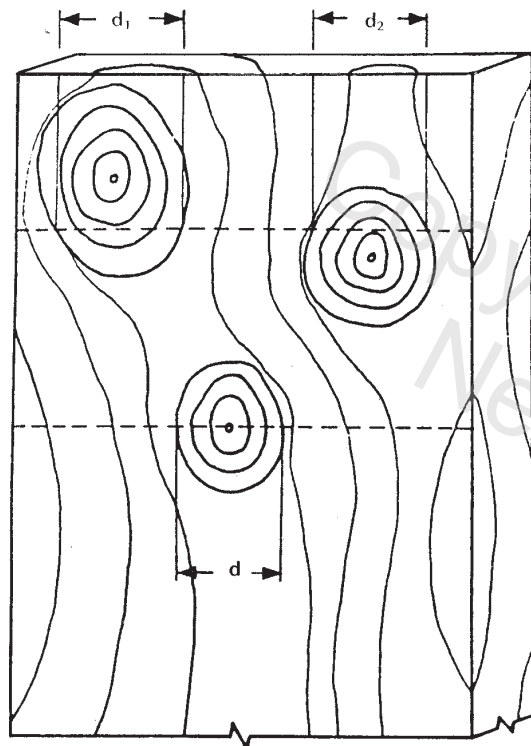


Fig. 11
SLOPING GRAIN AS DEPICTED BY THE
SPLIT FOLLOWING THE GRAIN IN
THE FIGURE



Fig. 12
SLOPING GRAIN – ABRUPT SLOPING GRAIN
ASSOCIATED WITH INTERGROWN KNOT



Knot size = d or $(d_1 + d_2)$, whichever is the greater

Fig. 13
APPEARANCE GRADES – METHOD OF MEASURING
SINGLE KNOTS AND KNOT COMBINATION OTHER
THAN SPIKE KNOTS

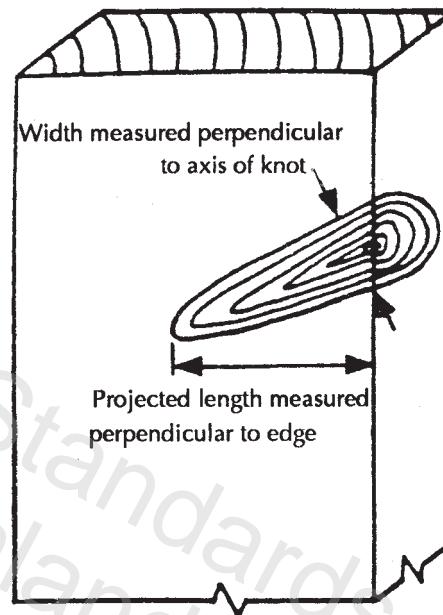


Fig. 14
APPEARANCE GRADES – METHOD OF MEASURING
SPIKE KNOTS AND OCCLUDED SPIKE KNOTS

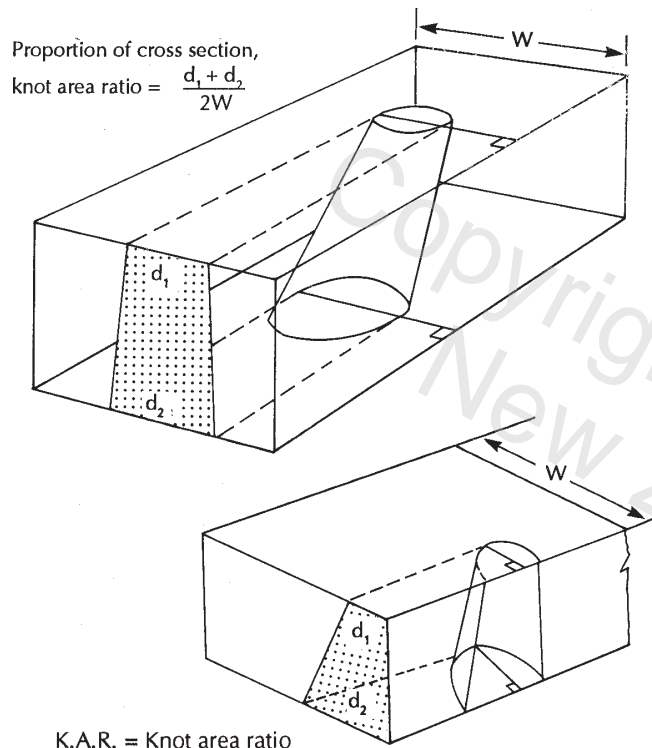


Fig. 15
STRUCTURAL GRADES – METHOD OF MEASURING KNOTS
SINGLE OR IN GROUPS, OTHER THAN OCCLUDED KNOTS
AND SPIKE KNOTS, APPEARING ON OPPOSITE SURFACES

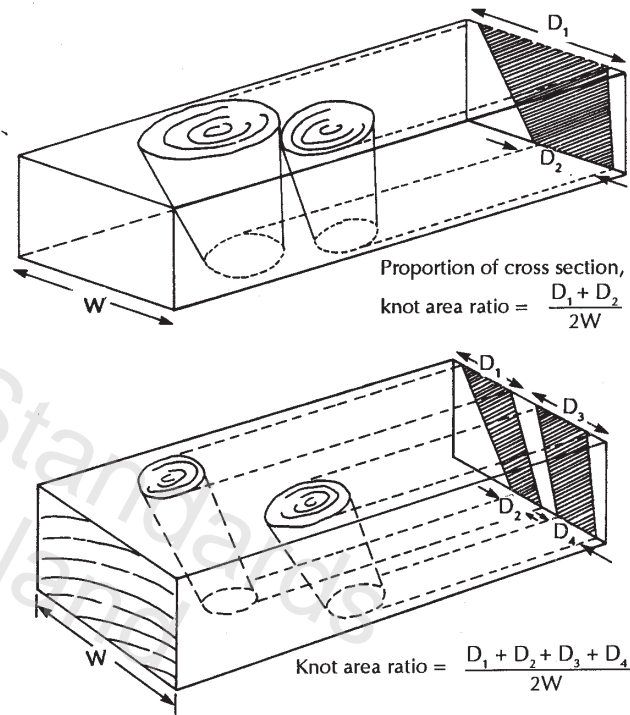


Fig. 15 (Continued)
STRUCTURAL GRADES – METHOD OF MEASURING KNOTS
SINGLE OR IN GROUPS, OTHER THAN OCCLUDED KNOTS
AND SPIKE KNOTS, APPEARING ON OPPOSITE SURFACES

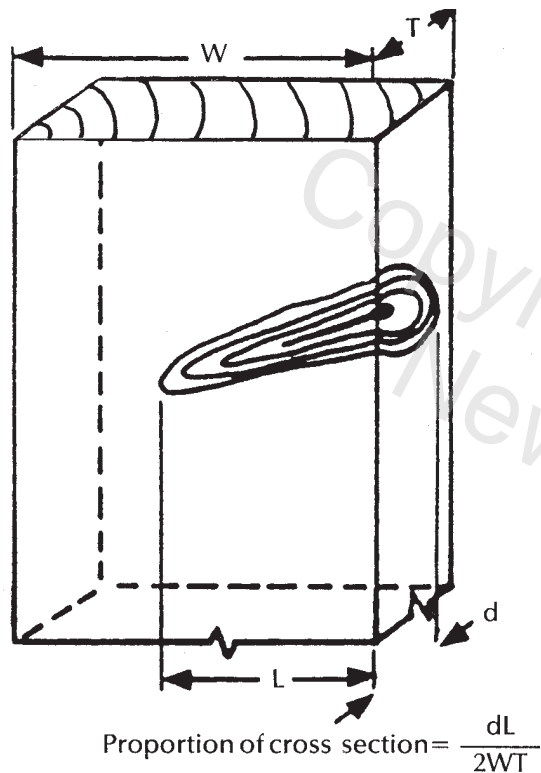


Fig. 16
STRUCTURAL GRADES – METHOD OF MEASURING SPIKE
KNOTS APPEARING ON ONE EDGE ONLY

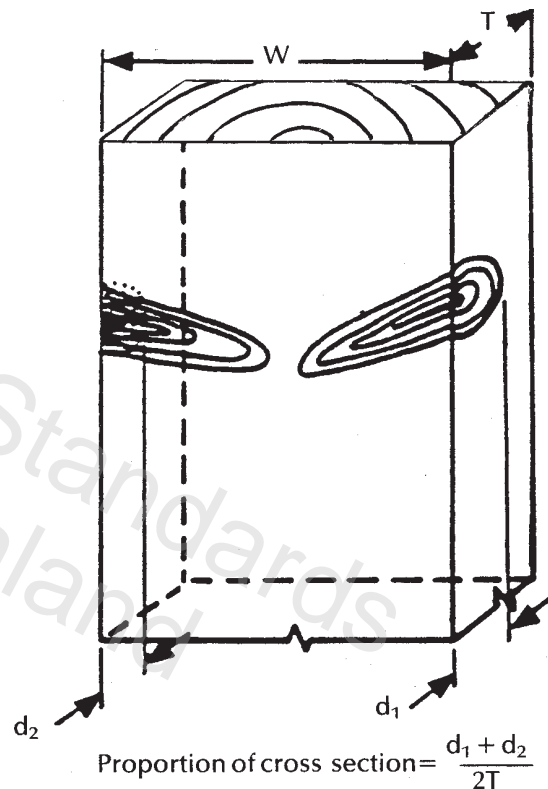


Fig. 17
STRUCTURAL GRADES – METHOD OF MEASURING DOUBLE
SPIKE KNOTS

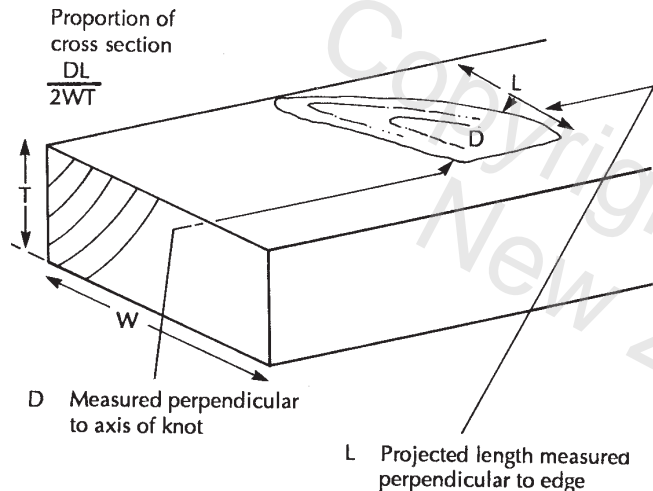


Fig. 18
STRUCTURAL GRADES – METHOD OF ASSESSING CROSS-SECTIONAL AREA OF OCCLUDED KNOTS WHICH ARE CUT LONGITUDINALLY BY THE FACE OF THE PIECE

Proportion of knot area ratio
to be measured as: $\frac{d}{W}$

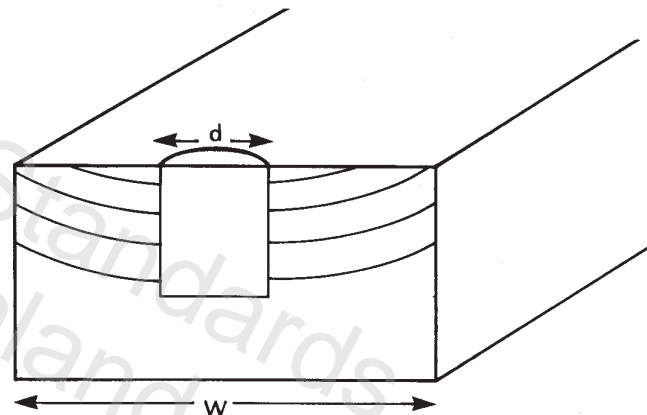
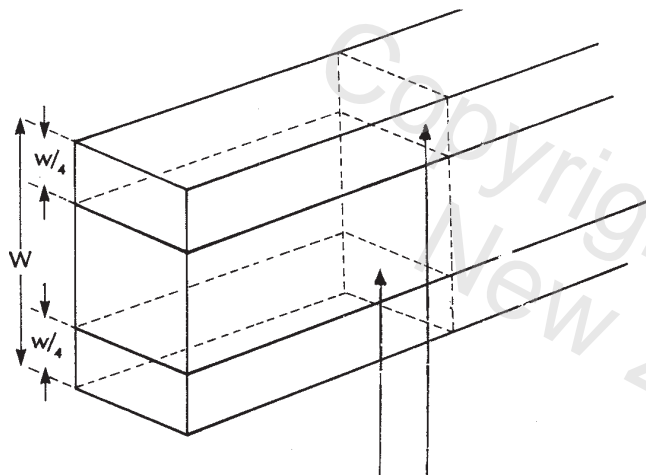


Fig. 19
STRUCTURAL GRADES – METHOD OF ASSESSING CROSS-SECTIONAL AREA OF OTHER OCCLUDED KNOTS



Each margin region equals $\frac{1}{4}$ total cross-sectional area. Based on actual dimensions of the piece.

Fig. 20
ENGINEERING GRADE – FACE AND MARGIN REGIONS

Projected cross-sectional area of defects in the margin region

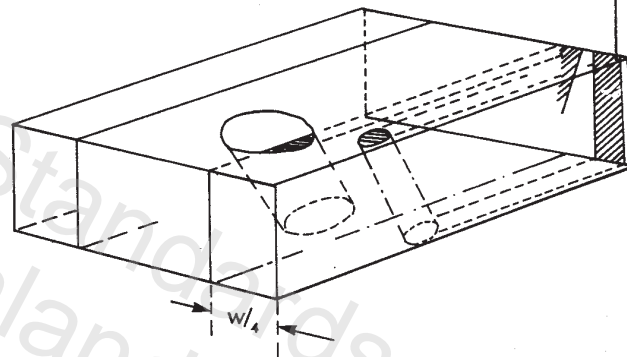
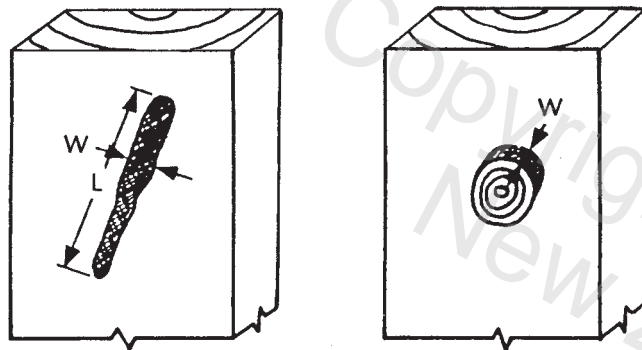


Fig. 21
ENGINEERING GRADE – DIAGRAM INDICATING THE METHOD FOR ASSESSING THE PROJECTED AREA OF ANY KNOTS OR HOLES APPEARING PARTIALLY OR WHOLLY WITHIN THE MARGIN REGION

Width = W

Length = L



W measured at right angles to the direction of the pocket at the point of maximum width.

L measured parallel to the direction of the pocket (not measured on pockets associated with knots).

Fig. 22
METHOD OF MEASURING BARK AND RESIN OR GUM POCKETS

It is expressed as a slope of grain of: 1 in (L/d)

e.g. L = 10 d = 2
slope of grain = 1 in 5

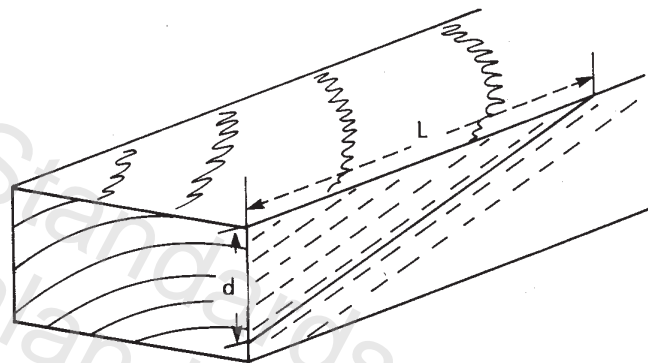


Fig. 23
METHOD OF MEASURING SLOPING GRAIN

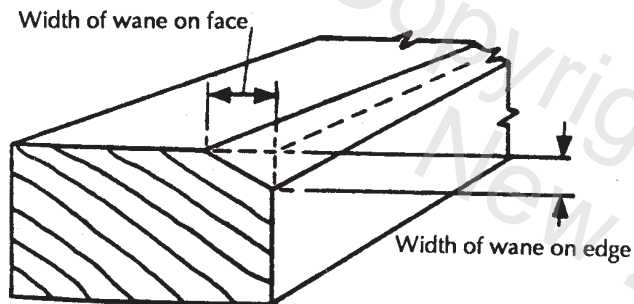


Fig. 24
METHOD OF MEASURING WANE

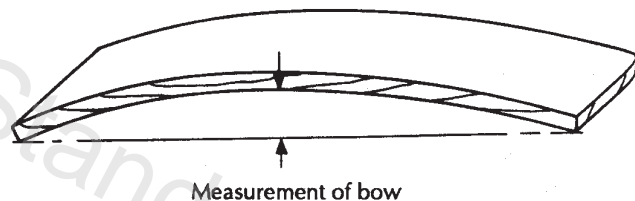


Fig. 25
METHOD OF MEASURING BOW

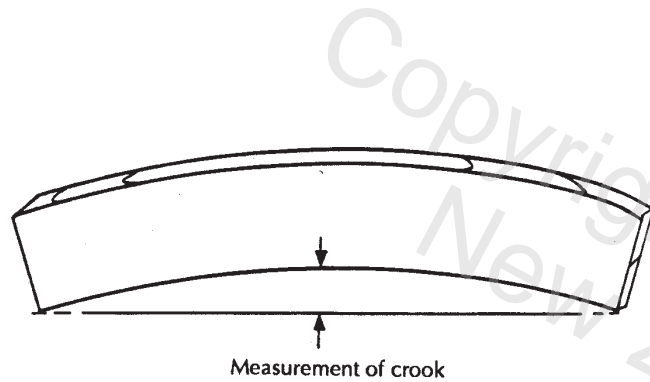


Fig. 26
METHOD OF MEASURING CROOK

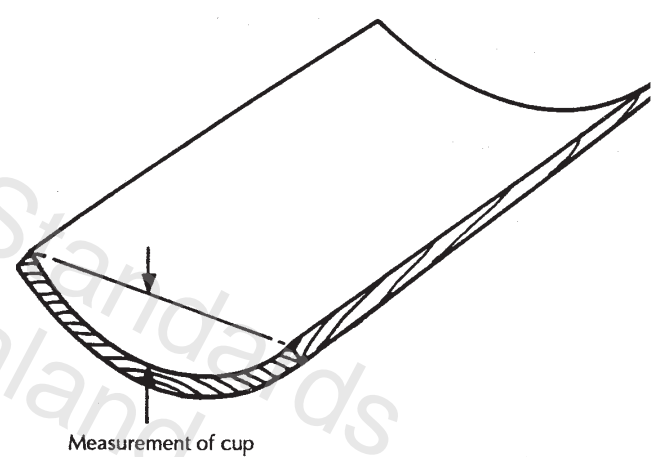


Fig. 27
METHOD OF MEASURING CUP

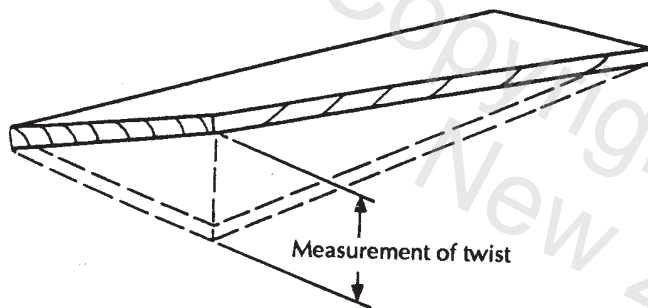
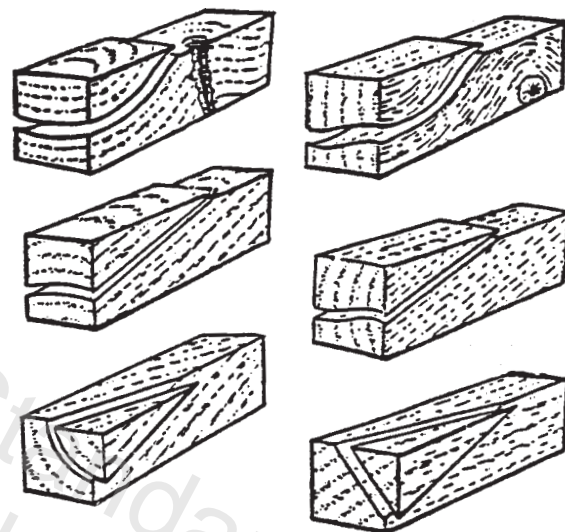


Fig. 28
METHOD OF MEASURING TWIST



A.

B.

Variations of Sloping Grain.

Sawn timber exhibiting sloping grain and showing separation following the grain after splitting.

A. Sloping grain as seen on the quarter-sawn face.

B. Sloping grain as seen on the flat sawn face.

Fig. 29
VARIATIONS OF SLOPING GRAIN

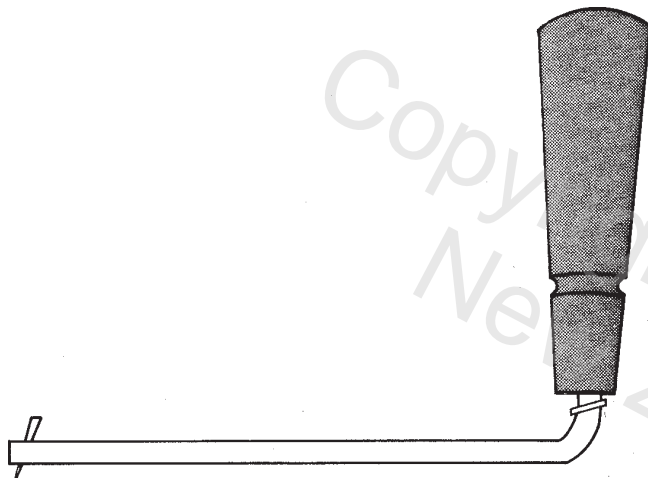


Fig. 30
SWIVEL-HANDLED SCRIBE FOR DETERMINATION OF SLOPE
OF GRAIN IN WOOD

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