

Nordic Timber Grading Rules

Règles de classement du bois Nordique

Herkomst : Scandinavia / Scandinavie

Origine : Scandinavie

GOST Timber Grading Rules

Règles de classement du bois GOST

Herkomst : Russia / Rusland

Origine : Russie

Algemeen

Op het noordse hout wordt een kwaliteitssorting gedaan door de zagerij afhankelijk van de herkomst. Dit is van toepassing voor de houtsoorten Rode Noordse Den (Pine), Witte Noordse Den (Spruce) en Lariks (Siberian Larix).

Noords hout wordt hoofdzakelijk aangeboden als standaard bijgedroogd (KD = Kiln Dry) en hierdoor is het hout ook HT-ISPM behandeld. Op speciaal verzoek kan er extra bijgedroogd worden, maar doorgans standaard ligt het vochtgehalte op (KD) 18 à 20% voor noords hout.

In scandinavie (Zweden, Noorwegen, Finland) worden de NORDIC GRADING RULES gehanteerd. Zagerijen in de baltische staten sluiten zich doorgaans aan bij de Nordic Grading Rules, terwijl in Rusland de GOST GRADING RULES worden gevolgd.

Général

Une triage de qualité est appliquée au bois nordique par les scieries du nord en fonction de son origine. Cela s'applique aux essences de bois suivantes : Sapin Rouge du Nord (SRN / Pine), Sapin Blanc du Nord (Spruce) et mélèze (Larix de Sibérie).

Le bois nordique est principalement proposé comme bois standard séché au four (KD = Kiln Dry) et est donc également traité HT-ISPM. Sur demande spéciale, un séchage supplémentaire au four peut être appliqué, mais le taux d'humidité standard du bois nordique est de 18 à 20 %.

En Scandinavie (Suède, Norvège, Finlande), les règles de classement nordiques sont appliquées (Nordic Grading Rules). Les scieries des États baltes adhèrent généralement aux règles de classement nordiques, tandis qu'en Russie, ce sont les règles de classement GOST qui sont appliquées.

Sawn timber is graded to different wood quality grades in the sawmills through visual sorting according to one of the following rules. It is important to know there is also a difference in quality grades between Scandinavian sawmills, Russian Sawmills and American Sawmills.

1. BRIEF OVERVIEW

Europe / Scandinavia			Russia	America
Unsorted Sawfalling Scand. * Sawfalling + Vte Scand.	Green Book (1960)	Blue Book (1994)	GOST	
	I Prima	A1	I	Nr. 1 Clear A
	II Secunda	A2	II	Nr. 2 Clear B & Better
	III Tertia	A3	III Tertia	Nr. 3 Clear C
	IV Quarta	A4	IV Quarta	SELECT-Merchantable
	V Quinta	B	V Quinta	Nr. 1 Merchantable
	VI Sexta	C		Nr. 2 Merchantable
Schaalboard	D	Schaalboard	Nr. 3 Common	
Unsorted in scandinavia is mainly I+II+III+IV Sawfalling is mainly I to V, can have small portion VI * according to contract.			Unsorted in Russia is mainly I+II+III (+small portion of IV) Sawfalling in Russia is mainly I+II+III+IV (+small portion of V) * according to contract	

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There have been several editions over the years by the scandinavian federation of sawmills summarising the Nordic Grading rules. The latest version is The Grey Book

GREY BOOK – NORDIC TIMBER– Wood graded according to the Green Book is divided into seven grades from I-VII, where grade I equivalent to the highest quality and grade VII to the lowest.

Grade I-IV is usually summarized under designation U/S (unsorted), grade V is called Fifths or Quinta, grade VI Sixths or Sexta, and grade VII is Domestic quality or Schaalboards.

[1994] BLUE BOOK – NORDIC TIMBER - Wood graded ACCORDING TO THE RULES OF The Blue Book (1994) is divided into four grades from A to D, where grade A is equivalent to the highest quality and grade D to the lowest. In addition, grade A can be subdivided into A1-A4 qualities. Additional special grades are : “3-4 sides Knotless” (in pine sideboards only) and HVS = “Halvrena

[1960] GREEN BOOK – Wood graded according to the Green Book (1960) is divided into seven grades from I-VII.

Lengths (mm) : 1800/2100/2400/2700/3000/3300/3600/4200/4500/4800/5100/5400/5700/6000

Main dimensions	Pine (Red Wood) Pinus Sylvestris	Spruce (White Wood) Picea Abies
Thickness (mm) :	19/25/32/38/44/50/63/75/100	22/32/35/38/44/50/63/75
Width (in mm):	100/125/150/175/200/225	100/125/150/175/200/225

Drying

- **Scandinavia** : The wood can be Kiln Dried (**KD**) to around 18% - 20% or **Fresh sawn** (= unseasoned) 50 – 80%. (Special drying e.g. 10% -15% is also possible on demand).
- **Russia** : according GOST 26002-83 : **KD** = 18% (with +- 2%) **AD** = 20 – 25% **Fresh cutted** 50 – 80%

HT-ISPM treatment

International Standards For Phytosanitary Measures No. 15 (**HT-ISPM 15**) is an International Phytosanitary Measure that directly addresses the need to treat wood materials (of a thickness greater than 6mm), used to ship products between countries. Its main purpose is to prevent the international transport and spread of disease and insects that could negatively affect plants or ecosystems. ISPM 15 affects all wood packaging material

(Heat Treatment) - The wood need to be heated until its core reaches 56°C, for, at least, 30 minutes.

Packaging

- LP = one length per package
- SP = Step package – 3-5 following lengths per package
- TP = many lengths per package

EX-LOG

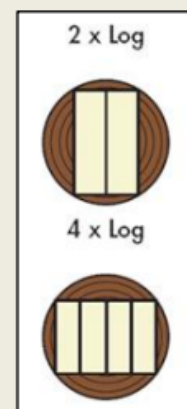
- How many pieces of timber are cut from the middle section of the log

Centercut

- The timber cut from the middle section of the log. Usually centerboards are with the higher value.

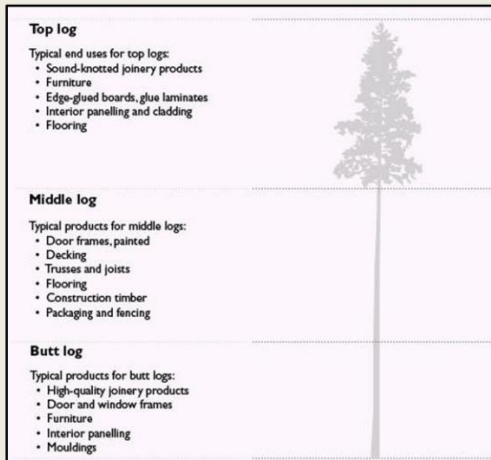
Sideboards

- Sideboards are the timber which is cut from the side section of the log.



A / B / C Logs

- A log is the bottom log of the tree, B log is the middle log and C log is the top log.



END-USE	A				B	C	D
	A1	A2	A3	A4			
Visible joinery							
Window and door frames, opaque painted							
Furniture, edge glued boards							
Load bearing constructions							
Exterior cladding							
Interior panels							
Mouldings							
Slating battens, strips							
Flooring boards							
Covered floorings							
Schaalboards							
Wind and snow fences							
Formwork							
Euro-, finnpallets							
Disposable pallets							
Packaging							
Boat building							
Handicrafts, decorations							
Saunamaterial							

NORDIC GRADING RULES

pag. 4 -> pag.38

Source : www.swedishwood.com

More details “GREY BOOK”

pag. 39

GOST GRADING RULES

pag 60 -> pag 73

NORDIC GRADING RULES

Source : www.swedishwood.com

Grading

of sawn timber in Europe according to EN 1611-1



Terms and definitions,
methods of measurement

Preface

Since the mid 1980s the European standardizing organizations and the European timber industry have been deeply committed in producing standards for definitions, testing, classification etc of timber products in order to facilitate trading. This has been done under the auspices of the European standardizing committee CEN, Comité Européen de Normalisation, and also, for so called harmonized standards, the European Union.

For sawn timber uniform grading rules are very important and this actual standard EN 1611-1 will hopefully replace old national grading rules and ultimately be used for most of the trading of appearance graded timber in Europe.

Stockholm, October 2016

Johan Fröbel
 Swedish Wood

Terms and definitions, methods of measurement and requirements 4

Species 4

Sawing patterns 5

- Four piece cut with centre cut 5
- Four piece cut with pith catcher 6
- Through cut with centre cut, edged 6
- Through cut with pith catcher, edged 7

Size 8

- Dimension 8
- Thickness 8
- Width 9
- Face width 9
- Length 10
- Permitted deviations for thickness, width and length of sawn timber 10

Moisture content 11

- Location on piece 12
- Side of the piece of timber 12

Features according to table 1 14

Knot condition 15

- Sound, intergrown knot 15
- Partially intergrown knot / Dead knot 15
- Encased knot 15
- Unsound knot 16
- Loose knot 16

Knot shape 17

- Round knot 18
- Oval knot 19
- Traversing edge knot 20
- Not traversing arris knot 21
- Traversing arris knot 22
- Spike knot 23
- Splay knot 24
- Pin knot 25
- Knot cluster 26

Features according to table 2 27

Other natural features 27

- Bark pocket 28
- Resin pocket 29
- Resin wood 30
- Reaction wood (Compression wood) 31
- Slope of grain 32
- Curly grain 33
- Top rupture 34
- Pith 35

Attacks of micro-organisms and insects 36

- Dot 37
- Soft rot 38
- Surface blue stain 39
- Deep blue stain 39
- Insect attack 40

Features according to table 3 41

Production related features 42

- Wane 42
- Fissures 43
- Check 43
- End shake 44

Warp 45

- Bow 45
- Spring 45
- Twist 46
- Cup 46

Tables 47

- Table 1 48
- Table 2 49
- Table 3 50
- Trading qualities – grades 51
- References 55
- Disclaimer 56
- Keywords 57

Grading 3

Species

Terms and definitions, methods of measurement and requirements

Species

Conifers – Definition Timber from trees in the botanical group gymnosperms.
 Pine – *Pinus sylvestris*.
 Spruce – *Picea abies*.

Fact How can you distinguish between pine and spruce?

- The heartwood in pine is darker than the sapwood and clearly visible. The heartwood and sapwood in spruce have the same colour when the wood is dry and therefore you cannot see the heartwood in dry timber.
- There are often small pin knots between the branch whorls in spruce but not in pine. The knots in pine are often oval.
- In planed spruce timber there is often chipped grain around the knots. It is easier to plane pine timber without getting chipped grain.
- There are often resin pockets in spruce but very seldom in pine.

4 Grading

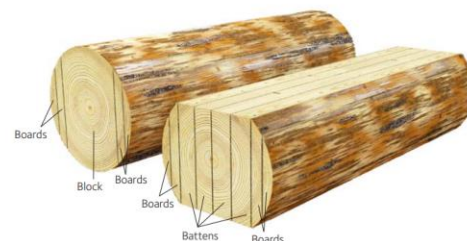
Sawing patterns

Sawing patterns

The sawing patterns described below are the desired cuts through a log. Because of the interior structure and the exterior form of the logs variations can occur.

Four piece cut with centre cut

Definition First cut takes boards from the opposite sides of the log. The rest of the log (the block) is turned 90 degrees and is cut to boards and battens. The block is cut through the centre (pith). The other cuts result in centre yield and side yield. Centre yield is made up of even pieces of the same width and the same or different thickness (Nordic practice).



Grading 5

Sawing patterns

Four piece cut with pith catcher

Definition First cut takes boards from the opposite sides of the log. The rest of the log (the block) is turned 90 degrees and is cut to boards and battens. The block is cut so that the pith is in the middle of a batten (pith catcher). The other cuts result in centre yield and side yield. Centre yield is made up of uneven pieces of the same width and the same or different thickness.



6 Grading

Size

Size

- **Nominal size** (trading size) is used in the name of a piece of timber.
- **Target size** is the size specified (at the reference moisture content) and to which the deviations are to be related.
- **Actual size** is the size present at the time of measurement.

Target size and actual size have to be under consideration of the moisture content in the piece of timber.

Dimension

Definition Name of the cross-section of the piece of timber (rectangular or square) using the nominal sizes for thickness and width in mm (for example 50 x 100 mm).

Thickness

Definition Distance between the faces of a piece of timber at the specified place of measurement.

Requirement Thickness in mm at specified moisture content.

Measuring rule Thickness is measured in the transverse direction near to but at least 150 mm from both ends of the piece of timber and at at least one randomly chosen point in between. Record only the smallest measured thickness.



8 Grading

Sawing patterns

Through cut with centre cut, edged

Definition The log is cut by a number of parallel cuts with one cut through the pith. The resulting pieces are edged.



Through cut with pith catcher, edged

Definition The log is cut by a number of parallel cuts of which two are cutting a piece containing the pith (pith catcher). The resulting pieces are edged.



Grading 7

Size

Width

Definition Distance between the edges of a piece of timber at the specified place of measurement.

Requirement Width in mm at specified moisture content.

Measuring rule Width is measured in the transverse direction near to but at least 150 mm from both ends of the piece of timber and at at least one randomly chosen point in between. Record only the smallest measured width.



Face width

Definition Width that is visible after final assembly.

Requirement Width in mm at specified moisture content.

Measuring rule Width is measured in the transverse direction near to but at least 150 mm from both ends of the piece of timber and at at least one randomly chosen point in between. Record only the smallest measured width.



Grading 9

Size

Length

Definition	The shortest distance between the ends of a piece of timber.
Requirement	Length in mm or m at specified moisture content.
Measuring rule	Length is measured as the length of the largest possible rectangular parallelepiped that can be inscribed in the piece of timber.



Permitted deviations for thickness, width and length of sawn timber

(According to EN 1313-1:2010)

Definition	Permitted deviation from the target size.
Requirement	Permitted deviations from the target size at the reference moisture content 20 %: For thickness and width ≤ 100 mm: + 3 mm / - 1 mm For thickness and width > 100 mm: + 4 mm / - 2 mm The average thickness and the average width shall not be less than the target sizes. For length: minus deviations not permitted, plus deviations agreed by contract.

Example

Thickness, target size = 50 mm
Maximum thickness = 50 + 3 = 53 mm
Minimum thickness = 50 - 1 = 49 mm

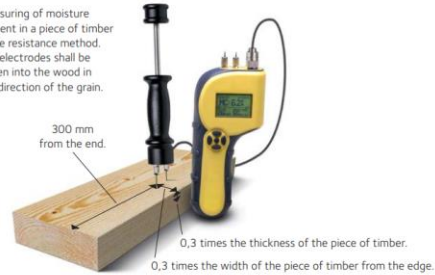
10 Grading

Moisture content

Moisture content

Definition	Mass of water present in wood expressed as a percentage of the wood's oven dry mass.
Measuring rule	Measuring (estimation) is carried out with a calibrated electrical resistance moisture content meter with isolated hammer electrodes or with a calibrated capacitance moisture content meter.

Measuring of moisture content in a piece of timber – the resistance method. The electrodes shall be driven into the wood in the direction of the grain.



Measuring rule: The oven dry method which is the most exact.



$$\frac{\text{mass of the test piece before drying (raw mass)} - \text{mass of the oven dry test piece (dry mass)}}{\text{mass of the oven dry test piece}} \times 100 = \text{moisture content in percent}$$

Grading 11

Location on piece

Location on piece

In order to grade a piece of timber you need to be able to locate the grade requirements to a certain side of the piece, a certain part of the length or part of the cross section, for instance one edge or 10 mm of any adjacent face.

Side of the piece of timber

Face

Definition	Either of the wider longitudinal opposite surfaces of the piece of timber or any longitudinal surface if the piece is of square cross section.
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Outside face

Definition	The face further from the pith of the log.
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Inside face

Definition	The face nearer to the pith of the log.
-------------------	---

Better face

Definition	The face that, when applying a particular grading rule, is judged to be better than the other face.
-------------------	---

Worse face

Definition	The face that, when applying a particular grading rule, is judged to be worse than the other face.
-------------------	--



12 Grading

Location on piece

Edge

Definition	Either of the narrower longitudinal opposite surfaces of square edged timber.
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Better edge

Definition	The edge that, when applying a particular grading rule, is judged to be better than the other edge.
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Worse edge

Definition	The edge that, when applying a particular grading rule, is judged to be worse than the other edge.
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Arris

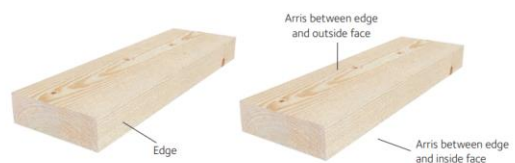
Definition	Line of intersection between an edge and a face or between two faces if the piece is of square cross section.
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Arris between edge and outside face

Definition	Arris between edge and outside face.
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Arris between edge and inside face

Definition	Arris between edge and inside face.
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Grading 13

Features according to table 1

Knot condition

Features according to table 1

Knot condition

This describes the different types of knots. The type of knot depends on how the knots have developed in the growing tree.

- Sound, intergrown knot
- Partially intergrown knot / Dead knot
- Encased knot
- Unsound knot
- Loose knot.

Knot shape

All knots start from the pith and extend outwards with an increasing diameter. Depending on how the saw cut passes through the knot, its shape on the surface of the timber can vary considerably. These different knot shapes require individual measuring rules and requirement formulations.

- Round knot
- Oval knot
- Traversing edge knot
- Not traversing arris knot
- Traversing arris knot
- Spike knot
- Splay knot
- Pin knot.

Knot cluster

Definition: Knots located so that no grain recovery is evident between adjacent knots.

14 Grading

Knot condition



Unsound knot

Definition | Knot affected by rot.



Loose knot

Definition | Dead knot that is not held firmly in the surrounding wood.

16 Grading

Knot condition



Sound, intergrown knot

Definition | Knot that, on the surface considered, is intergrown with the surrounding wood along more than 75 percent of its circumference and is free of rot.



Partially intergrown knot / Dead knot

Definition | Knot that, on the surface considered, is intergrown with the surrounding wood for more than 25 percent but less than 75 percent of its circumference (partially intergrown knot) or less than 25 percent of its circumference (dead knot).



Encased knot

Definition | Knot that is surrounded by bark for more than 75 percent of its circumference.

Grading 15

Knot shape

Knot shape

Fact: Measuring rules

Knots shall be measured by their shape and location on the piece of timber. The following symbols are used for identification:

- a = smallest diameter in mm.
- b = largest diameter in mm.
- d = knot size in mm.
- x = size perpendicular to the length of the piece of timber.
- y = size parallel to the length of the piece of timber.

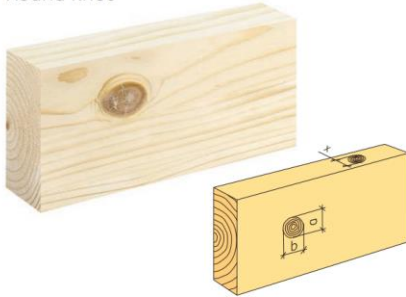
Knot

Definition | Portion of a branch embedded in wood.

Grading 17

Knot shape

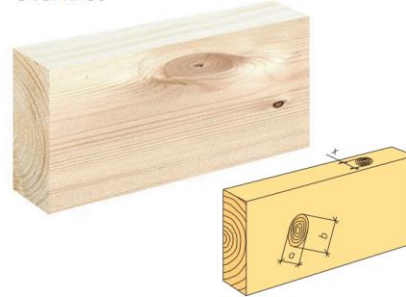
Round knot



Definition	Knot cut more or less straight through so that the ratio between the largest and the smallest transverse measurement is not more than 1,5.
Requirement	Face: Maximum size = 10 percent of the width + [table value] (mm). Maximum number on worst meter. Edge: Maximum size in percent of thickness. Maximum number on worst meter.
Measuring rule	Face: Average value of smallest and largest diameters $d = (a + b) / 2$. Edge: $d = x$.

Knot shape

Oval knot



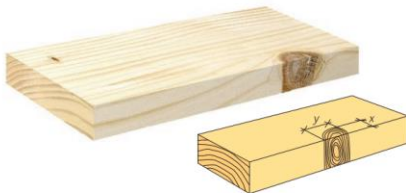
Definition	Knot cut more or less straight through so that the ratio between the largest and the smallest transverse measurement is more than 1,5 but not more than 4.
Requirement	Face: Maximum size = 10 percent of the width + [table value] (mm). Maximum number on worst meter. Edge: Maximum size in percent of thickness. Maximum number on worst meter.
Measuring rule	Face: Average value of smallest and largest diameters $d = (a + b) / 2$. Edge: $d = x$.

18 Grading

Grading 19

Knot shape

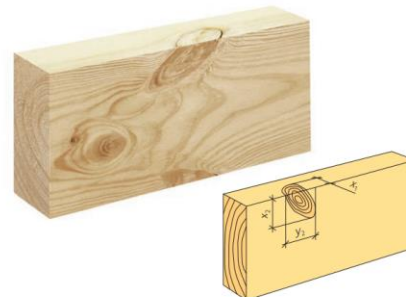
Traversing edge knot



Definition	Through cut knot that runs across the edge from one face to the other.
Requirement	Face: Maximum size = 10 percent of the width + [table value] (mm). Maximum number on worst meter. Edge: Maximum number on worst meter.
Measuring rule	Face: Average value of width and length $d = (x + y) / 2$. Edge: Not to be measured.

Knot shape

Not traversing aris knot



Definition	Knot that is exposed on an aris on the inside face of a piece of timber.
Requirement	Face: Maximum size = 10 percent of the width + [table value] (mm). Maximum number on worst meter. Edge: Maximum size in percent of thickness. Maximum number on worst meter.
Measuring rule	Face: Average value of width and length $d = (x + y) / 2$. Edge: $d = x$.

20 Grading

Grading 21

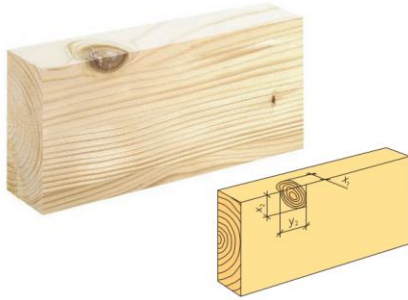
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Knot shape

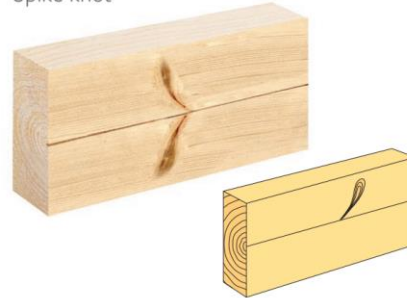
Traversing arris knot



Definition	Knot that is exposed on an arris on the outside face of a piece of timber.
Requirement	Face: Maximum size = 10 percent of the width + [table value] (mm). Maximum number on worst meter. Edge: Maximum size in percent of thickness. Maximum number on worst meter.
Measuring rule	Face: Average value of width and length $d = (x_1 + y_1) / 2$. Edge: $d = x_1$.

Knot shape

Spike knot



Definition	Knot cut so that the ratio between the largest and the smallest transverse measurement exceeds 4 and that does not reach an arris.
Requirement	Maximum number on worst meter.
Measuring rule	Not to be measured.

22 Grading

Grading 23

Knot shape

Splay knot



Definition	Knot cut through the longitudinal axis that, on the inside face, splays towards the edge/arris and is also partially exposed on the edge. The ratio between the largest and the smallest transverse measurement exceeds 4.
Requirement	Face: Maximum number on worst meter. Edge: Maximum size in percent of thickness. Maximum number on worst meter.
Measuring rule	Face: Not to be measured. Edge: $d = x_1$.

Knot shape

Pin knot



Definition	Small, intergrown, rot-free knot, not larger than 5 mm. Not to be considered.
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24 Grading

Grading 25

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Knot cluster

Features according to table 2

Knot cluster



Definition	Knots located so that no grain recovery is evident between adjacent knots. Note: Normally the distance to an adjacent knot should be less than the width of the piece of timber or less than 150 mm if the width exceeds 150 mm.
Measuring rule	Knots shall be measured individually in the same way as other knots.

Features according to table 2

Other natural features

Some biological phenomena, so called features, in wood that have strong influence on the quality.

- Bark pocket
- Resin pocket
- Resin wood
- Reaction wood, so called compression wood
- Strong, abnormal grain structure:
 - Slope of grain
 - Curly grain
 - Top rupture
- Pith.

Note Resin

Definition: The task of the resin is to defend wood against micro-organisms and against drying out in the event of damage. It is stored under pressure in the wood's resin channels. When mechanical damage occurs, the resin flows and accumulates.

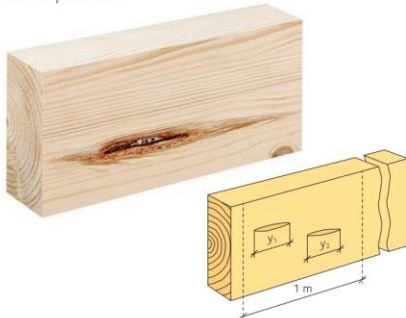
26 Grading

Grading 27

Other natural features

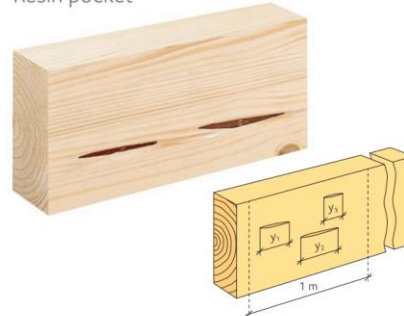
Other natural features

Bark pocket



Definition	Bark that is partly or wholly enclosed in the wood.
Requirement	Maximum total length and maximum number on worst meter.
Measuring rule	Length y in the longitudinal axis of the piece of timber. $y = y_1 + \dots + y_n$

Resin pocket



Definition	Lens-shaped cavity in the wood containing, or that has contained, resin. Depending on how the saw cuts into the cavity, the resin pocket is visible as a wide, shallow depression or as an oblong opening in the surface. Can also be a round cavity.
Requirement	Maximum total length and maximum number on worst meter.
Measuring rule	Length y in the longitudinal axis of the piece of timber. $y = y_1 + \dots + y_n$

28 Grading

Grading 29

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Other natural features

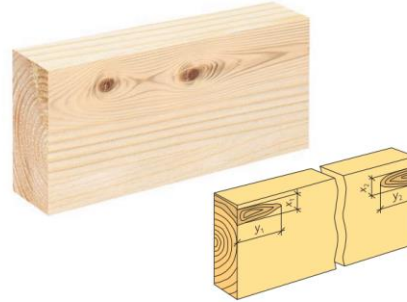
Resin wood



Definition	Wood that has been saturated with resin. Usually darker than surrounding, normal wood. The resin wood is formed through a more dense concentration of resin channels.
Requirement	Maximum total area in percent of the area of the side.
Measuring rule	Total area on the side. $A = x_1 \cdot y_1 + \dots + x_n \cdot y_n$

Other natural features

Reaction wood (Compression wood)



Definition	Wood with a distinctive anatomical character with different properties, which normally occurs in crooked or leaning trees and in branches. Most distinctive are very large moisture movements in the grain direction.
Requirement	Maximum total area in percent of the area of the side.
Measuring rule	Total area on the side. $A = x_1 \cdot y_1 + \dots + x_n \cdot y_n$

30 Grading

Grading 31

Other natural features

Slope of grain



Definition	Divergence in the direction of the grain in relation to the longitudinal axis of the piece of timber. Does not refer to disruption of the grain around knots or other local deviations.
Requirement	Not permitted / permitted.

Other natural features

Curly grain



Definition	Grain that follows tight, irregular curves.
Requirement	Not permitted / permitted.

32 Grading

Grading 33

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Other natural features

Top rupture



Definition	Grain deviation caused when a leading shoot breaks and a side shoot takes over its role, after which everything is gradually encased by the increasingly thick stem. Depending on the location of the saw cut in the log, the top rupture is either clear and illustrative on the surface of the piece of timber or if it is deeper down, when it is only possible to see a rough yet diffuse disturbance in the grain. Often to be found in connection with curly grain and rot.
Requirement	Not permitted / permitted.

Other natural features

Pith



Definition	Zone within the first growth ring that consists chiefly of soft tissue. Dark colour.
Requirement	Not permitted / permitted.

34 Grading

Grading 35

Attacks of micro-organisms and insects

Attacks of micro-organisms and insects

Refers to attacks of fungus, bacteria and insects.

- Dote
- Soft rot
- Surface blue stain
- Deep blue stain
- Insect attack.

Note Rot

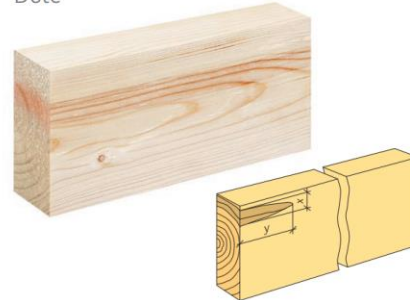
Definition	Decomposition of wood due to fungi or other micro-organisms resulting in softening, progressive loss of strength and mass, and often changes in colour and texture.
-------------------	---

Note Blue stain

Definition	Stain caused by fungi, where the discolouration ranges from pale blue to black, usually in sapwood.
-------------------	---

Attacks of micro-organisms and insects

Dote



Definition	Early stage of rot, characterized by discoloured streaks or patches (often at knots) in the wood. The general texture and strength properties remain more or less unchanged.
Requirement	Maximum total area in percent of the area of the side.
Measuring rule	Total area on the side. $A = x_1 \cdot y_1 + \dots + x_n \cdot y_n$

36 Grading

Grading 37

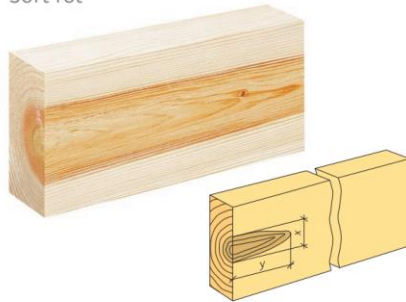
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Attacks of micro-organisms and insects

Soft rot

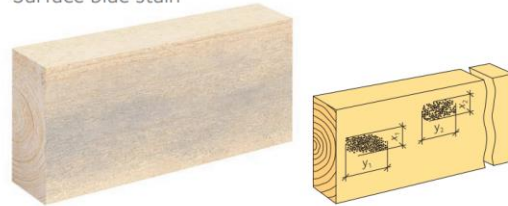


Definition	The wood has been attacked by rot and has lost its firmness. It gives way to pressure.
Requirement	Maximum total area in percent of the area of the side.
Measuring rule	Total area on the side. $A = x_1 \cdot y_1 + \dots + x_n \cdot y_n$

38 Grading

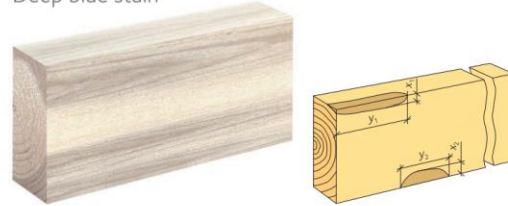
Attacks of micro-organisms and insects

Surface blue stain



Definition	Superficial blue stain, less than 2 mm deep, that can be removed by surface planing.
Requirement	Maximum total area in percent of the area of the side.
Measuring rule	Total area on the side. $A = x_1 \cdot y_1 + \dots + x_n \cdot y_n$

Deep blue stain

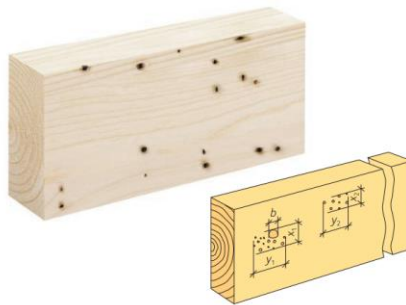


Definition	Blue stain, more than 2 mm deep, that cannot be removed by surface planing. Normally found in the log even before sawing (log blue stain).
Requirement	Maximum total area in percent of the area of the side.
Measuring rule	Total area on the side. $A = x_1 \cdot y_1 + \dots + x_n \cdot y_n$

Grading 39

Attacks of micro-organisms and insects

Insect attack



Definition	Bore holes or pinholes in wood caused by insects or insect larvae.
Requirement	Maximum diameter and maximum total damaged area in percent of the area of the side.
Measuring rule	Maximum diameter b , total damaged area on the side. $A = x_1 \cdot y_1 + \dots + x_n \cdot y_n$

40 Grading

Features according to table 3

Features according to table 3

Production related features

- Wane.

Fissures

- Check:
 - Not traversing
 - Traversing (Split)
- End shake.

Warp

- Bow
- Spring
- Twist
- Cup.

Note Fissure

Definition	Opening between the wood cells resulting in longitudinal separation of fibres.
-------------------	--

Note Warp

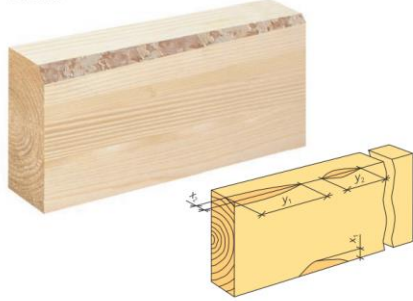
Definition	Distortion of a piece of timber in the process of conversion and/or drying and/or storage.
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Grading 41

Production related features

Production related features

Wane

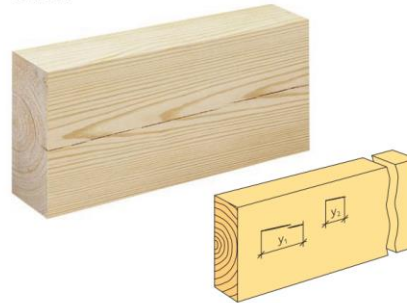


Definition	Original rounded surface of a log, with or without bark, on an arsis in sawn timber. Also surface formed during ring chipping.
Requirement	Maximum total length of wane on each arsis in percent of the length of the piece of timber. Maximum width of wane on face and edge respectively in mm.
Measuring rule	Total length on each arsis, $y = y_1 + \dots + y_n$ Maximum width of wane on face x_f Maximum width of wane on edge x_e

Fissures

Fissures

Check



Definition	Not traversing check: Short, narrow and shallow fissure, only visible on one side of the piece of timber. Traversing check (Split): Fissure that extends from one side to another.
Requirement	Maximum total length of checks, y in percent of the length of the piece of timber.
Measuring rule	Total length of checks, $y = y_1 + \dots + y_n$ measured parallel with the longitudinal axis of the piece of timber.

42 Grading

Grading 43

Fissures

End shake

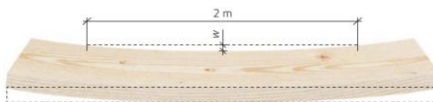


Definition	Fissure showing on the end surface of the piece of timber. Usually extending through the piece from one side to another and of limited length.
Requirement	Maximum length y in percent of the width of the piece of timber.
Measuring rule	Individual fissure length y measured parallel with the longitudinal axis of the piece of timber.

44 Grading

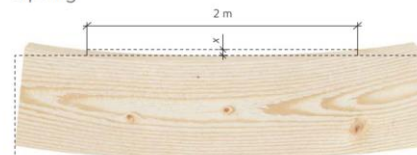
Warp

Bow



Definition	Lengthwise curvature of a piece of timber at right angles to the face.
Requirement	Maximum deviation, dimension w , in mm.
Measuring rule	Largest deviation, dimension w , over the worst 2 m length.

Spring



Definition	Lengthwise curvature of a piece of timber at right angles to the edge.
Requirement	Maximum deviation, dimension x , in mm.
Measuring rule	Largest deviation, dimension x , over the worst 2 m length.

Warp

Grading 45

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Twist



Definition	Lengthwise spiral distortion of a piece of timber.
Requirement	Maximum deviation, dimension y, in percent of the width of the piece of timber.
Measuring rule	Largest deviation, dimension y, over the worst 2 m length in relation to the outside face of the piece of timber.

Cup



Definition	Curvature of a piece of timber across the width of the face.
Requirement	Maximum deviation, dimension z, in percent of the width of the piece of timber.
Measuring rule	Largest deviation, dimension z, over the width of the piece of timber.

Tables

Grading methods

Judgement of features shall be done with regard to the grading method and the location of the feature on the piece of timber.

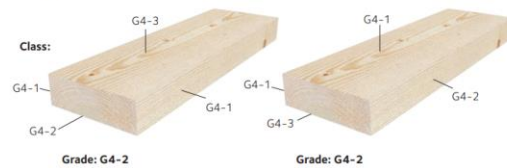
Grading method	Location	Judgement according to tables
G4, 4-sided grading	Faces	All features
	Edges	

G2, 2-sided grading, is seldom used in Sweden.

Determination of grade

Each side is judged separately and assigned its own class. If, when determining the grade of the piece of timber as a whole, one face is of a lower class than any of the other three sides, the grade of the piece is one grade better than this worse face.

Example:



General

The rules are applicable to all sawn timber, dried or undried. Only the lower limit for each grade is given. A lot of timber graded according to the rules shall contain a fair distribution of quality.

Table 1 – Knots

Table 1 Knots.

Feature	Class of the side						
	2-sided grading ¹⁾	G2-0	G2-1	G2-2	G2-3	G2-4	
Maximum permitted on worst meter	4-sided grading	G4-0	G4-1	G4-2	G4-3	G4-4	
Face	Knot size						
	10 percent of the width + [table value] (mm)						
	Sound intergrown knot	10	20	35	50	6)	
	Partially intergrown knot / Dead knot	0	10	20	50		
	Encased knot	1)	0	15	40		
	Unsound or loose knot	1)	1)	15	40		
Edge	Knot number						
	Total number	2	4	6	1)	6)	
	Of which encased, unsound and/or loose knots	0	1 ²⁾	2	5		
	4-sided grading	Knot size in percent of thickness ³⁾ (%)					
		Sound intergrown knot	50	90	100	100	6)
		Partially intergrown knot / Dead knot	33	67	75	100	
2-sided grading	Encased knot	1)	33	50	90		
	Unsound or loose knot	1)	1)	50	90		
	Knot number						
Total number	1	2	4	1)	6)		
Of which encased, unsound and/or loose knots	0	1 ²⁾	2	3			

Maximum permitted knot size on face is 10 percent of the width + [table value] (mm).
 Knots of 10 mm or less are not considered unless they are unsound or loose.
Traversing edge knots are permitted in G4-2, G4-3 and G4-4 but if unsound or loose only permitted in G4-4.
Compensation rule for face knots
 If the knots are smaller than the maximum permitted knot size a larger number may be permitted but the sum of the sizes of such knots shall not exceed the maximum permitted size multiplied by the maximum permitted number of the largest knots. Only applicable for face knots.
 In spruce in widths of 225 mm or wider the maximum permitted knot size on face may be increased by 10 mm. In pine in widths of 180 mm or wider the maximum permitted knot size on face may be increased by 10 mm. The total number of knots on worst meter for widths 225 mm or wider may be increased by 50 percent on both face and edge.
¹⁾ Not permitted.
²⁾ Applies to encased knots.
³⁾ Unlimited.
⁴⁾ 2-sided grading, G2, is seldom used in Sweden.
⁵⁾ The knot size on edge must not be larger than the corresponding maximum permitted knot size on face.
⁶⁾ Knot size and knot number unlimited but the piece of timber must hold together.

Table 2 – Other features

Table 2 Other features.

Feature	Class of the side					
	2-sided grading ⁴⁾	G2-0	G2-1	G2-2	G2-3	G2-4
Maximum permitted	4-sided grading	G4-0	G4-1	G4-2	G4-3	G4-4
Bark pocket						
Number on worst meter		1)	2	2	4	3)
Total length (mm)		1)	100	200	300	3)
Resin pocket						
Number on worst meter		2	4	4	4	3)
Total length (mm)		75	100	200	300	3)
Resin wood						
Percent of the area of the side (%)		1)	10	30	50	3)
Reaction wood (Compression wood)						
Percent of the area of the side (%)		1)	10	30	50	3)
Strong, abnormal grain structure						
		1)	1)	5)	5)	5)
Soft rot						
		1)	1)	1)	1)	2)
Blue stain and dote						
Deep blue or dote, percent of the area of the side (%)		1)	1)	10	50	3)
Surface blue, percent of the area of the side (%)		1)	1)	20	100	3)
Insect attack, diameter < 2 mm						
Percent of the area of the side (%)		1)	1)	1)	15	5)
Pith						
		1)	5)	5)	5)	5)

Strong, abnormal grain structure includes slope of grain, curly grain, top rupture and similar features.
Active insect attack is not permitted.
Bark pockets and resin pockets are only considered on face.
No compensation rule for bark, pockets and resin pockets.
 When features are unlimited in G2-4 and G4-4 the piece of timber must still hold together.
 For features that are limited as a percent of the area of the side and there are several affected areas those areas shall be summarized according to:
 Affected area = $x_1 \cdot y_1 + \dots + x_n \cdot y_n$
 The x- and y-measurements shall be taken as a rectangle enclosing the affected areas respectively.
¹⁾ Not permitted.
²⁾ Small areas permitted.
³⁾ Unlimited.
⁴⁾ 2-sided grading, G2, is seldom used in Sweden.
⁵⁾ Permitted.

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Table 3 – Wane, fissures, warp

Trading qualities – grades

Table 3 Wane, fissures, warp.

Features	Class of the side					
	2-sided grading ²⁾	G2-0	G2-1	G2-2	G2-3	G2-4
Maximum permitted	4-sided grading	G4-0	G4-1	G4-2	G4-3	G4-4
Wane						
Width, on face (mm)		3	5	10	20	30
Width, on edge (mm)		3	5	10	20	20
Length, percent of each arris (%)		20	20	30	50	100
Fissures						
End shake, percent of timber width (%)		100	100	150	200	500
Check, percent of timber length (%) for:						
timber thicknesses < 60 mm		10	25	35	75	100
timber thicknesses ≥ 60 mm		10	33	50	90	100
Split, percent of timber length (%)		¹⁾	¹⁾	¹⁾	20	40
Warp						
Bow, mm on 2 m for:						
timber thicknesses < 45 mm		10	10	15	50	50
timber thicknesses ≥ 45 mm		10	10	10	20	50
Spring, mm on 2 m		4	4	4	10	30
Twist, percent of timber width on 2 m (%)		8	8	8	10	20
Cup, percent of timber width (%)		3	3	3	5	5

Wane with bark is not permitted.

Check on edge is judged as split.

Ring shake is judged as split.

¹⁾ Not permitted.²⁾ 2-sided grading, G2, is seldom used in Sweden.

Trading qualities – grades

The timber is shown in the cross-sections: 25 × 100, 50 × 150 och 75 × 200 mm



Grade A1 – Pine
Grade I – Pine

Grade A1 – Spruce
Grade I – Spruce

Grade A2 – Pine
Grade II – Pine

Grade A2 – Spruce
Grade II – Spruce

European Standard EN 1611-1

According to the standard for appearance grading of softwoods, EN 1611-1, the grading can be based on both the faces and the edges or only on the faces (as regards knots). The grades are called G4 and G2 respectively. The grade name is followed by a figure which details the grade of the timber, 0-4, where 0 is the highest grade. A grade can be G4-2 which denotes 4-sided visual grading of typical building timber, corresponding to grade V according to an older grading rule. An approximate comparison with older grading rules is given in table 4, page 54. The grading method G2 is seldom used in Sweden.

50 Grading

Grading 51

Trading qualities – grades

Trading qualities – grades



Grade G4-0 – Pine
Grade A3 – Pine
Grade III – Pine

Grade G4-0 – Spruce
Grade A3 – Spruce
Grade III – Spruce

Grade G4-1 – Pine
Grade A4 – Pine
Grade IV – Pine

Grade G4-1 – Spruce
Grade A4 – Spruce
Grade IV – Spruce



Grade G4-2 – Pine
Grade B – Pine
Grade V – Pine

Grade G4-2 – Spruce
Grade B – Spruce
Grade V – Spruce

Grade G4-3 – Pine
Grade C – Pine
Grade VI – Pine

Grade G4-3 – Spruce
Grade C – Spruce
Grade VI – Spruce

Older grading rules for trading qualities – grades

Nordic Timber – Grading rules (The "Blue book")

According to the rules in "Nordic Timber – Grading rules" the timber is graded in three grades: A, B and C, where grade A is the highest grade, used for high-class joinery and visible boarding. Grade A can be subdivided into the grades A1-A4. Grade B is commonly used in building, while grade C is used in for example packing.

52 Grading

Guiding principles for grading of Swedish sawn timber (The "Green book")

According to the rules in "Guiding principles for grading of Swedish sawn timber" the timber is graded in six grades, where grade I is the highest grade. Usually the grades I–IV are not separated but sold together under the name US, unsorted. Grade V is usually named fifths and grade VI is named sixths.

Grading 53

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Table 4 Timber qualities. Approximate relations between the different trading qualities – grades.

Grading rules	The grades						
EN 1611-1							
4-sided grading	-	-	G4-0	G4-1	G4-2 ²⁾	G4-3	G4-4
2-sided grading ¹⁾	-	-	G2-0	G2-1	G2-2	G2-3	G2-4
Older grading rules	The grades						
Nordic timber – Grading rules, 1994 (The "Blue book")	A				B	C	D
	A1	A2	A3	A4			
Guiding principles for grading of Swedish sawn timber, 1976 (The "Green book")	U/S				Fifths	Sixths	Rejects
	I	II	III	IV	V	VI	VII

¹⁾ 2-sided grading, G2, is seldom used in Sweden.

²⁾ Typical building timber.

References

This book is based on the content of the following standards and reports:

- EN 844-1 Round and sawn timber – Terminology – Part 1: General terms common to round timber and sawn timber.
- EN 844-3 Round and sawn timber – Terminology – Part 3: General terms relating to sawn timber.
- EN 844-4 Round and sawn timber – Terminology – Part 4: Terms relating to moisture content.
- EN 844-6 Round and sawn timber – Terminology – Part 6: Terms relating to dimensions of sawn timber.
- EN 844-7 Round and sawn timber – Terminology – Part 7: Terms relating to anatomical structure of timber.
- EN 844-9 Round and sawn timber – Terminology – Part 9: Terms relating to features of sawn timber.
- EN 844-10 Round and sawn timber – Terminology – Part 10: Terms relating to stain and fungal attack.
- EN 844-11 Round and sawn timber – Terminology – Part 11: Terms relating to degrade by insects.
- EN 844-12 Round and sawn timber – Terminology – Part 12: Additional terms and general index.
- EN 1313-1:2010 Round and sawn timber – Permitted deviations and preferred sizes – Part 1: Softwood sawn timber.
- EN 1611-1:1999 Sawn timber – Appearance grading of softwoods – Part 1: European spruces, firs, pines and Douglas firs.
- EN 1611-1:1999/A1:2002 Sawn timber – Appearance grading of softwoods – Part 1: European spruces, firs, pines, Douglas fir and larches.
- Defining quality – A guide to the specification of softwood (ISBN 91-88170-31-4).

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Keywords

Arris.....13	Inside face.....12	Round knot.....18
Attacks of micro-organisms and insects...36	Knot cluster.....26	Sawing patterns.....5
Bark pocket.....28	Length.....10	Size.....8
Bow.....45	Loose knot.....16	Slope of grain.....32
Check.....43	Moisture content.....11	Soft rot.....38
Compensation rule.....48	Moisture content meter...11	Sound, intergrown knot...15
Compression wood.....31	Not traversing	Species.....4
Conifers.....4	arris knot.....21	Spike knot.....23
Cup.....46	Outside face.....12	Splay knot.....24
Curly grain.....33	Oval knot.....19	Spring.....45
Deep blue stain.....39	Oven dry method.....11	Spruce.....4
Determination of grade...47	Partially intergrown knot/Dead knot.....15	Strong, abnormal grain structure.....27
Dimension.....8	Permitted deviations.....10	Surface blue stain.....39
Dote.....37	Picea abies.....4	Thickness.....8
Edge.....13	Pin knot.....25	Through cut.....7
Encased knot.....15	Pine.....4	Top rupture.....34
End shake.....44	Pinus sylvestris.....4	Trading qualities.....51
Face.....12	Pith.....35	Traversing arris knot...22
Face width.....9	Pith catcher.....6	Traversing edge knot...20
Fissures.....43	Reaction wood.....31	Twist.....46
Four piece cut.....5	References.....55	Unsound knot.....16
Grading methods.....47	Resin pocket.....29	Wane.....42
Insect attack.....40	Resin wood.....30	Warp.....45
		Width.....9

Wood grades



Naturum Store Mosse, Gnosjö, nominated for the Swedish Timber Prize 2008. Architect: White Arkitekter. Photo: Åke E:son Lindman

Appearance grading

The grade of wood can be specified using a number of parameters. The grade is determined by the number and size of the parameters below. Fewer and smaller knots, for example, result in a higher grade.

Knots	Top rupture	Wane
Insect attack	Pitchwood	Pitch pocket
Bark-encased scar	Reaction wood	Open scar

[Go to main content](#)

11-12-2023 18:05

Wood grades - Swedish Wood



Seasoning check

Shake

End check

Deformations

Handling damage

Dimension deviations

The parameters are assessed in visual sorting, known as appearance grading. This is usually done at the sawmill.

It is common for each piece of wood to be stamped on the end with a shipping mark. This allows the graded quality to be checked along the chain from the sawmill to the retailer. After processing, e.g. planing or resawing, these marks may be cut away or hard to identify. The grade is then marked on the packaging.

The grading of wood is a general process based on appearance. It is thus not designed to take account of the wood's use, for example in joinery, construction or packaging.

Appearance grades – Quality classes

The wood is shown in the dimensions: 25x100, 50x150 and 75x200 mm



[Go to main content](#)

<https://www.swedishwood.com/wood-facts/about-wood/wood-grades/>

2/39

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Wood grades - Swedish Wood



At the Swedish sawmills, the wood is usually graded using the rules on appearance grading set out in *Grading of Sawn Timber*. However, among timber merchants and when describing wood grades used in construction, for example in the AMA Hus and VilmaBas databases, grading mostly follows the European standard for appearance grading of softwoods, SS-EN 1611-1.

Grading of Sawn Timber

Grading of Sawn Timber is a grading regulation established in 2020. It is based on the *Nordic Timber Grading Rules for Pine and Spruce Sawn Timber* and the European standard *SS-EN 1611-1 Sawn timber – Appearance grading of softwoods*.

The sawn timber is sorted into seven classes, designated I–VII. CLASS U/S is one of the main grades, comprising unspecified proportions of sub-classes OS I – OS IV. The other main grades are CLASS V (Fifths), CLASS VI (Sixths) and CLASS VII, which has low quality requirements.

Standard SS-EN 1611-1

According to standard *SS-EN 1611-1 Sawn timber – Appearance grading of softwoods*, the grading may be performed on the faces and the edges or only on the faces. In these cases, the grades are called G4 and G2 respectively. The grading designations are followed by a number from 0–4 stating the quality of the wood, with 0 as the highest quality. A grade can thus have the designation G4-2, which means a 4-sided visual sorting of typical construction timber, corresponding to CLASS V, Fifths, in the *Grading of Sawn Timber* system. A rough comparison with *Grading of Sawn Timber* is given in *table 18, page 62*. G2 entails 2-sided visual sorting and is rarely used in Sweden.

Table 17 Timber grades

Common wood products with appropriate appearance grades and wood types.

[Go to main content](#)

<https://www.swedishwood.com/wood-facts/about-wood/wood-grades/>

3/39

11-12-2023 18:05

Wood grades - Swedish Wood



Construction timber	G4-0 - G4-2	Spruce and pine
Sheathing	G4-2 - G4-3	Gran
Formwork	G4-4 or better	Spruce and pine
Packaging wood	G4-3	Spruce and pine
Exterior cladding and bargeboards	G4-2 or better	Gran
Interior cladding	G4-1 or better	Pine and spruce
Planed wood for interior joinery	G4-1 or better	Pine
Floorboards	G4-2 or better	Pine and spruce
Fencing	G4-2 or better	Spruce, poss. treated pine
Mouldings	A - B	Pine as per SS 232811

Description of appearance grades in line with SS-EN 1611-1

Wood sorted in line with SS-EN 1611-1 is not intended for load-bearing structures. The aim of the grading is, instead, to sort wood in terms of its appearance. Dead knots, for example, are judged more harshly than sound knots. Properties that affect the function of the wood, such as deformations, are also assessed.

Grade G4-0

Grade G4-0 is suitable for planed wood for interior joinery and internal mouldings. Planed pine is often this grade.

High quality, where defects that affect the appearance to a large extent, are not permitted. A few small sound and dead knots are permitted but no encased or decayed knots.

It is very uncommon for spruce to have Grade G4-0. The grade is attained primarily by the side yield of butt logs.

Grade G4-1

Grade G4-1 applications include high quality interior and exterior cladding with small knots. Planed spruce is often this grade.

Defects that affect the appearance to some extent, such as bark-encased scars and reaction wood, are permitted. Small encased knots are also permitted, but not decayed knots.

[Go to main content](#)



Grade G4-2

Grade G4-2 is suitable for applications such as exterior cladding with a knotty structure. Grade G4-2 is also suitable for higher quality decking and sheathing. In addition, the grade can be used in the form of dimension planed spruce for wall studs in non-load-bearing internal walls.

Grade G4-2 permits defects that affect the appearance to a greater extent, such as bark-encased scars, pitchwood and decayed knots. Blue stain, firm rot, wavy grain and top rupture are also permitted to a small extent.

Note This grade is often the highest to which spruce is sorted, which means that it will contain G4-2 or better.

Grade G4-3

Grade G4-3 is suitable for applications such as lower quality decking and sheathing, plus packaging wood.

This grade allows defects that greatly affect the appearance in terms of both size and number, including decayed knots, bark-encased scars, blue stain, firm rot, through checks, wavy grain and top rupture. Extensive deformations are also permitted, as are knot holes.

Note This grade is sometimes the highest to which spruce is sorted, which means that it will contain G4-3 or better.

Grade G4-4

Grade G4-4 is suitable for low quality formwork and packaging.

G4-4 allows most defects to an unlimited extent, as long as the piece of wood remains intact, which means that the wood can be handled without falling apart.

Defects that may be present to an extensive but not unlimited extent are wane, checks and deformations.

A small amount of soft rot is permitted.

Tabell 18 Wood grades

Approximate equivalences between the different appearance grades – quality classes.

Grading rules	Quality classes – appearance grades						
	U/S				Fifths	Sixths	
Appearance grading of sawn timber	I	II	III	IV	V 2)	VI	VII

[Go to main content](#)

11-12-2023 18:05

Wood grades - Swedish Wood



2-sided grading ¹⁾	-	-	G2-0	G2-1	G2-2	G2-3	G2-4
-------------------------------	---	---	------	------	------	------	------

¹⁾ 2-sided grading, G2, seldom used in Sweden.

²⁾ Most common for structural timber.

Application-specific grading

VilmaBas – Application-specific base range

A base range called VilmaBas has been created in Sweden as a means of clearly describing wood products in a user-friendly way. Behind this database lie the wood engineering industry, builders' merchants and building contractors who, over the years 2010–2020, have jointly assessed and established a relevant base range of wood products. Each product specification, referred to as a properties declaration, is identified by a VilmaBas product ID, a VB number. Each product is described in terms of a selection of properties. Find out more at www.vilmabas.se.

Comparable products, the same for everyone

For its comparable products, each manufacturer can add the relevant VB number or properties declaration. The parties in the value chain can then safely use the VB numbers as a reference.

Traceability

Each individual product/pack can be labelled and identified using a barcode and a Global Trade Item Number (GTIN). This ensures complete traceability, as long as each party in the value chain uses these identifiers in its incident reporting concerning order confirmations, goods reception, stock balance, and so on. See also gs1.se.

Strength grading

Load-bearing structures use construction timber that is sorted mechanically or visually.

The old visual grading rules (T-virkesreglerna) have been replaced by joint Nordic grading regulations. In Sweden they are issued as Swedish standard SS 230120, while the joint Nordic designation is INSTA 142. The rules apply to pine, spruce, silver spruce, larch, Sitka spruce and Douglas fir. The wood continues to be called T-virke and the classes are T0, T1, T2 and T3.

To judge the impact of the knots on strength, the grading regulations specify measurement rules stating how the size of the knots must be measured and how they are to be assessed.

- Size in relation to dimensions of wood
- Positioning on edge and face
- Positioning along the length of the wood

[Go to main content](#)

<https://www.swedishwood.com/wood-facts/about-wood/wood-grades/>

6/39

11-12-2023 18:05

Wood grades - Swedish Wood



wood, fungal attack, deformation, wavy grain, handling damage and dimension deviations.

Wood graded in line with SS 230120 is labelled with a grading class of T0, T1, T2 or T3, and a strength class of C14, C18, C24 or C30. The C classes follow standard *SS-EN 338 Structural timber – Strength classes*. The labelling also includes the number of the standard and the company's mark. Grading T-virke wood requires special training.

Mechanical grading follows the standard SS-EN 14081-1, which also gives detailed labelling rules. During mechanical grading, these strength classes can be produced: C14, C18, C24, C30 and C35.

Mechanical strength grading identifies a physical property that is associated with strength, such as the static or dynamic modulus of elasticity. Some machines combine judgements on multiple properties, such as density, modulus of elasticity or inner structure, using x-rays. The most common mechanical principle in use today involves determining the modulus of elasticity by measuring the resonance frequency from a tap on the end of the wood. Visual supplementary grading is also required for parameters that machines cannot assess, such as cross grain, top rupture, compression wood, fungal attack, checks, deformation, wavy grain, handling damage and dimension deviations. Visually and mechanically graded construction timber must be CE marked and have a performance declaration in line with SS-EN 14081-1.

Pressure treated wood can also be ordered as strength graded construction timber and this must then also be CE marked.

Typical base values for calculating the load-bearing capacity and stiffness of construction timber in strength classes C14–C50 are stated in the standard SS-EN 338.

Note

Wood components for glulam are graded under SS-EN 14080. See also the section [Manufacture and control](#).

Description of construction timber in strength classes C14 – C35

Strength class C14

Strength class C14 is used for wall studs in load-bearing internal and external walls with deformation requirements that are not too stringent.

C14 is a strength class where factors that affect the strength and deformation of the construction timber are permitted to a large extent.

In visual grading, individual knots are permitted to be equal to 1/2 of the construction timber's width and the whole of its thickness.

A top rupture may be 3/4 of the construction timber's width. Firm rot is permitted in narrow strips and bands.

[Go to main content](#)



The minimum strength class C14 spruce has slightly higher requirements concerning crook, bow and blue stain compared with the regular strength class C14.

The permitted crook is 8 mm per 2 metres in length compared with 12 mm per 2 metres in length for strength class C14. The permitted bow is 15 mm per 2 metres in length compared with 20 mm per 2 metres in length for strength class C14. Blue stain is permitted in strips and bands.

Strength class C18

Strength class C18 can be used for load-bearing structures that do not require high strength, or where it is possible to use large dimensions or short lengths. The strength class can also be used for wall studs in load-bearing structures if the requirements concerning deformation are not high.

C18 is a strength class where factors that affect the strength of the construction timber are permitted to a moderate extent.

Deformation is permitted to a much greater extent than in strength classes C24, C30 and C35.

In visual grading, individual knots are permitted to be equal to 2/5 of the construction timber's width and 4/5 of its thickness. The principles behind mechanical grading mean that the number of knots is often higher than would be permitted in visual grading.

Top ruptures must not be present in the outer 1/4 of the construction timber's width.

A small amount of firm rot is permitted. Construction timber in strength class C18 is rarely kept in stock.

Strength class C24

Strength class C24 is used in load-bearing structures that require high strength, such as roof trusses and floor systems.

C24 is a strength class where factors that affect the strength and deformation of the construction timber are permitted to a low extent.

In visual grading, individual knots are permitted to be equal to 1/4 of the construction timber's width and 1/2 of its thickness. The principles behind mechanical grading mean that the number of knots is often higher than would be permitted in visual grading.

Top ruptures must not be present in the outer 1/4 of the construction timber's width. The strength class is not usually graded simultaneously with C30. This means that it comprises strength class C24 and higher.

Construction timber in strength class C24 is stocked by most builders' merchants.

Strength class C30

[Go to main content](#)



In visual grading, individual knots are permitted to be equal to 1/6 of the construction timber's width and 1/8 of its thickness. The principles behind mechanical grading mean that the number of knots is often higher than would be permitted in visual grading.

Strength class C30 is a homogenous but not very widespread grade. Construction timber in strength class C30 is rarely kept in stock.

Strength class C35

Strength class C35 is suitable for load-bearing structures that require extra high strength but cannot make use of large dimensions.

C35 is a strength class where factors that affect the strength and deformation of the construction timber are permitted to a low extent.

Strength class C35 can only be mechanically graded. Construction timber in strength class C35 is rarely kept in stock.

[Go to main content](#)



Roof trusses in construction timber.

Table 19 Sorting of construction timber

[Go to main content](#)

11-12-2023 18:05

Wood grades - Swedish Wood



Mechanical grading in line with SS-EN 338	C16	C18	C20	C22	C24	C27	C30	C35	C40	C45	C50
---	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----

The strength classes marked in orange are the manufacturing standard for Swedish manufacturers of strength graded construction timber.

Table 20 Characteristic bending-strength values for various wood products for load-bearing structures

Table 28 Characteristic bending strength values for various wood products for load-bearing structures

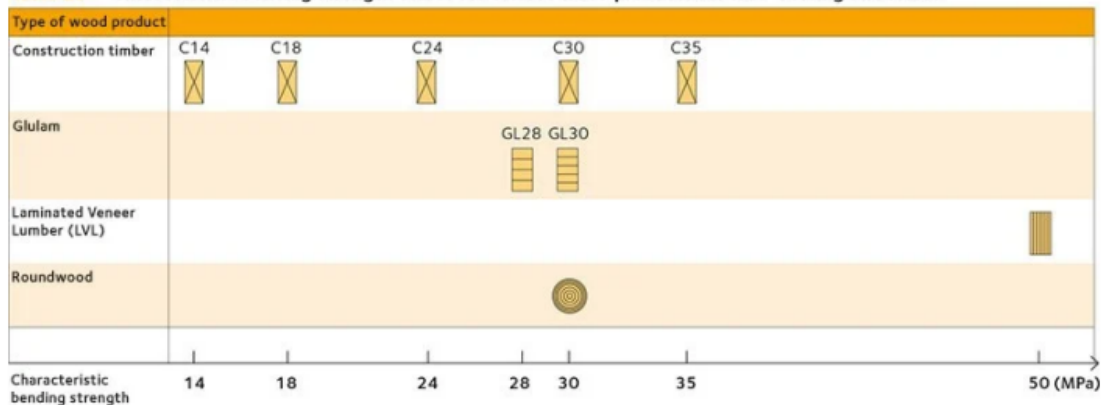


Table 21 Different strength classes and appearance grades have different deformation requirements

Defect	Strength class C14	Strength class C18 Vilma Regel C14	Strength class C24	Strength class C30	Appearance grade G4-2	Appearance grade G4-3
Bow (<i>w</i>)	20 mm/2 m	15 mm/2 m	20 mm/2 m	10 mm/2 m	10 mm/2 m*	20 mm/2 m*
Crook (<i>x</i>)	12 mm/2 m	8 mm/2 m	12 mm/2 m	8 mm/2 m	4 mm/2 m	10 mm/2 m
Warping (<i>y</i>)	2 mm/25 mm width	2 mm/25 mm width	2 mm/25 mm width	1 mm/25 mm width	2 mm/25 mm width	2.5 mm/25 mm width

* For wood thicknesses ≥ 45 mm.

[Go to main content](#)



According to Boverket's regulation implementing SS-EN 1995-1-1 (Eurocode 5), finger-jointed timber can be used in a load-bearing structure on condition that the structure is designed so that the failure of an individual finger joint would not cause other significant parts of the structure to collapse. Finger-jointed construction timber should not be used in scaffolding or in other structures subject to any kind of impact loads.

Finger-jointed construction timber should be individually CE marked and carry a performance declaration in line with SS-EN 15497. In exceptional cases, where required by the customer, the wood may be free from labelling. In this case, each delivery should include documents providing the information prescribed by the standard.



Finger-jointed timber can be used when you want long lengths that do not require joining on site.

Cross-sectional dimensions

Table 22 Cross-sectional dimensions of sawn timber

[Go to main content](#)

11-12-2023 18:05

Wood grades - Swedish Wood



	25	38	50	75	100	125	150	175	200	225	250
12											
16											
19											
22											
25											
32											
38											
44											
47											
50											
63											
75											
100											

Table 24 Cross-sectional dimensions (commonly occurring in sawn timber and planed timber in Sweden)

Sawn timber Four sawn sides		Part planed One sawn face		Planed timber Four planed sides	
Thickness	Width	Thickness	Width	Thickness	Width
12	-	10	-	9	-
16	-	14	-	13	-
19	-	17	-	16	-
22	-	20	-	19	-
25	25	23	22	22	22
32	32	30	28	28	28
38	38	36	34	34	34
50	50	48	45	45	45
63	63	61	58	58	58
75	75	73	70	70	70

[Go to main content](#)

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13/39

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Specific technical requirements must be requested and confirmed by the manufacturer.

Les données sont informatif et indicatif.
Des exigences techniques et spécifiques doivent être demandées et confirmées par le fabricant.

11-12-2023 18:05

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-	125	-	120	-	120
-	150	-	145	-	145
-	175	-	170	-	170
-	200	-	195	-	195
-	225	-	220	-	220

Note

Not all dimensions are stocked by sawmills, builders' merchants and timber merchants.

Sawn timber

The dimensions for sawn timber apply at a moisture content of 20%. The permitted size deviations for sawn timber and construction timber are specified in SS-EN 1313-1 and SS-EN 336. No standardised cross-sectional dimensions are stated, apart from those recommended in SS-EN 1313-1. The following deviations from the agreed value are permitted in sawn timber:

Table 23 Cross-sectional dimensions and permitted size deviations **for sawn timber**

	Allowable dimension deviations	
Thickness and width	Up to 100 mm	- 1 mm + 3 mm
	Over 100 mm	- 2 mm + 4 mm
Length*	1 800 - 5 400 mm	No minus tolerance, Plus tolerance as stated in contract or agreement

** No minus tolerance is permitted under SS-EN 1313-1 or SS-EN 336.*

If overlength is a problem, the plus tolerance is to be specified in line with the contract or agreement.

Note The average value for actual thickness and width in the batch of wood products must not fall below the agreed value.

Example

Thickness, agreed value = 50 mm

Maximum thickness = 50 + 3 = 53 mm

Minimum thickness = 50 - 1 = 49 mm

Length: No minus tolerance, plus tolerance as stated in contract or agreement.

[Go to main content](#)

Table 25 Cross-sectional dimensions of planed timber

Table 34 Cross-sectional dimensions for planed timber

Thickness (mm)	Width (mm)									
	21/22	33/34	45	70	95	120	145	170	195	220
9										
12/13										
15/16										
18/19										
21/22										
28										
33/34										
45										
70										

	Batten
	Board
	Joist
	Plank
	Beam and post

In practice, the boundaries between the designations are not clear and absolute. They vary between different builders' merchants and timber merchants and locally across Sweden.

Planed timber

The dimensions for planed timber apply at a moisture content of 20%. Permitted size deviations for planed timber as set out in the table below are stated only in SS-EN 336 using the designation Tolerance class 2. The following deviations from the agreed value are permitted in planed timber:

Tabell 24 Cross-sectional dimensions and allowable deviations for planed timber

	Allowable dimension deviations	
Thickness and width	Up to 100 mm	± 1,0 mm
	Over 100 mm	± 1,5 mm
Length*	1800-5400mm	No minus tolerance, Plus tolerance as stated in contract or agreement

* No minus tolerance is permitted under SS-EN 1313-1 or SS-EN 336.

If overlength is a problem, the plus tolerance is to be specified in line with the contract or

[Go to main content](#)

11-12-2023 18:05

Wood grades - Swedish Wood



Width

Thickness

Thickness and width up to and including 100 mm.

Thickness and width over 100 mm.

Length

The wood is usually cut into the standardised lengths 1,800, 2,100, 2,400 and so on up to 5,400 mm, i.e. multiples of 300 mm between 1,800 and 5,400 mm. Sawmills and builders' merchants normally stock lengths up to 5,400 mm. Longer lengths and custom lengths are available to order. Wood in longer lengths may be finger-jointed.

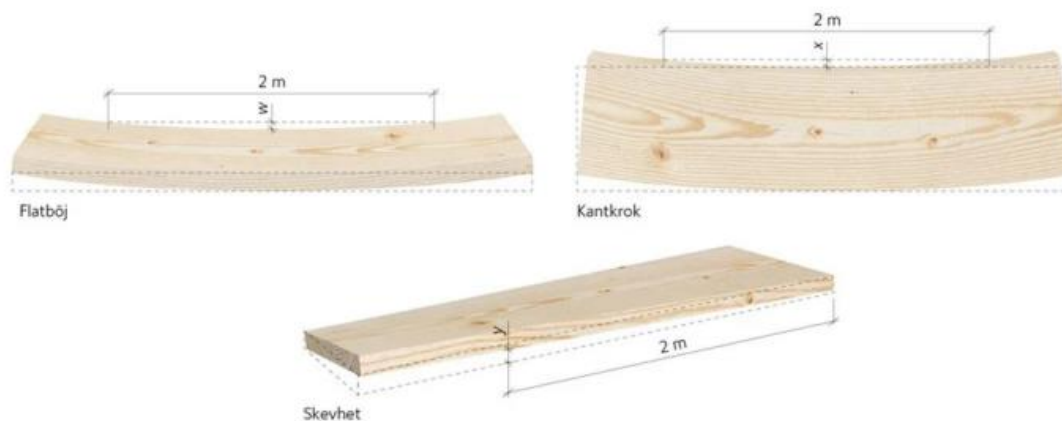


Fig. 65 Examples of deformations

Surface structures

The surface of wood can be finished to meet various technical and aesthetic requirements.

Sawn surfaces, known as original sawn timber, are obtained directly in the sawmill process when the log is green, which means undried. The surfaces will have a different appearance, depending on the sawing technique used. A circular saw will leave circular marks, while a band saw will leave straight marks. Reducer saws also leave circular marks that are usually coarser than the marks from a circular saw. A saw cut may sometimes be produced by two counter-rotating circular saw blades, which leaves two separate circular marks on the cut surface. Different saw patterns may occur on different sides of the same piece. At builders' merchants, sawn surfaces are only found on a few products, namely scaffolding planks, formwork and packaging wood.

Fine sawn or dry sawn timber has a finer surface structure than original sawn timber from green wood. Fine sawn surfaces appear mostly on exterior cladding.

[Go to main content](#)

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16/39

11-12-2023 18:05

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Wood is smooth planed for the smooth surfaces necessary on interior cladding, moldings and flooring. The best results are obtained with pine.

Surfaces that were previously planed may now be grooved. Grooving is a basic profiling of a planed surface to give paint better adhesion.

In order to accentuate the surface structure of the wood with a painted finish, a special paintable surface called paint cutter has been developed.

Wood surfaces for interior fittings and furniture are sanded or polished to give a completely smooth finish, with no tool marks.

A planed wood surface can be given a relief through brushing, which wears away the springwood and leaves the summerwood as raised ridges.

Common surfaces on wood



Circular sawn



Overlapping circular saw blades

[Go to main content](#)

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17/39

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11-12-2023 18:05

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Band sawn



Dimension planed



Fine sawn



Paint cutter

[Go to main content](#)

11-12-2023 18:05

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Smooth planed



Reduced

[Go to main content](#)

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19/39

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11-12-2023 18:05

Wood grades - Swedish Wood



Grooved

[Go to main content](#)

More details see GREY BOOK

<p style="text-align: center;">Nordic Timber</p> <h3>Contents</h3> <p>Preface 5</p> <p>Introduction 6</p> <p>1. Properties of Nordic sawn timber 8</p> <p style="padding-left: 20px;">Raw material 8</p> <p style="padding-left: 20px;">Sawn timber 9</p> <p>2. Nordic sawing practice 10</p> <p style="padding-left: 20px;">Log dividing according to Nordic practice 10</p> <p style="padding-left: 20px;">Heart-freesawing 10</p> <p>3. Sawn timber terminology 11</p> <p style="padding-left: 20px;">Sawn timber 11</p> <p style="padding-left: 20px;">Centre yield 11</p> <p style="padding-left: 20px;">Side yield 11</p> <p style="padding-left: 20px;">Studs 11</p> <p style="padding-left: 20px;">Spars 11</p> <p style="padding-left: 20px;">Beams 12</p> <p style="padding-left: 20px;">Resawn timber 12</p> <p style="padding-left: 20px;">Slating battens and strips 12</p> <p>4. Quality classes and terminology 13</p> <p style="padding-left: 20px;">4.1 Division into GRADES 13</p> <p style="padding-left: 40px;">GRADE US 13</p> <p style="padding-left: 40px;">GRADE V 13</p> <p style="padding-left: 40px;">GRADE VI 13</p> <p style="padding-left: 40px;">GRADE VII 14</p> <p style="padding-left: 40px;">GRADE US+V 14</p> <p style="padding-left: 40px;">GRADE US+V+VI 14</p> <p style="padding-left: 40px;">Schaalboards 15</p> <p style="padding-left: 40px;">Knotfree, three sides 15</p> <p style="padding-left: 40px;">"Halvrena" 15</p> <p style="padding-left: 20px;">4.2 Market oriented end-use grading 16</p> <p style="padding-left: 40px;">Grademix 16</p> <p style="padding-left: 40px;">Knotty sawn timber 16</p> <p style="padding-left: 20px;">4.3 Examples of various end-use areas for the different grades of sawn timber 17</p>	<p style="text-align: center;">Nordic Timber</p> <p style="text-align: right; border: 1px solid black; padding: 2px; display: inline-block;">GREY BOOK</p> <p style="text-align: right;">3</p> <p>5. Instructions and rules 18</p> <p style="padding-left: 20px;">Nordic grading practice 18</p> <p style="padding-left: 20px;">Species 18</p> <p style="padding-left: 20px;">Determination of GRADE 18</p> <p style="padding-left: 20px;">Values 19</p> <p style="padding-left: 20px;">Standard sizes for sawn timber 19</p> <p style="padding-left: 20px;">Permitted size deviations 19</p> <p style="padding-left: 20px;">Shrinkage of knots, discolouration, handling damage 20</p> <p style="padding-left: 20px;">Moisture content 20</p> <p style="padding-left: 20px;">Insect damage 21</p> <p style="padding-left: 20px;">Width of annual rings 21</p> <p style="padding-left: 20px;">Other GRADE-inclusion 21</p> <p style="padding-left: 20px;">Other grading applications 21</p> <p>6. Classification tables 22</p> <p style="padding-left: 20px;">Main grades US, V, VI: Knots, number / size 23</p> <p style="padding-left: 40px;">Fissures and wane 25</p> <p style="padding-left: 40px;">Other features 27</p> <p style="padding-left: 20px;">Sub-grades US I - IV: Knots, number / size 28</p> <p style="padding-left: 40px;">Fissures and wane 30</p> <p style="padding-left: 40px;">Other features 33</p> <p style="padding-left: 20px;">Grade tables GRADE US I 34</p> <p style="padding-left: 40px;">GRADE US II 36</p> <p style="padding-left: 40px;">GRADE US III 38</p> <p style="padding-left: 40px;">GRADE US IV 40</p> <p style="padding-left: 40px;">GRADE V 42</p> <p style="padding-left: 40px;">GRADE VI 43</p> <p>7. Wood features:</p> <p style="padding-left: 20px;">definitions and measurement practices 46</p> <p style="padding-left: 20px;">7.1 Knots 46</p> <p style="padding-left: 40px;">Form of the knots 46</p> <p style="padding-left: 40px;">Location of knots 46</p> <p style="padding-left: 40px;">Internal position of the knots 47</p> <p style="padding-left: 40px;">Different types of knots 47</p> <p style="padding-left: 40px;">Size and measuring - guidelines 48</p> <p style="padding-left: 20px;">7.2 Fissures 49</p> <p style="padding-left: 40px;">Drying checks 49</p> <p style="padding-left: 40px;">Heart shakes 49</p> <p style="padding-left: 40px;">Ring shakes 50</p> <p style="padding-left: 40px;">Measuring of the fissure length 50</p>
---	---

<p style="text-align: center;">Nordic Timber</p> <p>4</p> <p>7.3 Wane 50</p> <p>7.4 Resin pockets 51</p> <p>7.5 Bark pockets 51</p> <p>7.6 Scars 51</p> <p>7.7 Slope of grain 51</p> <p>7.8 Top rupture 51</p> <p>7.9 Compression wood 52</p> <p>7.10 Curly grain 52</p> <p>7.11 Resin wood 53</p> <p>7.12 Fungus infection 53</p> <p style="padding-left: 20px;">Mould 53</p> <p style="padding-left: 20px;">Log blue stain 53</p> <p style="padding-left: 20px;">Rot 54</p> <p>7.13 Warp 54</p> <p style="padding-left: 20px;">Bow 54</p> <p style="padding-left: 20px;">Spring 54</p> <p style="padding-left: 20px;">Cup 55</p> <p style="padding-left: 20px;">Twist 55</p> <p>7.14 Other definitions 55</p> <p style="padding-left: 20px;">Moisture content 55</p> <p style="padding-left: 20px;">Width of annual rings 55</p> <p style="padding-left: 20px;">Size deviation 56</p> <p style="padding-left: 20px;">Shrinkage of knots 56</p> <p style="padding-left: 20px;">Discolouration 56</p> <p style="padding-left: 20px;">Handling damage 56</p> <p style="padding-left: 20px;">Water storage damage 56</p> <p style="padding-left: 20px;">Insect damage 56</p> <p>8. Short history 57</p> <p style="padding-left: 20px;">Historical grading rules 57</p> <p style="padding-left: 20px;">"Guiding Principles for Grading of Sawn Timber" (1960): the Swedish "Green Book" 57</p> <p style="padding-left: 20px;">"Instructions for the Grading of Export Timber" (1960): the Finnish "Green Book" 58</p> <p>9. Photographic examples 60</p> <p style="padding-left: 20px;">List of pictures 60</p>	<p style="text-align: center;">Nordic Timber</p> <p style="text-align: right;">5</p> <h3>Preface</h3> <p>Svenskt Trätekniskt Forum, Suomen Sahateollisuusmiesten Yhdistys and Treindustriens Tekniska Förning, Norway, (the Association of Swedish Wood Processing Forum, the Association of Finnish Sawmillmen and The Norwegian Sawmillmen's Association) have jointly updated the 1994 edition of the Nordic Timber Grading Rules also known as Nordic Timber or the Blue book.</p> <p>The background of this update is that the market has gradually changed through new sales techniques, customer-specific products and changes in product ranges etc, resulting in a need to update the Grading Rules. Information about the intended updates was sent to member companies of the above mentioned associations in Sweden, Norway and Finland, and at the same time we asked whether they felt any additional changes were needed. We would like to thank all the member companies for their valuable comments and help in updating these rules.</p> <p>The revision committee included, from Sweden: Tomas Ivarsson, Secretary STTF, Niklas Eklund, Project leader, STTF and Senior Advisor Kjell Markusson, VIDA AB, From Finland: Development Manager Mika Lehmonen, UPM Timber and Quality Manager Jarmo Joki, Westas Group, and from Norway: Seniorrådgiver Jan Brønning, Norsk Treteknisk Institutt.</p> <p>As before, the NORDIC TIMBER will be published in several languages. All editions will contain the same text, form and layout as the original English edition.</p>
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De data is informatief en indicatief.
Bijzondere technische eisen moeten opgevraagd worden en bevestigd door de fabrikant.

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Introduction

The GRADES listed in NORDIC TIMBER reflect qualities that the forest sector produces on a sustained basis and which the sawmills are able to continuously deliver to the markets.

The NORDIC TIMBER grading practice, which will be applied in all the Nordic countries, illustrates the potential for sawmills to adjust themselves to delivering sawn timber which meets the end-users demand and requirements.

NORDIC TIMBER applies to both the export and domestic markets. It divides the sawn timber into GRADES according to the wood features. NORDIC TIMBER gives the maximum permitted values of wood features for each GRADE.

It is very seldom that several wood features with the maximum permissible values appear at the same time in one piece of sawn timber. Therefore, a parcel with a normal distribution of wood features will be considerably below the maximum permitted values.

NORDIC TIMBER forms a basis for grading.

NORDIC TIMBER will form a tool for training of graders and others who work in the timber trade.

Great effort has been taken to make the book easy to understand. The language has been simplified and clarified. Terms, definitions and measuring rules have been specified and conform in principle with other rules used in Europe. Text and tables have been formed in a more pedagogic and logical way. All this is to make it easier to use in grading, training and as a guideline for the trade of sawn timber.

The process automation and data management within the sawmill industry requires exactly defined grading criteria. The requirements of the latest technology have been considered as far as possible. Numerical limit values have been given to all measurable features.

NORDIC TIMBER divides the sawn timber into grades according to the wood features.

The main grades are GRADE US, GRADE V, GRADE VI, and GRADE VII.

The NORDIC TIMBER classification of different qualities gives a guideline to division into the GRADES. The division of GRADES is not binding. The sawmills can after agreement with the buyer compile individual grades with their own GRADE names adapted to customer and product needs. This is done by using a GRADEMIX based on the features of the main grades.

In this new edition the traditional quality names US, V, VI and VII are again used instead of A, B, C and D, since the system of letter grades, introduced in 1994, has not been widely adopted.

1. Properties of Nordic sawn timber

Raw material

The Nordic countries Sweden, Finland, and Norway, produce approx. 30 million m³ of sawn timber, pine (*Pinus silvestris*) and spruce (*Picea abies*) annually. The raw material, approx. 60 mill.m³, is of high quality with good wood properties and fulfils the highest requirements of end-users.

The forests are a renewable natural resource, and are managed according to the principle of sustainable development. About 80 % of the total growing stock in the forests is pine and spruce.

The growing habitats of different species have been chosen by natural selection. The best quality pine grows on dry, firm forest land. Spruce, however, favours luxuriant sites. The type of soil as well as the latitude have great effect on the properties of growing trees and their by-products.

Both pine and spruce, which grow in the north, form tall and straight trunks. Due to the slower growth rate at high latitudes, the average width of the annual growth rings will remain small. As a criterion for slow growth, 10 annual rings per 25 mm is used. Trunks with small taper produce long logs with even form, which guarantees sawn timber with favourable length distribution.

Pine and spruce trunks have different but typical knot zones. The pine trunk has an almost knotfree butt part, followed by a middle part with dead knots and a top part with sound knots. The spruce trunk has usually a butt part of about one log length with dead knots, whereas the other part of the trunk contains sound knots.

Sawn timber

Nordic sawn timber is produced by well-trained people. The technology required for production and handling of sawn timber is kept up-to-date by continuous new investments.

Good accuracy of measurements, smooth and even sawn surfaces and a moisture content required by the specific endusers are technical properties which allow the use of main grades of sawn timber in various end-uses without further machining and handling. The same properties are important also for further processing of sawn wood. They allow for small processing allowances and reduce waste.

Sawn softwood is easy to machine and has an aesthetic appearance with good inner structure. The high percentage of heartwood is an advantage in the industrial use of sawn timber.

The good stability of sawn timber is achieved in the sawing process through log dividing according to Nordic practice, in which the internal stresses are removed by heart splitting. Most of the pith also disappears due to the saw kerf in heart splitting.

Due to the favourable strength/density ratio, Nordic sawn timber is also suitable for all kinds of load bearing constructions.

The good hygroscopic and insulation properties are of advantage when using wood as building material: a wooden house is environmentally sound and pleasant to live in.

Wood is a product of nature, which is renewable and belongs to the natural cycle. The by-products produced in all stages of the production process can be industrially utilized in many ways without ecological problems.

10

Nordic Timber

2. Nordic sawing practice

Log dividing according to Nordic practice

Log dividing according to Nordic practice requires splitting of the log in the middle with a saw cut - heart splitting, see figure 2.1.

Other cuts divide the log into centre yield and side yield. The centre yield contains two or more pieces, which can be of the same or different thicknesses. Deviation from this sawing practice is special sawing (e.g. heart-free sawing).

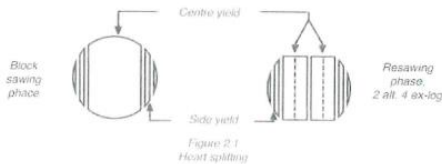


Figure 2.1
Heart splitting

Heart-free sawing

Heart-free sawn timber is produced by cutting one sawn timber piece from the centre of the log, thus removing the pith and the possible defects within it, see figure 2.2.

Heart-free sawing and other exceptions from the Nordic sawing practice are special sawing methods, which must be defined in the contract.

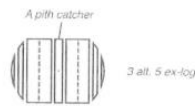


Figure 2.2
Heart-free sawing

Nordic Timber

11

3. Sawn timber terminology

Sawn timber

Sawn timber is the general term for pieces of wood sawn from saw logs, see figure 3.1.

Centre yield

Centre yield is the sawn timber sawn from the central part of the log. Centre yield with a thickness of minimum 32 mm is mostly called battens.

Side yield

Side yield is sawn timber produced from the parts outside the centre of the log. Side yield with a thickness under 32 mm is usually called boards.

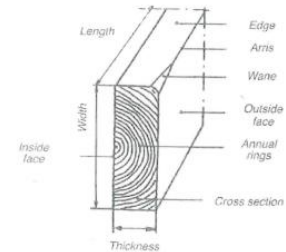


Fig. 3.1
A piece of sawn timber

Studs

Studs are pieces of sawn timber with a thickness of 38-50 mm and 75-150 mm in width. Studs with guaranteed sizes and form properties can be delivered on agreement.

Spars

Spars are pieces of small square sawn timber with four sawn sides with a thickness of 75 mm or more and with width the same as the thickness with a deviation not more than 25mm.

12

Nordic Timber

The spars are usually sawn without splitting the heart and with a big wane. The saw blade must, however, touch all the four sides through the whole length of the piece. Smaller wane can be separately defined in the contract. This can be stated as e.g. minimum 30 %, 50 % etc. sawn surface, which refers to the smallest width of the sawn surface on each side.

Beams

Beams are large square pieces of timber, centre yield, with four sawn sides, intended for structural purposes, such as floor joists and load bearing elements in wall and rafter constructions. The difference between the width and thickness is usually more than 25 mm.

It is usually a requirement for structural timber that it is graded for strength, according to special rules.

Resawn timber

Example 1: 63 x 175 mm resawn to 32 x 175 mm

Example 2: 32 x 175 mm resawn from 63 x 175 mm

In the first example the sawn timber has been sold as 63 x 175 mm and graded accordingly without considering what the quality of the resawn 32 x 175 mm would be.

The second example assumes that the goods are resawn from 63 x 175 mm and that the normal negative size deviation 2 mm caused by resawing is acceptable, but the goods are graded according to the rules for 32 x 175 mm.

It has to be exactly defined in the contract according to which size the sawn timber shall be graded.

Slating battens and strips

Slating battens are resawn timber 12-38 mm in thickness and 25-63 mm in width. The normal negative size deviation 2 mm caused by resawing is acceptable.

Nordic Timber

13

4. Quality classes and terminology

4.1 Division into GRADES

The sawn timber is divided into the following classes according to the quality features. These are called GRADES:

GRADES			
US	V	VI	VII
US I US II US III US IV			

The main grades are GRADE US, GRADE V, GRADE VI and GRADE VII.

GRADE US

US is the highest main grade, which includes falling share of sub-grades US I – US IV from the production. Of these US I is the highest.

GRADE V

Falling GRADE V at the grading of the production.

GRADE VI

Falling GRADE VI at the grading of the production. GRADES V and VI are not divided into sub-grades.

GRADE VII

No numerical values are given for GRADE VII. In GRADE VII all features contained in a piece of sawn timber are permitted. The piece must, however, hold together. The sawblade must have touched the main part of all the sides of the piece. It can be accepted for side yield that 1/3 of the length on one side is not touched by the blade.

Sawn timber will be graded according to the contract with either **each GRADE separately or by combining different GRADES e.g. according to the following examples:**

GRADE US+V

often named SF (sawfelling) excluding sixths.

GRADE US+V+VI

often named SF including sixths.

In the examples above, the unspecified distribution of each GRADE can be different:

- in different geographical locations
- in different dimensions
- between different sawmills even in the same regions

Other GRADE combinations are also possible by agreement.

SCHAALBOARDS

Shaalboards are side yields of standard thickness and 75-125 mm in width.

Shaalboard (in Finland called export Schaalboard) fulfill at least grade VI requirements and have at least 25% wide sawn surface in each edge and the outside face throughout the whole length of the piece. Deviating requirements for the size of sawn surface must be defined in the contract.

Shaalboard VII (in Finland called domestic Schaalboard) fulfill at least grade VII requirements. The sawblade must have touched 85% of the length of the outside face. The wane of edges can be 100% of timber thickness however the width must be fulfilled on the inside face of the board. Any other diverting demands in the quality Schaalboard VII must be mentioned in the contract.

KNOTFREE, THREE SIDES

The outside face and both edges have to be fully knotfree and have to fulfill other features of GRADE US I requirements. The inside face has to fulfill GRADE US III requirements. Wane requirements are defined in the contract.

"HALVRENA"

This term is divided into two categories:

- A) "Halvrena" side yield has to fulfill GRADE US requirements or in contract named GRADE with minimum 1/2 sawn surface in the outside face and each edge throughout the whole length of the piece.
- B) "Halvrena" centre yield has to fulfill GRADE VI requirements with minimum 1/3 sawn surface in the outside face and each edge throughout the whole length of the piece.

4.2 Market oriented end-use grading

GRADEMIX

This is specifying a mix of grades for a specific end-use with permitted wood features from main GRADES US, V, VI, and VII. The GRADES and the features which are included in the mix shall be specified in the contract.

Example: The contract specifies GRADE US with seasoning shakes according to GRADE US III, pitch pockets according to GRADE V and wane according to GRADE VI etc.

KNOTTY SAWN TIMBER

Knotty sawn timber is a special grade. The number and size of sound knots and other requirements are set according to the agreed GRADE-MIX.

4.3 Examples of various end-use areas for the different grades of sawn timber

End-use areas	US					V	VI	VII
	US I	US II	US III	US IV	US V			
Visible joinery								
Sawn timber for construction								
Formwork, underflooring								
Mouldings								
Interior cladding								
Limbs, handrails								
Slating battens and strips								
Euro-pallets								
Disposable pallets								
Packaging material								
Flooring boards								
Covered floorings								
F&G Schaalboards								
Ceiling								
Covered external cladding								
Walls and snow fences								
Shaalboards								
Roofbuilding, decking								
Handicrafts								
Sawing material								
Knotty sawn timber								
Windows and door frames								
Pressure and glulam products								

5. Instructions and rules

Nordic grading practice

The basis for NORDIC TIMBER grading rules is that the sawn timber to be graded has been sawn according to the Nordic sawing practice and that the grade is defined from a sawn timber piece trimmed to the final length, or if not trimmed, to the intended length.

Species

Redwood (pine) and whitewood (spruce) are graded separately. Unless otherwise agreed, sawn timber pieces of wrong species, which are by mistake mixed with the other species, will be graded into GRADE VII.

Determination of GRADE

The GRADE is determined on the basis of the number, location, type and the maximum permitted values of the wood features according to the tables.

- * Each side of the piece shall be graded separately
- * The maximum values of wood features which are permitted in each GRADE on the worst one meter of length are given in the tables
- * The GRADE is decided on the basis of the outside face and both edges
- * The inside face may be one GRADE lower

When evaluating features, which are defined in percentages of total area, the (*) marked points in the frame above are not considered. In those cases the whole piece of sawn timber has to be considered in the determination of GRADE.

Values

The values given in the tables are the higher limits of the permitted wood features in each respective GRADE. They are related to standard sizes at 20 % moisture content. No values are given for GRADE VII, see GRADE VII, page 14.

Standard sizes for sawn timber

Thicknesses 16, 19, 22, 25, 32, 38, 44, 50, 63 and 75 mm.

Widths 75, 100, 115, 125, 150, 175, 200 and 225 mm.

Lengths 1800 - 6000 mm in 300 mm or alternatively in 100 mm modules.

Other lengths and modules can be agreed separately.

- The given sizes are the nominal measures of sawn timber at 20 % moisture content.
- Sizes which are not mentioned above are special sizes. These can usually be obtained by special agreement.

Special sizes are graded according to values of the nearest bigger standard size. Sizes over 75 x 225 mm are, however, graded according to rules for 75 x 225 mm.

Permitted size deviations

The nominal sizes are applicable at 20 % moisture content. The following deviations from the nominal sizes of sawn timber are permitted:

Thickness and width	up to 100 mm	- 1 mm	+ 3 mm
	more than 100 mm	- 2 mm	+ 4 mm
Lengths 1800-6000		- 0 mm	+ 50 mm

The average thickness and width of the sawn timber lot may not, however, be less than the nominal size.

Shrinkage of knots is not considered if it stays within the permitted size deviations, otherwise the classification is done as for loose knot or knot hole, see page 24.

Discoloration, which can be measured and is deeper than the permitted negative size deviation, will be evaluated and classified according to the values for log blue stain, see table 3, page 27.

Handling damage, which can be measured and is deeper than the permitted negative size deviation, will be evaluated and classified according to the values for barking knot, see table 1, page 23-24.

Moisture content

The maximum moisture content for all sawn timber sizes is 24 %. At least 93,5% of the pieces in a lot shall have an individual moisture content between the upper and lower limits as defined in EN 14298.

When determining the moisture content of a sawn timber piece or a lot, moisture content standard INSTA 141 or EN14298 can be applied. Requirements which deviate from standard rule have to be defined in the contract.

At the change of moisture content to less than 20 %, the following has to be considered:

- A** The actual thickness and width can become smaller than the nominal size, which applies at 20 %. The relation of 1 % shrinkage to 4 % reduction of moisture content holds true as a guideline.

Example: Nominal size 50 x 100 mm at 20 % moisture content equals size 49 x 98 mm at 12 % moisture content.

- B** The occurrence of fissures and warp may increase and exceed the table values if the timber is dried to moisture content below 20 %.

Insect damage

Insect damage is not permitted. Such insect damages (holes) under 2 mm that cannot be discerned at grading, will be permitted provided that the depth does not exceed the permitted negative size deviation. The maximum number of wood pieces with insect damage is 2% of the total number.

Width of annual rings

The width of annual rings varies according to the growing conditions of different forest areas. Requirements concerning the average width of annual rings are therefore not given. If special requirements are needed, they have to be defined in the contract between the seller and the buyer.

Other GRADE-inclusion

The guideline is that at least 90 % of the pieces in the lot shall not have wood features with values exceeding the maximum permitted values for a contracted GRADE.

Other grading applications

If there are specific reasons to deviate from these grading rules, e.g. because of different species etc., or to consider a wood feature outside these rules, it must be agreed in the contract.

6. Classification tables

The values for wood features are presented in tables on the following pages in the order given below. The content has been grouped according to various end-use requirements.

Tables 1-3 present the maximum permitted values for GRADES US, V and VI.

Tables 4-6 present respective values for US I - US IV.

Tables 7-12 present the maximum permitted values for one GRADE only in each table

Main grades			
Table 1	US - VI	Knots, number / size	page 23
Table 2	US - VI	Fissures and wane	page 25
Table 3	US - VI	Other features	page 27
Sub-grades			
Table 4	US I - US IV	Knots, number / size	page 28
Table 5	US I - US IV	Fissures and wane	page 31
Table 6	US I - US IV	Other features	page 33
Grade tables			
Table 7	US I		page 34
Table 8	US II		page 36
Table 9	US III		page 38
Table 10	US IV		page 40
Table 11	V		page 42
Table 12	VI		page 44

In order to make interpretation easier, tables 1-6 are provided with comments. These comments apply also to the other tables.

Definitions and measuring systems for different features are presented in paragraph 7, page 46.

Table 1: Main grades - Number of knots

	Total number of max. size knots on the worst 1 meter outside face				
	Sound knot	Dead knot	Bark knot	Unsound knot	Total sum of knots
US	4	4	2	0	6
V	5	5	3	3	10

	Total number of max. size knots on the worst 1 meter edge				
	Sound knot	Dead knot	Bark knot	Unsound knot	Total sum of knots
US	2	2	1	0	3
V	3	3	2	2	5

VI knot sizes or number of knots are not limited

Knots 10 mm or smaller

Sound knots and dead knots which are 10 mm or smaller are not considered in GRADES US IV - VI.

Tight knots

The knots have to be tight in GRADES US and V.

Barkringed knots

A barkringed knot which is encircled by bark for less than 1/4 is evaluated and classified as a dead knot.

Unsound knots

Unsound knots are not permitted on the outside face and the edges in GRADE US, irrespective of the size of the knots.

Compensation rule for the number of knots

If the knot size is smaller than the table value for the GRADE in question, a greater number of knots is permitted. The sum of knot sizes (= number of knots x diameter) cannot, however, be exceeded for the respective types of knots.

Loose knots and open knot holes

Sawn timber pieces, which contain loose knots or open knot holes maximum 30 mm or smaller, are classified as GRADE VI. Pieces containing loose knots or knot holes above 30 mm are classified as GRADE VII.

Table 1, cont.: Main grades - Knot size

Wood features	Timber thickness mm	Timber width mm	GRADE			
			US	V		
Sound knots	Faces	16-25	75-115	20	35	
			125-150	25	40	
		32-38	175-225	30	45	
			75-115	25	40	
		44-50	125-150	30	45	
			175-225	35	50	
	Edges	63-75	75-115	30	45	
			125-150	35	50	
		125-150	175-225	40	55	
			175-225	45	60	
	Other knots	Type of knot	Reduced to % of sound knot size	Knot cluster, per knot	70	70
				Dead knot	70	70
Barkringed knot				50	60	
Unsound knot				-	50	

* equal to the timber thickness

Fissures

Heart shakes are evaluated and classified according to the rules for drying checks.

Parallel drying checks run in one direction, parallel, through their whole length or part of the length. Drying checks can be oblique and they can also go through the arris (see below).

Edge shakes and shakes extending over the arris, irrespective of their length, are not permitted in GRADE US.

Splits longer than 100 mm are permitted only in GRADE VII. The end shakes (splits) max length 50 mm should only be permitted in 10% of pieces (US & V). The maximum percentage of allowable timber pieces with shake is 10% (US & V).

Table 2: Main grades - Fissures and wane

Drying checks	timber thickness	Total fissure length % of timber length outside face		
		US	V	VI
	16 - 31	15	25	70
	32 - 50	25	35	100
	51 - 100	35	45	100
Oblique checks	max	1:10	1:10	1:5
		mm		% of thickness/width
		US	V	VI
Depth per edge	5	5	25	
Width per edge	7	10	15	
	Total wane % of timber length			
One edge	30	30	50	
Both edges	20	20	40	

Wane

3 mm wane is generally allowed. This generally allowed 3 mm shall therefore be added to the permitted wane values for the outside face and the edges. The maximum percentage of allowable timber pieces with wane is 10% (US & V).

Wane, max 150 mm long, is permitted, if it is a maximum of one half of the thickness of the piece and if it is not longer than the width of the piece (but not exceeding 150 mm long). This wane is not permitted in the end of the piece. The number of this kind of pieces cannot be more than 3 %.

Arriis damage

Arriis damage is evaluated and classified according to the values for wane.

Surface bark

Sawn timber pieces with surface bark are classified as GRADE VII.

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Resin pockets
Resin pockets shorter than 20 mm are not considered in GRADES V-VI.

Compensation rules for the number of resin pockets, bark pockets and scars
If the resin pockets (and equivalent) are shorter than permitted for each respective GRADE, a greater number will be permitted. The value for the total length (= number of resin pockets x length) in mm may not be exceeded.

Slope of grain
Slope of grain = a:b. Deviation (a) to be in proportion to the length (b), see definition on page 51.

Top rupture
a) If the defect caused by top rupture occurs in the form of a vertical knot, it will be evaluated and classified as a splay knot. b) If the damage has caused visible distorted grain, it will be evaluated in percentages of the width and classified as top rupture.

Compression wood
Definition on page 52. Compression wood which does not affect the form of the piece and which is smaller than 1/3 of the width of the annual ring is not considered.

Soft rot
Soft rot is not permitted in GRADES US - VI.

Warp: bow or twist
Bow or twist which are evenly distributed throughout the whole length of the piece, provided it has been caused by other reasons than compression wood, will not be considered in 25 mm and thinner goods.

Table 3: Main grades - Other features

Wood features	GRADE		
	US	V	VI
Resin pockets	2	2	2
On the worst 1 m	50	100	150
Bark pockets, scars *)	1	1	1
On the worst 1 m	100	200	300
Slope of grain	Max. 1:10	1:7	1:2
	% of timber width		
Top rupture	10	30	50
	% of the surface of the piece		
Compression wood, curly grain *)	10	20	50
Resin wood	5	30	70
Log blue stain, dotc *)	-	5	30
Warp			
on the worst 2 m unit of length at 20% moisture content			
	US	V	VI
Bow mm	15	15	25
Spring mm	7	7	10
Twist (% of timber width)	10	10	20
Cup (% of timber width)	2	2	4

*) Number of max warped pieces 10% (US and V)

*) each

Table 4: Sub-grades - Number of knots

Wood features		GRADE			
		US I	US II	US III	US IV
Number of knots	Per face	1	2	3	4
	Per edge	-	1	1	2
Of which	Dead knots	-	1	3	4
	Barkringed knots	-	-	1	2
Of which	Dead knots	-	1	1	2
	Barkringed knots	-	-	1	1

Small knots
a) Sound and dead knots, smaller than 7 mm, are not considered in GRADES US I - US III.
b) Sound and dead knots, smaller than 10 mm, are not considered in GRADE US IV.

Compensation rule for the number of knots
See notes page 24.

Tight knots
The knots have to be tight in GRADES US I - US IV.

Knot clusters
Knot clusters are not permitted in GRADES US I - US III.

Barkringed knots
A barkringed knot which is encircled by bark for less than 1/4 is evaluated and classified as a dead knot.

Unsound knots
Unsound knots are not permitted on the outside face and the edges in GRADES US I - US IV, irrespective of the size of the knot.

Table 4, cont.: Sub-grades - Knot size

Wood Features		GRADE				
		US I	US II	US III	US IV	
Sound knots	Timber thickness mm	Knot size mm				
	Timber width mm					
Faces	16-25	75-115	8	10	10	20
		125-150	8	10	15	25
		175-225	8	15	20	30
	32-38	75-115	8	10	15	25
		125-150	8	15	20	30
		175-225	10	15	25	35
44-50	75-115	8	15	20	30	
	125-150	10	15	25	35	
	175-225	10	20	30	40	
63-75	75-115	10	20	25	35	
	125-150	15	20	30	40	
	175-225	15	25	35	45	
Sound knots	Timber thickness mm	Knot size mm				
	Timber width mm					
	Edges	16-19	-	8	10	15
		22-25	-	8	10	20
		32-38	-	10	15	25
44-50		-	10	20	30	
63-75	-	15	25	35		
Other knots	Type of knot	Reduced to % of sound knot size				
	Knot cluster, per knot	-	-	-	70	
	Dead knot	-	70	70	70	
	Barkringed knot	-	-	50	50	
	Unsound knot	-	-	-	-	

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All data is informative and indicative.
Specific technical requirements must be requested and confirmed by the manufacturer.

Les données sont informatif et indicatif.
Des exigences techniques et spécifiques doivent être demandées et confirmées par le fabricant.

Fissures

Heart shakes are evaluated and classified according to the rules for drying checks.

Parallel drying checks run in one direction, parallel, through their whole length or part of the length. Drying checks can be oblique and they can also go through the arris (see below).

When deciding to which GRADE the piece belongs, one must calculate the total fissure length on the outside face of the piece as if it were one unbroken fissure.

Edge shakes and shakes extending over the arris, irrespective of their length, are not permitted in GRADES US I - US IV.

Splits longer than 100 mm are permitted only in GRADE VII.

Wane

3 mm wane is generally allowed. This generally allowed 3 mm shall therefore be added to the permitted wane values for the outside face and the edges.

Wane, max 150 mm long, is permitted, if it is a maximum of one half of the thickness of the piece and if it is not longer than the width of the piece (but not exceeding 150 mm long). This wane is not permitted in the end of the piece. The percentage of this kind of pieces cannot be more than 3 %.

Arriis damage

Arriis damage is evaluated and classified according to the values for wane.

Surface bark

Sawn timber pieces with surface bark are classified as GRADE VII.

Table 5: Sub-grades - Fissures and wane

Wood features	GRADE				
	US I	US II	US III	US IV	
Fissures at 20 % moisture content					
Drying checks longer than 100 mm	Timber thickness mm	Total fissure length on outside face			
		% of timber length			
	16-31	-	-	5	15
	32-50	-	5	15	25
	51-100	-	15	25	35
Oblique checks	max	1:10	1:10	1:10	1:10
Wane exceeding 3 mm					
	Depth mm per edge	-	-	5	5
	Width mm per edge	-	-	7	7
	% of timber length				
	One edge	-	-	30	30
Both edges	-	-	20	20	

Compensation rules for the number of resin pockets, bark pockets and scars
 If the resin pockets (and equivalent) are shorter than permitted for each respective GRADE, a greater number will be permitted. The value for the total length (= number of resin pockets x length) in mm may not be exceeded.

Slope of grain
 Slope of grain = a.b. Deviation (a) to be in proportion to the length (b), see definition on page 51.

Top rupture
 (A) If the defect caused by top rupture occurs in the form of a vertical knot, it will be evaluated and classified as a splay knot.
 (B) If the damage has caused visible distorted grain, it will be evaluated in percentages of the width and classified as top rupture.

Compression wood
 Definition on page 52. Compression wood which does not affect the form of the piece and which is smaller than 1/3 of the width of the annual ring is not considered.

Soft rot
 Soft rot is not permitted in GRADES US I - US IV.

Warp: bow or twist
 Bow or twist which are evenly distributed throughout the whole length of the piece, provided it has been caused by other reasons than compression wood, will not be considered in 25 mm and thinner goods.

Table 6: Sub-grades - Other features

Wood features	GRADE			
	US I	US II	US III	US IV
Resin pockets	-	1	1	2
On the worst 1 m	-	20	40	50
Bark pockets, scars *)	-	-	-	1
On the worst 1 m	-	-	-	100
Slope of grain	Max.	1:15	1:12	1:10
		% of timber width		
Top rupture	-	-	-	10
		% of the area of the piece		
Compression wood, curly grain *)	-	-	-	10
Resin wood	-	-	-	5
Log blue stain, dote *)	-	-	-	-
Warp				
on the worst 2 m unit of length at 20% moisture content				
	US I	US II	US III	US IV
Bow mm	5	10	15	15
Spring mm	3	5	7	7
Twist % of timber width	5	7	10	10
Cup % of timber width	2	2	2	2

*) each

Table 7: Grade table GRADE US I

Knots						
Number of knots				1 knot per face		
Sound knots				- knot per edge		
Total number of max. size, on the worst 1 m.				8		
Knot size mm						
Timber thickness mm	Faces			Edges	Type of knot	%
	75-115	125-150	175-225			
16-25	8	8	8	-	Knot cluster	-
32-38	8	8	10	-	Dead knot	-
44-50	8	10	10	-	Barkringed knot	-
63-75	10	15	15	-	Unsound knot	-
Fissures						
at 20% moisture content						
Drying checks longer than 100 mm						
Timber thickness mm	Total length on outside face					
	% of timber length					
16-31	-					
32-50	-					
51-100	-					

Table 7, cont.: Grade table GRADE US I

Wane	
(exceeding 3 mm)	
Depth mm	-
Width mm	-
% of timber length	
One edge	-
Both edges	-
Warp	
on the worst 2 m unit of length at 20% moisture content	
Bow mm	5
Spring mm	5
Twist % of timber width	5
Cup % of timber width	2
Other features	
Resin pockets	-
Bark pockets, scars	-
Slope of grain	1:15
Top rupture	-
Compression wood, curly grain	-
Resin wood	-
Log blue stain	-
Dote	-

De data is informatief en indicatief.
 Bijzondere technische eisen moeten opgevraagd worden en bevestigd door de fabrikant.

All data is informative and indicative.
 Specific technical requirements must be requested and confirmed by the manufacturer.

Les données sont informatif et indicatif.
 Des exigences techniques et spécifiques doivent être demandées et confirmées par le fabricant.

36 Nordic Timber

Table 8: Grade table GRADE US II

Knots						
Number of knots		2 knots per face (of which 1 dead knot)				
Sound knots		1 knot per edge (of which 1 dead knot)				
Total number of max. size, on the worst 1 m						
Knot size mm						
Timber thickness mm	Faces			Edges	Type of knot	%
	Timber width, mm					
	75-115	125-150	175-225			
16-25	10	10	15	8	Knot cluster	-
32-38	10	15	15	10	Dead knot	70
					Barkringed knot	-
44-50	15	15	20	10	Unsound knot	-
63-75	20	20	25	15		
Fissures						
at 20 % moisture content						
Drying checks longer than 100 mm						
Timber thickness mm	Total length on outside face % of timber length					
16-31	-					
32-50	5					
51-100	15					
Oblique max.	1:10					

Nordic Timber

37

Table 8, cont.: Grade table GRADE US II

Wane (exceeding 3 mm)	
Depth mm	-
Width mm	-
% of timber length	
One edge	-
Both edges	-
Warp on the worst 2 m unit of length at 20 % moisture content	
Bow mm	10
Spring mm	5
Twist % of timber width	7
Cup % of timber width	2
Other features	
Resin pockets	1 piece (length 20 mm on the worst 1 m)
Bark pockets, scars	-
Slope of grain	1:15
Top rupture	-
Compression wood, curly grain	-
Resin wood	-
Log blue stain	-
Date	-

38 Nordic Timber

Table 9: Grade table GRADE US III

Knots						
Number of knots		3 knots per face (of which 1 barkringed)				
Sound knots and/or dead knots		1 knot per edge (of which 1 barkringed)				
Total number of max. size, on the worst 1 m						
Knot size mm						
Timber thickness mm	Faces			Edges	Type of knot	%
	Timber width, mm					
	75-115	125-150	175-225			
16-25	10	15	20	10	Knot cluster	-
32-38	15	20	25	15	Dead knot	70
					Barkringed knot	-
44-50	20	25	30	20	Unsound knot	50
63-75	25	30	35	25		
Fissures						
at 20 % moisture content						
Drying checks longer than 100 mm						
Timber thickness mm	Total length on outside face % of timber length					
16-31	5					
32-50	15					
51-100	25					
Oblique max.	1:10					

Nordic Timber

39

Table 9, cont.: Grade table GRADE US III

Wane (exceeding 3 mm)	
Depth mm	5
Width mm	7
% of timber length	
One edge	30
Both edges	20
Warp on the worst 2 m unit of length at 20 % moisture content	
Bow mm	15
Spring mm	7
Twist % of timber width	10
Cup % of timber width	2
Other features	
Resin pockets	1 piece (length 40 mm on the worst 1 m)
Bark pockets, scars	-
Slope of grain	1:12
Top rupture	-
Compression wood, curly grain	-
Resin wood	-
Log blue stain	-
Date	-

De data is informatief en indicatief.
Bijzondere technische eisen moeten opgevraagd worden en bevestigd door de fabrikant.

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Specific technical requirements must be requested and confirmed by the manufacturer.

Les données sont informatif et indicatif.
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40

Nordic Timber

Table 10: Grade table

GRADE US IV

Knots						
Number of knots			4 knots per face			
Sound knots and/or dead knots			(of which 2 barkringed)			
Total number of max. size, on the worst 1 m			2 knots per edge (of which 1 barkringed)			
Knot size mm						
Timber thickness mm	Faces			Edges	Type of knot	%
	Timber width, mm					
16-19	20	25	30	15	Knot cluster	70
22-25	20	25	30	20	Dead knot	70
32-38	25	30	35	25	Barkringed knot	50
44-50	30	35	40	30	Unsound knot	-
63-75	35	40	45	35		
Fissures						
at 20 % moisture content						
Drying checks longer than 100 mm						
Timber thickness mm	Total length on outside face % of timber length					
16-31	15					
32-50	25					
51-100	35					
Oblique max	1:10					

Nordic Timber

41

Table 10, cont.: Grade table

GRADE US IV

Wane	
(exceeding 3 mm)	
Depth mm	5
Width mm	7
% of timber length	
One edge	30
Both edges	20
Warp	
on the worst 2 m unit of length at 20 % moisture content	
Bow mm	15
Spring mm	7
Twist % of timber width	10
Cap % of timber width	2
Other features	
Resin pockets	2 pieces (length 100 mm on the worst 1 m)
Bark pockets, scars *)	1 piece (length 100 mm on the worst 1 m)
Slope of grain	1:10
Top rupture	10% (of timber width)
Compression wood, curly grain *)	10% (of the area of piece)
Resin wood	5% (of the area of piece)
Log blue stain	0% (of the area of piece)
Date	0% (of the area of piece)

*) each

42

Nordic Timber

Table 11: Grade table

GRADE V

Knots						
Number of knots			5 knots per face			
Sound knots and/or dead knots			(of which 3 barkringed)			
Total number of max. size, on the worst 1 m			3 knots per edge (of which 2 barkringed)			
Knot size mm						
Timber thickness mm	Faces			Edges	Type of knot	%
	Timber width, mm					
16-25	35	40	45	*	Knot cluster	70
32-38	40	45	50	50	Dead knot	70
44-50	45	50	55	40	Barkringed knot	60
63-75	50	55	60	50	Unsound knot	50
Fissures						
at 20 % moisture content						
Drying checks longer than 100 mm						
Timber thickness mm	Total length on outside face % of timber length					
16-31	25					
32-50	35					
51-100	45					
Oblique max	1:10					

*) equal to the timber thickness

Nordic Timber

43

Table 11, cont.: Grade table

GRADE V

Wane	
(exceeding 3 mm)	
Depth mm	5
Width mm	10
% of timber length	
One edge	30
Both edges	20
Warp	
on the worst 2 m unit of length at 20 % moisture content	
Bow mm	15
Spring mm	7
Twist % of timber width	10
Cap % of timber width	2
Other features	
Resin pockets	2 pieces (length 100 mm on the worst 1 m)
Bark pockets, scars *)	1 piece (length 200 mm on the worst 1 m)
Slope of grain	1:7
Top rupture	30% (of timber width)
Compression wood, curly grain *)	20% (of the area of piece)
Resin wood	30% (of the area of piece)
Log blue stain	5% (of the area of piece)
Date	5% (of the area of piece)

*) each

De data is informatief en indicatief.
Bijzondere technische eisen moeten opgevraagd worden en bevestigd door de fabrikant.

All data is informative and indicative.
Specific technical requirements must be requested and confirmed by the manufacturer.

Les données sont informatif et indicatif.
Des exigences techniques et spécifiques doivent être demandées et confirmées par le fabricant.

44 Nordic Timber
Table 12: Grade table
GRADE VI

Fissures at 20 % moisture content	
Drying checks longer than 100 mm	
Timber thickness mm	Total length on outside face % of timber length
16-31	70
32-50	100
51-100	100
Oblique max	1:5

Nordic Timber 45
Table 12: Grade table
GRADE VI

Wane (exceeding 3 mm)	
Depth % of timber thickness	25
Width % of timber width	10
% of timber length	
One edge	50
Both edges	40
Warp on the worst 2 m unit of length at 20 % moisture content	
Bow mm	25
Spring mm	10
Twist % of timber width	20
Cup % of timber width	4
Other features	
Resin pockets	2 pieces (length 150 mm on the worst 1 m)
Bark pockets, sears *)	1 piece (length 300 mm on the worst 1 m)
Slope of grain	1:2
Top rupture	50% (of timber width)
Compression wood, curly grain *)	50% (of the area of piece)
Resin wood	70% (of the area of piece)
Log blue stain	30% (of the area of piece)
Dote	30% (of the area of piece)

*) each

46 Nordic Timber

7. Wood features: definitions and measurement practices

7.1 Knots

The location, number, size and type of knots are the decisive factors when deciding to which GRADE a piece of sawn timber belongs.

Form of the knots

The knots are divided into the following knot forms:

Round and oval knots are knots sawn more or less straight across and are located on the faces or the edges of a piece. Arris knot. A knot located in the intersection of a face and an edge of a piece.

Splay knot. A splay knot is a knot on the inside face of a piece, which extends to the arris and which partly shows also on the edge. Top rupture occurred in growing trees, can create vertical or cone-shaped knots. These are classified as splay knots.

Spike knot. A spike knot is a knot on the inside face, which does not extend to the arris of the piece.

Location of knots

The knots are divided according to their location into **face knots, edge knots and arris knots.**

Nordic Timber

Internal position of the knots

The following are distinguished:

Scattered knots are knots which are spread along the piece and do not form knot clusters.

Knot cluster is a group of adjacent knots which have clearly separated grain deviations. If the knots are not clearly separated by undisturbed grain, they are considered as one knot. Knot clusters are evaluated on the outside face as well as on the edges. In order to be considered a knot cluster, it must contain at least 4 knots with a diameter bigger than 12 mm and the whole group of knots must be located within 150 mm of the length of the piece.

Different types of knots

Different types of knots are distinguished. These are evaluated in different ways in the grading, see tables.

Sound knot. A sound knot is intergrown to more than 3/4 with the surrounding wood.

Dead knot. A knot whose function in the growing tree has ceased.

A black knot is a dark coloured dead knot.

A pin knot is a very small dead knot, usually dark coloured, with a diameter of not more than 7 mm.

A dead knot can be tight or loose.

Barkringed knot. A barkringed knot is partly or completely surrounded by bark. If less than 1/4 is encircled by bark, it is evaluated and classified as a dead knot.

Unsound knot. An unsound knot is completely or partly damaged by rot.

Size and measuring - guidelines

Face knot (round and oval knots). The size is the mean value of the biggest diameter, D , and the smallest diameter, d .

Splay knot. The part visible on the inside face is measured as the sum of the length and width of the knot divided by three (the width is measured in the middle). The part of the knot visible on the edge is measured according to the rule for edge knots.

Spike knot. A spike knot on the inside face ceases before the arris. It is measured as the sum of the length and width of the knot divided by six (the width is measured in the middle).

Edge knots are measured perpendicular to the length of the piece.

Arri knot. The part of the knot visible on the face is measured according to the rule for face knots. The part of the knot visible on the edge is measured according to the rule for edge knots.

Knot cluster. Measurement according to the guidelines in figure 7.1. If the knots are not clearly separated by undisturbed grain they are measured as one knot.

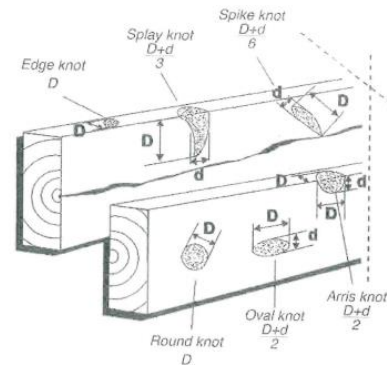


Figure 7.1
Guidelines for measuring the knot size

7.2 Fissures

Three different kinds of fissures are distinguished.

Drying checks

These fissures occur in the sawn timber in connection with seasoning. The drying checks can be parallel or diagonal to the length of the piece depending on the grain direction within the piece, see table 2. The depth and the width of the drying check is usually dependent on the length of the check.

Heart shakes

These are shakes that run along the radii from the pith in the middle of the tree towards the surface. They are formed in the heartwood due to internal stresses within the tree.

Ring shakes

These are shakes that are running along the annual rings, concentric with each other. They can sometimes be distinguished on the end surface of newly cut timber.

Measuring of the fissure length

The fissure length, S , is given as a percentage of the timber length:

$$\frac{a+b}{\text{timber length}} \cdot 100 = S \%$$

where $(a+b)$ = the total length of the fissures in the piece, see figure 7.2.

Parallel drying checks run in one direction, parallel to one another, through their whole length or part of the length. Drying checks can be oblique and they can also go through the arris. When evaluating the fissure length, they are considered as one single fissure.

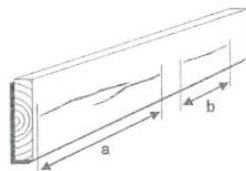


Figure 7.2
Measuring the fissure length

7.3 Wane

Wane is the part of the surface of the sawn timber, which has not been touched by the saw, see table 2. The length and the depth of wane are given as a percentage of the nominal size of the sawn timber piece. The width is given in mm.

7.4 Resin pockets

A resin pocket is an opening between two annual rings of the sawn timber piece. It is usually filled with resin. The opening is occluded the same year it is formed, see table 3, p.27.

7.5 Bark pockets

A bark pocket is intergrown bark. The bark pocket can be formed e.g. by overlaying growth of a butt scar. It can also be caused by damage to the growing tree, which has been covered, see table 3, p.27.

7.6 Scars

A scar is an opening caused by damage to the growing tree, which has been healed over in the trunk by occlusion. The fibres of the occlusion are often irregular and mostly resinous, see table 3, p.27.

7.7 Slope of grain

Slope of grain means that the wood fibres do not run parallel to the longitudinal direction of the piece. The deviation of the grain direction from the longitudinal direction of the piece measured on the outside face is the value for slope of grain, see figure 7.3.

This can apply to a part or the whole piece of sawn timber. Slope of grain can be caused by spiral growth of the tree, a crook in the tree or a big taper, see table 3, p.27.

7.8 Top rupture

Top rupture is formed when the tree is broken and the growth tries to repair the damage. The grain deviation is usually followed by formation of compression wood and curly grain with lower strength properties as a result.

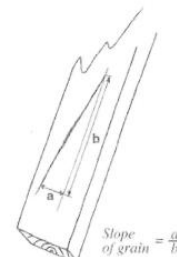


Figure 7.3
Slope of grain

The size of a top rupture is in proportion to the diameter of the trunk at the time of damage. The damage can be evaluated in two ways depending on how it looks. If it has the character of a vertical knot, it is evaluated and classified as a splay knot. If the damage is visible as a grain deviation, it is evaluated as a percentage of the timber width and classified as top rupture.

Measuring of top rupture takes place from the visible pith to the imagined pith, see table 3, p.27.

7.9 Compression wood

Compression wood is wood with abnormal fibre properties. It has been formed to compensate for abnormal compression stresses within the tree. The wood material is harder and often darker than the surrounding normal wood material, see table 3, p.27.

Compression wood is measured by the % of the surface of the total piece. Area X compression percentage (length x width x compression percentage), see figure 7.4

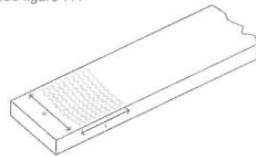


Figure 7.4
Compression wood

7.10 Curly grain

This kind of wood has very irregular grain, which runs in different directions. Curly grain is formed e.g. due to local disturbances of the growth, see table 3, p.27. The area containing curly grain is given as a percentage of the surface of the piece and is measured according to the guidelines for compression wood in figure 7.4.

7.11 Resin wood

Resin wood is wood containing an abnormal content of resin. It is usually darker than normal wood, see table 3, p.27. The amount of resin wood is given as a percentage of the area of the piece and is measured according to the guidelines for compression wood in figure 7.4. (Resin wood should not be confused with resin flow, which can occur when seasoning wood at high temperatures.)

7.12 Fungus infection

Different kind of fungi, e.g. mould, stain and rot producing fungi, can infect the wood and cause light to strong discolouration. The infection can be superficial or penetrate deep into the sapwood.

Mould

Mould spreads only superficially. It is visible as discolouration and can occur after sawing and during seasoning. Mould has earlier been called yard or seasoning blue and it is often invisible in its first stage and disappears during planing.

Log blue stain

This blue stain usually penetrates deep into the wood or through the piece and it already exists in the log prior to sawing. The amount of log blue stain is given as a percentage of the area of the piece and is measured according to the guidelines for compression wood in figure 7.4.

Rot

Rot is formed when the wood is infected by fungi producing rot. Two types of rot are distinguished. Dote (hard rot, incipient decay) means that the wood has not lost its firmness. Soft rot means that the wood is not firm any more and yields when pressed. The amount of rot is given as a percentage of the area of the piece and is measured according to the guidelines for compression wood in figure 7.4.

7.13 Warp

Four different kinds of warp are distinguished. The amount of deformation is given in height in mm, see table 3, p.27.

Bow

The faces are bowed in the longitudinal direction of the piece. Bow is measured as the height of the bow in mm within 2 m of the piece, see figure 7.5.

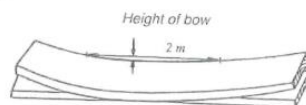


Figure 7.5
Bow

Spring

The edges are bowed in the longitudinal direction of the piece. Spring is measured as the height of the spring in mm within 2 m of the piece, see figure 7.6.

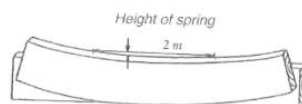


Figure 7.6
Spring

Cup

This is how concave or convex a piece of sawn timber is cross-directionally. It is measured as the height of cup across the width on the concave face and evaluated as a percentage of the timber width, see figure 7.7.

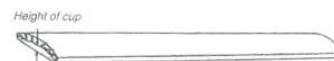


Figure 7.7
Cup

Twist

Twist is a flatways deviation in the form of a screw. It is measured as the height of deviation within 2 m of the piece from the level plane to the outside face of the piece and evaluated as a percentage of the timber width, see figure 7.8.

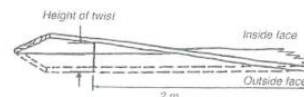


Figure 7.8
Twist

7.14 Other definitions

Moisture content. Moisture content is the weight of the water in the wood compared to the weight of absolutely dry wood. Moisture content is given as a percentage.

Width of annual rings. The width of annual rings means average width. The annual rings located more than 25 mm from the visible or imaginary pith are measured. For practical reasons the width of annual rings is usually measured in the butt end. Width of annual rings is given in mm.

Size deviation. Size deviation is the amount of deviation from the nominal size, which is greater than the permitted deviation, see Permitted size deviations, page 19.

Shrinkage of knots. This occurs when a loose dead knot shrinks from the plane of the surface of the piece during seasoning. The knot adheres to the wood at the end of seasoning and forms a bump on the other side of the piece. Shrinkage of knots is not considered if it stays within the permitted size deviations of the piece, otherwise the classification is done as for loose knot or knot hole, see page 24.

Discolouration. Such superficial colouring as dark-brown, weathering and mould is called discolouration. They may develop during seasoning and storage, see page 20.

Handling damage. This is damage occurring during the handling of the goods, e.g. damage caused by infeed rollers or cutting tools. Such damage can also be caused by packages being dropped or in the packing press, see page 20.

Water storage damage. This kind of damage may occur after storage in water for a long period or lengthy watering of logs stored on land. Such damage cannot be evaluated in normal grading.

Insect damage. Insect damage can be divided into wood wasp attack (e.g. hymenoptera, ants, bees, wasps) and insect holes (bark beetles). Insect holes are normally less than 2 mm in diameter, see also page 21.

8. Short history

Historical grading rules

The Norrland region of Sweden has had several printed rules since the 1880's. In 1888 the "Rules and Hints for Grading of Deals, Battens and Boards" were published.

In 1926, Harnosands Distrikts Travaruexportforening (the Sawn Timber Export Association of Harnosand Region) printed and published the "Sorteringsregler for sagade travaror inom Harnosand distrikt tillampade sedan ar 1880" ("Grading Rules for Sawn Timber within Harnosand Region applied since 1880").

In 1950 and 1954, South Sweden published the so-called "Gothareglerna" ("Gotha-rules") for whitewood and redwood respectively.

In Finland in 1936, the Puuteknikan Tutkimuksen Kannatusyhdistys r. y. (the Benevolent Association for Wood Technology Research, Registered Association) published the "Instructions for the Grading of Export Timber".

In Norway the "Ofentlig Norsk Maaleinstitusjon" was established in 1893 for export to England. This was connected with the main export ports. The prevailing practice was documented in the "Ostlandets Skurlasimling" which in 1932 published rules for South Norway, with the last revision in 1955. These rules replaced the previous Oslo Grading, Fredrikstad Grading, Drammen Grading, Skienfjord Grading etc.

"Guiding Principles for Grading of Sawn Timber" (1960): the Swedish "Green Book"

In the annual meeting of the Association of Swedish Sawmillmen on 10th April 1957, the board of directors was given the task of improving uniformity in the application of the practice of evaluating sawn timber for export.

A committee was appointed and Messrs. Abr. Abrahamsson, Växjö, Tord Heime, Malmö, R. B. Hillman, Stockholm, E. J. Lindberg, Sundborn, Carl Malmström, Linköping, Henrik Palmberg, Sigtuna and Bertil Thunell were appointed as members of the committee.

In the establishment meeting on the 26th February, 1958, Mr. Torsten Thornander, Stockholm, was elected chairman of the committee and doctor Bertil Thunell vice chairman. Mr. Endel Saarman, Svenska Träforskningsinstitutet (the Swedish Forest Products Research Laboratory), Stockholm, was appointed secretary of the committee. The committee was named "1958 års virkessorteringskommitté" (the Sawn Timber Grading Committee of 1958).

The prepared instructions applied to export sawn timber and defined the upper limit within the respective qualities. The relative distribution of qualities was not considered, because it is mainly dependent on the composition of raw material in different sawmills.

The instructions were compiled in a small practical booklet, which according to the colour of the cover was called the "Green Book". The Swedish "Green Book" has been published in five editions. The latest revision was in 1987.

"Instructions for the Grading of Export Timber" (1960): the Finnish "Green Book"

The Association of Finnish Sawmillmen brought up the question of including sawn timber grading in the research programme in the Benevolent Association for Wood Technology Research. As a result of the multi-faceted and expansive research, in 1936, the Association published the "Instructions for the Grading of Export Timber".

The second edition of the grading rules was published in 1947 by a committee consisting of members of the Association of Finnish Sawmillmen representing various shipping regions. The chairman of the committee was Professor Martti Levan and the secretary Mr. Eino Jussila. The contents of the 1936 grading rules were not revised in the new edition.

It was decided at the Association of Finnish Sawmillmen meeting on the 25th September, 1957, to appoint another committee to evaluate, revise and complete the grading rules of 1936. The chairman of this committee was Professor Martti Levan. The members of the committee were Messrs. Rene Harju-Jeanty, Olli Heikinheimo, Axel Naesman, Olavi Santaholma, G. O. Snellman, Toivo Vesa, Knut Virtanen and Professor F. E. Siimes.

Additionally, Mr. Heikki Aarnio participated in the work of the committee as a representative of the Suomen Sahanomistajayhdistys (the Finnish Sawmill Owners Association). Messrs. Olli Heikinheimo and Matti Kovanen functioned as secretaries of the committee.

The committee worked in close co-operation with the respective Swedish committee, which had been established on the initiative of the Association of Swedish Sawmillmen in early 1958. The co-operation led to the grading rules - which are mainly uniform - being published at the same time in the two countries.

The Finnish book was very much appreciated and gained a large circulation both in Finland and abroad.

The Finnish "Green Book" has been published in three editions. The last revision was in 1979.

De data is informatief en indicatief.
Bijzondere technische eisen moeten opgevraagd worden en bevestigd door de fabrikant.

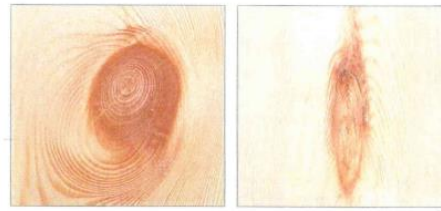
All data is informative and indicative.
Specific technical requirements must be requested and confirmed by the manufacturer.

Les données sont informatif et indicatif.
Des exigences techniques et spécifiques doivent être demandées et confirmées par le fabricant.

9. Photographic examples

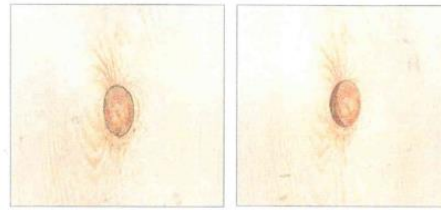
Wood features and GRADE pictures US I - VI

Knots	Page	Other features, cont.	Page
1 Sound knot	9-1	25 Slope of grain	9-7
2 Sound knot	9-1	26 Top rupture	9-7
3 Dead knot	9-1	27 Compression wood	9-7
4 Shrinkage of knots	9-1	28 Curly grain	9-7
5 Black knot	9-2	29 Resin wood	9-8
6 Pin knot	9-2	30 Log blue stain	9-8
7 Barkringed knot	9-2	31 Dote	9-8
8 Unsound knot	9-2	32 Width of annual rings	9-8
9 Round knot	9-3		
10 Oval knot	9-3	Discolouration	
11 Arris knot	9-3	33 Bark-brown	9-9
12 Splay knot	9-3	34 Weathering	9-9
13 Spike knot	9-4	35 Mould	9-9
14 Edge knot	9-4		
15 Scattered knots	9-4	Handling damage	
16 Knot cluster	9-4	36 Feed-roller marks	9-9
		37 Bad sawn surface	9-10
		38 Dropping damage	9-10
		Insect damage	
		39 Wood wasp attack	9-10
		40 Insect holes	9-10
		Wane	
20 Wane	9-5		
21 Bark	9-6	GRADES US I - VI	
		41 GRADE US I red/white	9-11
		42 GRADE US II red/white	9-12
		43 GRADE US III red/white	9-13
		44 GRADE US IV red/white	9-14
		45 GRADE V red/white	9-15
		46 GRADE VI red/white	9-16
		Other features	
22 Resin pocket	9-6		
23 Bark pocket	9-6		
24 Scar	9-6		



1. Sound knot
Frisk kvist
Frisk kvist
Tuore oksa
Frisk knast
Gesunder Ast
Noeud sain
Nodo sano

2. Sound knot
Frisk kvist
Frisk kvist
Tuore oksa
Frisk knast
Gesunder Ast
Noeud sain
Nodo sano



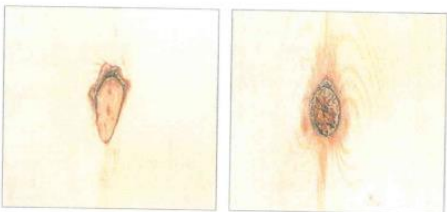
3. Dead knot
Torrkvist
Torrkvist
Kuiva oksa
Tör knast
Toter Ast
Noeud mort
Nodo morto

4. Shrinkage of knots
Kvistkrypning
Kvistkrypning
Oksakohouma / -painuma
Udkogte knast
Kriechast
Noeud, traversant
Nodo passante



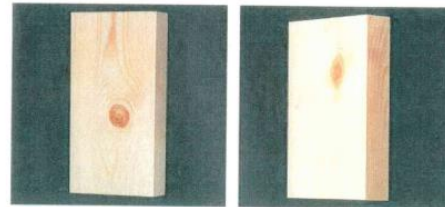
5. Black knot
Svartkvist
Svartkvist
Musta oksa
Sort knast
Schwarzast
Noeud noir
Nodo nero

6. Pin knot
Pärilkvist
Perlekvist
Helmioksa
Perleknast
Punkast
Oeils perdrix
Nodi a spillo



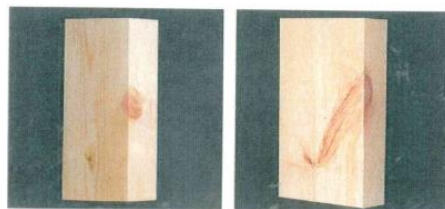
7. Barkringed knot
Barkringskvist
Barkringskvist
Kuoren ympäröima oksa
Barkringsknast
Rindenumrandeter Ast
Noeud à entre écorce
Nodo con corteccia

8. Unsound knot
Rötchkvist
Rätchkvist
Laho-oksia
Rädknast
Faulast
Noeud vicieux
Noco marcio



9. Round knot
Rund kvist
Rund kvist
Pyöreä oksa
Rund knast
Runder Ast
Noeud rond
Nodo rotondo

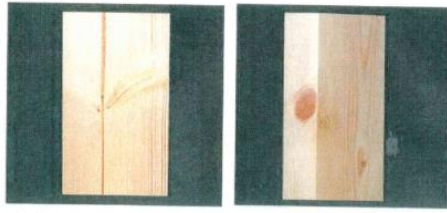
10. Oval knot
Oval kvist
Oval kvist
Soikea oksa
Oval knast
Ovaler Ast
Noeud ovale
Nodo ovale



11. Arris knot
Hörnkvist
Hörnkvist
Hjörnekvist
Särmäoksa
Hörne knast
Kantenast
Noeud d'arête
Nodo di spigolo

12. Splay knot
Hornkvist
Hornkvist
Sarvioksa
Hornknast
Flügelast
Noeud tranchant
Nodo piatto

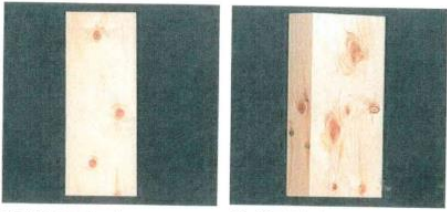
9-4

**13. Spike knot**

Bladkvist
Bladkvist
Lehtioksa
Bladknast
Länglicher Ast
Noeud plat
Nodo a baffo

14. Edge knot

Kantsidekvist
Kantkvist
Syrjäoksa
Kantknast
Schmulseitenast
Noeud de rive; noeud de chant
Nodo laterale

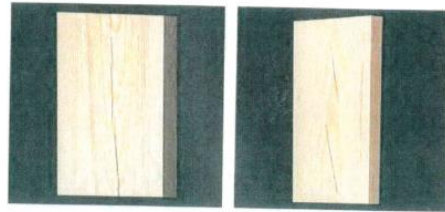
**15. Scattered knots**

Strökvistar
Spredte kvister
Hajaoksia
Enkelt knaster
Einzeläste
Noeuds isolés
Nodo piatto

16. Knot cluster

Kvistgrupp
Kvistgrupp
Oksaryhmä
Knastgrupper
Astansammlung
Noeuds groupés
Nidi di nodi

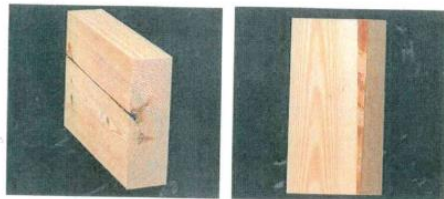
9-5

**17. Parallel drying check**

Rak torkningsspricka
Rett torkesprekk
Suora kuivumishalkeama
Lige tørrerene
Geräder verlaufender
Trocknungsriß
Fente droite
Fenditura diritta

18. Oblique drying check

Sned torkningsspricka
Skrå torkesprekk
Vino kuivumishalkeama
Skrå tørrerene
Schräg verlaufender
Trocknungsriß
Fente oblique
Fenditura obliqua

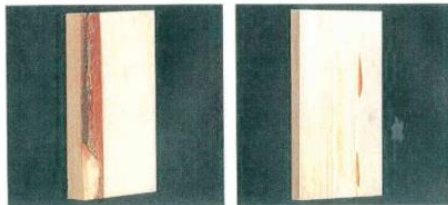
**19. Ring shake**

Ringspricka
Ringsprekk
Rengashalkeama
Ringrevne
Ringriß
Roulure
Cipollatura

20. Wane

Vankant
Vankant
Vajasaarmä
Vankant
Baumkante
Flache
Smusso

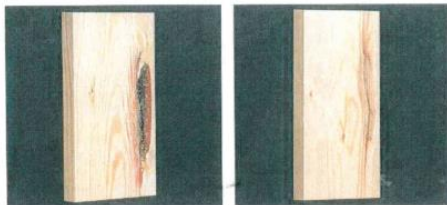
9-6

**21. Bark**

Yibark
Ytebark
Kuori
Ytebark
Rinde und Bast
Écorce
Corteccia

22. Resin pocket

Kädläpor
Kvaelomme
Pihkakolot
Harpikslommer
Harzgalien
Poche de résine
Sacche di resina

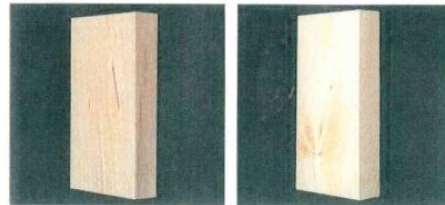
**23. Bark pocket**

Barkdrag
Barkflak
Kaarmaroso
Indgroet bark
Rindeneinwuchs
Entre écorce
Sacche di corteccia

24. Scar

Lyra
Føyre
Koro
Overvoknsing
Überwallungsstelle
Lyre (bourrelet de recouvrement)
Cicatrici

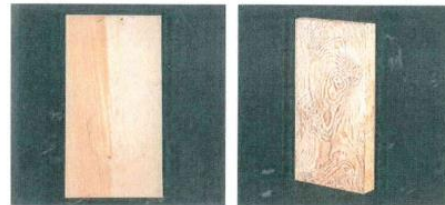
9-7

**25. Slope of grain**

Snedfibriighet
Fiberhelling
Vinosisyys
Fiberhældning
Faserneigung
Contre fil (Pente de fil)
Fibratura controfilo

26. Top rupture

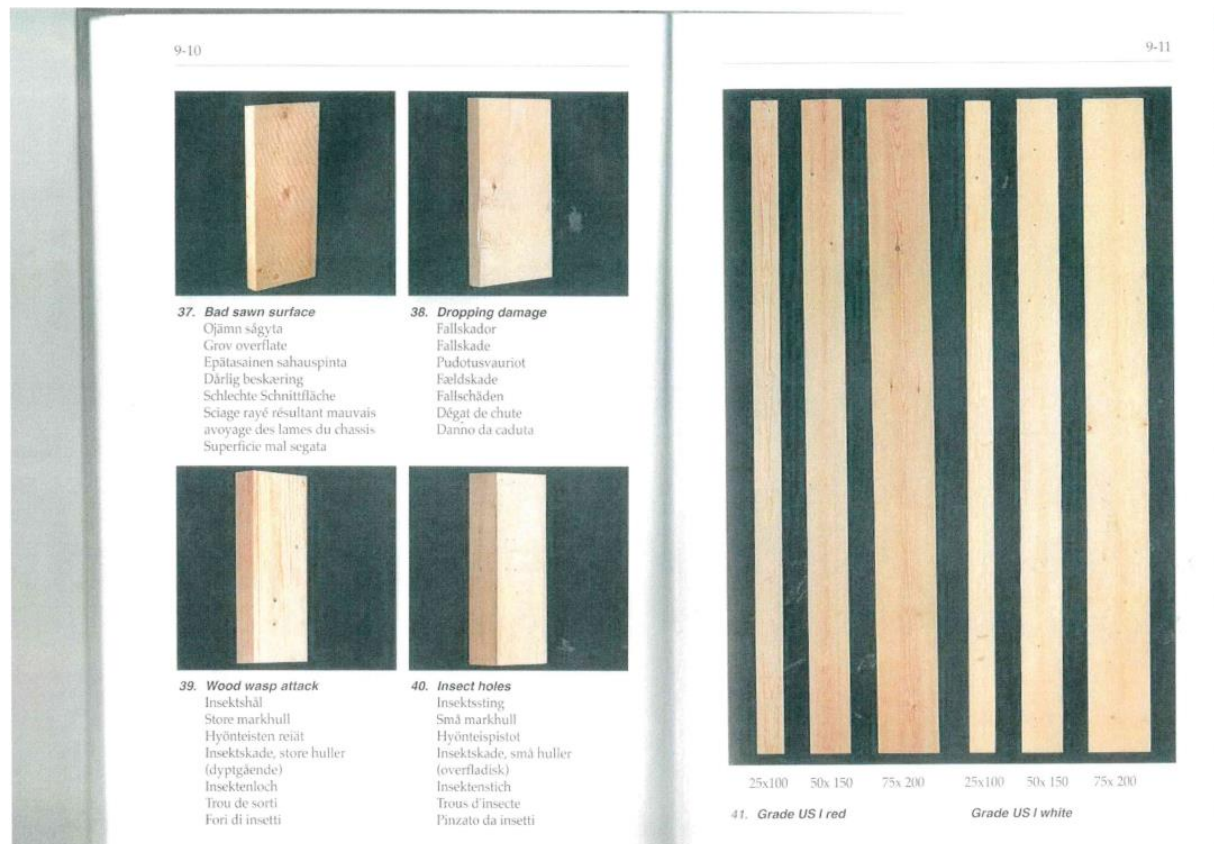
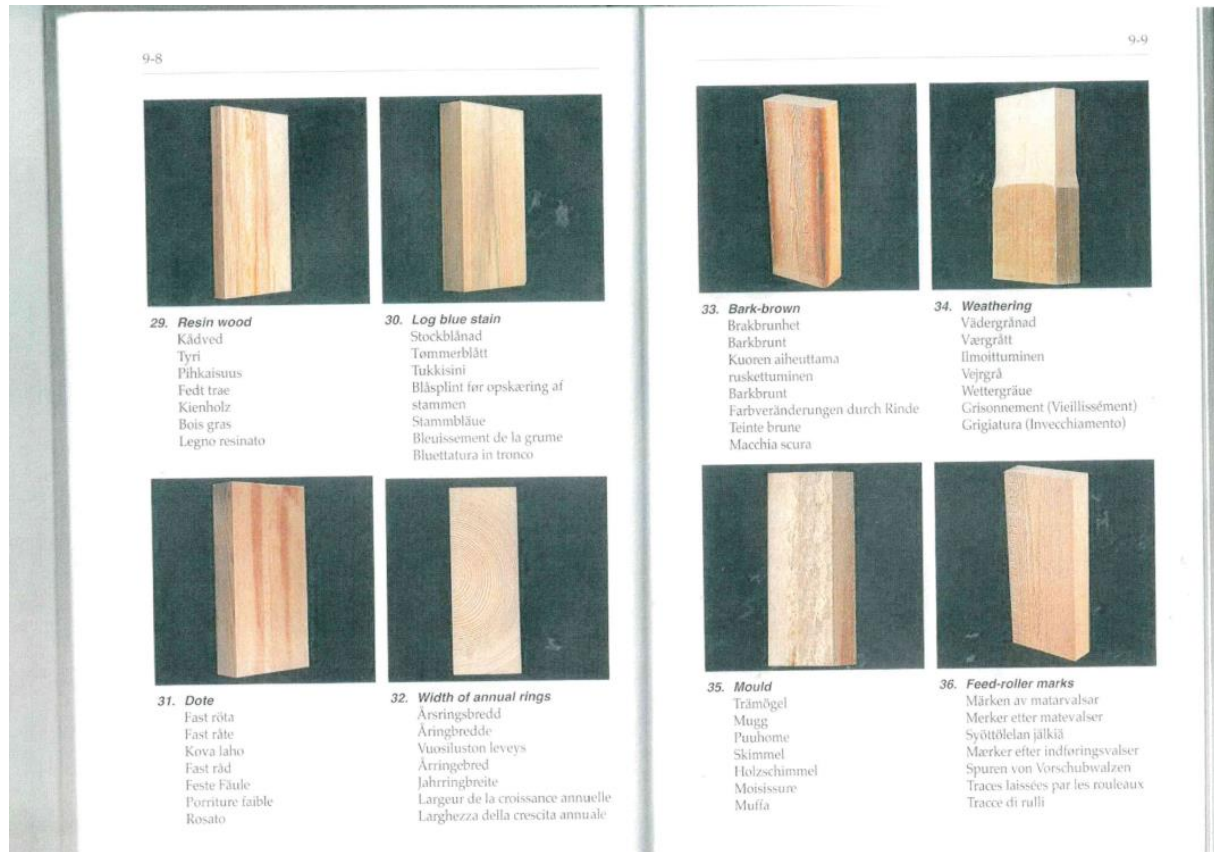
Toppbrott
Toppbrudd
Latvamurto
Topbrud
Wipfelbruch
Cassure (du bout)
Spaccatura

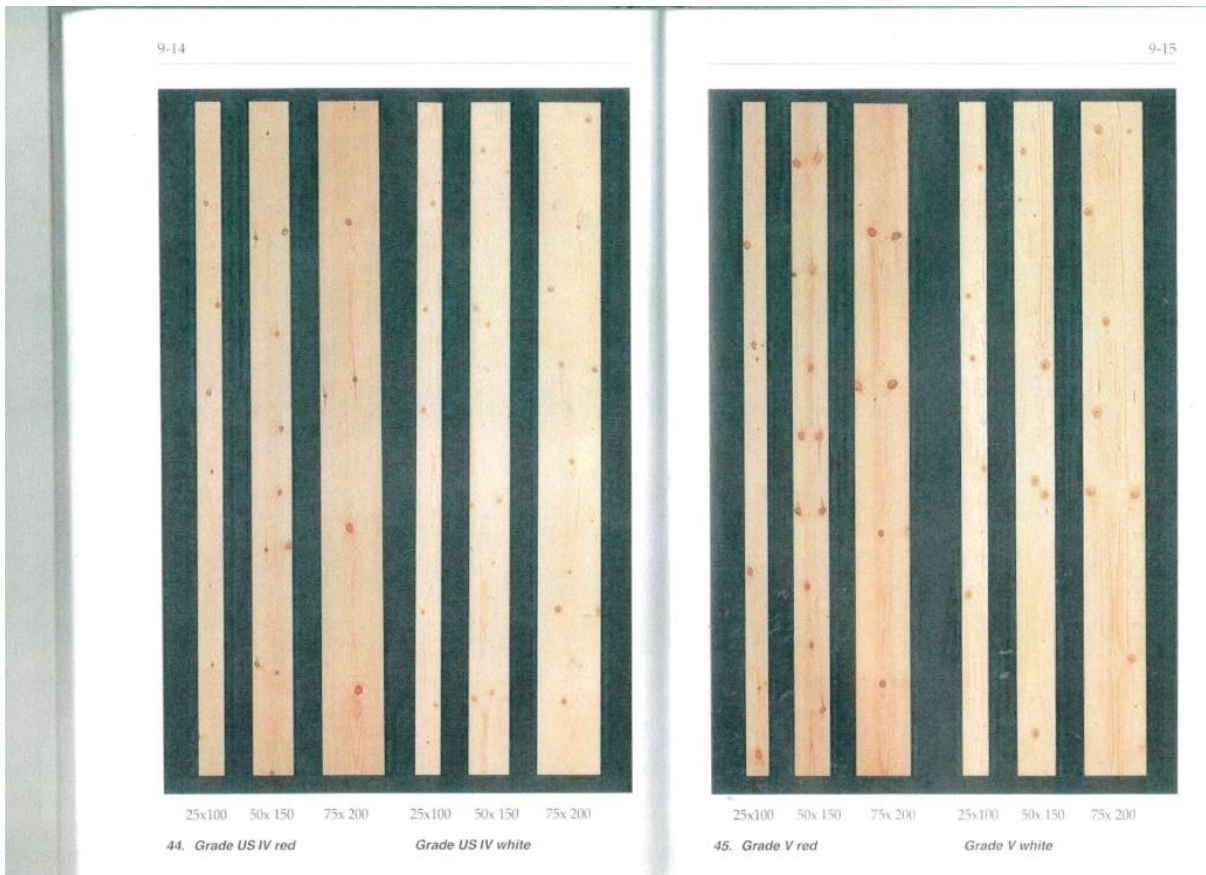
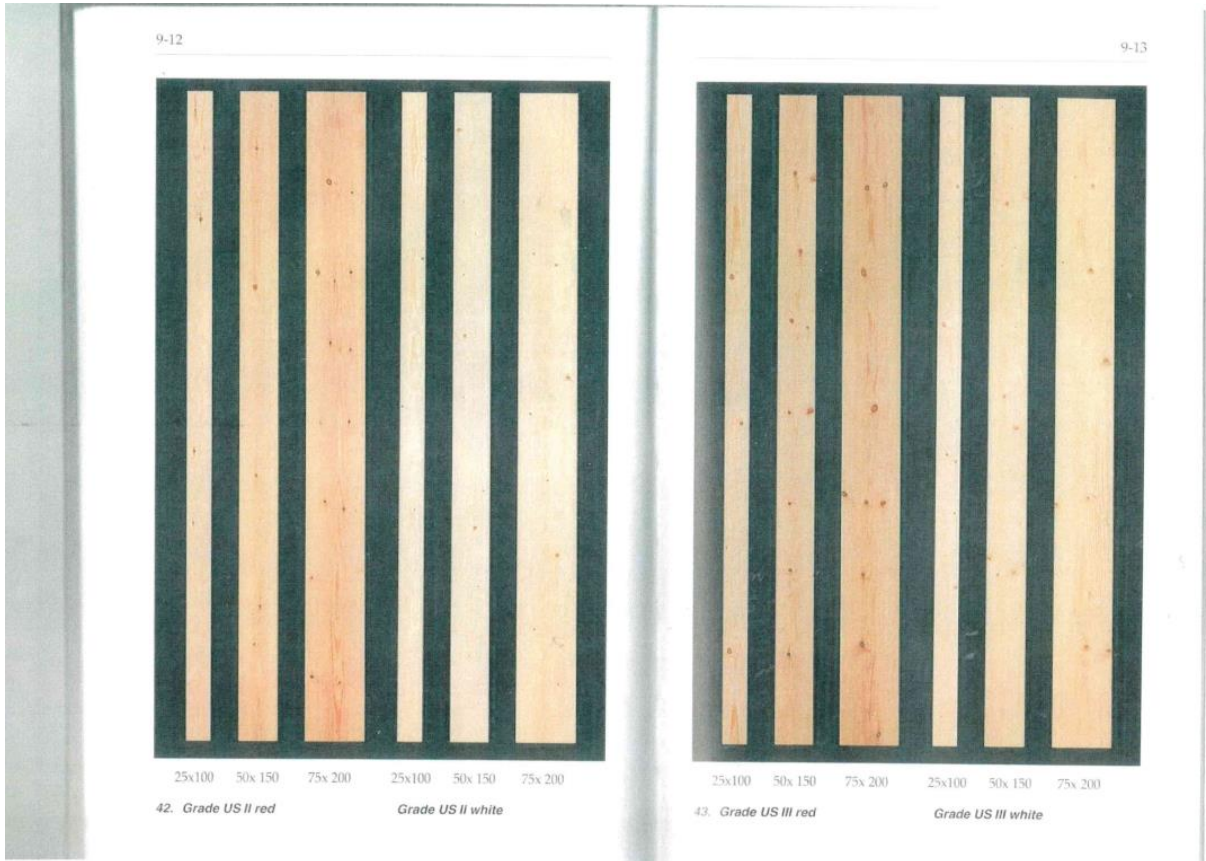
**27. Compression wood**

Tjørved-Reaktionsved
Temnar
Lyly
Reaktionsved
Druckholz-Reaktionsholz
Bois de compression
Canastro

28. Curly grain

Vresved
Fiberoser
Syhäiriö
Maserved
Wirbelwuchs
Bois ronceux
Fibratura incrociata





9-16



25x100 50x 150 75x 200 25x100 50x 150 75x 200

46. Grade VI red

Grade VI white

Notes

GOST GRADING RULES

Rough lumber of coniferous species.
Interpretation of Russian export grading rules in accordance to GOST 26002-83

1. Dimensions:

1.1 Sawn lumber is subdivided:

By thickness:	Thin	16 - 22 mm
	Medium	25 - 44 mm
	Thick	50 - 100 mm
By width:	Narrow	75 - 125 mm
	Wide	150 mm and wider
By length:	Short	450 - 2400 mm
	Long	2700 - 6300 mm

1.2. Nominal thickness and width are guided by standard GOST 24454-80, where thickness of the lumber shall not exceed 100 mm.

1.3. Lengths of lumber are ranged:

from 1500 mm and up with a step of 300 mm;

from 450 mm up to 1350 mm with a step of 150 mm;

Lumber with length from 450 mm up to 1350 mm is manufactured by an order of State foreign trade organization.

1.4. Nominal dimensions of lumber are established for the wood of MC (moisture content) 20%. With MC of more or less than 20%, actual thickness and width of lumber shall be more or less than nominal dimensions in correlation with shrinkage value according to standard GOST 6782.1-75.

1.5. Limiting deviations from nominal dimensions of lumber shall not exceed in mm:

By length	+ 25	- 12
By width	+ 3	- 2
By thickness:		
thickness less than 50 mm	+ 2	- 1
thickness 50 mm und up	+ 3	- 2

Volume of lumber with maximum admitted deviations shall not exceed 25% of total volume of lumber.

2. Technical Requirements

2.1. Lumber shall be manufactured in accordance to the requirements of the present technology standard for the wood of Pine, Spruce, Fir and Larch species.

2.2. Lumber is subdivided by quality of the wood and by its machining into 1, 2, 3, 4 and 5 grades.

2.3. Lumber is arranged:

By dimensions;

By species;

By grades:

U/S Unsorted (combining 1, 2, 3 grades together, the percentage correlation of which shall correspond to the natural recovery of lumber while sawing);

4 grade separately;

5 grade separately;

Up to 15% of Fir is admitted in a load of Spruce lumber.

2.4. MC moisture content of lumber shall not exceed 22%. Variation of the moisture content is admitted by custom orders.

2.5. Antiseptic treatment of lumber is per standard GOST 10950-78.

2.6. Quality of the wood and manufacture of lumber shall correspond to the requirements specified in tables 1-3.

Pine and Larch Lumber

Table 1

Wood defects	Limiting norms of wood defects by grades									
	1 grade		2 grade		3 grade		4 grade		5 grade	
	size	number	size	number	size	number	size	number	size	number
1. Knots 1.1. Intergrown knots 1.1.1. Round and Oval 1.1.1.1. Face	Admitted on outside face in dimensions in mm and number in pieces on average per 1000 mm of length of lumber.									
	In thick wide sawn lumber									
	13-17	1	18-27	1	28-38 over 38 up to 50	2 1	Admitted			
	In thick narrow lumber									
	10-14	1	15-24	1	25 over 25 up to 38	2 2	Admitted			
	In medium wide lumber									
	10-14	1	15-18	1	19-25 over 25 up to 38	3 1	Admitted			
	In medium narrow lumber									
	10-14	1	15-18	1	19-25 over 25 up to 32	3 1	Admitted			
	In thin lumber									
	10-14	1	15-18	1	19-22 over 22 up to 32	2 1	Admitted			
	In lumber of 75 mm wide knots shall not exceed:									
	1/4		1/3		1/2		2/3		Admitted	
	of face width									
	Number of knots on the inside face of lumber of 1 & 2 grades is admitted twice more and in 3 grade one and a half times more than for outside face.									
1.1.1.2. Edge & corner	Admitted on each edge with dimensions in mm and number in pieces for entire length of a piece:									
	In thick lumber:									
	up to 6	3-4	7-12	3-5	13-16	5-8	Admitted			
			13-19	3-5	over 16 up to 25	3-5				
					over 25 up to 32	3				
	In medium lumber:									
	up to 6	2-3	7-12	2-4	13-16	2-4	Admitted			
						over 16				

De data is informatief en indicatief.
Bijzondere technische eisen moeten opgevraagd worden en bevestigd door de fabrikant.

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Les données sont informatif et indicatif.
Des exigences techniques et spécifiques doivent être demandées et confirmées par le fabricant.

		13-19	2-3	up to 3/4 of thickness	2-4									
		In thin lumber:												
	up to 6	1-2	7-10	1-2	up to 2/3 of thickness	2	Admitted							
1.1.1.3. End	Admitted on each end with dimensions in mm and number in pieces:													
	Not admitted			25	1	Admitted								
1.1.2. Spike, branchy including appeared on corners, and edge	Admitted on the inside face of sawn timber (lumber) in total number of intergrown round and oval knots with dimensions and amount as per paragraphs 1.1.1.1.; 1.1.1.2.													
	Dimension of knots in mm by maximum diameter is admitted of not more than:													
	38	50	admitted											
	Appearing of knots on edges:													
	Admitted with appearing on edge of not more than:													
	Not admitted		1/4 of the thickness	1/3 of the thickness	Admitted									
Wood defects	Limiting norms of wood defects by grades													
	1 grade		2 grade		3 grade		4 grade		5 grade					
	size	number	size	number	size	number	size	number	size	number				
1.2. Encased sound, unsound, decayed, rotten	Admitted on the outside face within the amount of intergrown sound knots with dimensions in mm and number in pieces in average per 1000 mm of the length of lumber:													
1.2.1. Face	In thick wide sawn timber lumber													
	Not admitted		25	1	63	1	Admitted Knot holes shall not exceed 32 mm in narrow and 38 mm in wide sawn timber (lumber)							
	Through the board unsound, decayed and rotten													
	Not admitted		25	1										
	In thick narrow lumber													
	Not admitted		19	1	50	1								
	Through the board unsound, decayed and rotten													
	Not admitted		25	1										
	In medium wide lumber													
	Not admitted		19	1	50	1								
	Through the board unsound, decayed and rotten													
	Not admitted		19	1										
	In medium narrow lumber													
	Not admitted		13	1	38	1								
	Through the board unsound, decayed and rotten													
	Not admitted		19	1										
	In thin lumber													
	Not admitted		Only sound											
	13		1		38	1					Through the board unsound, decayed and rotten			
					19	1								
	In lumber of 75 mm wide of all thickness the knot's sizes shall not exceed:													
	Not admitted		1/3		1/2		2/3							
	Of width of face													
1.2.2. Edge and corner, including knot holes	Admitted on each edge with dimensions in mm and by number in pieces on the entire length of lumber.													
	In thick lumber													
	Not admitted		13	1-2	38	2-4	Admitted							
	In medium lumber													
	Sound only													
	Not admitted		10	1-2	32	2-4	Admitted							
	In thin lumber													

De data is informatief en indicatief.
Bijzondere technische eisen moeten opgevraagd worden en bevestigd door de fabrikant.

All data is informative and indicative.
Specific technical requirements must be requested and confirmed by the manufacturer.

Les données sont informatif et indicatif.
Des exigences techniques et spécifiques doivent être demandées et confirmées par le fabricant.

		Sound only																													
		Not admitted		6	1-2	25	2-4	Admitted																							
		Knot holes not more than:																													
		Not admitted		Admitted with depth not more than:				Admitted																							
		Not admitted		In thick - 1/4	thickness of lumber with showing on outside face not more than 2,0 mm				Admitted																						
		Not admitted		In medium - 1/3																											
		Not admitted		In thin - 1/2																											
		Not admitted		Of thickness of lumber																											
Wood defects		Limiting norms of wood defects by grades																													
		1 grade		2 grade		3 grade		4 grade		5 grade																					
		size	number	size	number	size	number	size	number	size	number																				
1.2.3. End		Not admitted					Admitted																								
2. Checks		Admitted by conditions of integrity of lumber																													
2.1. Side checks												Admitted by conditions of integrity of lumber																			
2.1.1. Face checks																						Admitted by conditions of integrity of lumber									
2.1.1.1. Non through																															
		Admitted with extent of not more than:																													
		1/3		1/2		2/3																									
		Of the length of lumber																													
		Without appearing on ends and edges				With appearing on one end up to 1/3 of thickness without exiting from end to edge.																									
2.1.1.2. Through		Admitted by conditions of integrity of lumber																													
2.1.1.2.1. Through without appearing on the end, including ring shakes												Admitted by conditions of integrity of lumber																			
																						Not admitted		Admitted without exiting on edges from outside and inside faces with length of not more than:							
																						Not admitted		In thick lumber							
																						Not admitted		1/5 (1/2)		1/3 (2/3)					
																						Not admitted		Of the length of a piece							
																						Not admitted		In medium lumber							
		Not admitted		1/10 (1/4)		1/5 (1/3)																									
		Not admitted		Of the length of lumber																											
		In thin lumber																													
		Not admitted																													
Note:		Check sizes, shown without brackets, relate to outside face; those in brackets relate to inside face.																													
2.1.1.2.2. Through appearing on end		Admitted with extension from each end of not more than, mm:																													
		30		40		50		Width of lumber		600																					
2.1.2. Edge checks		Admitted:																													
		Shallow, length not more than 40 mm				Not crossing corners of edge				Admitted																					
Wood defects		Limiting norms of wood defects by grades																													
		1 grade		2 grade		3 grade		4 grade		5 grade																					
		size	number	size	number	size	number	size	number	size	number																				
2.2. End checks																															
2.2.1. Heart checks		Heart checks				Admitted in thick lumber on one end with length extent not more than 1/2 of width of a piece				Admitted																					
2.2.2. Ring shakes		Not admitted				Admitted with diameter of not more than, mm: In lumber with width 25 to 44mm – 10				Admitted by conditions of integrity of lumber																					

		45 to 63mm – 19 above 63mm – 25								
3. Defects of wood structure										
3.1. Slope of grain	Admitted, if grain deviation from straight direction per 300 mm of length of lumber compose not more than, mm:		Admitted							
	10	19	25							
3.2. Compression wood	Admitted without splits on ends		Admitted							
3.3. Pitch pockets	On faces		Admitted							
	In thick lumber									
	Admitted non through with width not more than, mm:									
	3	3		6						
	With length up to, mm:									
	75	100		200						
	On each face in amount in pieces of not more than:									
	2-3	4-6		8						
	In medium and thin lumber									
	Admitted non through with width not more than, mm:									
	3	3		6						
	With length up to, mm:									
	25	75		125						
	On each face in amount in pieces of not more than:									
	2-3	3-4	5							
	Without appearing on edges and ends		-							
Note:	Indicated amount of pitch pockets is admitted in less numbers on outside face and more numbers on inside face.									
	On edges		Admitted							
	Admitted									
	Not admitted	1/2 of norm for outside face		Width up to 3 mm; length up to 100 mm in amount up to 4 pieces on each edge						
	On ends									
	Not admitted		Admitted in medium and thin lumber with width up to 3 mm and length up to 1/3 of width of lumber							
Wood defects	Limiting norms of wood defects by grades									
	1 grade		2 grade		3 grade		4 grade		5 grade	
	size	number	size	number	size	number	size	number	size	number
3.4. Pith	Admitted in lumber of over 25 mm thick (without ring shakes and checks)				Admitted		Admitted			
	With extent up to 1/2 of length of lumber appearing on one end at distance not more than 1/6 of thickness of timber from inside face.		With extent of total length of lumber appearing on one end at distance not more than 1/4 of thickness from inside face.							
	Admitted in lumber of 25 mm thick and thinner				Admitted attached to inside face with appearing on outside face.		Admitted			
Note:	In a load of lumber of 3 grade not more than 30% of boxed heart is admitted									
3.5. In bark (Bark pockets)			Admitted on faces		Admitted up to 50					

			non through not more than 25 mm wide in amount of 1 piece up to 75 mm long and up to 3 pieces with length up to 50 mm; On edges 2 pieces up to 2 mm wide, not more than 15 mm long; not admitted on ends.	mm wide; In thick lumber on one face with no limit length. In medium and thin lumber up to 175 mm long.	Admitted						
3.6. Pitch & Pitch Streaks	Not admitted	Admitted on faces and edges in form of spots and streaks		Admitted							
4. Fungal defects											
4.1. Fungal heartwood stains (streaks)	Not admitted	Admitted in thick lumber on face or edge without appearing on ends up to 1/5 of width and length of a piece. Not admitted in medium and thin lumber	Admitted on faces and edges up to 1/2 of width and length of lumber, admitted showing on end with covering of not more than 10% of end's area.	Admitted							
4.2. Light fungal sap stains and mold											
4.2.1. Surface	Not admitted	Admitted on faces and edges up to 2 mm deep in shape of spots and streaks with total area of covering of not more than 15% of area of one face.	Admitted on faces and edges in shape of spots and streaks.	Admitted							
4.2.2. Deep	Not admitted	Admitted on faces and edges up to 2 mm deep in shape of spots and streaks with total area of covering of not more than 5% of area of one face.	Admitted on faces and edges up to 2 mm deep in shape of spots and streaks with total area of covering of not more than 50% of area of one face and edges. With covering of not more than 10% of end area.	Admitted							
Note:	Volume of lumber with maximum admitted norm of deep fungal sap stains in a batch of 4 grade shall not exceed 25%.										
Wood defects	Limiting norms of wood defects by grades										
	1 grade		2 grade		3 grade		4 grade		5 grade		
	size	number	size	number	size	number	size	number	size	number	
4.3. Decay											
4.3.1. Sap Decay											
4.3.1.1. Firm	Not admitted	In thick lumber is admitted on face or edge up to 1/5 of width and length without appearing on ends. Not admitted in medium and thin lumber	Admitted on faces and edges up to 1/2 of width and length of lumber without appearing on end.	Admitted							
4.3.1.2. Soft	Not admitted										

4.3.2. Heart Decay	Not admitted	Brown checked not admitted. Firm mottle honeycomb is admitted appearing on all sides in shape of streaks covering not more than 50% area of one face. Decay shall not cover more than 20% of and area.
4.3.3. External rot	Not admitted	
5. Insect damages		
5.1. Wormholes	Not admitted	External is admitted, caused by bark beetles

Spruce and Fir Lumber

Table 2

Wood defects	Limiting norms of wood defects by grades																																																																									
	1 grade		2 grade		3 grade		4 grade		5 grade																																																																	
	size	number	size	number	size	number	size	number	size	number																																																																
1. Knots	Admitted on outside face in dimensions in mm and amount in pieces on average per 1000 mm of lumber length. <div style="text-align: center;">In thick lumber</div> <table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 10%;">13</td> <td style="width: 10%;">3</td> <td style="width: 10%;">19-25</td> <td style="width: 10%;">3</td> <td colspan="2" style="text-align: center;">Admitted</td> <td rowspan="3" style="width: 20%; text-align: center; vertical-align: middle;">Admitted</td> </tr> <tr> <td style="text-align: center;">Over 13 up to 19</td> <td style="text-align: center;">1</td> <td style="text-align: center;">Over 25 up to 38</td> <td style="text-align: center;">2</td> <td style="width: 10%; text-align: center;">70-75</td> <td style="width: 10%; text-align: center;">1-2 on entire length</td> </tr> <tr> <td style="text-align: center;">Over 19 up to 25</td> <td style="text-align: center;">1</td> <td style="text-align: center;">Over 38 up to 50</td> <td style="text-align: center;">1-2 on entire length</td> <td colspan="2" style="text-align: center;">With absence of enlisted unsound, decayed, rotten knots</td> </tr> </table> <div style="text-align: center;">In medium lumber</div> <table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 10%;">13</td> <td style="width: 10%;">2</td> <td style="width: 10%;">19-25</td> <td style="width: 10%;">2</td> <td style="width: 10%;">38-50</td> <td style="width: 10%;">1</td> <td rowspan="2" style="width: 20%; text-align: center; vertical-align: middle;">Admitted</td> </tr> <tr> <td style="text-align: center;">Over 13 up to 19</td> <td style="text-align: center;">1</td> <td style="text-align: center;">Over 25 up to 37</td> <td style="text-align: center;">1</td> <td style="text-align: center;">(over 50 up to 63)</td> <td style="text-align: center;">1 - 2 on entire length</td> </tr> <tr> <td colspan="7" style="text-align: center;">With absence of unsound, decayed, rotten knots</td> </tr> </table> <div style="text-align: center;">In thin lumber</div> <table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 10%;">13-18</td> <td style="width: 10%;">1</td> <td style="width: 10%;">19-31</td> <td style="width: 10%;">1-2</td> <td style="width: 10%;">32</td> <td style="width: 10%;">3</td> <td rowspan="3" style="width: 20%; text-align: center; vertical-align: middle;">Admitted</td> </tr> <tr> <td colspan="4"></td> <td style="text-align: center;">(over 32 up to 38)</td> <td style="text-align: center;">1</td> </tr> <tr> <td colspan="7" style="text-align: center;">With absence of unsound, decayed, rotten knots</td> </tr> </table> <div style="text-align: center;">In lumber of 75 mm wide of all thickness size of knots shall not exceed:</div> <table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 15%;">1/3 of face width</td> <td style="width: 15%;">1/3 of face width</td> <td style="width: 15%;">1/2 of face width</td> <td style="width: 15%;">2/3 of face width</td> <td style="width: 30%; text-align: center;">Admitted</td> </tr> </table>										13	3	19-25	3	Admitted		Admitted	Over 13 up to 19	1	Over 25 up to 38	2	70-75	1-2 on entire length	Over 19 up to 25	1	Over 38 up to 50	1-2 on entire length	With absence of enlisted unsound, decayed, rotten knots		13	2	19-25	2	38-50	1	Admitted	Over 13 up to 19	1	Over 25 up to 37	1	(over 50 up to 63)	1 - 2 on entire length	With absence of unsound, decayed, rotten knots							13-18	1	19-31	1-2	32	3	Admitted					(over 32 up to 38)	1	With absence of unsound, decayed, rotten knots							1/3 of face width	1/3 of face width	1/2 of face width	2/3 of face width	Admitted
13											3	19-25	3	Admitted		Admitted																																																										
Over 13 up to 19											1	Over 25 up to 38	2	70-75	1-2 on entire length																																																											
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1/3 of face width	1/3 of face width	1/2 of face width	2/3 of face width	Admitted																																																																						
Note:	1. Knots, dimensions of which are shown in brackets, admitted among recorded knots of smaller dimensions.																																																																									

	2. Quantity of knots on inside face is admitted: in 1 grade – double, in 2 grade – one and a half, in 3 grade – one time correspondently to norm for outside face.									
Wood defects	Limiting norms of wood defects by grades									
	1 grade		2 grade		3 grade		4 grade		5 grade	
	size	number	size	number	size	number	size	number	size	number
1.1.1.2. Edge & Corner	Admitted on each edge with dimensions in mm and number in pieces for entire length of lumber:									
	In thick lumber:									
	Up to 13	8								
	Over 13 up to 16	4	19-43	3-6	44-50	1-3	Admitted			
	Over 16 up to 18	1-3								
	In medium lumber									
	up to 13	2-3	From 14 up to 2/3 of thickness of timber	2-3	From 19 up to 3/4 of thickness of timber	3-5	Admitted			
	In thin lumber									
	Up to 6	2-3	From 7 up to 12	1-2	From 13 up to thickness of timber	2-4	Admitted			
1.1.1.3. End	Admitted with dimensions in mm and number in pieces:									
	On one end 1 knot up to 25		On both ends 1 knot up to 25		25	1	Admitted			
	On each end									
1.1.2. Spike, branchy including appeared on corners, and edge knots	Admitted on the inside face of sawn timber (lumber) in total number of intergrown round and oval knots with dimensions and amount as per paragraphs 1.1.1.1.; 1.1.1.2. In sawn timber of 1 grade largest diameter of branchy knot shall not exceed 50 mm and it shall not cover more than 1/4 of thickness of an edge.									
1.2. Encased sound, unsound, decaying, rotten	Admitted on each face within the amount of intergrown sound knots with dimensions in mm and number in pieces for the entire length of lumber:									
1.2.1. Face	In thick lumber									
	Not admitted	Up to 30	3-6	Over 30 up to 50	3-6	Admitted	Admitted. Knot holes shall not exceed 32 mm in narrow and 38 mm in wide lumber			
	Through the board unsound, decayed and rotten									
	Not admitted						Up to 38	Admitted		
	In medium lumber									
	Not admitted	Up to 20	2-4	Over 20 up to 25	2-4	Admitted				
	Through the board unsound, decayed and rotten									
	Not admitted						Up to 25	Admitted	Admitted	
	In thin lumber									
	Not admitted	Up to 16	1-3	Over 16 up to 22	1-3	Admitted				
	Through the board unsound, decayed and rotten									
	Not admitted						Up to 25	Admitted	Admitted	
	In lumber with width of 75 mm and any thickness, dimension of knots shall not exceed:									
	Not admitted				1/3 of the face width		1/2 of the face width		Admitted	
Wood defects	Limiting norms of wood defects by grades									
	1 grade		2 grade		3 grade		4 grade		5 grade	
	size	number	size	number	size	number	size	number	size	number
1.2.2. Edge and corner, including knot holes	Admitted on each edge with dimensions in mm and number in pieces on the entire length of lumber									

	In thick lumber									
	Not admitted	Up to 15	1-2	16-25	2-4	Admitted				
	In medium lumber									
	Not Admitted			13-19	1-3	Admitted				
	In thin lumber									
	Not admitted			6-10	1-2	Admitted				
	Knot holes on edges									
	Admitted-covering up to:									
	Not admitted			2/3 of thickness of lumber	Entire thickness of lumber with appearing on outside face in extent of 2 mm	Admitted				
1.2.3. End	Not admitted					Admitted				
2. Checks										
2.1. Side Checks										
2.1.1. Face										
2.1.1.1. Non through	Admitted with extent of not more than:					Admitted by conditions of integrity of lumber				
	1/3	2/3		3/4						
	of the length of lumber									
	Without appearing on ends and edges			with appearing on one end up to 1/2 of thickness without exiting from end to edge.						
2.1.1.2. Trough										
2.1.1.2.1. Through without appearing on the end, including ring shakes	Not admitted		Admitted on outside face and for ring shakes on inside face with length of not more than:			Admitted by conditions of integrity of lumber				
			1/4	1/3						
	Of the length of lumber									
2.1.1.2.2. Through appearing on end	Admitted with extension from each end of not more than, mm:									
	50	75		100		Width of a piece	600			
2.1.2. Edge checks	Admitted, mm:									
	Shallow, length not more than 75 mm			Not crossing corners of edge			Admitted			
2.2. End checks										
2.2.1. Heart checks	Not admitted			Admitted in thick sawn timber on one end with length extent not more than 3/4 of width of a piece			Admitted by conditions of integrity of lumber			
2.2.2. Ring shakes	Not admitted			Admitted with diameter of not more than, mm: In sawn timber with width: 25 to 44mm – 10 45 to 63mm – 19 above 63mm – 25			Admitted by conditions of integrity of lumber			
Wood defects	Limiting norms of wood defects by grades									
	1 grade		2 grade		3 grade		4 grade		5 grade	
	size	number	size	number	size	number	size	number	size	number
3. Defects of wood structure										
3.1. Slope of grain	Admitted, if grain deviation from straight direction per 300 mm of piece's length compose not more than, mm:					Admitted				
	13		25		38					

3.2 Compression wood	Admitted without splits on ends				Admitted							
3.3 Pitch pockets	On faces											
	Admitted on each face without appearing on edges and ends with width up to 3 mm and length not more than, mm:				Admitted not through up to 6 mm wide and up to 200 mm long in amount of 10 pcs. on each face							
	75		150									
	In amount of not more than, pcs:											
	3		5									
	On edges											
	Admitted with dimensions and numbers not exceeding 1/2 of those stipulated for the face.				Admitted							
On ends												
Not admitted				Admitted in medium and thick sawn timber with width up to 3 mm and length up to 1/3 of width of lumber								
3.4. Pith	In lumber of less than 22 mm thick:											
	Not admitted				Admitted							
	In lumber of over 22 mm and up to 44 mm thick:											
	Admitted with extend of entire length of lumber with appearing on one or both ends not far from inside face than:				Admitted							
	1/4		1/3						1/3			
	Of thickness of lumber without checks and shakes in 1 and 2 grades.											
	In lumber of over than 44 mm thick:											
Admitted with extend of entire length of lumber far from inside face not less than 1/4 of thickness of lumber		Admitted										
Note:	In a load of sawn timber of 3 grade not more than 30% of boxed heart is admitted											
3.5. In bark (bark pockets)	Not admitted				Admitted on faces non through in amount up to 4 pcs in lumber with thickness of 55 mm and up: 125 mm long and 25 mm wide; in lumber with thickness of less than 55 mm: 63 mm long and 15 mm wide; On edges 2 pieces up to 2 mm wide, not more than 20 mm long;				Admitted			
3.6. Pitch & Pitch Streaks	Not admitted		Admitted on faces and edges in form of spots and streaks				Admitted					
Wood defects	Limiting norms of wood defects by grades											
	1 grade		2 grade		3 grade		4 grade		5 grade			
	size	number	size	number	size	number	size	number	size	number		
4. Fungal defects 4.1. Fungal heartwood stains (streaks)	Not admitted				Admitted on face or edge up to 1/4 of width and length of lumber		Admitted on faces and edges up to 1/2 of width and length of lumber, admitted showing		Admitted			

			on end with covering of not more than 10% of end's area.	
4.2. Light fungal sap stains and mold				
4.2.1. Surface	Not admitted	Admitted on faces and edges up to 2 mm deep in shape of spots and streaks with total area of covering of not more than 15% of area of one face	Admitted on faces and edges in shape of spots and streaks. Covering of not more than 10% of end's area	Admitted
4.2.2. Deep	Not admitted	Admitted on faces and edges in shape of spots and streaks with total area of covering of not more than 5% of area of one face.	Admitted on faces and edges in shape of spots and streaks with total area of covering of not more than 50% of area of one face and edges. With covering of not more than 10% of end's area.	Admitted
Note:	Volume of lumber with maximum admitted norm of deep fungal sap stains in a batch of 4 grade shall not exceed 25%.			
4.3. Decay				
4.3.1. Sap decay				
4.3.1.1. Firm	Not admitted	Admitted on face or edge up to 1/4 of width and length of lumber	Admitted on faces and edges up to 1/2 of width and length of lumber without appearing on ends	Admitted
4.3.1.2. Soft	Not admitted			
4.3.2. Heart Decay	Not admitted	Admitted firm non through with dimensions up to 1/5 of width and length of lumber without appearing on ends	Admitted firm on one face with dimensions up to 1/4 of width and 1/3 of length of lumber, slightly exiting on another face and edges	Brown checked not admitted. Firm mottle honeycomb is admitted appearing on all sides in shape of streaks covering not more than 50% area of one face. Decay shall not cover more than 25% of end's area
4.3.3. External rot	Not admitted			
5. Insect damages				
5.1. Wormholes	Not admitted			External is admitted, caused by bark beetles
Note: Table 1 & 2	<p>1. Amount of knots for entire length of lumber, shown "from – to" means that less amount is admitted for short lumber and more – for long.</p> <p>2. Knots with less dimensions than indicated are disregarded.</p> <p>3. Intergrown knots could be knots fully intrgrown on one face and fully incased on another face or edge.</p> <p>4. In U/S (1-3 grades together) lumber, simultaneous presence of incased knots, checks and fungus sapwood stains with maximum limits are not admitted.</p> <p>5. With absence of other limiting defects one defect is admitted exceeding 20% of parameters, except for blue stain and checks.</p>			

Table 3

Limiting norms of wood defects by grades
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De data is informatief en indicatief.
Bijzondere technische eisen moeten opgevraagd worden en bevestigd door de fabrikant.

All data is informative and indicative.
Specific technical requirements must be requested and confirmed by the manufacturer.

Les données sont informatif et indicatif.
Des exigences techniques et spécifiques doivent être demandées et confirmées par le fabricant.

Wood defects	1 grade		2 grade		3 grade		4 grade		5 grade		
	size	number	size	number	size	number	size	number	size	number	
1. Manufacturing defects											
1.1. Wane											
1.1.1. Obtuse	Admitted on one edge with extension of not more than:						Admitted on both edges extended not more than 2/3 of the length of lumber		Admitted on both edges extended on entire length with covering of not more than 2/3 of thickness and width of lumber		
	1/5		1/4		1/3	Of the length of the lumber					
	On both edges:										
	1/10		1/5		1/4	Of the length of the lumber					
	Width of wane, calculated by maximum value of miss sawn part in mm, is admitted of not more than:										
	In lumber with thickness up to 25 mm:						2/3				
	1/4		1/3		1/2	Of thickness of lumber					
	In lumber with thickness over 25 mm:						2/3				
	1/5		1/4		1/3	Of thickness of lumber					
							Wane admitted on condition that sawn part of edge shall be not less than 1/2 of thickness of lumber				
1.1.2. Sharp	Not admitted								Admitted on one edge not more than 1/10 of length of lumber provided that nominal width of inside face shall be maintained		
Note:	The wane shall be free of bark and inner bark, in lumber of 5 grade inner bark may be present										
1.2. Saw marks	The depth of saw teeth marks shall not exceed 0,75 mm										
1.3. Fringe	Not admitted										
1.4. Bevel cut	Declinations from perpendicularity of end to face and to edge are admitted up to 3% of width and thickness of lumber correspondently.										
1.5. Chipping	Chipping due to mechanical damages, saw kerfs, knife marks caused by debarking machines on edge corners next to inside face are not admitted; on edge corners next to outside face are admitted correspondently to wane limitations.										
1.6. Waving	The height of wave shall not exceed 0,75 mm										
1.7. Torn grain	On faces										
	Admitted not more than 0,75 mm deep without number limitations						Admitted up to 3 mm deep without number limitations		Admitted		
	On edges										
	Admitted not more than 3 mm deep without number limitations						Admitted not more than 5 mm deep without number limitations		Admitted		
Note:	Limits for waving and torn grain are indicated only for lumber recovered on "chip and saw" equipment										
1.8. Foreign particles (nails, wire, metal debris and etc.)	Not admitted										
	Limiting norms of wood defects by grades										
	1 grade		2 grade		3 grade		4 grade		5 grade		
	size	number	size	number	size	number	size	number	size	number	
2. Warping											
	Admitted with deflection of not more than, %										
2.1. Crook	0,10		0,10		0,15		0,20		admitted		
	Of the length of lumber										
	1. Volume of lumber with admitted crook warp shall not exceed 20% of the total volume of the said										

Note:	grade.				
	2. Values for crook warp for lumber of different length are given in reference Annex				
2.2. Bow	Admitted with deflection per each 1500 mm of the length of lumber of not more than, mm:				Admitted
	2	4	6	13	
2.3. Cup	Admitted with deflection of not more than, mm:				Admitted
	For wide lumber				
	3	3	6	10	
	For narrow lumber				
	1	1	3	6	
2.4. Twist	Admitted with deflection from sawing plain not more than 13 mm for entire length of lumber				Admitted
Note:	Volume of lumber with crook, bow and twist, provided p. 2.2-2.4 shall not exceed in U/S grade - 10%, in 4 grade - 20% of total volume.				

3. Acceptance Rules and Methods of Control

3.1. Acceptance rules and methods of control – as per GOST 6564-84

3.2. Sizes of knots are determined by the smallest diameter. Measurement of spike, branchy including appeared on corners and edge knots shall be taken on corner of lumber. Their size to be accepted as per the norms of admitted knots on edges. Their depth of covering of edge shall be measured by the distance between corner and tangent placed parallel to the corner.

Values of crook warping for lumber by length and grades:

Length of lumber in mm	Crook warping by grades			
	Unsorted (U/S)		4 grade	
	%	mm	%	mm
1500	0,15	2,2	0,2	3,0
1800	0,15	2,7	0,2	3,6
2100	0,15	3,2	0,2	4,2
2400	0,15	3,6	0,2	4,8
2700	0,15	4,0	0,2	5,4
3000	0,15	4,5	0,2	6,0
3300	0,15	5,0	0,2	6,6
3600	0,15	5,4	0,2	7,2
3900	0,15	5,8	0,2	7,8
4200	0,15	6,3	0,2	8,4
4500	0,15	6,8	0,2	9,0
4800	0,15	7,2	0,2	9,6
5100	0,15	7,6	0,2	10,2
5400	0,15	8,1	0,2	10,8
5700	0,15	8,6	0,2	11,4
6000	0,15	9,0	0,2	12,0
6300	0,15	9,4	0,2	12,6
6600	0,15	9,9	0,2	13,2
6900	0,15	10,4	0,2	13,8
7200	0,15	10,8	0,2	14,4
7500	0,15	11,2	0,2	15,0