

Grading of Oak Sawn Timber

Appearance grading / European standard EN 975-1

Strength class / French standard NFB 52-001



FOREWORD

APECF has recently carried out a series of characterisation studies aimed at visually grading French oak in response to end-user requirements.

Two grading systems are used to characterise oak sawn timber prior to marketing:

- **Appearance grading**
according to European standard EN 975-1 (April 2009) to highlight the timber's aesthetic qualities, for use by cabinetmakers, fitters, joiners and so on.
- **Mechanical strength grading**
(structural grading) required for use in the construction industry according to French standard NF B 52-001, Part 1, for use by architects, engineering firms, building inspectors, etc.

- This leaflet is for guidance only, full reference should be made to the relevant standards.
- Photos for illustration purposes only.

Appearance grading

European standard EN 975-1 (2009)

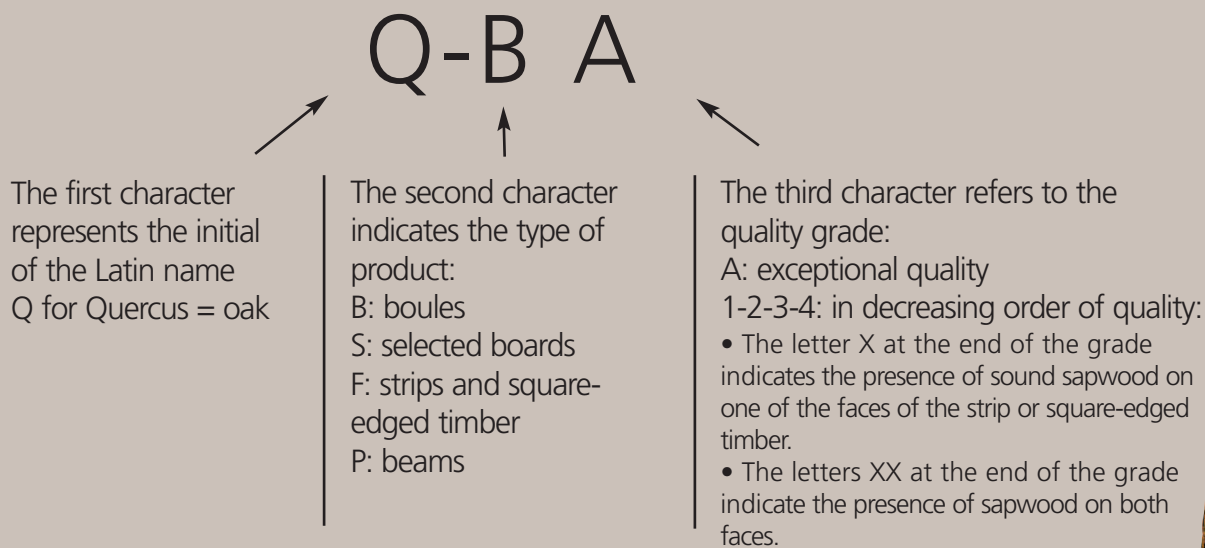
This document indicates the method for visually grading the appearance of oak sawn timber and specifies the designations and definitions of the different appearance grades for oak sawn timber.

This document applies to oak products in the following categories:

- Un-edged timber (selected boards and boules).
- Square-edged timber of thickness ≤ 41 mm.
- Beams: thickness + width ≥ 200 mm and thickness ≥ 80 mm.

Other oak products not included in these categories may, if necessary, be subject to specific contract requirements based on this standard.

The chosen designation features three characters (letters and numbers) including two or three extra letters if necessary:



The following grades have therefore been standardised:

Boules

Q-B A Q-B 1 Q-B 2 Q-B 3 Q-B 4

Selected boards

Q-S A Q-S 1 Q-S 2 Q-S 3 Q-S 4

Strips and square-edged timber

Q-F 1 a Q-F 1 b Q-F 2 Q-F 3 Q-F 4

Beams

Q-P A Q-P 1 Q-P 2

Dimensional grading of oak sawn timber

Boules

• **Boules** are marketed in categories of specific dimensions that are determined by the width of the central board, including the sapwood and measured halfway along the length, under bark, without any reductions and freshly sawn.

- Width for grade Q-B A: ≥ 350 mm
- Width for grades Q-B 1, Q-B 2, Q-B 3 and Q-B 4: ≥ 250 mm
- Narrowest width:
 - 120 mm, excluding sapwood, for the whole length of the board for grade Q-B A
 - 100 mm, excluding sapwood, measured halfway along the board for grade Q-B 1
 - 80 mm, excluding sapwood, measured halfway along the board for grade Q-B 2
 - 60 mm, excluding sapwood, measured halfway along the board for grades Q-B 3 and Q-B 4
- Minimum length: 2 meters & up

• **Selected boards** meet the same criteria (narrowest width and width) as those for boules.

Square-edged timber

The definitions below apply to two types of square-edged timber:

- Strips in widths of 40 to 99 mm: in fixed-width batches; length 250 to 2100 mm in 50 mm increments.
- Square-edged timber: 100 mm & up, in variable or fixed-width batches

Beams

Oak beams are commonly available in the following dimensions (freshly sawn) expressed in mm:

- 100x100 150x150 200x200
- 120x120 180x180 250x250

Rules for determining grades

Appearance grades for oak are defined in the EN 975-1 standard (2009).

Size variations are disregarded when grading timber quality.

Such variations are covered by the EN 1313-2 standard or governed by specific contract requirements.

1 - Selected boards:

Each board is assessed in terms of its quality. No more than 10% of boards with a grade lower than the lowest of the specified grades are permitted.

2 - Boules:

The entire boule is assessed in terms of its quality. In case of any features that are not permitted according to the corresponding grade definition, the volume is reduced accordingly. The proportion of grades admitted within a boule is given in the following table:

Proportion of grades admitted within a boule	
$\geq 65\%$	Specified grade
$< 25\%$	One grade lower
$< 10\%$	Two grades lower

3 - Strips or square-edged timber:

The quality of every sawn piece is assessed by the appearance of its faces and, if applicable, its edges, while taking account of the presence, extent, position and distribution of any features, specific sawing and deteriorations resulting from it.

In case of failure to meet any one of the specified conditions, the piece in question will be downgraded. Size defects due to sawing (irregular thicknesses and widths) are disregarded when appearance grading pieces (see standard EN 1313-2).

Such products may not be subjected to width and/or length reduction.

4 - Beams:

Only features distributed across the entire piece are taken into account, with the exception of dead knots, the maximum number of which is determined per linear metre.

Principles for taking features into consideration

Boules and selected boards

Grading face

a) For selected boards:

- Take account of features on the "top" face, which is defined as the face that can be seen on the production line after sawing.
- In case of special measuring-out arrangements, quality is determined by the face whose width is being measured.

b) For boules:

- Take account of features on the top face of the stack forming the boule.

Grading area

The grade for each board is determined using a virtual rectangle measuring 0.2 m x 2.0 m, which contains the maximum number of features or the most detrimental features on the grading face.

Features less than 10 cm from the edges or ends of a board are ignored, unless the width and length are too small to draw a rectangle of 0.20 m x 2 m. This approach is not suitable for Q-B A and Q-S A grades, where only the width can be reduced, which is then limited to one third of the width.

Presence of an isolated feature (no more than one): un-edged timber cannot be downgraded due to a single feature that is not permitted in the grading system. As a result, the feature is accepted by reducing the width or length.

Strips and square-edged timber

Grading face

- Take account of features on the best face.

Knots

Take account of the timber's length or the most affected linear metre if the length is > 1 m.

Concept of equivalence: except for Q-F 1a. This allows for any distribution of knots, provided that:

- The diameter of each knot is less than the permitted diameter.
- The sum of the diameters is less than the permitted maximum value.

Example for Q-F 2:

- The maximum permitted knot diameter is 25 mm.
- The maximum number is three, so the sum is 75 mm (25 mm x 3).

One possible distribution is four 10 mm knots, one 15 mm knot and one 20 mm knot.

Other features

These features are taken into account across the entire piece.

Beams

Take account of features across the piece as a whole, with the exception of dead knots, the maximum number of which is determined per linear metre.

Reminder: the method for measuring knots differs for appearance grading and structural grading (the principles are described in the appendix).

Boules and boards

Un-edged oak boules (or selected boards) are appearance graded by means of a virtual grading rectangle measuring 0,20 m x 2 m.

See page 4: tolerance for boards in boules

Features less than 10 cm from the board's edges are generally permitted with a reduction in volume.



Grades Q-B A and Q-S A

- Fairly straight boards with a practically straight grain.
- One sound knot permitted with a diameter less than 20 mm.
- Permitted with a reduction: an isolated knot less than 15% of the board width, unsound sapwood if isolated, sapwood with holes.

Excluded: not intergrown or unsound knots, ring shake, frost crack, bark pocket, included sapwood, brown pith, rot.



Grades Q-B 1 and Q-S 1

- Sound knots less than 5 mm, permitted if fewer than eight.
- Sound knots with a diameter between 5 and 25 mm, permitted where equivalent to one knot of less than 50 mm.
- Permitted with a reduction: one not intergrown or unsound knot less than 25 mm, one isolated knot less than 20% of the board width, ring shake, frost crack, bark pocket, unsound sapwood if isolated, brown pith less than 25%, sapwood with holes.

Excluded: included sapwood, rot.





Grades Q-B 2 and Q-S 2

- Sound knots less than 5 mm, permitted without any restrictions.
- Sound knots with a diameter between 5 and 40 mm, permitted where equivalent to one knot of less than 100 mm.
- Permitted with a reduction: one not intergrown or unsound knot less than 40 mm, one isolated knot less than 25% of the board width, ring shake, frost crack, bark pocket, unsound sapwood if isolated, brown pith less than 25%, rot if isolated, sapwood with holes.

Excluded: included sapwood.

Grades Q-B 3 and Q-S 3

- Sound knots less than 10 mm, permitted without any restrictions.
- Sound knots with a diameter between 10 and 70 mm, permitted where equivalent to one knot of less than 160 mm.
- Permitted with a reduction: one not intergrown or unsound knot less than 70 mm, one isolated knot less than 30% of the board width, ring shake, frost crack, bark pocket, unsound sapwood only if isolated, included sapwood, brown pith less than 25%, rot only if isolated, sapwood with holes



Grades Q-B 4 and Q-S 4

No restrictions in terms of features, unless stipulated as an exclusion in the contract.

Strips and square-edged timber

For all grades, the letter X indicates the presence of sound sapwood less than two thirds of the thickness, and XX if it is present on both faces.

Grades Q-F 1a

- Pieces with a straight grain (3%) free of features other than sound knots.
- One sound knot less than 10 mm is permitted in pieces with a width less than 120 mm (two knots for other pieces).
- 20% of pieces may have an additional sound knot on the face.

Grades Q-F 1b

- Pieces are practically free of features other than sound knots. Sound knots less than 5 mm are ignored.
- Three knots less than 12 mm are permitted in pieces with a width less than 120 mm and one extra knot for every additional 40 mm in width in case of wider pieces.



Grades Q-F 2

- Pieces are practically free of features other than knots.
- Sound knots less than 5 mm are ignored.
- Three knots less than 25 mm are permitted in pieces with a width less than 120 mm and one extra knot for every additional 40 mm in width in case of wider pieces.



Grades Q-F 3

- Sound knots less than 10 mm are ignored.
- Three knots less than 40 mm are permitted in pieces with a width less than 120 mm and one extra knot for every additional 40 mm in width in case of wider pieces.
- Tolerance for one dead or unsound knot less than 20 mm and wane less than 3 mm.

Excluded: bark pocket, brown pith, rot, holes, boxed heart or exposed pith, included sapwood.



Grades Q-F 4

- Sound knots less than 70 mm, permitted without any restrictions.
- Tolerance for two dead or unsound knots, one less than 35 mm and the other less than 20 mm.
- Wane permitted up to 10% of the width and 20% of the length.

Excluded: rot, holes.

Structural grading of beams

NF B 52-001 part 1 (2011)

The construction market requires structural grading (NF B 52-001 standard) of sawn timber with the CE marking (estimate of the potential mechanical strength) for the beams.

For the following two product categories, rules have been defined for visually sorting pieces:

• Beams with a thickness > 100 mm

LARGE SECTION

Criteria	Visual classes	1	2	3
	Strength classes according to EN 338	D30	D24	D18
Growth ring width		< 10 mm		
Knots	Sound and inter-grown knots on the face	$\varnothing < 1/3$ of the width	$\varnothing < 1/2$ of the width	$\varnothing < 3/4$ of the width
	Sound and inter-grown knots on the edge	$\varnothing < 1/2$ of the thickness	$\varnothing < 1/2$ of the thickness	$\varnothing < 3/4$ of the thickness
	Other knots	Excluded	$\varnothing < 1/3$ of the width or thickness And $\varnothing < 50$ mm	$\varnothing < 1/3$ of the width or thickness And $\varnothing < 60$ mm
Grain slope	Local	1 : 5	1 : 4	1 : 3
	Général	1 : 10	1 : 10	1 : 10
Sapwood	cannot be used to predict the natural durability class	Sound sapwood less than 15% of the face width	Sound sapwood permitted on the arrises if less than half the width of the faces and edges	
Wane		Less than 10% of the width of the face and edge across no more than 25% of the length	Less than 10% of the width of the face and edge across no more than 35% of the length	

• Other beams with a thickness between 22 mm (EN 336) and 100 mm, and a cross-section greater than 2 200 mm² (NF 52-001)

SMALL SECTION

Criteria	Visual classes	1	2	3
	Strength classes according to EN 338	D 30	D 24	D 18
Growth ring width		< 10 mm		
Knots	Sound and inter-grown knots on the face (1)	$\varnothing < 1/5$ of the width	$\varnothing < 1/3$ of the width	$\varnothing < 1/2$ of the width
	Sound and inter-grown knots on the edge (2)	$\varnothing < 30$ mm et $\varnothing < 1/3$ of the thickness	$\varnothing < 30$ mm et $\varnothing < 1/2$ of the thickness	$\varnothing < 45$ mm et $\varnothing < 4/5$ of the thickness
	Other knots	Excluded	$\varnothing < 30$ mm and $< 1/3$ of the thickness or the width	$\varnothing < 45$ mm and $< 1/3$ of the thickness or the width
Grain slope	Local	1:3		
	Général	1:5		
Sapwood	cannot be used to predict the natural durability class	Sound sapwood less than 15% of the face width	Sound sapwood permitted on the arrises if less than half the width of the faces and edge	
Wane		Less than 10% of the width of the face and edge across no more than 25% of the length	Less than 10% of the width of the face and edge across no more than 35% of the length	

Correspondence between CE appearance and strength classes

Campaigns aimed at grading French oak have led to a correspondence between the methods used to appearance grade and strength grade beams **with a thickness > 100 mm**. As such, a structural grade can be assigned to an appearance grade.

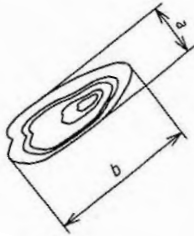
Appearance classes	Strength classes
EN 975 - 1	EN 338
Q-P A	D 30
Q-P 1	D 24
Q-P 2	D 18

Appendix

Principles for taking features into consideration

The quality criteria are determined in accordance with the rules specified in the EN 1310 and EN 1311 standards.

Appearance



Knot sizes are measured as the average of their largest and smallest diameters

In case of strips and square-edged timber, knots with a diameter of less than 5 mm, which are excluded from grade A, are not taken into consideration for other grades.

Cat's paws are measured as one knot whose size corresponds to the diameter of the cat's paw.

In case of knots whose size is less than the maximum permitted size for a given grade, a larger number of knots may be permitted. However, the sum of the dimensions of the knots in the measuring-out area must not exceed the maximum size permitted for knots for a given grade.

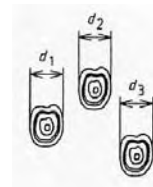
Structure



The size is the width of the knot or group of knots, measured perpendicular to the longitudinal axis of the piece.

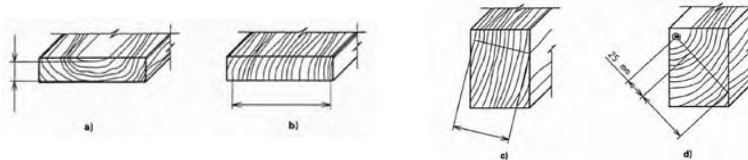


Groups of knots are measured on the surface where they were cross-cut. Dimension d is the total width of the group of knots or the sum of the individual knot sizes, such that:
 $d = d_1 + d_2 + \dots + d_n$



Growth ring widths are measured at each end of the piece.

The value used is the average of both measurements. Measurements are made as follows:



CE marking

The CE marking, which became mandatory on 1 January 2012 for all sawn timber used for structural applications in the construction industry, requires, according to harmonised standard EN 14081-1, the potential load-bearing characteristics of each beam to be estimated either by visual grading (NF B 52-001) or machine grading which uses non-destructive sounding techniques (EN 14081 standard (Parts 2-4)).

Irrespective of the method used, timber must be graded based on how its intrinsic features are qualified in several different mechanical strength classes (EN 338), the mechanical properties of which can be used directly for structural calculations.

Information concerning the CE marking for oak sawn timber must be included on the label affixed to each stack or piece:

Name of the sawmill or its identification mark	CE	Number of the organisation notified
Identification code of the document accompanying the sale		NF B 52-001
The last TWO figures of the year in which the marking was first applied	Dry graded (if applicable)	D1 ou D2 ou D3

Beams



Appearance grade Q-P A

- Sawn timber with sharp arrises; in case of pieces longer than 3 m, wane less than 10% of the face width is permitted across no more than 25% of the length.
- Sound sapwood permitted on two arrises if the total width is less than 15% of the face width.
- Fully or partly intergrown sound knots are permitted if the diameter is less than one third of the face width.
- Dead knots, permitted where equivalent to two dead knots with a diameter less than 15 mm per linear metre.
- Boxed heart permitted, as well as slight traces of heartwood on two faces. Slope of the grain less than 7%, not exceeding 12% locally.

Excluded: unsound knots, end shake, frost crack, ring shake, star shake, curly grain, bark pocket, unsound sapwood, brown pith, brown streak, rot, holes.



Appearance grade Q-P 1

- Sawn timber with practically sharp arrises, permitting wane less than 10% of the face width across no more than 30% of the length.

This width tolerance is increased to 15% for sections above 250 x 250 mm.

- Sound sapwood permitted on two arrises if the total width is less than 15% of the face width.
- Fully or partly intergrown sound knots are permitted if the diameter is less than half the face width.
- Two dead knots are permitted per linear metre if less than one quarter of the face width.
- Boxed heart permitted, as well as traces of heartwood on both faces. Slope of the grain less than 12%, not exceeding 20% locally.

Permitted on a limited number of pieces: brown streak, black holes, brown pith.

Excluded: unsound knots, frost crack, ring shake, star shake, curly grain, bark pocket, unsound sapwood, rot, white holes.



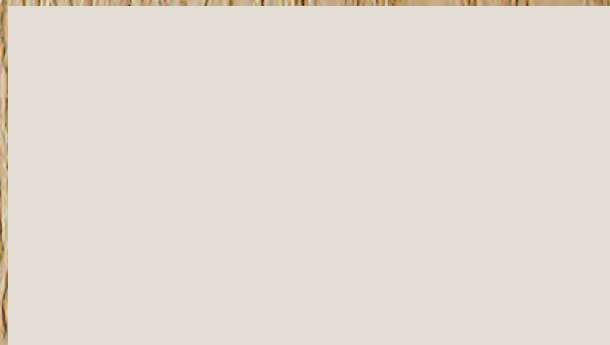
Appearance grade Q-P 2

- Timber with wane less than 15% of the face width across no more than 30% of the length.
- Dead knots permitted if less than one third of the face.
- One unsound knot is permitted per linear metre if less than 15% of the piece width.

Permitted without any restrictions:
sound sapwood, fully or partly intergrown sound knots, sloping grain,
brown pith, brown streak, black holes, exposed pith.

Permitted on a limited number of pieces: superficial bark pocket, unsound sapwood.

Excluded: frost crack, ring shake (unless it cannot be seen on the faces), rot, white holes.

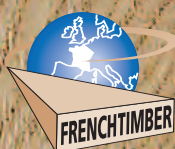


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