EUROPEAN ASSESSMENT DOCUMENT

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STRENGTH GRADED STRUCTURAL TIMBER – SQUARE EDGED LOGS WITH WANE - CHESTNUT

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Contents

1 SCOPE OF THE EAD

1.1 Description of the construction product

The product, "Strength graded structural timber – Square edged logs with wane – Chestnut", is a full log that is edged on four sides maintaining boxed heart according to the grading rules of Annex 1.

The square edged logs with wane of chestnut are full logs

- visually graded according to Annex 1,
- without preservative treatment,
- without flam retardant and
- exclusively made in virgin wood; no recycled wood is used.

Square edged logs with wane of chestnut do not feature a full square cross section with four sharp arrises, but maintain the wane along the entire length of the log, i.e.

- sum of lengths of sections along the product with $s \geq 1/3$:

  At least 1/3 of the length of the product

- local sections along the product with $s \geq 9/10$:

  Along a length not exceeding 0.5 m each section

NOTE The cross sections of the square edged logs with wane of chestnut are virtually squares, i.e. $h \approx b$ according to the grading rules of Annex 1.

Where

s ..... Wane as defined in Anx 1.3.4.1

h ..... Larger side of the cross section, see Anx 1.3.4.1

b ..... Smaller side of the cross section, see Anx 1.3.4.1

There is one kind of square edged logs with wane of chestnut for structural use,

- with constant external dimensions of the cross section along the entire length.

☒ The product is not covered by a harmonised European standard.

Concerning product packaging, transport, storage, maintenance, replacement and repair it is the responsibility of the manufacturer to undertake the appropriate measures and to advise his clients on the transport, storage, maintenance, replacement and repair of the product as he considers necessary.

It is assumed that the product will be installed according to the manufacturer's instructions or (in absence of such instructions) according to the usual practice of the building professionals.

Relevant manufacturer's stipulations having influence on the performance of the product covered by this European Assessment Document shall be considered for the determination of the performance and detailed in the ETA.

1.2 Information on the intended use(s) of the construction product

1.2.1 Intended use(s)

The square edged logs with wane of chestnut are intended for load bearing uses in buildings and civil engineering works.

1.2.2 Working life/Durability

The assessment methods included or referred to in this EAD have been written based on the manufacturer's request to take into account a working life of the "Strength graded structural timber – Square edged logs with wane – Chestnut" for the intended use of 50 years when installed in the

works, provided that the "Strength graded structural timber – Square edged logs with wane – Chestnut" is subject to appropriate installation, see Clause 1.1.3. These provisions are based upon the current state of the art and the available knowledge and experience.

When assessing the product the intended use as foreseen by the manufacturer shall be taken into account. The real working life may be, in normal use conditions, considerably longer without major degradation affecting the basic requirements for works[1].

The indications given as to the working life of the construction product cannot be interpreted as a guarantee neither given by the product manufacturer or his representative nor by EOTA when drafting this EAD nor by the Technical Assessment Body issuing an ETA based on this EAD, but are regarded only as a means for expressing the expected economically reasonable working life of the product.

1.3 Specific terms used in this EAD

1.3.1 Characteristic strength

population 5 % percentile value, obtained from the results of tests with a duration of (300 ± 120) s using test pieces at an equilibrium moisture content resulting from a temperature of 20 °C and a relative humidity of 65 %.

1.3.2 Dry-graded timber

timber that is part of a batch that has intentionally been graded at a mean moisture content of 20 % or less, without any measurement exceeding 24 %.

1.3.3 Nominal cross section

Cross section defined by the rectangle circumscribing the piece of timber at mid-length.

NOTE The cross sections of the square edged logs with wane of chestnut are virtually squares, i.e. $h \approx b$ according to the grading rules of Annex 1.

1.3.4 Batch

quantity of timber of one species, one population and one size graded in one working shift. An order of a combination of different sizes of one customer may be considered as a batch as well.

1.3.5 Species population

timber from an identifiable source and of a species that is, or is intended to be, strength graded and marketed as a commercially defined product.

1.3.6 Timber size

For the nominal cross section, see 1.3.3, the permitted deviations are given in EN 336[2].

1.3.7 Visual strength grading

process by which a piece of timber can be sorted, by means of visual inspection, into a grade to which characteristic values of strength, stiffness and density may be allocated.

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1 The real working life of a product incorporated in a specific works depends on the environmental conditions to which that works is subject, as well as on the particular conditions of the design, execution, use and maintenance of that works. Therefore, it cannot be excluded that in certain cases the real working life of the product may also be shorter than referred to above.

2 Reference documents are listed in Clause 4.

1.3.8 Wane

original rounded surface of a log, without bark or with restricted residual part of bark, also regularized by machining with the removal of not more than 5 mm under the bark, which connects two adjacent faces of the piece of timber.

2 ESSENTIAL CHARACTERISTICS AND RELEVANT ASSESSMENT METHODS AND CRITERIA

2.1 Essential characteristics of the product

Table 1, shows how the performance of the square edged logs with wane of chestnut is established in relation to the essential characteristics.

Table 1 Essential characteristics of the product and assessment methods and criteria for the performance of the product in relation to those essential characteristics

№	Essential characteristic	Assessment method	Type of expression of product performance level, class, or description
Basic Works Requirement 1: Mechanical resistance and stability			
1	**Shape**	2.2.1	Description
2	**Dimensions**	2.2.2	Description
3	**Bending strength**	2.2.3	Level
4	**Tension strength parallel**	2.2.4	Level
5	**Tension strength perpendicular**	2.2.5	Level
6	**Compression strength parallel**	2.2.6	Level
7	**Compression strength perpendicular**	2.2.7	Level
8	**Shear strength**	2.2.8	Level
9	**Modulus of elasticity parallel**	2.2.9	Level
10	**Modulus of elasticity perpendicular**	2.2.10	Level
11	**Shear modulus**	2.2.11	Level
12	**Density**	2.2.12	Level
13	**Dimensional stability**	2.2.13	Description
14	**Durability of timber**	2.2.14	Description
Basic Works Requirement 2: Safety in case of fire			
15	**Reaction to fire**	2.2.15	Class
16	**Resistance to fire**	2.2.16	Description
Basic Works Requirement 3: Hygiene, health and environment			
17	**Content and/or release of dangerous substances**	2.2.17	Description

№	Essential characteristic	Assessment method	Type of expression of product performance level, class, or description
Basic Works Requirement 4: Safety and accessibility in use			
18	**Same as basic requirement 1**	—	—

2.2 Methods and criteria for assessing the performance of the product in relation to essential characteristics of the product

Characterisation of products to be assessed shall be done in accordance with available specifications, notably by

- Samples shall be selected from the population of timber visually graded according to Annex 1. The specimen shall be representative of the population. The timber shall represent the timber source, sizes and quality that will be graded in production. Each sample shall be from one source.

  NOTE 1 Any known or suspected difference in the mechanical properties of the population distribution due to growth regions, sawmills, tree size or method of conversion should be represented within the number of samples selected, by a similar proportion to their frequency in the population. This should be the major influence in determining the number and size of samples.

- The number of specimens in each sample shall be not less than 40.

  NOTE 2 Where samples are small and/or few in number the characteristic values will be considered according to EN 384, see Clause 5.4 only for visual strength graded timber.

- Test specimens for shear, tension perpendicular to grain and compression perpendicular to grain strengths are comparatively small and therefore shall be free of strength reducing characteristics, but shall represent the full range of growth areas, density and rates of growth.

- The following mechanical properties are referred to the Nominal cross section, see Clause 1.3.3 of the European Assessment Document.

Basic Works Requirement 1

2.2.1 Shape

Shape of square edged logs with wane of chestnut is determined by visual inspection and measurement of dimensions regarding wane and external dimensions of the cross section according to Annex 1.

Shape of square edged logs with wane of chestnut with regard to wane and external dimensions of the cross section shall conform to Clause 1.1.

2.2.2 Dimensions

Dimensions of square edged logs with wane of chestnut given in Annex 1 shall be determined according to EN 1309-1.

Tolerances of cross section shall be according to EN 336. Other dimensions shall, according to Clause 1.1, meet the tolerances specified in Annex 1.

2.2.3 Bending strength

The test shall be carried out in accordance with Clause 19 of EN 408.

Calculation of the characteristic value shall be performed according to Clauses 5.3 (where relevant) and 5.4 (only for visual grading method) of EN 384

2.2.4 Tension strength parallel

The test shall be carried out in accordance with Clause 13 of EN 408.

If no structural size test data are available, the characteristic value shall be determined in accordance with Clause 6.2.2 (where relevant) of EN 384.

2.2.5 Tension strength perpendicular

The test shall be carried out in accordance with Clause 16 (where relevant) of EN 408.

If no structural size test data are available, the characteristic value shall be determined in accordance with Clause 6.2.3 of EN 384.

2.2.6 Compression strength parallel

The test shall be carried out in accordance with Clause 15 of EN 408.

If no structural size test data are available, the characteristic value shall be determined in accordance with Clause 6.2.2 (where relevant) of EN 384.

2.2.7 Compression strength perpendicular

The test shall be carried out in accordance with Clause 16 (where relevant) of EN 408.

If no structural size test data are available, the characteristic value shall be determined in accordance with Clause 6.2.4 of EN 384.

2.2.8 Shear strength

The test shall be carried out in accordance with Clause 18 of EN 408.

If no structural size test data are available, the characteristic value shall be determined in accordance with Clause 6.2.2 (where relevant) of EN 384.

2.2.9 Modulus of elasticity parallel

The test shall be carried out in accordance with Clause 9 of EN 408.

Calculation of the mean characteristic value shall be performed according to Clauses 5.3 (where relevant) and 5.5 of EN 384.

Calculation of the 5 % percentile characteristic value shall be performed according to Clause 6.2.5 of EN 384.

2.2.10 Modulus of elasticity perpendicular

The test shall be carried out in accordance with Clause 17 of EN 408.

If no structural size test data are available, calculation of the mean characteristic values shall be performed according to Clause 6.2.6 of EN 384.

2.2.11 Shear modulus

The test shall be carried out in accordance with Clause 11.1 (where relevant) or 11.2 of EN 408.

If no structural size test data are available, calculation of the mean characteristic value shall be performed according to Clause 6.2.7 of EN 384.

2.2.12 Density

The measurements shall be carried out in accordance with Clause 6.1 of ISO 3131.

NOTE Where not all the specimens are tested to failure, the density of each specimen is permitted to be determined from the mass and volume of the whole specimen and adjusted to density of the small defect-frees prism given in ISO 3131 by dividing by 1.05.

Calculation of the mean value shall be performed with the densities of the individual specimens determined according to Clause 8 (where relevant) of EN 384.

Calculation of the characteristic value of density as 5 % percentile shall be performed according to Clause 8 (where relevant) of EN 384.

2.2.13 Dimensional stability

Dimensional stability shall be considered as swelling and shrinkage of structural timber due to changes of its moisture content.

Swelling and shrinkage value can be regarded as a constant value in the perpendicular to grain and parallel to grain directions of timber as given in EN 336.

2.2.14 Durability of timber

Natural durability without preservative treatment shall be taken as given in EN 350-2. If the species is not given in EN 350-2, it shall be tested according to EN 350-1.

The timber shall have adequate natural durability in accordance with EN 350-2 for the respective service classes as defined in EN 1995-1-1, which shall be declared in the ETA.

Basic Works Requirement 2

2.2.15 Reaction to fire

The square edged logs with wane of chestnut is considered to satisfy the requirements for performance class D-s2, d0 of the characteristic reaction to fire in accordance with the Commission Decision 2003/43/EC, as amended[3], without the need for testing on the basis of it fulfilling the conditions set out in that Decision and its intended use being covered by that Decision.

Therefore the performance of the product is class D-s2, d0.

Otherwise the square edged logs with wane of chestnut shall be tested, using the test method(s) relevant for the corresponding reaction to fire class, in order to be classified according to EN 13501-1.

2.2.16 Resistance to fire

Either

the part of the works or assembled system in which the square edged logs with wane of chestnut are intended to be incorporated, installed or applied shall be tested, using the test method relevant for the corresponding fire resistance class, in order to be classified according to EN 13501-2.

Or

the calculation methods and charring rates as given in EN 1995-1-2 shall be applied.

Basic Works Requirement 3

2.2.17 Content and/or release of dangerous substances

The performance of the square edged logs with wane of chestnut related to the emissions and/or release and, where appropriate, the content of dangerous substances will be assessed on the basis of the information provided by the manufacturer using the methods and criteria of EOTA TR 034.

Basic Works Requirement 4

The same applies as for basic requirement for construction works 1.

3 See in particular amendment by Commission Decision 2003/593/EC of 7 August 2003.

3 ASSESSMENT AND VERIFICATION OF CONSTANCY OF PERFORMANCE

3.1 System(s) of assessment and verification of constancy of performance

For the products covered by this EAD the applicable European legal act is: Commission Decision 97/176/EC as amended.

The systems to be applied are:

1 for products of reaction to fire class A1, A2, B, or C for which a clearly identifiable stage in the production process results in an improvement of the reaction to fire classification (e.g. an addition of fire retardants or a limiting of organic material)

2+ for products of reaction to fire class A1, A2, B, or C for which there is no clearly identifiable stage in the production process results in an improvement of the reaction to fire classification

2+ for products of reaction to fire class D or E

2+ for products of reaction to fire class A1 to E, or F that do not require to be tested for reaction to fire (e.g. Products/materials of Classes A1 according to Commission Decision 96/603/EC)

3.2 Tasks of the manufacturer

The cornerstones of the actions to be undertaken by the manufacturer of the product in the process of assessment and verification of constancy of performance are laid down in Table 2.

Table 2 Control plan for the manufacturer – Cornerstones

№	Subject/type of control	Test or control method	Criteria, if any	Minimum number of samples	Minimum frequency of control
Factory production control (FPC)					
1	According to EN 14081-1 for visual strength grading timber				

3.3 Tasks of the notified body

The cornerstones of the actions to be undertaken by the notified body in the process of assessment and verification of constancy of performance for the product are laid down in Table 3.

Table 3 Control plan for the notified body – Cornerstones

№	Subject/type of control	Test or control method	Criteria, if any	Minimum number of samples	Minimum frequency of control
Initial inspection of the manufacturing plant and of factory production control					
1	The notified product certification body shall verify the ability of the manufacturer for a continuous and orderly manufacturing of the product according to the European Technical Assessment. In particular the following items shall be appropriately considered – personnel and equipment – the suitability of the factory production control established by the manufacturer – full implementation of the prescribed test plan				—

№	Subject/type of control	Test or control method	Criteria, if any	Minimum number of samples	Minimum frequency of control
Continuous surveillance, assessment and evaluation of factory production control					
2	The notified product certification body shall verify that – the manufacturing process – the system of factory production control – the implementation of the prescribed test plan are maintained.				1 per year

4 REFERENCE DOCUMENTS

As far as no edition date is given in the list of standards thereafter, the standard in its current version at the time of issuing the European Technical Assessment, is of relevance.

EN 336:2003	Structural timber – Sizes, permitted deviations
EN 350-1:1994	Durability of wood and wood-based products – Natural durability of solid wood – Part 1: Guide to the principles of testing and classification of the natural durability of wood
EN 350-2:1994	Durability of wood and wood-based products – Natural durability of solid wood – Part 2: Guide to natural durability and treatability of selected wood species of importance in Europe
EN 384:2010	Structural timber – Determination of characteristic values of mechanical properties and density
EN 408:2010	Timber structures – Structural timber and glued laminated timber – Determination of some physical and mechanical properties
EN 1309-1:1997	Round and sawn timber – Method of measurement of dimensions – Part 1: Sawn timber
EN 1310:1997	Round and sawn timber – Method of measurement of features
EN 1995-1-1:2004 EN 1995-1-1/AC:2006 EN 1995-1-1/A1:2008	Eurocode 5 – Design of timber structure – Part 1-1: General – Common Rules and rules for building
EN 1995-1-2:2004 EN 1995-1-2/AC:2009	Eurocode 5 – Design of timber structure – Part 1-1: General – Structural fire design
EN 13183-1:2002 EN 13183-1/AC:2003	Moisture content of a piece of sawn timber – Determination by oven dry method
EN 13183-2:2002 EN 13183-2/AC:2003	Moisture content of a piece of sawn timber – Part 2: Estimation by electrical resistance method
EN 13501-1:2007+ EN 13501-1/A1:2009	Fire classification of construction products and building elements – Part 1: Classification using test data from reaction to fire tests
EN 13501-2:2007+ EN 13501-2/A1:2009	Fire classification of construction products and building elements – Part 2: Classification using data from fire resistance tests, excluding ventilation services
EN 14081-1:2005+ EN 14081-1/A1:2011	Timber structures – Strength graded structural timber with rectangular cross section – Part 1: General requirements
ISO 3131:1975	Wood – Determination of density for physical and mechanical tests
EOTA TR 034	EOTA Technical Report TR 034, General ER 3 Checklist for EADs/ETAs – Content and/or release of dangerous substances in products/kits

96/603/EC	Commission Decision 96/603/EC of 04 October 1996 establishing the list of products belonging to Classes A "No contribution to fire" provided for in Decision 94/611/EC implementing Article 20 of Council Directive 89/106/EEC on construction products, OJ L 267 of 19.10.1996, p. 23, Amended by Commission Decision 2000/605/EC of 26 September 2000, OJ L 258 of 12.10.2000, p. 36, and Commission Decision 2003/424/EC of 06 June 2003 OJ L 144 of 12.06.2003, p. 9
97/176/EC	Commission Decision 97/176/EC of 17 February 1997 on the procedure for attesting the conformity of construction products pursuant to Article 20 (2) of Council Directive 89/106/EEC as regards structural timber products and ancillaries, OJ L 73 of 14.03.1997, p. 19, Amended by Commission Decision 2001/596/EC of 8 January 2001, OJ L 209 of 02.08.2001, p. 33
2003/43/EC	Commission Decision 2003/43/EC of 17 January 2003 establishing the classes of reaction-to-fire performance for certain construction products, OJ L 13, 18.01.2003, p. 35 Amended by Commission Decision 2003/593/EC of 07 August 2003, OJ L 201, 08.08.2003, p. 25, Commission Decision 2006/673/EC of 05 October 2006, L 276, 07.10.2006, p. 77, Commission Decision 2007/348/EC of 15 May 2007, OJ L 131, 23.05.2007, p. 21, and corrected by Corrigendum, OJ L 33, 08.02.2003, p. 44
CPR 305/2011	Regulation (EU) № 305/2011 of the European Parliament and of the Council of 09 March 2011 laying down harmonised conditions for the marketing of construction products and repealing Council Directive 89/106/EEC, OJ L 088 of 04.04.2011, p. 5

ANNEX 1 GRADING OF STRENGTH GRADED STRUCTURAL TIMBER – SQUARE EDGED LOGS WITH WANE

Anx 1.1 General

This Annex specifies the terminology, the methods to measure the characteristics and the rules for visual strength grading of timber destined to use as load-bearing element.

This Annex covers structural solid timber of any size and moisture content, only identifiable with the definition of strength graded structural timber - square edged logs with wane of chestnut, see Clause 1.1.

The product is either dry-graded as defined in Clause 1.3.2 or not.

Anx 1.2 Terms and definitions

For the purposes of this Annex the following terms and definitions apply.

Anx 1.2.1 External dimension

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

Anx 1.2.2 Cross section

Section defined by the rectangle circumscribing the piece of timber and perpendicular to the longitudinal axis.

NOTE The cross sections of the square edged logs with wane of chestnut are virtually squares, i.e. $h \approx b$ according to the grading rules of Annex 1.

Anx 1.2.3 Maximum cross section

Cross section with the maximum thickness

Anx 1.2.4 Eccentricity

Distance between the pith and the geometric centre of the cross section of the piece.

Anx 1.2.5 Taper

Gradual reduction in cross section of the piece of timber along its length.

Anx 1.2.6 Warp

Distortion from the geometrical shape of the piece due to spring or twist.

Anx 1.2.7 Nominal cross section

Cross section defined by the rectangle circumscribing the piece of timber at mid-length.

NOTE The cross sections of the square edged logs with wane of chestnut are virtually squares, i.e. $h \approx b$ according to the grading rules of Annex 1.

ANX 1.2.8 Grade

The group to which the piece of timber is assigned by visual strength grading according the rules of this Annex.

Anx 1.3 Measurement of Characteristic

Anx 1.3.1 General

Each piece of visual graded timber can be assigned to a grade if it meets the requirements given for that grade. Therefore, it is the worst defect, wherever it is located, that determines the grade assignment.

If the piece of timber cannot be assigned to any of the specified grades, it shall be rejected as not gradable for structural uses.

The limitations on the characteristics for the different timber populations are reported in Table 5.

Anx 1.3.2 Reference moisture content

When a piece of timber is graded at a moisture content higher than 20 %, some characteristics may not be visible or may not be easy to assess.

The moisture content of a seasoned or dried piece of timber shall be determined by the electric method in accordance with EN 13183-2, with one or more measuring points. In the case of multiple measuring points, the reference value is given by the arithmetic mean of all measurements, by the equation:

$$u_{\text{mean}} = \frac{1}{n} \cdot (u_1 + u_2 + \ldots + u_n)$$

Where:

u_1, u_2, u_n..... individual measurement values

n ..... number of measurements

Because of the strong influence of the surface moisture content and the possible variations of the moisture content in transversal direction, it is opportune to use insulated electrodes with fully efficient insulation.

Other measurement methods are also accepted if the correspondence with the electric method in accordance with EN 13183-2 is proved. In the cases of dispute, different agreements between the parties excepted, the estimation of the average moisture content shall be performed by the oven dry method defined in EN 13183-1.

Anx 1.3.3 Strength-reducing characteristics

Anx 1.3.3.1 Knots

The following instructions apply to single knots and to knot groupings. The practical instructions to distinguish them are illustrated in Figure 1.

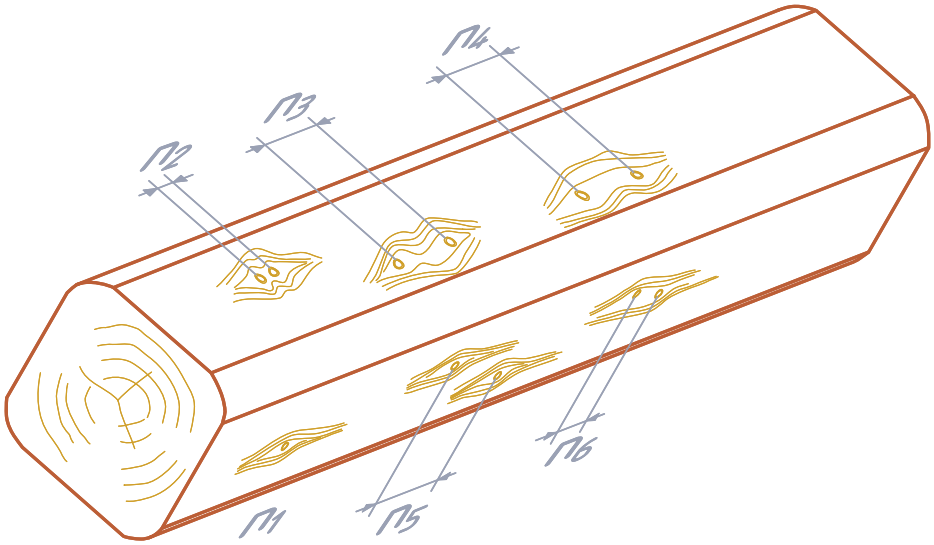


Figure 1 Examples of single knots and knot groupings

Key

Knots:

n_1 ..... Single knot

n_2 ..... Knot grouping, aligned and closer than 150 mm

n_3 ..... Single knots, aligned but more than 150 mm apart

n_4 ..... Knot grouping, more than 150 mm apart but the grain does not regain its original direction between the knots

n_5 ..... Single knots, although within a distance of 150 mm, they are not aligned and the grain between them regains its original direction

n_6 ..... Knot grouping, the grain does not regain its original direction between them

Single knots having a diameter, d, smaller than 5 mm are not considered.

All types of knots are admissible (intergrown, loose, sound, unsound, etc.).

Single knots and knot groupings are permitted if they satisfy the limitations specified for the grade.

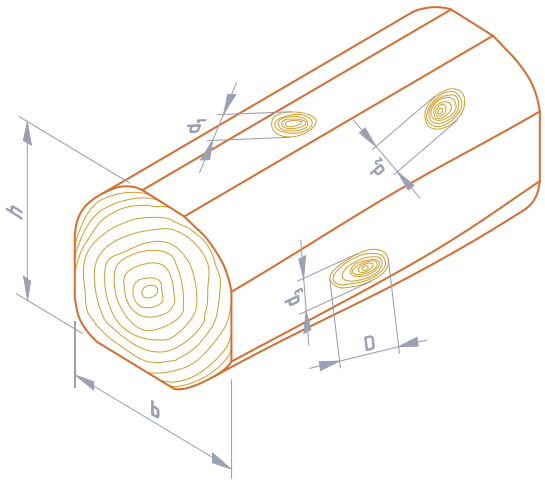


Figure 2 Measurement of knot diameter

For single knots, see Figure 2, the ratio of knot minimum diameter to the thickness upon which the knot is taken shall be calculated, according to the equation:

$$A = \max\left[\frac{d_1}{b}; \frac{d_2}{\min(b;h)}; \frac{d_3}{h}\right]$$

Where:

d_1, d_2, d_3.....minimum knot diameter

b, h.....thickness upon which the knot is taken

For the knots at the wane, the minimum knot diameter d shall be divided by the smaller side of the timber cross section at the point of knot measurement.

For knot grouping, the minimum diameter of all the grouped knots shall be added and the ratio A_g of the sum to the thickness upon which the knot grouping is measured shall be calculated.

The greater ratio of the four faces of the piece shall be considered.

For chestnut the maximum knot diameter, D, shall be considered.

Anx 1.3.3.2 Slope of grain

The general grain direction is measured on a minimum length of 1 000 mm. The slope of grain is calculated as height x divided by the horizontal length y, see Figure 3. This ratio is expressed in percentage according to the equation:

$$F = \frac{x}{y} \cdot 100$$

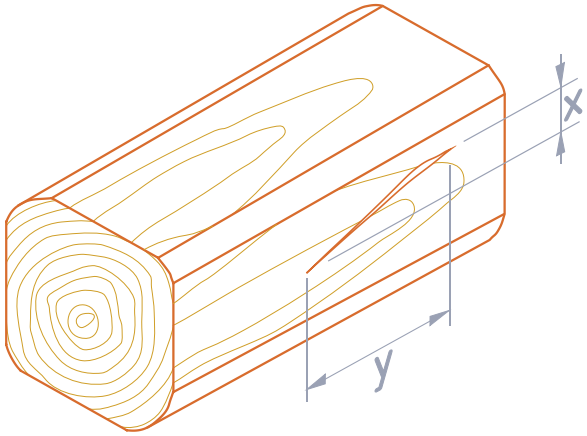


Figure 3 Measurement of the slope of grain by means of shrinkage fissures

Key

x.....height

y.....length

The slope of grain can be determined based on the fissures if visible, or with the correct use of a marking tool, see Figure 4, in accordance with EN 1310.

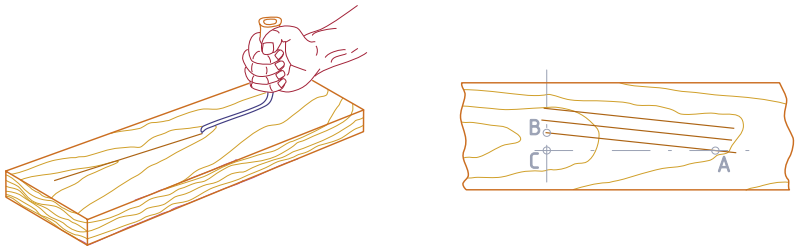


Figure 4 Measurement of the slope of grain using the marking tool

Key

$\overline{AB}$ .....grain direction, determined with the marking tool

$\overline{AC}$ .....geometrical axis of the piece of timber

Slope of grain is given by the equation:

$$\frac{\overline{BC}}{\overline{AC}} \cdot 100$$

Anx 1.3.3.3 Density and ring width

The average density shall be determined for each piece of timber by the ratio of its mass M (in kilograms, measured with an accuracy of 1 %), and its volume V (in cubic metres, obtained by multiplying the area of the mid cross section by the piece length and expressing the result with at least 3 significant figures), and at the moisture content of 20 % (see Clause Anx 1.3.2).

The ring width shall be measured at both ends of the piece of timber. It is the average width of the growth rings, expressed in millimetres. The measurement is taken on the longest line as perpendicular as possible to the growth rings and starting at y = 25 mm from the pith, see Figure 5. The ring width is given by the equation:

$$\omega = \frac{Z}{N}$$

Where:

Z.....at least 75 mm (when possible)

N.....the number of rings included in z

ω.....the ring width

Z.....longest line perpendicular to the growth rings

y.....minimum distance from the pith

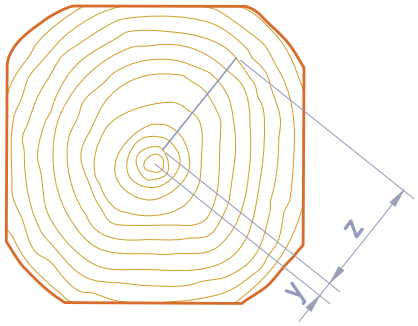


Figure 5 Measurement of the ring width

Anx 1.3.3.4 Shrinkage fissures

The length and the depth of the shrinkage fissures is linked to the moisture content of the piece of timber, therefore, the grade limitations apply only to timber at a moisture content of 20 % or lower, see Anx 1.3.2.

Anx 1.3.3.5 Ring shake

Single shakes, not reaching a lateral surface but visible on the ends, are permitted if not continuous for the whole length of the piece of timber and if they meet the limitations on maximum radius and eccentricity specified for the different timber populations.

If the grading is performed on timber having a moisture content higher than the fibre saturation point a “probable ring shake” shall be considered, when a growth ring (visible in the cross section) has a width at least twice the width of the narrowest of the two rings immediately adjacent,

preceding and following. Any probable ring shake has to be considered as an effective shake, and to be permitted, it shall satisfy the same limitations as the effective shake, see Figure 8.

Figure 6 and Figure 7 show the methods to measure the following parameters: the maximum radius of the ring shake (r_{max}) and the eccentricity.

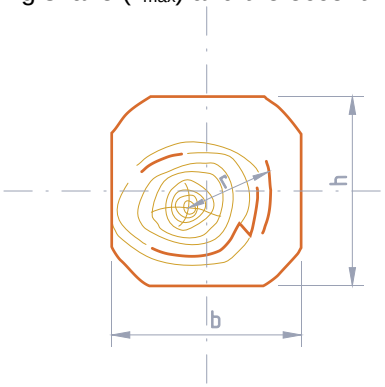


Figure 6 Measurement of maximum radius of ring shake

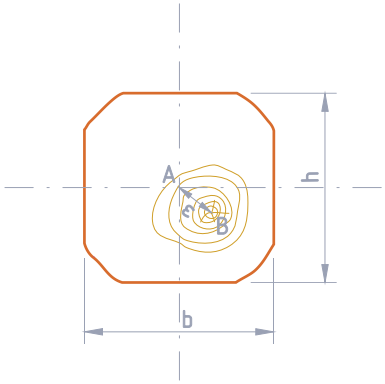


Figure 7 Measurement of eccentricity

Key

r_{max} ..... maximum radius of the ring shake

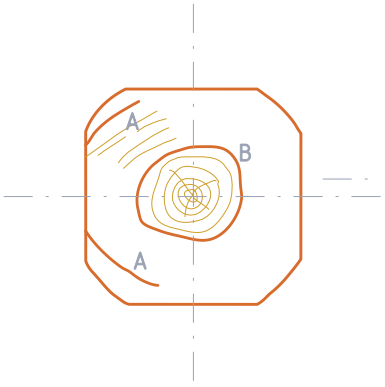
b ..... smaller side of the cross section

h ..... larger side of the cross section

A ..... geometrical centre of the cross section

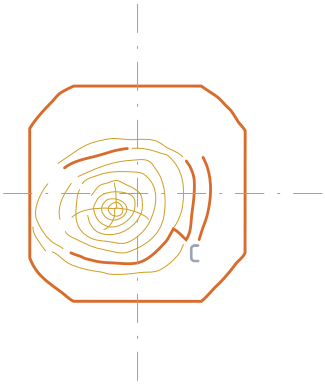
B ..... pith

The eccentricity is given by $\overline{AB}$.

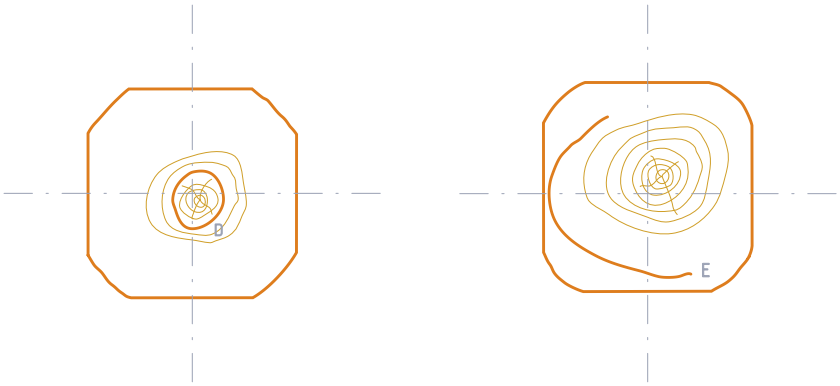


A: Surfacing ring shake

B: Complete and included ring shake



C: Multiple ring shake



D: Permitted ring shake

E: Ring shake not permitted because of the excessive radius

Figure 8 Examples of ring shake

Anx 1.3.4 Geometrical characteristics

Anx 1.3.4.1 Wane

The wane is measured as the ratio of its projection on one side to the side length, see Figure 9.

It is given by:

On one face of the piece of timber:

$$s = \frac{1}{h} \cdot (V_1 + V_2)$$

Where:

V_1, V_2 ..... orthogonal projections of the wanes on the larger side of the cross section

h ..... larger side of the cross section

On one edge of the piece of timber:

$$s = \frac{1}{b} \cdot (K_1 + K_2)$$

Where:

K_1, K_2 ..... orthogonal projections of the wanes on the smaller side of the cross section

b ..... smaller side of the cross section

The determination of the wane shall be carried out where the ratio is a maximum.

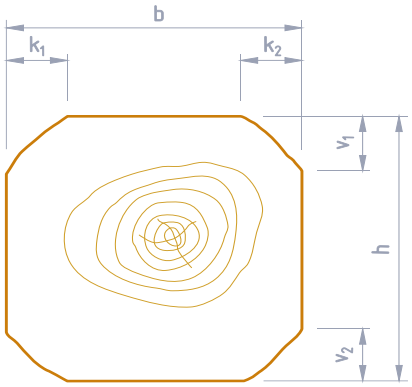


Figure 9 Measurement of wane

Key

b.....smaller side of cross section

h .....larger side of cross section

V_1, V_2.....orthogonal projections of the wane on the larger side of the cross section

K_1, K_2 .....orthogonal projections of the wane on the smaller side of the cross section

Anx 1.3.4.2 Warp

The measurement of warp is illustrated in Figure 10.

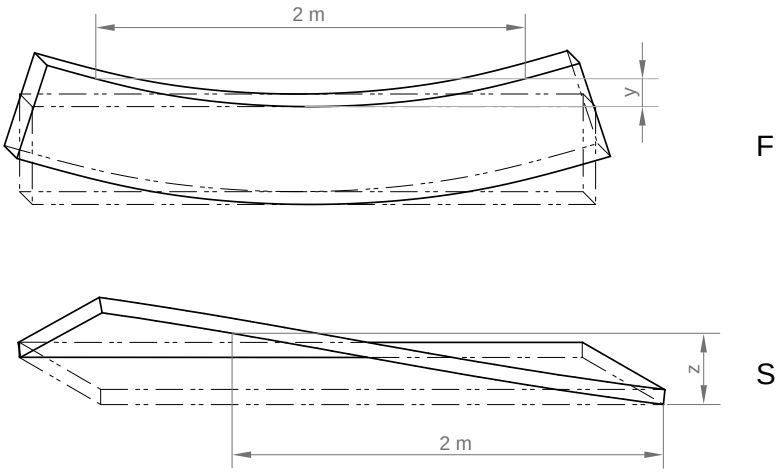


Figure 10 Measurement of warp, measuring length 2 m

Key

F.....Spring

S.....Twist

Anx 1.3.4.3 Taper

Ratio of the maximum difference between the thicknesses of the cross sections at the ends of the piece of timber divided by its length, expressed in mm/m.

The measurement of taper is explained in Figure 11.

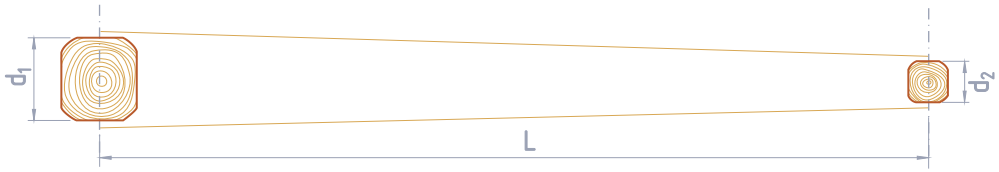


Figure 11 Measurement of taper

Key

d_1 .....larger thickness of the piece of timber in mm

d_2 .....smaller thickness of the piece of timber in mm

L .....length of the piece of timber in m

The taper is given by the equation:

$$R = \frac{1}{L} \cdot (d_1 - d_2)$$

Anx 1.3.4.4 Eccentric pith

The eccentric pith is given by the percentage of the eccentricity ε to the larger side of the cross section. It is measured at the ends of the piece of timber, see Figure 12, and the greater value is considered.

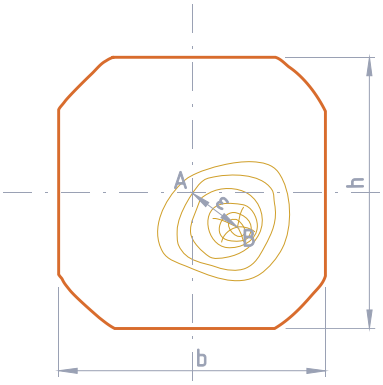


Figure 12 Measurement of the eccentricity

Key

b ..... smaller side of the cross section

h ..... larger side of the cross section

A ..... geometrical centre of the cross section

B ..... pith

ε ..... eccentricity is given by the distance $\overline{AB}$

The eccentricity is given by the equation:

$$\frac{\overline{AB}}{h}$$

Anx 1.3.4.5 Regularity of the cross section

The regularity of the cross section is given by the difference between the two contiguous sides, measured where this difference is the greatest.

NOTE The cross sections of the square edged logs with wane of chestnut are virtually squares, i.e. $h \approx b$ according to the grading rules of Annex 1.

Anx 1.3.5 Biological characteristics

Anx 1.3.5.1 Insect damage

Insects shall be taken into consideration that can infest and proliferate in green and seasoned wood (generally Anobiidae, Lyctidae, Ceramycidae).

Anx 1.3.5.2 Fungal damage

Any signs of fungi alteration (such as rot or dote) shall be considered.

Anx 1.3.6 Other characteristics

Anx 1.3.6.1 Reaction wood

Reaction wood shall be measured on the ends where it appears with the following method: the area of reaction wood shall be measured and referred to the cross-sectional area, see Clause Anx 1.2.2, where it appears, taking into account always the greater value.

Anx 1.3.6.2 Damage

Damages are the lesions of the wood tissues caused in the standing tree by frost, lightning, wind and other traumas of various origins. In the same way, mechanical damages due to work done in the forest or at the sawmill and mistletoe damages has to be considered, if their effects could compromise timber strength.

Fissures, see Clause Anx 1.3.3.4, and ring shakes, see Clause Anx 1.3.3.5, are not part of this characteristic.

Anx 1.3.7 Other criteria

Only strength-affecting criteria or characteristics that directly influence the timber use in constructions can be taken into consideration for grading purposes. If a piece of timber shows defects not listed in this Annex, they shall be assessed comparing them to those listed. If these defects, in the judgement of the grader, affect the timber strength less than the defects listed in this document, they can be considered permitted.

Anx 1.4 Grading Rules

Anx 1.4.1 Procedures for visual strength grading

Visual strength grading shall be performed as follows:

a) choice of the rule depending on the timber population;

b) visual inspection of all the faces and both ends of each piece of timber;

c) verify the limitations for all the timber characteristics;

d) assign the sawn timber to the worst grade of those obtained in c);

e) if the piece of timber cannot be assigned to any of the specified grades, it shall be rejected as not gradable for structural use.

Anx 1.4.2 Choice of the grading rule

The grading rule shall be selected according to Table 4.

The table indicates:

- species/origin combination
- the grading rule to apply
- the grade to which each piece of timber, after grading, can be assigned

Table 4 Grading rules for square edged logs with wane of chestnut from different timber populations, see Clause 1.1

Species/Origin	Grading rule	Grade
Hardwood		
Chestnut [1)]	Hardwood with constant external dimension of the cross section along the entire length, with wane and boxed heart	C

1) Includes chestnut (*Castanea sativa* Mill.) from defined origin.

Table 5 Visual strength grading – Rule for square edged logs with wane of chestnut: Hardwood with constant external dimension of the cross section along the entire length with wane and boxed heart

Characteristics	Grade C
Wane[1)]	Sum of lengths of sections along the product with $s \geq 1/3$: At least 1/3 of the length of the product Local sections along the product with $s \geq 9/10$: Along a length not exceeding 0.5 m each section
Single knots [2)]	$A \leq 2/5$ and in any case $d \leq 70$ mm and D { ≤ 120 mm; and; ≤ minimum dimension of cross section
Knot grouping [3)]	$A_g \leq 1/2$ and in any case $t \leq 70$ mm
Ring width	No limitation
Slope of grain	≤ 1 : 6 (16.5 %)
- shrinkage fissures - ring shake - damage (lightning, frost, lesions)	Permitted with limitation [4)] Permitted with limitation [5)] Not permitted
Fungal damage: - brown and white rot	Not permitted
Eccentric pith [6)]	No limitation
Regularity of the cross section	≤ 2 cm
Tension wood	No limitation
Insect damage	Permitted with limitation [7)]
Mistletoe	Not permitted
Warps: - spring - twist	Not larger than 8 mm over a length of 2 m Not larger than 1 mm over a cross section side of 25 mm
Taper	Not permitted

1) s is the ratio of the wane projections on a side of the cross section to the side dimension.

2) A is the ratio of the knot minimum diameter d to the side of the cross section on which the knot is measured. For the knots at the wane, the ratio A of the minimum knot diameter d to the smaller side of the cross section is calculated.
D is the maximum knot diameter.

3) t is the sum of the minimum diameters of the knots within 150 mm. A_g is the ratio of the sum t to the side of the cross section on which the knots are measured.

4) Fissure through the thickness is only permitted at the ends, with a length not larger than twice the width of the piece.

5) Generally not permitted; only the visible ring shake is permitted if $r_{max} \leq \frac{b}{3}$ and $\varepsilon \leq \frac{b}{6}$,

Where:

r_{max} ..... maximum radius of the ring shake
b ..... smaller side of the cross section
ε..... eccentricity, that is the maximum distance between the pith and the geometrical centre of the cross section.

6) Double pith at the ends is not permitted.

7) Only holes with a blackish ring, or round holes, without a blackish ring, with diameter between 1.5 mm and 2.5 mm (Anobiidae) are permitted, as long as the infestation is actually terminated. A maximum of 10 holes, uniformly distributed, per metre of length (the sum of all faces) is permitted.