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English Version

Timber structures - Strength graded structural timber with rectangular cross section - Part 1: General requirements

Structures en bois - Bois de structure à section rectangulaire classé pour sa résistance - Partie 1: Exigences générales

Holzbauwerke - Nach Festigkeit sortiertes Bauholz für tragende Zwecke mit rechteckigem Querschnitt - Teil 1: Allgemeine Anforderungen

This European Standard was approved by CEN on 26 August 2005.

CEN members are bound to comply with the CEN/CENELEC Internal Regulations which stipulate the conditions for giving this European Standard the status of a national standard without any alteration. Up-to-date lists and bibliographical references concerning such national standards may be obtained on application to the Central Secretariat or to any CEN member.

This European Standard exists in three official versions (English, French, German). A version in any other language made by translation under the responsibility of a CEN member into its own language and notified to the Central Secretariat has the same status as the official versions.

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Contents

Page

Foreword

This European Standard (EN 14081-1:2005) has been prepared by Technical Committee CEN/TC 124 “Timber structures”, the secretariat of which is held by SFS.

This European Standard shall be given the status of a national standard, either by publication of an identical text or by endorsement, at the latest by May 2006, and conflicting national standards shall be withdrawn at the latest by August 2007.

This European Standard has been prepared under a mandate given to CEN by the European Commission and the European Free Trade Association, and supports essential requirements of EU Directive(s).

For relationship with EU Directive(s), see informative Annex ZA, which is an integral part of this European Standard.

This European Standard will supersede EN 518:1995 and EN 519:1995.

Other parts of this European Standard are:

EN 14081-2 Timber structures - Strength graded structural timber with rectangular cross section - Part 2: Machine grading; additional requirements for initial type testing,

EN 14081-3 Timber structures - Strength graded structural timber with rectangular cross section - Part 3: Machine grading; additional requirements for factory production control,

EN 14081-4 Timber structures - Strength graded structural timber with rectangular cross section - Part 4: Machine grading; grading machine settings for machine controlled systems.

According to the CEN/CENELEC Internal Regulations, the national standards organizations of the following countries are bound to implement this European Standard: Austria, Belgium, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Slovakia, Slovenia, Spain, Sweden, Switzerland and United Kingdom.

Introduction

There are basically two methods of strength grading: visual grading and machine grading.

Machine grading is in common use in a number of countries. The countries use two basic systems, referred to as 'output controlled' and 'machine controlled'. Both systems require a visual override inspection to cater for strength-reducing characteristics that are not automatically sensed by the machine.

The output-controlled system is suitable for use where the grading machines are situated in sawmills grading limited sizes, species and grades in repeated production runs of around one working shift or more. This enables the system to be controlled by testing timber specimens from the daily output. These tests together with statistical procedures are used to monitor and adjust the machine settings to maintain the required strength properties for each strength class. With this system it is permissible for machine approval requirements to be less demanding and for machines of the same type to have non-identical performance.

The machine controlled system was developed in Europe. Because of the large number of sizes, species and grades used it was not possible to carry out quality-control tests on timber specimens drawn from production. The system relies therefore, on the machines being strictly assessed and controlled, and on considerable research effort to derive the machines settings, which remain constant for all machines of the same type.

There are many different visual strength grading rules for timber in use in Europe. These have come into existence to allow for:

- different species or groups of species;
- geographic origin;
- different dimensional requirements;
- varying requirements for different uses;
- quality of material available;
- historic influences or traditions.

Because of the diversity of existing visual grading rules in use in different countries, it is currently impossible to lay down a single set of acceptable rules for all Member States.

The requirements given in this European Standard on visual strength grading rules therefore give basic principles, which should be followed when drawing up requirements for limits for some of the characteristics.

1 Scope

This European Standard specifies the requirements for visual and machine graded structural timber with rectangular cross-sections shaped by sawing, planing or other methods, and having deviations from the target sizes corresponding to EN 336.

This European Standard covers structural rectangular timber, untreated or treated against biological attack.

This European Standard does not cover timber treated by fire retardant products.

This European Standard identifies as a minimum the characteristics for which limits shall be given in visual grading rules.

Finger jointed timber is not covered in this European Standard.

2 Normative references

The following referenced documents are indispensable for the application of this European Standard. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

EN 336, *Structural timber — Sizes, permitted deviations*

EN 338, *Structural timber — Strength classes*

EN 350-1, *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, *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, *Structural timber — Determination of characteristic values of mechanical properties and density*

EN 408, *Timber structures — Structural timber and glued laminated timber — Determination of some physical and mechanical properties*

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 1310:1997, *Round and sawn timber — Method of measurement of features*

EN 1912, *Structural timber — Strength classes — Assignment of visual grades and species*

EN 13183-2, *Moisture content of a piece of sawn timber — Part 2: Estimation by electrical resistance method*

EN 13238, *Reaction to fire tests for building products — Conditioning procedures and general rules for selection of substrates*

EN 13501-1, *Fire classification of construction products and building elements — Part 1: Classification using test data from reaction to fire tests*

EN 13556, *Round and sawn timber — Nomenclature of timbers used in Europe*

EN 13823, *Reaction to fire tests for building products — Building products excluding floorings exposed to the thermal attack by a single burning item*

EN 14081-2:2005, *Timber structures — Strength graded structural timber with rectangular cross section — Part 2: Machine grading; additional requirements for initial type testing*

EN 14081-3:2005, *Timber structures — Strength graded structural timber with rectangular cross section — Part 3: Machine grading; additional requirements for factory production control*

EN 14081-4:2005, *Timber structures — Strength graded structural timber with rectangular cross section — Part 4: Machine grading; grading machine settings for machine controlled systems*prEN 15228, *Structural timber — Structural timber preservative treated against biological attack*

EN ISO 3166-1, *Codes for the representation of names of countries and their subdivisions — Part 1: Country codes (ISO 3166-1:1997)*

EN ISO 11925-2, *Reaction to fire tests — Ignitability of building products subjected to direct impingement of flame — Part 2: Single-flame source test (ISO 11925-2:2002)*

3 Terms and definitions

For the purposes of this European Standard, the following terms and definitions apply.

3.1
batch
timber of one species population and size graded in one working shift. In the case of machine graded timber, the timber should also be graded by one machine

3.2
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 %

3.3
control plank
object that simulates the characteristics of timber that are being sensed by the measuring devices in a grading machine, which, when passed through the machine, is able to check the calibration of the machine dynamically

3.4
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 %

3.5
grade
strength grade or strength class

3.6
machine strength grading
process by which a piece of timber can be sorted by a machine sensing, non-destructively, one or more properties of the timber, with any necessary visual inspection, into grades to which characteristic values of strength, stiffness and density may be allocated. There are two methods of control, machine control and output control (see Introduction)

3.7
producer
legal entity responsible for the conformity of the product to the requirements of this European Standard

3.8
settings
values associated with the variable controls of a grading machine which determine the acceptance to each grade of timber graded by the machine

3.9
species population
timber from an identifiable source and of a species or species combination that is, or is intended to be, strength graded and marketed as a commercially defined product

3.10
strength-reducing characteristic
property or feature of a piece of timber that reduces its load carrying capacity

NOTE Can result from natural growth of the tree (e.g. knots, slope of grain), changes in moisture content (e.g. fissures), conversion of the log (e.g. the inclusion of wane), attack from fungi, insects or mechanical damage.

3.11
strength class
result of the classification of timber based on particular values of mechanical properties and density

3.12
timber size
sawn or processed dimensions with respect to the permitted deviations given in EN 336

3.13
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

NOTE Electronic or mechanical instruments can be used to assist the visual grader in this process.

3.14
width
greater dimension perpendicular to the longitudinal axis of a piece of timber

4 Symbols

None.

5 Requirements

5.1 Grading, general

5.1.1 Timber shall be either visually graded according to 5.2 or machine graded according to 5.3, and have characteristic values for the bending strength, tension strength, compression strength, shear strength, modulus of elasticity and density according to the method given in the appropriate subclause in 5.2 or 5.3.

5.1.2 If the grading has been carried out before processing, provided that the processing reduction is not greater than 5 mm for dimensions less than or equal to 100 mm, or not greater than 10 mm for dimensions greater than 100 mm, the grade shall be considered not to have changed. If the reduction is greater, the timber shall be re-graded.

5.1.3 Moisture content shall be determined in accordance with EN 13183-2.

NOTE A third part of EN 13183 is being drafted for determining moisture content using capacitance meters.

5.1.4 If the grading method restricts the timber to a special use, e.g. flatwise bending or compression, the timber shall be marked accordingly.

5.2 Visual strength grading

5.2.1 Timber shall be visual graded to a grading standard that meets the requirements given in Annex A.

5.2.2 If the grade and species have been assigned to a strength class by EN 1912, the characteristic values for the properties shall be those given for the assigned strength class in EN 338; otherwise they are determined in accordance with EN 384.

5.2.3 If there are any restrictions or additional criteria related to the strength or constructional use of timber, resulting from the method of grading or species of timber, they shall be stated in the grading standard.

5.3 Machine strength grading

5.3.1 If the timber is machine graded to a strength class from EN 338, the characteristic values for the properties shall be those given for the strength class in EN 338; otherwise they shall be determined in accordance with EN 384.

5.3.2 For a grade and species (or species combination) graded by a machine controlled system, the settings shall be derived for the total growth area from which the timber will be graded within one or more countries. Timber from a lesser area e.g. sub-division of the growth area, i.e. region within a country, shall be machine graded using the output controlled system.

5.3.3 Grading machines operating in a machine controlled system shall use settings determined in accordance with Clause 6 in EN 14081-2:2005 and listed in EN 14081-4:2005. Machines operating in an output controlled system shall use settings determined in accordance with Clause 7 of EN 14081-2:2005.

5.3.4 The visual characteristics of each piece of machine graded timber shall meet the requirements of the grade, which shall as a maximum be those given in Table 1. Fissures, warp and slope of grain shall be measured in accordance with EN 1310.

5.3.5 Where a machine does not fully grade to the ends of each piece of timber (as in bending type machines) these non-fully graded portions shall be visually examined. If the diameter of knots and slope of grain in the non-fully graded portions exceeds the size of such defects in the fully graded portion of the same piece of timber, and exceeds the limits given in Table 2, then the piece shall be rejected.

5.3.6 Timber that has previously been graded shall not be re-graded to the same or different grades unless the method of determining settings has made allowances for such changes to the species population caused by the previous grading.

NOTE The number of grades that can be graded in one pass through the machine will depend upon the accuracy and capabilities of the machine and the settings available.

Table 1 – Visual override requirements (see 5.3.4)

Strength class according to EN 338		C18 and below	Above C18
Max. permitted length of fissures [a]		Fissures less than half the thickness may be ignored	
	Fissures not going through the thickness	Not greater than 1,5 m or ½ the length of the piece, whichever is the lesser	Not greater than 1 m or ¼ the length of the piece, whichever is the lesser
	Fissures going through the thickness	Not greater than 1 m or ¼ the length of the piece, whichever is the lesser. If at the ends, a length not greater than two times the width of the piece	Only permitted at the ends with a length not greater than the width of the piece
Max. warp [b] in mm over 2 m of length	Bow	20 mm	10 mm
	Spring	12 mm	8 mm
	Twist	2 mm/25 mm width	1 mm/25 mm width
	Cup	Unrestricted	Unrestricted
Wane		Wane shall not be greater than one third of the full edge and/or face dimensions of the piece	
Soft rot and dote [c] (see EN 844-10)		Soft rot is not permitted. Dote is permitted	Soft rot is not permitted. Dote is not permitted
Insect damage		No active infestation is permitted. Wood wasp holes are not permitted and worm and pin holes shall be assessed as abnormal defects	
Abnormal defects		Where the reduction in strength caused by the abnormal defect is obviously less than caused by other defects permitted by this table, the piece may be accepted provided the defect is of a type that will not increase after conversion and drying	

[a] The length of fissures is linked with moisture content and therefore the limits given apply only at the time of grading. Limitations on fissures for special grades for specific components may be disregarded if research confirms that they have no effect on strength. Permitted limits for both the depth and length of fissures refer to the cumulative sum of fissures in one plane in a piece of timber.

[b] Because warp is influenced by moisture content, the limits apply only at the time of grading. Limits of warp will be less if required by the method of operation of the grading machine. Longitudinal curvature in square section pieces shall be assessed using the limits for bow.

[c] Sapstain is not a structural defect and is acceptable without limitation.

Table 2 – Visual override requirements for non-fully machine graded portions (see 5.3.5)

	Strength class according to EN 338	
	C18 and below	**Above C18**
Knot diameter on face	½ x width of piece	¼ x width of piece
Knot diameter on edge	¾ x thickness of piece	½ x thickness of piece
Slope of grain	1 in 6	1 in 10
NOTE 1 These maximum limits are only applicable where the size of knots and slope of grain in the non-fully graded portion exceeds the size of similar characteristics in the fully graded portion of the same piece. NOTE 2 The knot diameter is measured perpendicular to the longitudinal axis of the piece of timber. For arris knots the above limits apply to the portion of the knot visible on the particular face or edge being considered.		

5.4 Durability against biological attack

5.4.1 Natural durability

If listed in EN 350-2, the natural durability shall be as given therein; otherwise it shall be assessed in accordance with EN 350-1.

5.4.2 Timber treated against biological attack

Timber treated against biological attack shall meet the requirements of prEN 15228.

5.5 Reaction to fire

Where the manufacturer wishes to claim performance (e.g. when the product is subject to regulatory requirements) reaction to fire shall be tested and classified according to EN 13501-1, except for products covered by Annex C, which are classified without the need for further testing.

6 Evaluation of conformity

6.1 General

Compliance with the requirements of this European Standard shall be demonstrated by:

— initial type testing or initial assessment;

— factory production control by the producer.

All records shall be kept for at least ten years.

6.2 Initial type testing and assessment

6.2.1 Initial type testing or assessment shall be performed to demonstrate conformity with this European Standard and when a change occurs, e.g. in raw materials, which could significantly change one or more of the characteristics.

Where testing has previously been performed according to the requirements of this European Standard, such testing may be taken into account for the purpose of initial type testing.

6.2.2 For machine graded timber, initial type testing shall be carried out in accordance with EN 14081-2.

6.2.3 Where control planks are required to be used to calibrate a grading machine, they shall meet the requirements of Annex C in EN 14081-2:2005.

6.2.4 The testing and assessment methods shall be in accordance with Table 3.

Table 3 – Sampling plan and compliance criteria for initial and further testing

Property	Requirement	Method	Number of specimens	Compliance criteria
Characteristic strength - bending - compressive - tensile - shear - density		See EN 408 or for machine grading see EN 14081-2	See EN 384 or for machine grading see EN 14081-2	Characteristic values estimated according to EN 384 shall not be less than declared values. For machine grading see EN 14081-2
Modulus of elasticity		See EN 408 or for machine grading see EN 14081-2	See EN 384 or for machine grading see EN 14081-2	Characteristic values estimated according to EN 384 shall not be less than declared values. For machine grading see EN 14081-2
Natural durability	Fungi: Class 1-5 Termites, wood boring insects and marine organisms: Class D,M,S Beetles: Class D,S,SH	EN 350-1 EN 350-2		Natural durability shall be taken as given in EN 350-2. If the species is not given it shall be tested in accordance with EN 350-1
Timber treated against biological attacks	See 5.4.2			
Reaction to fire	Class C – E	EN 13823 EN ISO 11925-2	See EN 13501-1[a]	The requirements of the declared class shall be fulfilled

[a] CWFT products (see Annex C) do not require direct testing of reaction to fire.

6.3 Factory production control (FPC)

6.3.1 The producer shall establish document and maintain a production control system to ensure that the products placed on the market conform with the stated characteristics. The control system shall consist of procedures, regular inspections and test and/or assessment, and the use of the results to control raw materials, equipment, the process and the product.

6.3.2 In addition to the other requirements given in this clause for the factory production control of machine graded timber, the requirements of EN 14081-3 apply.

6.3.3 Where it is required to use control planks to calibrate a grading machine, the procedures given in Annex B of EN 14081-3:2005 shall be followed.

6.3.4 The results of inspections, tests or assessments requiring action shall be recorded, as shall any action taken. The action to be taken when control values or criteria are not met shall be recorded.

6.3.5 The following shall be controlled once per shift:

- timber source and species (or species combination);
- deviations from target size;
- grading;
- moisture content, if dry-graded timber;
- marking.

6.3.6 The following shall be controlled at least annually:

- competence of the personnel, including the assessment of graded material;
- calibration of moisture meter.

6.3.7 The following records shall be kept for each batch of graded timber:

a) job or order number and customer's name, if known;

b) timber species population;

c) grades and grading standard (where appropriate);

d) timber size and surface finish (planed or sawn);

e) for timber that is dry-graded, the moisture content;

f) date and working shift;

g) grader's or machine operator's name.

6.3.8 In addition to 6.3.7 the following records shall be kept for each batch of machine graded timber:

a) number of pieces in each grade and the number of pieces rejected by the machine;

b) all machine settings.

7 Marking

7.1 General

Each piece of graded timber shall be clearly and indelibly marked to provide the information given in 7.2. If the end use of the timber requires marking to be omitted for aesthetic reasons, each batch of timber shall be accompanied by a commercial document bearing all the information given in 7.2 and 7.3.

7.2 Information on the product (except if omitted for aesthetic reasons)

a) Name or identifying mark of producer.

b) Either the information required in 7.3 or a reference number that identifies the documentation containing the information required in 7.3.

c) If machine graded, then the letter M and the strength class to EN 338 if appropriate, otherwise the letter M and the strength grade and grading standard.

d) If visual graded, then the strength class as assigned in EN 1912, or the strength grade and grading standard if not included in EN 1912.

e) Any restriction to a special use (see 5.1.4 and 5.2.3).

f) Words 'DRY GRADED' if appropriate (see 3.4).

g) If preservative treated, additional marking according to prEN 15228.

7.3 Information either on the product (except if omitted for aesthetic reasons) or in accompanying documentation

a) If single species, the species code in accordance with EN 13556 (see Table B.1).

b) If species combination, the species code specified in Table 4.

c) Number of this European Standard, i.e. EN 14081-1.

d) If machine graded, the code identifying the country or region of origin in accordance with EN ISO 3166-1.

e) If visual graded and marked with a strength class (see 7.2), the grade and grading standard.

Table 4 – Marking codes for species combinations

Species commercial name	Botanical species	Visual grading rule publishing country	Source [a]	Species code
British pine	*Pinus nigra* *Pinus sylvestris*	UK	UK	WPNN
British spruce	*Picea abies* *Picea sitchensis*	UK	UK	WPCS
Caribbean pitch pine	*Pinus caribaea* *Pinus oocarpa*	UK	Caribbean	WPNC
Douglas fir-larch	*Larix occidentalis* *Pseudotsuga menziesii*	UK, USA, Canada	USA, Canada	WPSM
Hem-fir	*Abies amabilis* *Abies concolor* *Abies grandis* *Abies magnifica* *Abies procera* *Tsuga heterophylla*	UK, USA, Canada	USA, Canada	WABA
Larch	*Larix decidua* *Larix x eurolepsis* *Larix kaempferi*	UK	UK	WLAD
Pines	*Pinus nigra* *Pinus pinaster* *Pinus sylvestris*	France	France	WPNP
Redwood & whitewood	*Abies alba* *Picea abies* *Pinus sylvestris*	UK	CNE Europe	WPPA
s-p-f	*Abies balsamea* *Abies lasiocarpa* *Picea engelmannii* *Picea glauca* *Picea mariana* *Picea rubens* *Pinus banksiana* *Pinus contorta* *Pinus ponderosa*	UK, USA, Canada	USA, Canada	WPCE

Table 4 (*continued*)

Southern pine	*Pinus echinata* *Pinus elliottii* *Pinus palustris* *Pinus taeda*	UK, USA	USA	WPNE
Spruce & fir Whitewood	*Abies alba* *Picea abies*	France Netherlands Germany UK	France NC Europe CNE Europe CNE Europe	WPCA
Western white woods	*Abies balsamea* *Abies lasiocarpa* *Picea engelmannii* *Pinus contorta* *Pinus lambertiana* *Pinus monticola* *Pinus ponderosa* *Tsuga mertensiana*	UK, USA	USA	WABB
[a] Source codes from EN 1912 are: CNE Europe is Central, Northern and Eastern Europe, NNE Europe is Northern and North Eastern Europe, NC Europe is Northern and Central Europe.				

Annex A
(normative)

Requirements for strength reducing characteristics for visual grading standards

A.1 Limitations for strength-reducing characteristics

A.1.1 Knots

The grading standard shall specify the method of measurement of knots.

NOTE Methods of measurement of knots are given in EN 1310.

Maximum dimensions of knots or knot holes shall be specified in one of the following ways:

a) in relation to the width and or thickness of timber on the basis of linear values;

b) in relation to the cross-sectional area of timber on the basis of cross-sectional values;

c) in relation to absolute values for a given range of timber sizes.

Different limitations on knot sizes can be specified for different portions of the piece, e.g. a margin area with different knot limitations from the rest of the piece may be included.

In certain sizes, knot groupings affect the timber strength and shall be taken into account.

A.1.2 Slope of grain

The grading standard shall have a definition of slope of grain in accordance with EN 844-9 and refer to 4.4.1 of EN 1310:1997 for its method of measurement, and shall give limitations on the slope of grain for each grade specified.

NOTE For the limitations on the slope of grain, values in the following increments are preferred: 1:4, 1:6, 1:8 and 1:10.

Local fibre deviations around knots or other defects shall be disregarded in measuring slope of grain.

A.1.3 Density and rate of growth

The grading standard shall contain a requirement for either density or rate of growth.

If density is specified, it shall be linked to a stated moisture content.

NOTE 1 The preferred moisture content for this purpose is 20 %.

Where the density is given at a moisture content other than 20 %, correction factors shall be available for correction to 20 %.

NOTE 2 EN 384 gives a method of density correction.

If rate of growth is specified, the standard shall include limits for rate of growth and its method of measurement.

NOTE 3 For limits for rate of growth, the values in the following increments of ring width are preferred: 15 mm, 10 mm, 8 mm, 6 mm, 4 mm and 3 mm.

A.1.4 Fissures

Fissures shall be measured in accordance with 4.9.1 a) of EN 1310:1997.

Where fissures have a significant effect on strength, e.g. shear strength of a beam, they shall be limited. Otherwise they shall be disregarded.

The maximum length of fissures shall be no greater than as given in Table A.1.

Table A.1 – Maximum total of length of fissures in a piece of timber [b]

Type	**Max. permitted length corresponding to the levels of strength classes C18[a] and below**	**Max. permitted length corresponding to the levels of strength classes above C18[a]**
Fissures not going through the thickness	Fissures with depth less than half the thickness may be ignored	
	Not greater than 1,5 m or ½ the length of the piece, whichever is the lesser	Not greater than 1 m or ¼ the length of the piece, whichever is the lesser
Fissures going through the thickness	Not greater than 1 m or ¼ the length of the piece, whichever is the lesser. If at the ends, length not greater than twice the width of the piece	Only permitted at the ends with a length not greater than the width of the piece

NOTE The length of fissures is linked with moisture content and therefore the limits given above are only applicable at the time of grading.

[a] According to EN 338.

[b] Permitted limits for both the depth and length of fissures refer to the cumulative sum of fissures in one plane in a piece of timber.

A.2 Limitations for geometrical characteristics

A.2.1 Wane

Criteria for the wane limitations with references to the width, thickness and length of the piece and its method of measurement shall be given.

The maximum wane permitted shall not reduce the edge and face dimensions to less than 2/3 of the basic dimensions of the piece.

NOTE Wane should be restricted for general building reasons. Wane can be particularly undesirable when nail plates or connectors are used or there is transverse compression.

A.2.2 Warp

The limitations of maximum permitted values of warp for bow, spring and twist shall be given.

Maximum warp shall be no greater than as given in Table A.2. The requirements given in Table A.2 are applicable to dry-graded timber.

Bow and spring shall be measured in accordance with 4.10.1 of EN 1310:1997.

Twist shall be measured in accordance with 4.10.3 of EN 1310:1997.

NOTE 1 Even if warp of timber does not directly influence strength, it is strongly recommended that timber for building purposes should be subject to some restrictions in this respect.

NOTE 2 Warp is linked with moisture content and can therefore change with time.

NOTE 3 Warp is often linked to the dimensions of timber.

Table A.2 – Maximum warp (in mm) over 2 m of length [a]

Type	**Max. permissible warp corresponding to strength classes C18 [b] and below**	**Max. permissible warp corresponding to strength classes above C18 [b]**
Bow	20	10
Spring	12	8
Twist	2 mm / 25 mm width	1 mm / 25 mm width
Cup	No restrictions	No restrictions
[a] For warp of other lengths the requirements shall be adjusted *pro-rata*.		
[b] According to EN 338.		

A.3 Limitations for biological characteristics

Standards shall include requirements that limit fungal and insect damage to timber and which prohibit timber under live insect attack. Soft rot shall not be allowed in any grade, and dote shall only be permitted in grades to a level of EN 338 strength class C18 and below.

Grading standards shall conform to EN 844-10 for definitions of terms relating to stain and fungal attack.

A.4 Other characteristics

A.4.1 Reaction wood

Standards for softwood species shall take account of compression wood. Standards dealing with hardwood species shall take account of tension wood. Grading standards shall conform to EN 844-7 for definitions of these terms.

A.4.2 Other criteria

Other grade characteristics and strength affecting criteria, e.g. mechanical damage, inbark, covered damage to the stem and top rupture, are to be restricted in line with the requirements given in this annex for other strength reducing characteristics that will have a similar effect on the strength of timber.

Annex B
(informative)

Marking codes for single species

EN 13556 assigns a four-letter code to each of the species listed in that standard. Table B.1 gives the codes for those species that occur in EN 1912 classified as single species. Species that are only listed as part of a species combination in EN 1912 are excluded, see Table 4.

Table B.1 – Marking codes for single species (classified in EN 13556)

Species standard name	Botanical species	Visual grading rule publishing country	Source [a]	Code
Ekki	Lophira alata	Netherlands UK	West Africa	LOAL
Balau	*Shorea* spp. (section Shorea)	UK	South east Africa	SHBL
Douglas fir	*Pseudotsuga menziesii*	France, Germany, UK	France, Germany, UK	PSMN
Silver fir	*Abies alba*	Germany, Austria Nordic Countries	CNE Europe NNE Europe	ABAL
Greenheart	*Ocotea rodiaei*	UK	Guyana	OCRD
Radiata pine	*Pinus radiata*	Spain	Spain	PNRD
Iroko	*Milicia excelsa* *Milicia regia*	UK	Africa	MIXX
Jarrah	*Eucalyptus marginata*	UK	Western Australia	EUMR
Kapur	*Dryobalanops* spp	UK	South east Asia	DRXX
Karri	*Eucalyptus diversicolor*	UK	Western Australia	EUDV
Kempas	*Koompassia malaccensis*	UK	South east Asia	KOML
Keruing	*Dipterocarpus* spp	UK	South east Asia	DPXX
European larch	*Larix deciduas*	Germany, Austria Nordic countries	CNE Europe NNE Europe	LADC
Maritime pine	*Pinus pinaster*	Portugal Spain	Portugal Spain	PNPN
Merbau	*Intsia bijuga* *Intsia palembanica*	UK	South east Asia	INXX
Opepe	*Nauclea diderrichii*	UK	West Africa	NADD

Table B.1 (*continued*)

Parana pine	*Araucaria angustifolia*	UK	Brazil	ARAN
Scots pine Redwood	*Pinus sylvestris*	Germany, Austria Nordic countries UK	CNE Europe NNE Europe CNE Europe	PNSY
Poplar	*Populus* spp	France	France	POER
Sitka spruce	*Picea sitchensis*	Canada, UK, Nordic countries, Ireland UK	Canada, UK Nordic countries Ireland Canada	PCST C/PCST [b]
Spruce Spruce (whitewood) Norway spruce	*Picea abies*	Germany, Austria Nordic countries Ireland	CNE Europe NNE Europe Ireland	PCAB
Teak	*Tectona grandis*	UK	South east Asia	TEGR
Western red cedar	*Thuja plicata*	UK	Canada	THPL

[a] Source codes from EN 1912 are: CNE Europe is Central, Northern and Eastern Europe, NNE Europe is Northern and North Eastern Europe.

[b] To distinguish Canadian Sitka spruce graded to UK grading rules from Irish Sitka graded to the Irish rules, the prefix C/ is added to the code.

Annex C
(normative)

Reaction to fire: Euroclass without the need for further testing

Structural timber meeting the provisions of Table C.1 may be classified in the reaction to fire class indicated therein, without the need for further testing.

Table C.1 – Class of reaction to fire performance for structural timber [a]

Material	Product detail	Minimum mean density [c] (kg/m^3)	Minimum overall thickness (mm)	Class [b]
Structural timber	Visual and machine graded structural timber with rectangular cross-sections shaped by sawing, planing or other methods or with round cross-sections	350	22	D-s2,d0

[a] Applies to all species covered by this European Standard.

[b] Class as provided for in Table 1 of the annex to Decision 2000/147/EC.

[c] Conditioned according to EN 13238.

Annex ZA
(informative)

Clauses of this European Standard addressing the provisions of the EU Construction Products Directive

ZA.1 Scope and relevant characteristics

This European Standard has been prepared under Mandate M/112 Structural timber products and ancillaries, given to CEN by the European Commission and the European Free Trade Association.

The clauses of this European Standard shown in this annex meet the requirements of the mandate given under EU Construction Products Directive (89/106/EEC).

Compliance with these clauses confers a presumption of fitness of the strength graded structural timber with rectangular cross section covered by this annex for the intended uses indicated herein; reference shall be made to the information accompanying the CE marking.

> **WARNING:** Other requirements and other EU Directives, not affecting the fitness for intended uses, can be applicable to the strength graded structural timber with rectangular cross section falling within the scope of this European Standard.

NOTE 1 In addition to any specific clauses relating to dangerous substances contained in this standard, there may be other requirements applicable to the products falling within its scope (e.g. transposed European legislation and national laws, regulations and administrative provisions). In order to meet the provisions of the EU Construction Products Directive, these requirements need also to be complied with, when and where they apply.

NOTE 2 An informative database of European and national provisions on dangerous substances is available at the Construction web site on EUROPA (accessed through http://europa.eu.int/comm/enterprise/construction/internal/dangsub/dangmain.htm).

This annex establishes the conditions for the CE marking of the strength graded structural timber with rectangular cross section intended for uses indicated in Table ZA.1.

This annex has the same scope as Clause 1 of this European Standard.

Table ZA.1 – Relevant clauses for strength graded structural timber with rectangular cross section

Essential characteristics	Requirement clauses in this European Standard	Levels and/or classes	Notes
Bending strength	5.1, 5.2, 5.3		
Compressive strength	5.1, 5.2, 5.3		
Tensile strength	5.1, 5.2, 5.3		
Shear strength	5.1, 5.2, 5.3		
Modulus of elasticity (mean)	5.1, 5.2, 5.3		
Durability	5.4		
Reaction to fire	5.5	C - F	

The requirement on a certain characteristic is not applicable in those Member States (MSs) where there are no regulatory requirements on that characteristic for the intended use of the product. In this case, manufacturers placing their products on the market of these MSs are not obliged to determine nor declare the performance of their products with regard to this characteristic and the option "No performance determined" (NPD) in the information accompanying the CE marking (see ZA.3) may be used. The NPD option may not be used, however, where the characteristic is subject to a threshold level.

ZA.2 Procedure for attestation of conformity of strength graded structural timber with rectangular cross section

ZA.2.1 System of attestation of conformity

ZA.2.1.1 The system of attestation of conformity of strength graded structural timber with rectangular cross section indicated in Table ZA.1, in accordance with the Decision of the Commission 97/176/EC of 1997-04-29 as given in Annex III of the mandate for "Structural timber products and ancillaries", is shown in Table ZA.2 for the indicated intended uses and relevant level or class:

Table ZA.2 – System of attestation of conformity

Product	Intended uses	Level(s) or class(es)	Attestation of conformity system
Strength graded structural timber with rectangular cross section	Buildings and bridges	Reaction to fire class C[a], D, E, (D)[b], F	2+
System 2+: See Directive 89/106/EEC (CPD) Annex III.2 (ii) First possibility, including certification of the factory production control by an approved body on the basis of initial inspection of factory and of factory production control as well as of continuous surveillance, assessment and approval of factory production control. [a] Products/materials for which there is no stage in the production process resulting in an improvement of the reaction to fire classification (e.g. an addition of fire retardants or a limiting of organic material). [b] Products/materials that do not require to be tested for reaction to fire (i.e. products covered by the CWFT provisions of Annex C).			

The attestation of conformity of the strength graded structural timber with rectangular cross section in Table ZA.1 shall be according to the evaluation of conformity procedures indicated in Table ZA.3 resulting from the application of the clauses of this or other European Standard indicated therein.

ZA.2.1.2 Factory production control shall be checked by a notified body at least twice per year for machine grading and at least once per year for visual grading.

ZA.2.1.3 The requirement for acceptability of machine modifications given in 5.4 of EN 14081-3:2005 shall be carried out by a notified body.

ZA.2.1.4 A notified body shall check and monitor the producer's records with regard to suitability, set-up, calibration, service and maintenance of the grading machine, and the derivation and use of settings, as required in EN 14081-2 and EN 14081-3.

ZA.2.1.5 If the producer or notified body requires control planks to be used to dynamically calibrate a grading machine, the notified body shall meet the following requirements:

a) Notified bodies shall have written procedures for the use of control planks, and shall check that they meet the requirements given in Annex C of EN 14081-2:2005.

b) During each routine inspection and additionally when asked to make a specific check by the company operating a grading machine, notified bodies shall check that the procedures for the use of control planks (see Annex B in EN 14081-3:2005) have been correctly applied.

c) If the result from the machine is at variance with the result from the control plank, the machine shall be adjusted according to the manufacturer's handbook. If this fails to correct the machine a full machine calibration shall be required.

ZA.2.2 EC Certificate and declaration of conformity

When compliance with the conditions of this annex is achieved, and once the notified body has drawn up the certificate mentioned below, the manufacturer or his agent established in the EEA shall prepare and retain a declaration of conformity, which entitles the manufacturer to affix the CE marking. This declaration shall include:

— name and address of the manufacturer, or his authorised representative established in the EEA, and the place of production;

NOTE 1 The manufacturer may also be the person responsible for placing the product onto the EEA market, if he takes responsibility for CE marking.

— description of the product (type, identification, use,...), and a copy of the information accompanying the marking;

NOTE Where some of the information required for the Declaration is already given in the CE marking information, it does not need to be repeated.

— provisions to which the product conforms (i.e. Annex ZA of this EN), and a reference to the ITT report(s) and factory production control records as appropriate);

— particular conditions applicable to the use of the product (e.g. provisions for use under certain conditions);

— number of the accompanying factory production control certificate;

— name of, and position held by, the person empowered to sign the declaration on behalf of the manufacturer or his authorised representative.

Table ZA.3 – Assignment of conformity tasks for strength graded structural timber with rectangular cross section

Tasks			**Content of the task**	**Evaluation of conformity clauses to apply**
Tasks under the responsibility of the manufacturer	Factory production control (F.P.C)		Parameters related to all characteristics of Table ZA.1, relevant for the intended end use	6.3, ZA.2.1.5 6.2.2 in EN 14081-3:2005
	Initial type testing by a notified test lab		Reaction to fire (only when tested)	6.2
	Initial type testing by the manufacturer		All characteristics of Table ZA.1 relevant for the intended end use except reaction to fire (when tested)	6.2
	Testing of samples taken at the factory		All characteristics of Table ZA.1 relevant for the intended end use	6.2 6.2.1 in EN 14081-3:2005
	Certification of F.P.C by the F.P.C certification body on the basis of	Initial inspection of factory and of F.P.C	Parameters related to all characteristics of Table ZA.1 relevant for the intended end use	6.2, ZA.2.1.4 6.2.1 in EN 14081-3:2005
		Continuous surveillance, assessment and approval of F.P.C.	Parameters related to all characteristics of Table ZA.1, relevant for the intended end use, in particular: bending strength, compressive strength and tension strength	6.3, ZA.2.1.2, ZA.2.1.3, ZA.2.1.4, ZA.2.1.5 6.2.2 in EN 14081-3:2005

The declaration shall be accompanied by a factory production control certificate, drawn up by the notified body, which shall contain, in addition to the information above, the following:

— name and address of the notified body;

— number of the factory control certificate;

— conditions of validity of the certificate, where applicable;

— name of, and position held by, the person empowered to sign the certificate.

The above mentioned declaration and certificate shall be presented in the language or languages accepted in the Member State in which the product is to be used.

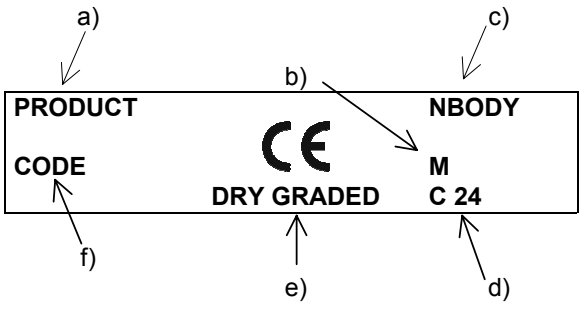
ZA.3 Marking

ZA.3.1 The manufacturer or his authorised representative established within the EEA is responsible for attaching the marking. Each piece of graded timber shall be clearly and indelibly marked to provide the information given in 7.2 plus the letters 'CE', in the format given in Directive 93/68/EC, and the identification number of the notified body. The information given in ZA.3.2 shall also be marked on each piece of timber or given in accompanying documentation. If the end use of the timber requires some or all marking to be omitted for aesthetic reasons in agreement with the notified body, each batch of timber shall be accompanied by a commercial document bearing the CE marking symbol and all the information given in 7.2, 7.3 and ZA.3.2, where this does not cause duplication of information in the commercial document.

ZA.3.2 The following information shall be given either in a mark on each individual piece or in the accompanying commercial document referred to in 7.2 and related to the marked code number (if relevant):

- identification number of the FPC certification body;
- name and registered address of the producer;
- last two digits of year of CE marking;
- number of the EC FPC certificate;
- description of the product (only on the commercial document);
- bending, compressive, tensile and shear strengths (may be done by reference to the strength class);
- modulus of elasticity (may be done by reference to the strength class);
- reaction to fire class and subclass ("Table C.1" if CWFT or mounting and fixing conditions if tested) or Class F;
- durability: for untreated timber, durability class, with reference to EN 350-2 or 'Durability NPD' (No performance determined), for treated timber , additional marking according to prEN 15228.

An example of a mark on the product for machine grading is given in Figure ZA.1, and for visual grading on the commercial document is given in Figure ZA.2. The examples include the information given in Clause 7.



a) Producer identification
b) Letter 'M'
c) Identification number of notified body
d) Strength class or grade and grading
e) If appropriate
f) Code number to identify documentation

Figure ZA.1 – Example of mark on the product with minimum information for untreated machine graded timber

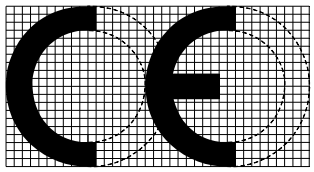
 01234	*CE conformity marking, consisting of the "CE"-symbol given in Directive 93/68/EEC* *Identification number of the FPC certification body*
AnyCo Ltd, PO Box 21, B-1050 **06** 01234-CPD-00234	*Producer identification* *Last two digits of the year in which the marking was affixed* *FPC Certificate number*
EN 14081-1 Structural timber **C24 (STII) Dry graded** **Species code WPCA** **Grading standard EN 338 + NF B 52 001** **Reaction to fire D-s2,d0 (Table C.1)** **Durability class 4**	*No. of European Standard* *Description of product* *and* *information on regulated characteristics*

Figure ZA.2 – Example of information on the commercial document for untreated visually graded timber