

SLOVENSKI STANDARD

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Nadomešča:
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Lesene konstrukcije - Razvrščanje konstrukcijskega lesa pravokotnega prečnega prereza po trdnosti - 1. del: Splošne zahteve

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

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

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

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

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This European Standard was approved by CEN on 26 August 2005 and includes Amendment 1 approved by CEN on 20 December 2010.

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Foreword

This document (EN 14081-1:2005+A1:2011) has been prepared by Technical Committee CEN/TC 124 "Timber structures", the secretariat of which is held by AFNOR.

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of an identical text or by endorsement, at the latest by August 2011, and conflicting national standards shall be withdrawn at the latest by August 2011.

This document includes Amendment 1, approved by CEN on 2010-12-20.

This document supersedes A1 EN 14081-1:2005 A1.

The start and finish of text introduced or altered by amendment is indicated in the text by tags A1 A1.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. CEN [and/or CENELEC] shall not be held responsible for identifying any or all such patent rights.

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.

A1 *deleted text* A1

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, Bulgaria, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Romania, 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; [SIST EN 14081-1:2006+A1:2011
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- 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*

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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 14081-4:2009 ^{A1}, *Timber structures — Strength graded structural timber with rectangular cross section — Part 4: Machine grading; grading machine settings for machine controlled systems*

EN 15228:2009 ^{A1}, *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* ^{A1} (ISO 3166-1:2006) ^{A1}

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

3.15**package**

timber of one grade, one species or species combination, and one cross section size or of multiple sizes where the timber is to be used for one structure, graded in one working shift to be delivered to one customer \triangleleft

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.

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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 $\overline{A_1}$ EN 14081-4:2009 $\overline{A_1}$. 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		
<p>^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.</p> <p>^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.</p> <p>^c Sapstain is not a structural defect and is acceptable without limitation.</p>			

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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	$\frac{1}{2}$ x width of piece	$\frac{1}{4}$ x width of piece
Knot diameter on edge	$\frac{3}{4}$ x thickness of piece	$\frac{1}{2}$ 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 **A1** EN 15228 **A1**.

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.