

Structural timber — Grading — Requirements for machine strength graded timber and grading machines

The European Standard EN 519:1995 has the status of a
British Standard

Committees responsible for this British Standard

The preparation of this British Standard was entrusted by Technical Committee B/518, Structural timber, to Subcommittee B/518/2, Solid timber, upon which the following bodies were represented:

- British Timber Merchants' Association
- British Woodworking Federation
- Council of the Forest Industries of British Columbia
- Department of the Environment (Building Research Establishment)
- Forestry Commission
- Institute of Building Control
- Institution of Civil Engineers
- National House-Building Council
- Nordic Timber Council (UK)
- Southern Pine Marketing Council
- Timber Research and Development Association
- Timber Trade Federation
- Trussed Rafter and Fabricators' Association
- UK Softwood Sawmillers' Association

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National foreword

This British Standard has been prepared by Subcommittee B/518/2 and is the English language version of EN 519:1995 *Structural timber — Grading — Requirements for machine strength graded timber and grading machines* published by the European Committee for Standardization (CEN).

It supersedes the following sections and appendices of BS 4978:1988 *Specification for softwood grades for structural use*: sections 4 and 5, **B.3**, **B.4** and appendices E, F and G. These are in the process of being withdrawn by revision of BS 4978¹⁾.

Cross-references

Publication referred to	Corresponding British Standard
EN 336:1995	BS EN 336:1995 <i>Structural timber — Coniferous and poplar — Sizes — Permissible deviations</i>
EN 338:1995	BS EN 338:1995 <i>Structural timber — Strength classes</i>
EN 384:1994	BS EN 384:1995 <i>Structural timber — Determination of characteristic values of mechanical properties and density</i>
EN 408:1995	BS EN 408:1995 <i>Timber structures — Structural timber and glued laminated timber — Determination of some physical and mechanical properties</i>

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Summary of pages

This document comprises a front cover, an inside front cover, pages i and ii, the EN title page, pages 2 to 20, an inside back cover and a back cover.

This standard has been updated (see copyright date) and may have had amendments incorporated. This will be indicated in the amendment table on the inside front cover.

¹⁾ In preparation.

ICS 79.040

Descriptors: Wood, sawn timber, laminated board, timber construction, filing, mechanical strength, test equipment, specifications

English version

Structural timber – Grading – Requirements for machine strength graded timber and grading machines

Bois de structure — Classement —
Spécifications pour le bois classé par machine
pour sa résistance et les machines à classer

Bauholz für tragende Zwecke — Sortierung —
Anforderungen an mashinell nach der
Festigkeit sortiertes Bauholz und an
Sortiermaschinen

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Foreword

This European Standard has been prepared by the Technical Committee CEN/TC 124, Timber structures, of which the secretariat is held by DS.

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 1995, and conflicting national standards shall be withdrawn at the latest by August 1995.

In accordance with the CEN/CENELEC Internal Regulations, the following countries are bound to implement this European Standard: Austria, Belgium, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Luxembourg, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland and United Kingdom.

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Introduction

There are basically two methods of strength grading: visual grading and machine grading. This standard deals with machine grading. Machine strength is in common use in a number of countries. Its greater predictive accuracy compared with visual grading enables higher yields of higher strength classes to be achieved. 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 particular sizes, species and grades in repeated production runs of around one working shift in duration. This enables the system to be controlled by testing timber specimens from the daily output. These tests together with the cusum statistical procedure are used to monitor and adjust the machine settings to maintain the required strength properties for each strength class. If the cusum procedure indicates that the process is in control then the machine settings may be modified to maximize yield. If the cusum procedure indicates that the process is out of control then, after further checks, the settings shall be modified to ensure the strength requirements are met and the timber may need to be re-graded. 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 around 1969. 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 machine settings, which remain constant for all machines of the same type.

The requirements in this standard are based on machines in current use and on future types of machines as far as these can be foreseen. It is recognized that additional clauses or standards may be required if unforeseen developments take place.

Because of the complexity of the subject, the standard is structured to facilitate use by the various interested parties as follows.

a) A specifier or user of machine strength graded timber, should refer to clauses **1** to **5** inclusive.

b) A company carrying out machine strength grading should refer to clauses **1** to **6** inclusive and Annex A and Annex C. If it is intended to operate the machine in an “output-controlled” system, then clause **9** and Annex B should also be studied.

c) A company manufacturing grading machines, should be familiar with all clauses and annexes, but, most importantly, clause **7**.

d) A certification body should refer to all clauses and annexes.

1 Scope

This European Standard specifies the requirements for assessing and operating machine strength grading systems, to strength grade structural timber and laminates for glulam.

NOTE Whilst it is permitted to use this standard to determine machine settings and to grade to any possible strength profile for a given species, this standard refers to the strength classes of EN 338 to provide suitable strength profiles and dictate the visual override requirements necessary to make machine grading to this standard possible.

In addition, guidance is given for the degree of quality control necessary to ensure the reliability of timber graded by strength grading machines. These requirements are given for both “machine-controlled” and “output-controlled” systems for grading timber.

2 Normative references

This European Standard incorporates by dated or undated reference, provisions from other publications. These normative references are cited at the appropriate places in the text and the publications are listed hereafter. For dated references, subsequent amendments to, or revisions of, any of these publications apply to this European Standard only when incorporated in it by amendment or revision. For undated references the latest edition of the publication referred to applies.

EN 336, *Structural timber — Coniferous and poplar — Sizes, permissible deviations.*

EN 338, *Structural timber — Strength classes.*

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.*

3 Definitions

For the purposes of this standard the following definitions apply.

3.1

batch

timber of one species population and size graded in one working shift

3.2

coefficient of determination

square of the correlation coefficient

3.3

depth

dimension perpendicular to the longitudinal axis of a timber beam, in the plane of the bending forces

3.4

indicating property

measurement or combination of measurements closely related to strength, from which the machine determines the grade of each increment of length of a piece of timber

3.5

machine-derived modulus of elasticity

value of modulus of elasticity calculated directly from an indicating property measurement and associated with the position of that measurement on the piece of timber

NOTE The calculation formula may assume the timber to be homogeneous within the machine's measuring span and may ignore the effects of shear deflection and minor end moments.

3.6

sample

number of specimens of timber of one size and representative of one species population

3.7

settings

values associated with the variable controls of a grading machine which determine the acceptance to each strength class of timber graded by the machine

3.8

strength-reducing characteristic

weakness in a piece of timber resulting from natural growth of the tree (e.g. knots, slope of grain) or changes in moisture content (e.g. fissures) or resulting from conversion of the log (e.g. the inclusion of wane) or caused by attack from fungi, insects or mechanical damage

3.9

strength class

classification of timber based on particular values of mechanical properties

3.10

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

3.11

timber size

sawn or processed dimensions with respect to the permitted tolerances given in EN 336

3.12

thickness

lesser dimension perpendicular to the longitudinal axis of a piece of timber

3.13

width

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

4 Symbols

A	cusum control parameter
B	cusum control parameter
B_a	cusum parameter associated with acceptable quality level
B_r	cusum parameter associated with rejectable quality level
b	width of cross section (in mm)
E	theoretical modulus of elasticity (in N/mm ²)
E_a	actual modulus of elasticity measured in a proof load test (in N/mm ²)
E_m	modulus of elasticity in bending (in N/mm ²)
E_{mac}	machine-derived modulus of elasticity (in N/mm ²)
$E_{0,mean}$	characteristic mean modulus of elasticity parallel to grain (in N/mm ²)
F	applied force (in N)
F_p	proof load (in N)
$f_{m,k}$	characteristic bending strength (in N/mm ²)
f_p	proof stress (in N/mm ²)
h	depth of cross section (in mm)
K	cusum control parameter
k_h	size factor
L_a	run length in acceptable region for cusum control
L_r	run length in rejectable region for cusum control
N	cusum control parameter
t	thickness (in mm)
w	deflection or deformation (in mm)
Y	cusum control parameter
Z	cusum control parameter