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Timber structures — Structural classification for sawn timber

Structures en bois — Classification structurelle pour bois sciés

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Foreword

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The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular the different approval criteria needed for the different types of ISO documents should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see www.iso.org/directives).

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For an explanation on the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the WTO principles in the Technical Barriers to Trade (TBT) see the following URL: Foreword - Supplementary information

The committee responsible for this document is ISO/TC 165, *Timber structures.*

Introduction

The production of many different combinations of species and grades complicates timber specification and structural design. Structural classification groups together species and grades of similar properties, to make them interchangeable for structural purposes. The development of this International Standard is intended to benefit industry, consumers, governments and distributors, by balancing the principles of simplicity, product utility and structural reliability.

One of the key reasons for developing this International Standard is to provide a framework for understanding and working on compatibility between approaches used in different regions, through standardization of the basic elements of structural classes, including underlying assumptions and the general method for setting up classes. An example table is presented in Annex B for illustration purposes.

This International Standard provides a model or template that may be modified before adoption and it does not present final design values and adjustment factors. The scope includes evaluation of structural properties; it does not cover suitability with regard to durability, fire resistance and other timber properties.

Timber structures — Structural classification for sawn timber

1 Scope

This International Standard provides a basic international framework for establishing structural classes for sawn timber.

2 Normative references

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO 12122-1, *Timber structures — Determination of characteristic values — Part 1: Basic requirements*

ISO 12122-2, *Timber structures — Determination of characteristic values — Part 2: Sawn timber*

3 Terms and definitions

For the purpose of this document, the following terms and definitions apply.

3.1
characteristic value
standard estimate of a structural property of a *timber population* (3.11) corresponding to a fractile, tolerance limit or mean of sample test data after being adjusted to accepted reference conditions

3.2
derived property
structural property for which characteristic values are determined by correlation with one or more primary properties, and not typically used in deciding how to classify a population

3.3
design value
numerical quantity assigned to a timber population for use in structural design, calculated from the characteristic value and modified to suit provisions in the appropriate building code and standards

Note 1 to entry: Design values are not used directly in structural classes.

3.4
full-size specimen
timber test piece that is similar in size and characteristics to typical structural timbers and is prepared and tested in a way similar to use in construction

Note 1 to entry: See also *small clear specimen* (3.7).

3.5
normalization
adjustment of data, beyond basic data breakdown and moisture and size corrections, to be on a compatible basis with other data for evaluation in the same structural class system

3.6
primary property
structural property that is used to set criteria for allocating a timber population to a structural class system, based on the characteristic value for that property

3.7
small clear specimen
timber test piece that is much smaller than typical structural timbers and normally prepared to be free of visible defects

Note 1 to entry: See also *full-size specimen* (3.4).

3.8
species combination
two or more species or multiple data sets of the same species from different growth or production regions, combined into a single marketing group on the basis of similar properties and property relationships, or other applicable criteria

3.9
grade
solid sawn timber population produced with standardized rules that maintain well-defined limits on strength-controlling characteristics or properties

3.10
structural classification
system for assigning shared structural properties to timber populations of similar capacities, for the purpose of structural design and specification

3.11
timber population
solid sawn timber product of a grade and species or species combination intended for use in structural applications

4 Timber population and structural property data

This International Standard is based on the timber population and structural property data estimates conforming to those identified in ISO 12122-1 and ISO 12122-2.

NOTE See Annex A for additional information.

5 Primary properties

5.1 Framework

Primary properties shall be established on a standardized basis to ensure compatibility between different sets of test data from accepted sampling and testing programs. Primary characteristic properties include the following:

— bending strength: the modulus of rupture at the 5th percentile, with specified level of confidence;

— bending stiffness: the modulus of elasticity at the mean and 5th percentile levels;

— density: the density at the mean and 5th percentile levels.

NOTE 1 Strength properties are typically estimated as tolerance limits at the 5th percentile level with confidence specified at 75 %. Stiffness and density properties are typically estimated as either means or percentiles without a confidence statement, or as tolerance limits with confidence specified at 75 %.

NOTE 2 An alternative approach is to use axial (tension) strength instead of bending strength as a primary property. Some representative testing standards for primary properties are identified in the Bibliography.

5.2 Bending or tension property evaluation

5.2.1 General

Primary bending property data or, where applicable, tension property data shall be evaluated as characteristic values determined on the basis of standardized full-size specimen testing, except as permitted in 5.2.2.

5.2.2 Exception

Where it is necessary to evaluate bending or tension property data on a basis other than full-size testing, the data shall be supported by but not combined or interchanged with full-size testing results.

NOTE Although full-size timber testing is preferred, small clear specimen testing is used in cases where full-size bending or tension testing is not feasible or practical, with modification factors to partially calibrate the data in accordance with characteristic value standards, and subject to a review of consistency in the level of safety between small clear and full-size testing approaches (see Annex C).

5.3 Density evaluation

Density property data shall be evaluated as characteristic values determined on the basis of standardized small clear wood specimen testing.

NOTE ISO 13910 provides a standardized approach to evaluating density properties.

5.4 Class boundaries

Class boundaries for primary bending or tension strength properties shall be set at intervals of no less than 2 MPa.

6 Derived properties

6.1 Framework

Derived properties shall be established on the basis of standardized relationships to one or more of the primary properties provided that it can be demonstrated that these relationships are generally applicable to the timber population.

Derived strength and stiffness properties for structural classes shall include properties other than the primary strength and stiffness properties and shall be expressed on the same basis as primary properties (See NOTES to 5.1).

6.2 Evaluation

6.2.1 General

Derived properties shall be assigned as characteristic values determined on the basis of standardized relationships identified in 6.1 or, where further evidence of compliance is required, evaluated in accordance with the alternative method in 6.2.2.

6.2.2 Exception

Where derived properties are to be evaluated or corroborated by testing, they shall be evaluated on a standardized basis to ensure compatibility between different sets of test data from accepted sampling and test programs. Bending or tension property data used to evaluate derived properties shall be

determined as characteristic values on the basis of standardized full-size specimen testing, except as permitted in 5.2.2.

NOTE Ongoing monitoring or quality control testing is sometimes used to demonstrate suitability for cases involving new or modified products or grading systems.

7 Allocation to a class

7.1 Framework

7.1.1 General

A timber population shall be qualified to be allocated to a class if the characteristic values for the primary properties equal or exceed the tabulated class values. In addition, where derived properties are to be evaluated or corroborated by testing, the population shall be qualified to be allocated to a class only if its characteristic values for such properties also equal or exceed the tabulated class values, except as provided in 7.1.2.

7.1.2 Normalization of characteristic values

Prior to allocation to a class, characteristic values for data sets derived following standard methods for sampling the timber population and evaluating the primary properties shall be permitted to be normalized to account for documented differences in property estimation as well as the dispersion in data sets around the characteristic value.

NOTE 1 This requirement is based on the assumption that a uniform approach will be applied to structural property modification for each or all structural classes to achieve a desired level of safety. Timber from grading systems or processes that are very different can require the use of normalization factors to calibrate characteristic values (see Annex C) to ensure that products allocated to a class demonstrate a consistent level of structural performance in end use.

NOTE 2 A different basis for sampling and deriving characteristic values (such as the use of small clear specimens versus samples of full-size commercial production) will yield different levels of dispersion in the data set as well as characteristic values. These differences require the development of different data set adjustments; for example, see Annex C for a comparison between the small clear and full-size specimen approach.

7.2 Grading systems

7.2.1 General

Structural classes shall be permitted to include timber populations from different grading systems provided that these populations fit within the established framework of structural property relationships.

NOTE An example of a structural classification framework appears in Annex B.

7.2.2 Exception

Where timber populations from different grading systems have significantly different structural property relationships or levels of variability, they shall be allocated either under separate classification systems, or in accordance with rules addressing these differences through appropriate adjustments to properties or grading processes.

7.3 Design values

This International Standard is based on the assumption that any structural property modifications made to establish design values in building codes and design standards will be consistent with the data and assumptions used to allocate populations to structural classes.

NOTE The body adopting a structural class system can also decide to incorporate individual species-grade design values in appropriate codes or standards as an alternative approach to structural class design values.

8 Reporting

Timber population and data estimates, sampling, test procedures and adjustments to data and structural class allocation shall be recorded and included in a report.

NOTE Other factors to be considered in setting up and implementing a structural classification system are identified in Annex C.