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Physical and mechanical properties of wood — Test methods for small clear wood specimens —

Part 11: Determination of resistance to impact indentation

Propriétés physiques et mécaniques du bois — Méthodes d'essais sur petites éprouvettes de bois sans défauts —

Partie 11: Détermination de la résistance à la pénétration dynamique

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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 voluntary nature of standards, the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the World Trade Organization (WTO) principles in the Technical Barriers to Trade (TBT) see the following URL: www.iso.org/iso/foreword.html.

This document was prepared by Technical Committee ISO/TC 218, *Timber*.

This first edition of ISO 13061-11 cancels and replaces ISO 3351:1975, which has been technically revised with regards to the sizes, moisture content of test pieces, and adjustment for moisture content.

A list of all parts in the ISO 13061 series can be found on the ISO website.

Introduction

The main purpose of this document is to establish the common international point of member countries of the International Organization for Standardization (ISO), concerning testing methods for small clear wood specimens and general requirements for determining physical and mechanical properties of wood.

Physical and mechanical properties of wood — Test methods for small clear wood specimens —

Part 11: Determination of resistance to impact indentation

1 Scope

This document specifies a method for the determination of the resistance of wood to impact indentation by a steel ball.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO 3129, *Wood — Sampling methods and general requirements for physical and mechanical testing of small clear wood specimens*

ISO 13061-1, *Physical and mechanical properties of wood — Test methods for small clear specimens — Part 1: Determination of moisture content for physical and mechanical tests*

ISO 13061-2, *Physical and mechanical properties of wood — Test methods for small clear specimens — Part 2: Determination of density for physical and mechanical tests*

ISO 24294, *Timber — Round and sawn timber — Vocabulary*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 24294 apply.

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

— IEC Electropedia: available at http://www.electropedia.org/

— ISO Online browsing platform: available at http://www.iso.org/obp

4 Principle

The resistance to impact indentation is determined by dropping a steel ball of 25 mm in diameter from a 500 mm height and measuring the diameter of the indentation on the surface of a test piece.

5 Apparatus

5.1 An equipment consisting of the following:

— a steel ball (density 7,8 g/cm^3) of (25 ± 0,05) mm in diameter;

— an arrangement for dropping the ball from a height of (500 ± 1) mm;

— a massive base-plate;

— a mechanism for pressing the test piece against the plate.

5.2 Measuring device for determining the diameter of indentations to a precision of 0,01 mm.

5.3 Carbon paper.

5.4 Equipment for the determination of moisture content and density in accordance with ISO 13061-1 and ISO 13061-2, respectively.

6 Preparation of test pieces

6.1 The sampling and preparation of test pieces shall be in accordance with ISO 3129.

6.2 The test pieces shall be made in the form of right prisms having a square cross-section at least 20 mm × 20 mm and length along the grain at least 150 mm. One face of the test piece shall be in a radial plane and the other in a tangential plane.

6.3 Moisture content of test pieces

6.3.1 Test pieces can be tested in green or in air-dry condition.

6.3.2 The moisture content of test pieces tested in green condition shall be equal or exceed fibre saturation point (FSP).

6.3.3 Test pieces tested in air-dry condition shall be conditioned to a constant mass in an atmosphere with a relative humidity of (65 ± 5) % and a temperature of (20 ± 2) °C.

NOTE Constant mass is considered to be reached when the results of two successive weighing operations, carried out at an interval of 8 h, do not differ by more than 0,2 % of the mass of the test piece.

6.3.4 After preparation, the test pieces shall be stored under conditions, which ensure that their moisture content remains unchanged before testing.

7 Procedure

7.1 Press the test piece, with a carbon paper placed on it, closely against the base-plate of the device (5.1). Make three indentations on the radial surface of the test piece, and another three on the tangential surface, by the impact from a steel ball falling freely from a height of 500 mm (measured from the lowest point of the ball surface). The distance between the centres of the indentations shall be about 40 mm.

7.2 Measure, to precision of 0,01 mm, the dimensions, parallel and perpendicular to the grain, of the impressions left on the test piece by the carbon paper after the impact of the steel ball.

7.3 As soon as the test has been completed, cut a portion of the test piece 100 mm long and 5 mm thick from each side having indentation marks as the test piece for the determination of moisture content in accordance with ISO 13061-1. Density shall be determined using the undamaged portion of the test piece in accordance with ISO 13061-2.

8 Calculation and expression of results

8.1 The resistance to impact indentation, H_{yW}, of each test piece at a moisture content, W, at the time of test, shall be calculated, in kJ/m^2, using the Formula (1):

$$H_{yW} = \frac{4\,000 \times m \times g \times h}{\pi \times d_0^2} \tag{1}$$

where

- m is the mass of the ball, in kg;
- g is the acceleration of free fall, in m/s^2;
- h is the height through which the ball falls, in m;
- d_0 is the average diameter of the indentation, in mm, to an accuracy of 0, 01 mm, given by Formula (2):

$$d_0 = \sqrt{d_1 \cdot d_2} \tag{2}$$

where

- d_1 and d_2 are the dimensions of the indentation parallel and perpendicular to the grain, respectively, in mm.

8.2 Calculate the arithmetic mean of the results of three determinations on the same test piece and express the result to precision of 0,1 kJ/m^2.

8.3 When required, the resistance to impact indentation, H_{yW} shall be adjusted to a 12 % moisture content using a nationally or an internationally recognized method.

NOTE An approximate adjustment of the resistance to impact indentation 12 % moisture content can be done using the following formula, which is valid for moisture contents of (12 ± 5) %:

$$H_{y12} = H_{yW} \left[1 + \alpha \left(W - 12 \right) \right]$$

where

- α is the correction factor for moisture content whose value should be obtained from a national standard or an internationally recognized method;

  NOTE In China, when air dry density of wood ≤ 500kg/m^3, α = 0,03; when air dry density of wood ≥ 900 kg/m^3, α = 0,07; when air dry density of wood is between 501kg/m^3 and 899 kg/m^3, α = 0,05.

- W is the moisture content of the wood, determined according to ISO 13061-1.

8.4 The mean and the standard deviation of the results obtained for the individual test pieces in a sample shall be calculated to a precision of 0,1 kJ/m^2.

