INTERNATIONAL STANDARD

ISO 13061-6

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

Part 6: Determination of ultimate tensile stress parallel to grain

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

Partie 6: Détermination de la contrainte de rupture en traction parallèle aux fibres

Reference number
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Contents

Page

Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

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).

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights. Details of any patent rights identified during the development of the document will be in the Introduction and/or on the ISO list of patent declarations received (see www.iso.org/patents).

Any trade name used in this document is information given for the convenience of users and does not constitute an endorsement.

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 218, *Timber.*

This first edition of ISO 13061-6 cancels and replaces ISO 3345:1975, which has been technically revised with regards to the sizes, moisture content of test pieces, and adjustment for moisture content.

ISO 13061 consists of the following parts, under the general title *Physical and mechanical properties of wood — Test methods for small clear specimens*:

— *Part 1: Determination of moisture content for physical and mechanical tests*

— *Part 2: Determination of density for physical and mechanical tests*

— *Part 3: Determination of ultimate strength in static bending*

— *Part 4: Determination of modulus of elasticity in static bend*ing

— *Part 6: Determination of ultimate tensile stress parallel to grain*

— *Part 7: Determination of ultimate tensile stress perpendicular to grain*

The following parts are under preparation:

— *Part 5: Determination of strength in compression perpendicular to grain*

— *Part 10: Determination of impact bending strength*

— *Part 11: Determination of resistance to impact indentation*

— *Part 12: Determination of static hardness*

— *Part 13: Determination of radial and tangential shrinkage*

— *Part 14: Determination of volumetric shrinkage*

— *Part 15: Determination of radial and tangential swelling*

— *Part 16: Determination of volumetric swelling*

— *Part 17: Determination of strength in compression parallel to grain*

Introduction

The main purpose of this International Standard 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 6: Determination of ultimate tensile stress parallel to grain

1 Scope

This part of ISO 13061 specifies a method for determining the ultimate tensile stress of wood parallel to grain on small clear specimens by measuring the breaking load applied statically along the longitudinal axis of a test piece.

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 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.

4 Principle

The ultimate tensile stress parallel to grain is determined by application of a gradually increasing load in direction parallel to grain of a test piece until failure.

5 Apparatus

5.1 Testing machine capable of ensuring constant rate of loading or of movement of the loading head and allowing measurement of the load to an accuracy of 1 %.

The grips of the testing machine shall be such that the load is applied along the longitudinal axis of the test piece and shall prevent longitudinal twisting of the test piece.

5.2 Measuring instrument capable of measuring the dimensions of the gauge portion of the test piece to the nearest 0,1 mm.

5.3 Equipment for the determination of moisture content, in accordance with ISO 13061-1.

6 Preparation of test pieces

6.1 General

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

6.1.2 The general direction of the wood grain in test pieces shall be parallel to the longitudinal axis of the gauge portion. The gauge portion shall have a rectangular cross-section with dimensions from 10 mm to 30 mm in the radial direction and from 5 mm to 10 mm in the tangential direction. The gauge length of the test piece shall be from 50 mm to 100 mm. The ends of the test pieces shall be so shaped as to ensure that the failure occurs within the gauge portion and to minimize stress concentration in the transition area. Use of test pieces with laminated ends is permitted.

6.2 Moisture content of test pieces

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

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

6.2.3 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.

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

7 Procedure

7.1 Measure the cross-sectional dimensions of the gauge portion of the test piece to the nearest 0,1 mm.

7.2 Clamp the ends of the test piece between the grips of the testing machine at a distance not less than 25 mm from the gauge portion.

7.3 Carry out the test at a constant rate of loading or of movement of the loading head such the test piece shall fail in not less than 0,5 min and not more than 5 min from the beginning of application of the load. Read the maximum load to the accuracy specified in 5.1. Discard results obtained on test pieces which fail outside the gauge portion.

NOTE Mechanical properties of wood depend on the speed of testing. Therefore, it is important to select the speed of testing appropriate for the purpose of the test program and include it in the report.

7.4 As soon as the test has been completed, cut the gauge portion of the test piece for the determination of moisture content and wood density according to ISO 13061-1 and ISO 13061-2, respectively.

8 Calculations and expression of results

8.1 The ultimate tensile stress parallel to grain, $\sigma_{W\parallel}$, of each test piece in N/mm^2 (MPa), at moisture content W at the time of test, shall be calculated using the following formula:

$$\sigma_{W\parallel} = \frac{P_{\max}}{bh}$$

where

$P_{\max}$ is the maximum load, in N;

b, h are the cross-sectional dimensions of the gauge portion of the test piece, in mm.

The results shall be expressed to a precision of 1 N/mm^2 (MPa).

8.2 When required, the ultimate stress, $\sigma_{W\parallel}$, shall be adjusted to 12 % moisture content using a nationally or an internationally recognized method.

NOTE An approximate adjustment of the ultimate tensile stress parallel to grain to 12 % moisture content can be done using the following formula, which is valid for a moisture content of (12 ±5) %:

$$\sigma_{12} = \sigma_{W\parallel}\left[1+\alpha\left(W-12\right)\right]$$

where

α is the correction factor for the moisture content, whose value has not been established;

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

8.3 The mean and the standard deviation of the results obtained for individual test pieces in a sample shall be calculated to a precision of 1 N/mm^2 (MPa).

9 Test report

The test report shall include the following particulars:

a) a reference to this part of ISO 13061, i.e. ISO 13061-6;

b) details concerning sizes of the test pieces;

c) sampling details in accordance with ISO 3129;

d) time to failure;

e) test results and their statistical values calculated as specified in Clause 8;

f) moisture content and density of each test piece measured in accordance with ISO 13061-1 and ISO 13061-2, respectively;

g) method and value of the coefficient used for the adjustment of the test results to a 12 % moisture content, if applicable;

h) mode of failure;

i) speed of testing:

j) date when the test was carried out;

k) name of the organization which carried out the test.