INTERNATIONAL STANDARD

ISO 3129

Third edition
2019-11

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

Bois — Méthodes d'échantillonnage et conditions générales pour les essais physiques et mécaniques de petites éprouvettes de bois net

Reference number
ISO 3129:2019(E)

ISO copyright office
CP 401 • Ch. de Blandonnet 8
CH-1214 Vernier, Geneva
Phone: +41 22 749 01 11
Fax: +41 22 749 09 47
Email: copyright@iso.org
Website: www.iso.org

Published in Switzerland

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 of 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 www.iso.org/iso/foreword.html.

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

This third edition cancels and replaces the second edition (ISO 3129:2012), which has been technically revised.

The main changes compared to the previous edition are as follows:

— Clause 2 and Bibliography were updated.

Any feedback or questions on this document should be directed to the user's national standards body. A complete listing of these bodies can be found at www.iso.org/members.html.

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

1 Scope

This document specifies methods for the extensive and limited sampling of wood, conditioning and preparation of test pieces. It also specifies the general requirements for physical and mechanical testing of small clear wood specimens. The sampling guidance provided in this document can be applied for timber taken from either trees, logs, or pieces of ungraded/graded/presorted sawn timber for non-structural applications, such as furniture, windows, doors, etc., only.

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 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 Online browsing platform: available at https://www.iso.org/obp

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

4 General principles

This document covers procedures of sampling for obtaining small clear specimens which, when tested in accordance with methods specified under relevant International Standards, may provide information on the influence on mechanical properties of such factors as moisture content, density, position in cross-section, height in the tree and locality of growth.

5 Sampling

5.1 Selection of material

The material intended for physical and mechanical tests shall be selected taking into account the purpose of the test, as well as the requirements to ensure that the properties obtained from the test pieces represent the sample population.

5.2 Sampling of wood material

5.2.1 General

The material selected shall be in the form of either logs or sawn timbers.

5.2.2 Logs

Trees or logs shall be selected to represent the population. For each species to be tested, at least five trees or logs representative of that species or species group shall be selected.

A heart plank shall be cut from a log of acceptable diameter. For a log having a concentric structure, the heart plank shall cover the geometrical centre (see Figure 1). In the case of a log having a diameter of 180 mm or less, the heart plank shall be cut in the direction of two mutually perpendicular diameters (see Figure 2).

For a log having an eccentric structure, the plank shall include the pith and not the geometrical centre.

The thickness of the heart plank shall be at least 60 mm, except for logs with a diameter of 180 mm or less, where the thickness shall be 40 mm. In this case, to obtain test pieces with a cross-sectional dimension greater than 30 mm, a disc that is at least 100 mm thick shall be cut from one end of the log prior to sawing out heart planks. This disc may be used for the hardness test.

5.2.3 Matching for test of dry material

If one purpose of the sampling is to provide comparison of green and dry properties, provisions shall be made for matching of specimens within the tree. The collection of the material shall be arranged to provide for tests of both green and dry specimens that are closely matched by selection from adjacent parts of the same tree.

To afford matching, the sticks of one heart plank shall be interchanged with the other sticks from the next adjacent heart plank from the same tree to form two composite heart planks, each being complete and made of equal portions of the adjacent heart planks. The sticks from one of these composite heart planks shall be tested green and those from the other shall be tested after drying. Thus, the sticks of each composite heart plank shall be regarded as if they were from the same heart plank.

This procedure provides for end-to-end matching (end matching) of sticks to be tested dry with those to be tested green, which is to be preferred when practicable. If, because of the nature of the material, end matching is not practicable, side matching may be used.

5.2.4 Sawn timber

In sampling of sawn timber, sticks shall be cut parallel to the direction of the grain. A sufficient number of sticks shall be cut to ensure that the sample and its statistical properties are representative of the population. The sticks shall be not less than 35 mm thick with sides in radial and tangential directions. Sticks containing pith shall be discarded.

6 Conditioning of material

6.1 Test pieces with a standardized moisture content (air-dry)

Before conversion into test pieces, the wood shall be thoroughly dried (at a temperature lower than 60 °C) to a moisture content close to that of the equilibrium state and shall be conditioned at a temperature of (20 ± 2) °C and a relative humidity of (65 ± 5) % to bring the moisture content of the wood to that of equilibrium. It is desirable that the ends of the sticks be covered with a moisture-protective substance to prevent splitting.

NOTE In certain climatic conditions, wood can be conditioned at a temperature above 20 °C with the appropriate change in relative humidity to obtain the same equilibrium moisture content.

6.2 Test pieces with moisture content of equal to or above fibre saturation point (green)

Prior to cutting into test pieces, the sticks shall be kept under controlled conditions to prevent further drying of the wood.

Dimensions in millimetres

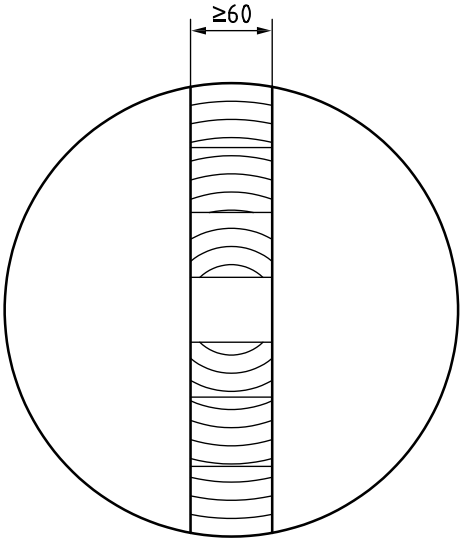

Figure 1 — General cutting pattern of heart plank from a log of diameter >180 mm

Dimensions in millimetres

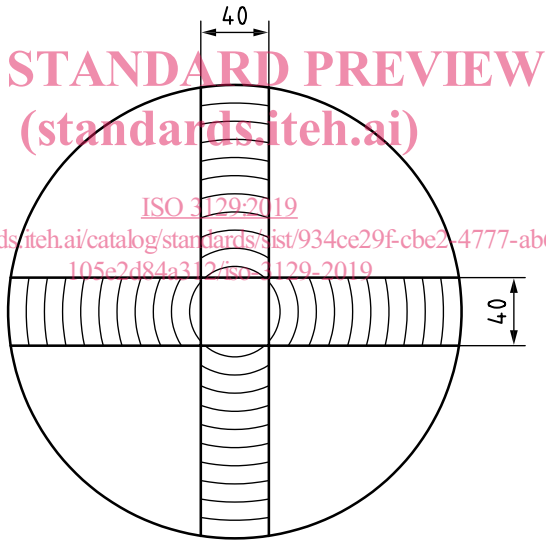

Figure 2 — General cutting pattern of heart planks from a log of diameter ≤180 mm

7 Preparation of test pieces

7.1 Form and dimensions

One test piece for each type of test shall be cut from each stick as specified in 5.2. The form and dimensions of the test pieces shall be those specified in the relevant International Standards for methods of testing small clear specimens of wood.

7.2 Direction of grain

The wood shall be cut with the grain parallel to the longitudinal axis of the test pieces. Growth rings on the end surfaces of test pieces shall be parallel to one pair of opposite faces and perpendicular to the other pair. Adjacent faces shall be at right angles. In the case of tropical timbers where the growth ring

is not clear, the cutting shall follow the direction of the rays on the cross-section which represents the radial surface of the test pieces.

7.3 Permissible deviations

The permissible deviations of the gauge length of the test pieces from nominal dimensions shall not exceed ±0,1 mm. The dimensions of test pieces not used in calculations (for example, the length of the test piece for the static bending test) shall be kept to an accuracy of ±1 mm. The working surfaces of the test pieces shall be clean finished.

7.4 Marking

Each test piece obtained from a heart plank shall be numbered to indicate its original position in the plank. In the case of sawn timber, each test piece shall be numbered to indicate the stick from which they were cut. The piece marking shall indicate whether it was cut from sapwood or heartwood, if they are differentiated.

7.5 Sample size (number of test pieces)

7.5.1 Random sampling

The number of test pieces shall be specified, taking into account:

— the purpose of the testing, for example, determination of the quality of standing tree or of a model tree or of a lot of timber or of an individual piece of sawn timber;

— the type of sampling method used, and

— the degree of test precision and confidence required.

Assuming that the test data is normally distributed, the average values of the physical and mechanical properties shall be determined with a precision of $p \leq 5$ % at a specified confidence level (see 7.5.2, 7.5.3 and Clause 9).

7.5.2 Selective sampling

In selective sampling, the minimum number of test pieces, n_{min}, is given by the following Formula (1):

$$n_{\min} = mn = \frac{C_V{}^2 t^2}{p^2} \left[\frac{\left(\frac{n\sigma_b^2}{\sigma_j^2} \right) + 1}{\left(\frac{\sigma_b^2}{\sigma_j^2} \right) + 1} \right] \tag{1}$$

where

m is the quantity of selected material (logs, sawn timber, boards, etc.);

n is the mean number of test pieces cut from each piece of the selected material;

C_V is the percentage coefficient of variation for the property to be determined (see Table 1);

t is the index of result authenticity (a half-length of the confidence interval in fractions of the standard deviation;

p is the percentage index of test precision (the relation between the standard deviation of the arithmetic mean and the arithmetic mean);

σ_b^2 is the expected variance of the property between trees;

σ_j^2 is the expected variance of the property within a tree.

The results shall be rounded to the nearest integer.

7.5.3 Mechanical sampling

In mechanical sampling, the minimum number of test pieces, n_{min}, is given approximately by Formula (2):

$$n_{min} = \frac{C_V{}^2 t^2}{p^2} \tag{2}$$

where C_V, t and p are as defined in 7.5.2.

The results shall be rounded to the nearest integer.

7.5.4 Minimum number of test pieces

For an approximate determination of the minimum number of test pieces, the mean values of the coefficients of variation for wood properties shown in Table 1 may be used.

Table 1 — Mean values of the coefficients of variation for wood properties

Wood property	Coefficient of variation %
Number of growth rings in 1 cm	37
Percentage of late wood	28
Density	10
Equilibrium moisture content	5
Coefficient of shrinkage: linear	28
Coefficient of shrinkage: volumetric	16
Ultimate compressive strength parallel to grain	13
Ultimate strength in static bending	15
Ultimate shearing strength parallel to grain	20
Modulus of elasticity in static bending	20
Proportional limit (conventional ultimate strength) in compression perpendicular to grain	20
Ultimate tensile strength: parallel to grain	20
Ultimate tensile strength: perpendicular to grain	20
Impact strength in bending	32
Hardness	17

For determining the number of test pieces for resistance to impact indentation, guidelines of EN 1534 may be used.

NOTE According to EN 1534, the number of test pieces for resistance to impact indentation depends on the number of indentations carried out on each test piece with a total number of indentations of at least 50. If three indentations are made on each radial and tangential surface for each test piece, and the number of test pieces is 30, the total number of indentations is 180. Hence n = 30 will satisfy the requirement of EN 1534.