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

Part 14: Determination of volumetric shrinkage

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

Partie 14: Détermination du retrait volumique

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Foreword

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

This second edition cancels and replaces the first edition (ISO 13061-14:2016), which has been technically revised.

The main changes are as follows:

— changes in the sizes and measurements of test pieces and the calculation of test results.

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

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.

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 14: Determination of volumetric shrinkage

1 Scope

This document specifies methods for the determination of volumetric shrinkage of wood.

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 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 terminology databases for use in standardization at the following addresses:

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

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

4 Principle

This document specifies two methods, stereometric method and immersion method, for determining the volumetric shrinkage by measuring volume of a test piece before and after drying to a constant mass. The volume is calculated as a product of the linear dimensions of the test piece in stereometric method or measured as the mass of the water displaced in immersion method. The volumetric shrinkage is calculated as the change of the volume expressed as a percentage of the original volume. The initial measurements shall be taken on test pieces in green or fully saturated condition. The final measurements shall be taken on test pieces in oven-dry state.

5 Sampling

The selection, preparation and the minimum number of test pieces shall be in accordance with ISO 3129.

6 Stereometric method

6.1 Apparatus

6.1.1 Measuring instruments, capable of determining dimensions of the test piece to the nearest 0,02 mm, fitted with parallel flat ends, each of diameter 5 mm to 8 mm, and applying a clamping force which will not cause any deformation greater than the precision of the instrument.

6.1.2 Forced convection oven that can be maintained at a temperature of (103 ± 2) °C throughout the drying chamber for the time required to dry the specimen to the end point shall be used. The oven shall be vented to allow the evaporated moisture to escape.

6.1.3 Desiccator, a vapour-tight container with absorbent material (e.g. silica gel, calcium chloride, etc.) to maintain the air dry.

6.1.4 Vessel, containing distilled water.

6.1.5 Balance, accurate to 0,001 g.

6.2 Preparation of test pieces

6.2.1 Dimensions of test pieces

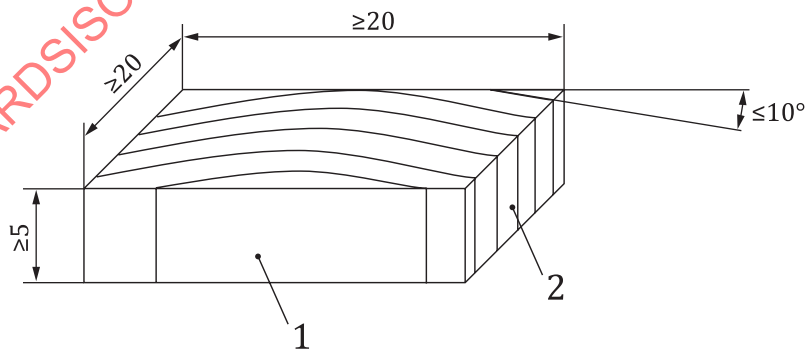
6.2.1.1 Test pieces shall be cut from wood in green condition in the form of rectangular prisms.

6.2.1.2 The size of the test piece shall be at least 20 mm in radial and tangential directions and at least 5 mm along the grain if the longitudinal shrinkage is neglected in the measurements.

6.2.1.3 If the longitudinal shrinkage is considered in the determination, the length of the test piece along the grain shall be not less than 100 mm.

6.2.2 Inclination of annual rings of test pieces

The angle of inclination of annual rings to a pair of opposite tangential faces of the test pieces shall not exceed 10° (see Figure 1).



Key

1 tangential face

2 radial face

Figure 1 — Inclination of annual rings of a test piece

6.2.3 Marking of measurement points

Measurement points shall be marked in the middle of each surface considered in the determination of the shrinkage.

6.3 Procedure

6.3.1 Determination of the dimensions of test pieces in green or fully saturated condition

The moisture content of test pieces shall be at or above the fibre saturation point (FSP). When the moisture content is below FSP, soak the test pieces in distilled water at a temperature of (20 ± 2) °C until no further change in dimensions occurs. Check the changes in dimensions every 3 days through repeated measurements at the same points until the difference between two successive measurements does not exceed 0,01 mm. In this case, it shall be reported that the results are obtained on test pieces which have been previously soaked. Measure the radial and tangential dimensions, l_{r1} and l_{t1}, of each test piece to an accuracy of 0,02 mm. If the longitudinal shrinkage is considered in the determination, measure the length of each test piece along the grain, l_{l1}, to an accuracy of 0,02 mm.

6.3.2 Determination of the dimensions of test pieces at oven-dry state

After air-seasoning, the test pieces shall be open-piled and dried to constant weight at a temperature of (103 ± 2) °C in the oven, ensuring no checks distorting their dimensions and shape occur. Check the changes in weights of two or three control test pieces after 8 h of drying and repeat the measurements every 8 h or longer until the difference between two successive weighing does not exceed 0,2 % of the test pieces or when the difference between two successive measurements does not exceed 0,02 mm of the corresponding dimension of the test piece. Test pieces in which checks occurred during the test period shall be disregarded. Cool the test pieces to room temperature in the desiccator. Measure the radial and tangential dimensions, l_{r2}, and l_{t2}, of each test piece to an accuracy of 0,02 mm. If the longitudinal shrinkage is considered in the determination, measure the length of each test piece along the grain, l_{l2}, to an accuracy of 0,02 mm.

6.4 Calculation and expression of results

If the longitudinal shrinkage is not considered, calculate the volumetric shrinkage, β_V, as a percentage by Formula (1):

$$\beta_V = \frac{(l_{r1} \times l_{t1}) - (l_{r2} \times l_{t2})}{l_{r1} \times l_{t1}} \times 100 \quad (1)$$

If the longitudinal shrinkage is considered, calculate the total volumetric shrinkage, β_V, as a percentage by Formula (2):

$$\beta_V = \frac{(l_{r1} \times l_{t1} \times l_{l1}) - (l_{r2} \times l_{t2} \times l_{l2})}{l_{r1} \times l_{t1} \times l_{l1}} \times 100 \quad (2)$$

where

l_{r1}, l_{t1} and l_{l1} are the dimensions, in millimetres, of the green or fully saturated test piece, measured in the radial, tangential and longitudinal directions, respectively;

l_{r2}, l_{t2} and l_{l2} are the dimensions, in millimetres, of the test piece at oven-dry state, measured in the radial, tangential and longitudinal directions, respectively.

Express the result to the nearest 0,1 %.

The mean and the standard deviation of the results obtained for the individual test pieces in a sample shall be calculated to an accuracy of 0,1 %.