International Standard

ISO 4469

Wood — Determination of radial and tangential shrinkage

Bois — Détermination des retraits radial et tangentiel

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Foreword

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Draft International Standards adopted by the technical committees are circulated to the member bodies for approval before their acceptance as International Standards by the ISO Council.

International Standard ISO 4469 was developed by Technical Committee ISO/TC 55, *Sawn timber and sawlogs*, and was circulated to the member bodies in May 1980.

It has been approved by the member bodies of the following countries :

Australia	France	Poland
Austria	Germany, F.R.	Romania
Belgium	Ghana	South Africa, Rep. of
Brazil	Hungary	Sweden
Bulgaria	India	Turkey
Czechoslovakia	Italy	USSR
Finland	Norway	Yugoslavia

The member bodies of the following countries expressed disapproval of the document on technical grounds :

Canada
Ireland
Netherlands

Wood — Determination of radial and tangential shrinkage

1 Scope and field of application

This International Standard specifies a method for the determination of linear shrinkage, in the radial and tangential directions, of wood.

2 References

ISO 3129, *Wood — Sampling methods and general requirements for physical and mechanical tests.*

ISO 3130, *Wood — Determination of moisture content for physical and mechanical tests.*

3 Principle

Determination of the linear dimensions, in the radial and tangential directions, of test pieces after drying, at a moisture content in equilibrium with the normal environment, and at a moisture content equal to or greater than the saturation point of the cellular walls of wood.

4 Apparatus

4.1 Measuring instrument, capable of determining dimensions to an accuracy of 0,01 mm, fitted with flat ends each of diameter 5 to 8 mm, and applying a clamping force which will not cause any deformation greater than the accuracy of the instrument.

4.2 Oven, for drying wood at a temperature of 103 ± 2 °C.

4.3 Vessel, containing distilled water.

4.4 Air-tight vessel, containing a desiccant.

4.5 Balance, accurate to 0,01 g, if the method of successive weighing (see ISO 3130) is to be used.

5 Preparation of test pieces

5.1 Test pieces shall be made in the form of rectangular prisms, of base 20 mm × 20 mm, and of length along the grain from 10 to 30 mm. The angle of inclination of annual rings to a pair of opposite faces of the test piece shall not exceed 10°.

5.2 The preparation and number of test pieces shall be in accordance with ISO 3129.

6 Procedure[1]

6.1 The moisture content of test pieces shall be considerably higher than the fibre saturation point. When the moisture content is less than the limit of saturation, soak the test pieces in distilled water in the vessel (4.3) at a temperature of 20 ± 5 °C until no further change in dimensions occurs. Check the changes in dimensions every 3 days through repeated measurements of two or three test pieces in corresponding directions. Stop the soaking when the difference between two successive measurements does not exceed 0,02 mm. In this case, it should be reported that the results of the determination of shrinkage are obtained on test pieces which have been previously soaked.

6.2 Measure the cross-sectional dimensions of every test piece to an accuracy of 0,01 mm in the middle of the radial and tangential faces of the pieces (dimension $l_{\text{r max}}$ being measured in a radial direction and dimension $l_{\text{t max}}$ in a tangential direction).

6.3 Condition the test pieces to a moisture content in equilibrium with the normal environment (relative humidity 65 ± 5 %; temperature 20 ± 2 °C) so that no checks distorting their dimensions and shape occur. Check the changes in dimensions of two or three control test pieces by repeated measurements, as specified in 6.2, every 6 h after stabilization of the conditioning environment. Stop the conditioning when the difference between two successive measurements does not exceed 0,02 mm. The conditioning of test pieces may be stopped by using the method of successive weighing in accordance with ISO 3130.

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[1] If necessary, shrinkage may also be determined at relative humidities between 30 and 90 %.

6.4 Measure the cross-sectional dimensions, l_r and l_t, of every test piece, as specified in 6.2.

6.5 Dry the test pieces to constant dimensions at a temperature of $103 \pm 2\ ^\circ C$ in the oven (4.2) so that no checks distorting their dimensions and shape occur. Check the changes in dimensions of two or three control test pieces by repeated measurements, as specified in 6.2, every 2 h after 6 h from the beginning of drying. Stop the drying when the difference between two successive measurements does not exceed 0,02 mm. The drying of test pieces may be stopped by using the method of successive weighing in accordance with ISO 3130.

6.6 Test pieces in which checks occurred during the test period shall be disregarded.

6.7 Cool the test pieces to room temperature in the air-tight vessel containing the desiccant (4.4).

6.8 Measure the cross-sectional dimensions, $l_{r\ min}$ and $l_{t\ min}$, of each test piece, as specified in 6.2.

7 Expression of results

7.1 Calculate the total linear shrinkage, β_{max}, as a percentage, by the formulae

a) for the radial direction :

$$\beta_{r\ max} = \frac{l_{r\ max} - l_{r\ min}}{l_{r\ max}} \times 100$$

b) for the tangential direction :

$$\beta_{t\ max} = \frac{l_{t\ max} - l_{t\ min}}{l_{t\ max}} \times 100$$

where

$l_{r\ max}$ and $l_{t\ max}$ are the dimensions, in millimetres, of the test piece at a moisture content above the saturation point, measured in the radial and tangential directions respectively;

$l_{r\ min}$ and $l_{t\ min}$ are the dimensions, in millimetres, of the test piece after drying, measured in the radial and tangential directions respectively.

Express the results to the nearest 0,1 %.

7.2 Calculate the linear shrinkage, β_n, when the moisture content changes to equilibrium with the normal environment, (relative humidity 65 ± 5 %; temperature $20 \pm 2\ ^\circ C$), as a percentage, by the formulae

a) for the radial direction :

$$\beta_{r_n} = \frac{l_{r\ max} - l_r}{l_{r\ max}} \times 100$$

b) for the tangential direction :

$$\beta_{t_n} = \frac{l_{t\ max} - l_t}{l_{t\ max}} \times 100$$

where

l_r and l_t are the dimensions, in millimetres, of the test piece at a moisture content in equilibrium with the normal environment, measured in the radial and tangential directions respectively;

$l_{r\ max}$ and $l_{t\ max}$ have the same meanings as in 7.1.

Express the results to the nearest 0,1 %.

8 Test report

The test report shall include the following particulars :

a) reference to this International Standard

b) information required by ISO 3129 (sub-clause 6.4);

c) type and volume of material tested (stand and number of selected trees; lot of sawn timber and number of selected boards, etc.);

d) dimensions of the test piece and the direction of the grain;

e) number of test pieces tested;

f) moisture content in equilibrium with the normal environment (relative humidity 65 ± 5 %; temperature $20 \pm 2\ ^\circ C$);

g) the test results, calculated as specified in clause 7, and their statistical values (together with the relative humidity and temperature if shrinkage was determined under conditions different from those specified in 6.3);

h) date of testing;

j) name of the organization responsible for testing.