International Standard ISO 4859

INTERNATIONAL ORGANIZATION FOR STANDARDIZATION•МЕЖДУНАРОДНАЯ ОРГАНИЗАЦИЯ ПО СТАНДАРТИЗАЦИИ•ORGANISATION INTERNATIONALE DE NORMALISATION

Wood — Determination of radial and tangential swelling

Bois — Détermination du gonflement radial et tangentiel

First edition — 1982-12-01

UDC 674.03 : 193.23 : 539.388.8 **Ref. No. ISO 4859-1982 (E)**

Descriptors : wood, tests, determination, swelling, specimen preparation.

Price based on 2 pages

Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards institutes (ISO member bodies). The work of developing International Standards is carried out through ISO technical committees. Every member body interested in a subject for which a technical committee has been set up 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.

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 4859 was developed by Technical Committee ISO/TC 55, *Sawn timber and sawlogs*, and was circulated to the member bodies in April 1980.

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

Australia	Ghana	Poland
Austria	Hungary	Romania
Belgium	India	South Africa, Rep. of
Brazil	Italy	Spain
Bulgaria	Korea, Dem. P. Rep. of	Sweden
Czechoslovakia	Korea, Rep. of	Turkey
Egypt, Arab Rep. of	New Zealand	USSR
Finland	Norway	Yugoslavia

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

Canada
France
Ireland
Netherlands

Printed in Switzerland

Wood — Determination of radial and tangential swelling

1 Scope and field of application

This International Standard specifies a method for the determination of linear swelling, 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 parallel 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 Dry the test pieces to constant dimensions in the oven (4.2) at a temperature of 103 ± 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, every 2 h after 6 h from the beginning of drying, in corresponding directions. 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.

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

6.3 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 piece (dimension $l_{r\ min}$ being measured in a radial direction and dimension $l_{t\ min}$ in a tangential direction).

6.4 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 6.3, 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.

1) If necessary, swelling may also be determined at relative humidities between 30 and 90 %.

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

6.6 Measure the cross-sectional dimensions, l_r and l_t, of every test piece, as specified in 6.3.

6.7 Submerge the test pieces in distilled water in the vessel (4.3) and soak at a temperature of 20 ± 5 °C until no further change in dimensions occurs. Check the changes in dimensions every 3 days by repeated measurements of two or three control test pieces in corresponding directions. Stop the soaking when the difference between two successive measurements does not exceed 0,02 mm.

6.8 Measure the cross-sectional dimensions, $l_{r\,max}$ and $l_{t\,max}$, of each test piece, as specified in 6.3.

7 Expression of results

7.1 Calculate the total linear swelling, α_{max}, as a percentage, by the formulae

a) for the radial direction :

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

b) for the tangential direction :

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

where

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

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

Express the results to the nearest 0,1 %.

7.2 Calculate the linear swelling, α_n, when the moisture content changes to equilibrium with the normal environment (relative humidity 65 ± 5 %; temperature 20 ± 2 °C), as a percentage, by the formulae

a) for the radial direction :

$$\alpha_{r_n} = \frac{l_r - l_{r\,min}}{l_{r\,min}} \times 100$$

b) for the tangential direction :

$$\alpha_{t_n} = \frac{l_t - l_{t\,min}}{l_{t\,min}} \times 100$$

where

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

$l_{r\,min}$ and $l_{t\,min}$ have the same meaning 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 (subclause 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) the test results, calculated as specified in clause 7, and their statistical values (together with the relative humidity and temperature if swelling was determined under conditions different from those specified in 6.4);

g) date of testing;

h) place of testing.