EAST AFRICAN COMMUNITY

EDICT OF GOVERNMENT

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EAS 275 (2002) (English): Timber — Determination of volumetric shrinkage

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EAST AFRICAN STANDARD

Timber — Determination of volumetric shrinkage

EAST AFRICAN COMMUNITY

First Edition 2002

Foreword

Development of the East African Standards has been necessitated by the need for harmonizing requirements governing quality of products and services in East Africa. It is envisaged that through harmonized standardization, trade barriers which are encountered when goods and services are exchanged within the Community will be removed.

In order to achieve this objective, the Partner States in the Community through their National Bureaux of Standards, have established an East African Standards Committee.

The Committee is composed of representatives of the National Standards Bodies in Partner States, together with the representatives from the private sectors and consumer organizations. Draft East African Standards are circulated to stakeholders through the National Standards Bodies in the Partner States. The comments received are discussed and incorporated before finalization of standards, in accordance with the procedures of the Community.

East African Standards are subject to review, to keep pace with technological advances. Users of the East African Standards are therefore expected to ensure that they always have the latest versions of the standards they are implementing.

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International Standard 4858

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

Wood — Determination of volumetric shrinkage

Bois — Détermination du retrait volumique

First edition — 1982-12-01

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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 4858 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	France	Poland
Austria	Ghana	Romania
Belgium	Hungary	South Africa, Rep. of
Bulgaria	India	Spain
Czechoslovakia	Italy	Sweden
Egypt, Arab Rep. of	Korea, Rep. of	Turkey
Finland	Norway	USSR

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

Canada
Ireland
Netherlands

Printed in Switzerland

Wood — Determination of volumetric shrinkage

1 Scope and field of application

This International Standard specifies two methods for the determination of the volumetric shrinkage of wood:

— the stereometric method, used for test pieces made in accordance with ISO 4469;

— the mercury volumenometer method, used for test pieces of any shape.

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.*

ISO 4469, *Wood — Determination of radial and tangential shrinkage.*

3 Principle

Determination of the change in volume 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 Stereometric method

4.1 Apparatus

See ISO 4469, clause 4.

4.2 Preparation of test pieces

See ISO 4469, clause 5.

4.3 Procedure [1)]

4.3.1 Carry out the test in accordance with ISO 4469, clause 6.

4.3.2 For species showing significant shrinkage along the grain, also measure the dimensional changes of the test piece in the longitudinal direction.

4.4 Expression of results

4.4.1 Calculate the volume shrinkage, $\beta_{V\max}$, as a percentage, without taking into account the swelling along the grain, by the (approximate) formula

$$\beta_{V\max} = \frac{(l_{t\,max} \times l_{r\,max}) - (l_{t\,min} \times l_{r\,min})}{l_{t\,max} \times l_{r\,max}} \times 100$$

where

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

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

Express the result to the nearest 0,1 %.

Calculate the total volumetric shrinkage, $\beta_{V\,max}$, if dimensional changes have also been measured on the test piece in the longitudinal direction, as a percentage, by the formula

$$\beta_{V\max} = \frac{(l_{t\,max} \times l_{r\,max} \times l_{a\,max}) - (l_{t\,min} \times l_{r\,min} \times l_{a\,min})}{l_{t\,max} \times l_{r\,max} \times l_{a\,max}} \times 100$$

where

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

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

Express the result to the nearest 0,1 %.

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

4.4.2 Calculate the volumetric shrinkage, β_{Vn}, when the moisture content changes to equilibrium with the normal environment (relative humidity 65 ± 5 %; temperature 20 ± 2 °C), as a percentage, by the formula

$$\beta_{Vn} = \frac{(l_{t\,max} \times l_{r\,max}) - (l_t \times l_r)}{l_{t\,max} \times l_{r\,max}} \times 100$$

where

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

$l_{t\,max}$ and $l_{r\,max}$ have the same meaning as in 4.4.1.

Express the result to the nearest 0,1 %.

Calculate the volumetric shrinkage, β_{Vn}, if dimensional changes have also been measured on the test piece in the longitudinal direction, as a percentage, by the formula

$$\beta_{Vn} = \frac{(l_{t\,max} \times l_{r\,max} \times l_{a\,max}) - (l_t \times l_r \times l_a)}{l_{t\,max} \times l_{r\,max} \times l_{a\,max}} \times 100$$

where

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

$l_{t\,max}$, $l_{r\,max}$ and $l_{a\,max}$ have the same meaning as in 4.4.1.

Express the result to the nearest 0,1 %.

5 Mercury volumenometer method

5.1 Apparatus

5.1.1 Mercury volumenometer, capable of measuring the volume of a test piece, from the volume of mercury it displaces, to an accuracy of 0,01 cm³.

NOTE — It is necessary to observe appropriate safety precautions when using a mercury volumenometer.

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

5.1.3 Vessel, containing distilled water.

5.1.4 Air-tight vessel, containing a desiccant.

5.2 Preparation of test pieces

5.2.1 Test pieces may be made in any shape, but shall have a volume of 4 to 16 cm³.

5.2.2 The number of test pieces shall be in accordance with ISO 3129.

5.3 Procedure[1)]

5.3.1 The moisture content of test pieces shall be considerably greater than the saturation point of the cellular walls of wood. If the moisture content is less than the saturation point, soak the test pieces in distilled water in the vessel (5.1.3) at a temperature of 20 ± 5 °C, until no further change in volume occurs. Check the change in volume every 3 days by repeated measurement of two or three control test pieces. Stop the soaking when the difference between two successive measurements does not exceed 0,02 cm³. 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.

5.3.2 Measure the volume, V_{max}, of every test piece to an accuracy of 0,01 cm³.

5.3.3 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 volume of two or three control test pieces by repeated measurements, as specified in 5.3.2, every 6 h after stabilization of the conditioning environment. Stop the conditioning when the difference between two successive measurements does not exceed 0,02 cm³. The conditioning of test pieces may be stopped by using the method of successive weighing in accordance with ISO 3130.

5.3.4 Measure the volume, V, of every test piece, as specified in 5.3.2.

5.3.5 Dry the test pieces to constant volume at a temperature of 103 ± 2 °C in the oven (5.1.2) so that no checks distorting their dimensions and shape occur. Check the changes in volume of two or three control test pieces by repeated measurements, as specified in 5.3.2, 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 cm³. The drying of test pieces may be stopped by using the method of successive weighing in accordance with ISO 3130.

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

5.3.7 Cool the test pieces to room temperature in the air-tight vessel containing the desiccant (5.1.4).

5.3.8 Measure the volume, V_{min}, of every test piece, as specified in 5.3.2.

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

5.4 Expression of results

5.4.1 Calculate the total volumetric shrinkage, $\beta_{V\max}$, as a percentage, by the formula

$$\beta_{V\max} = \frac{V_{\max} - V_{\min}}{V_{\max}} \times 100$$

where $V_{\max}$ and $V_{\min}$ are the volumes of the test piece, in cubic centimetres, at a moisture content greater than the saturation point of the cellular walls of wood, and after drying respectively.

Express the result to the nearest 0,1 %.

5.4.2 Calculate the volumetric shrinkage, β_{Vn}, when the moisture content changes to equilibrium with the normal environment (relative humidity 65 ± 5 %; temperature 20 ± 2 °C), as a percentage, by the formula

$$\beta_{Vn} = \frac{V_{\max} - V}{V_{\max}} \times 100$$

where

V is the volume of the test piece, in cubic centimetres, at a moisture content in equilibrium with the normal environment;

$V_{\max}$ has the same meaning as in 5.4.1.

Express the result to the nearest 0,1 %.

6 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) method of determining shrinkage;

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

e) shape and dimensions of the test pieces; the directions of the grains;

f) number of test pieces tested;

g) moisture content in equilibrium with the normal environment (relative humidity 65 ± 5 %; temperature 20 ± 2 °C);

h) the test results, calculated as specified in 4.4 or 5.4, and their statistical values (together with the relative humidity and temperature if shrinkage was determined under conditions different from those specified in 4.3 and 5.3.3);

j) date of testing;

k) place of testing.