STANDARDS AUSTRALIA/STANDARDS NEW ZEALAND

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RECONFIRMATION

OF
AS/NZS 1080.3:2000
Timber—Methods of test
Method 3: Density

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RECONFIRMATION NOTICE

Technical Committee TM-012 has reviewed the content of this publication and in accordance with Standards Australia procedures for reconfirmation, it has been determined that the publication is still valid and does not require change.

Certain documents referenced in the publication may have been amended since the original date of publication. Users are advised to ensure that they are using the latest versions of such documents as appropriate, unless advised otherwise in this Reconfirmation Notice.

Approved for reconfirmation in accordance with Standards Australia procedures for reconfirmation on 20 May 2016.

Approved for reconfirmation in New Zealand on behalf of the Standards Council of New Zealand on 5 July 2016.

The following are represented on Technical Committee TM-012:

Australian and New Zealand Timber Preservative Manufacturers Association
Australian Forest Products Association
Australian Pesticides and Veterinary Medicines Authority
Australian Timber Flooring Association
Australian Timber Importers Federation
Building Research Association of New Zealand
Department of Agriculture, Fisheries and Forestry (QLD)
Engineered Wood Products Association of Australasia
Forest and Wood Products Australia
Forestry Corporation of NSW
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Master Builders Australia
NATSPEC
New Zealand Timber Industry Federation
New Zealand Timber Preservation Council
New Zealand Wood Processors Association
Responsible Care New Zealand
Scion
Tasmanian Timber Promotion Board
Timber Preservers Association of Australia

Australian/New Zealand Standard™

Timber—Methods of test

Method 3: Density

[Modified and including the full text of ISO 3131:1975]

PREFACE

This Standard was prepared by the Joint Standards Australia/Standards New Zealand Committee TM/3, Timber Grading, to supersede AS 1080.3—1981, *Methods of testing timber, Method 3: Determination of Density*.

This Standard is an adoption with national modifications of, and is reproduced from, ISO 3131-1975, *Wood—Determination of density for physical and mechanical tests*.

The objective of this Standard is to provide producers and users of timber with a method for determining the density of timber.

Appendix ZZ lists the variations between this Standard and ISO 3131. For the purposes of this Standard, the ISO 3131 text is amended, supplemented or replaced as set out in Appendix ZZ. These changes are indicated by a rule in the margin against each clause, table, figure or part thereof affected.

As this Standard is reproduced from an International Standard, the following applies:

(a)   Its number does not appear on each page of text and its identity is shown only on the cover and title page.

(b)   In the source text 'this standard' should read 'this Australian/New Zealand Standard'.

(c)   A full point should be substituted for a comma when referring to a decimal marker.

(d)   References to International Standards should be replaced by references to equivalent Australian or Australian/New Zealand Standards, as follows:

Reference to International Standard		*Australian or Australian/New Zealand Standard*	
ISO/IEC		AS/NZS	
3129	Wood—Sampling methods and general requirements for physical and mechanical tests	See Appendix ZZ	
3130	Wood—Determination of moisture content for physical and mechanical tests	1080.1	Timber—Methods of test Part 1: Moisture content
….	Wood—Determination of shrinkage and swelling		

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NOTES

Wood — Determination of density for physical and mechanical tests

1 SCOPE AND FIELD OF APPLICATION

This International Standard specifies a method for determining the density (ratio of mass to volume) of wood for physical and mechanical tests both at the moisture content at the time of test and in the absolutely dry condition, as well as the conventional density (ratio of mass in the absolutely dry condition to volume of the test piece with moisture content greater than or equal to the fibre saturation point).

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 . . ., *Wood — Determination of shrinkage and swelling.* [1]

3 PRINCIPLE

Determination of the mass of the test piece by weighing and of its volume by measurement of its dimensions or by another method. Calculation of the mass of a unit volume of the wood.

4 APPARATUS

4.1 Measuring instrument capable of determining the dimensions of the test pieces to an accuracy of 0,1 mm.

4.2 Balance capable of weighing to an accuracy of 0,01 g.

4.3 Equipment for the determination of moisture content in accordance with ISO 3130.

5 PREPARATION OF TEST PIECES

5.1 Test pieces shall be prepared in the form of right prisms having a square cross-section of side 20 mm and length along the grain of 25 ± 5 mm. If the growth rings are more than 4 mm wide, the dimensions of the cross-section of the test piece shall be increased to include not less than five growth rings. For determination of the conventional density, it is permitted to prepare the test piece of any geometrical shape the volume of which may be easily measured.

To determine the relation between ultimate strength and density, it is recommended that the density be determined on test pieces made for particular tests or on test pieces for the determination of density cut from them in the form of right prisms with the dimensions stated above.

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

6 PROCEDURE

6.1 Determination of density at the moisture content at the time of test

Determine the mass of the test pieces to an accuracy of 0,01 g. Measure the sides of the cross-section and the length of the test pieces along the axes of symmetry to the nearest 0,1 mm. The volume of the test pieces may be determined by another method to an accuracy of $0,01 \text{ cm}^3$. Determine the moisture content of the test pieces according to ISO 3130. Take the whole test piece as the sample for the determination of moisture content.

6.2 Determination of density in the absolutely dry condition

Dry the test pieces gradually to constant mass to minimize their deformation and splitting. Carry out the weighing and measuring operations immediately after drying, in accordance with 6.1.

6.3 Determination of conventional density

The moisture content of test pieces shall be greater than or equal to the fibre saturation point. The test pieces may be soaked in distilled water at room temperature until no changes in dimensions occur. Measure the dimensions or volume of the test pieces according to 6.1, dry the test pieces according to 6.2 and weigh them according to 6.1.

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1) In preparation.

7 CALCULATION AND EXPRESSION OF RESULTS

7.1 The density ρ_W of each test piece at the moisture content W at the time of the test is given, in kilograms per cubic metre (or grams per cubic centimetre), by the formula :

$$\rho_W = \frac{m_W}{a_W \times b_W \times l_W} = \frac{m_W}{V_W}$$

where

m_W is the mass, in kilograms (or grams), of the test piece at moisture content W;

a_W, b_W and l_W are the dimensions, in metres (or centimetres), of the test piece at moisture content W;

V_W is the volume, in cubic metres (or cubic centimetres), of the test piece at moisture content W.

Express the result to the nearest 5 kg/m³ (or 0,005 g/cm³).

When required, the density ρ_W shall be adjusted to a 12 % moisture content by the formula valid for moisture content from 7 to 17 % :

$$\rho_{12} = \rho_W \left[1 - \frac{(1-K)\,(W-12)}{100} \right]$$

where K is the coefficient of volumetric shrinkage for a change in moisture content of 1 %. The value of K shall be that specified in national standards or shall be determined according to ISO . . .. For approximate calculations, the value of K can be taken as equal to $0,85 \times 10^{-3}\,\rho_W$ when the density is expressed in kilograms per cubic metre and $0,85\,\rho_W$ when the density is expressed in grams per cubic centimetre.

7.2 The density ρ_0 of each test piece in the absolutely dry condition is given, in kilograms per cubic metre (or grams per cubic centimetre), by the formula :

$$\rho_0 = \frac{m_0}{a_0 \times b_0 \times l_0} = \frac{m_0}{V_0}$$

where

m_0 is the mass, in kilograms (or grams), of the test piece in the absolutely dry condition;

a_0, b_0 and l_0 are the dimensions, in metres (or centimetres), of the test piece in the absolutely dry condition;

V_0 is the volume, in cubic metres (or cubic centimetres), of the test piece in the absolutely dry condition.

Express the result to the nearest 5 kg/m³ (or 0,005 g/cm³).

7.3 The conventional density, ρ_y, of each test piece is given, in kilograms per cubic metre (or grams per cubic centimetre), by the formula :

$$\rho_y = \frac{m_0}{a_{max} \times b_{max} \times l_{max}} = \frac{m_0}{V_{max}}$$

where

a_{max}, b_{max} and l_{max} are the dimensions, in metres (or centimetres), of the test piece at a moisture content greater than or equal to the fibre saturation point;

V_{max} is the volume, in cubic metres (or cubic centimetres), at a moisture content greater than or equal to the fibre saturation point.

Express the result to the nearest 5 kg/m³ (or 0,005 g/cm³).

7.4 Calculate, to an accuracy of 10 kg/m³ (or 0,01 g/cm³), the arithmetic mean of the results obtained for the individual test pieces and report this as the average value for the density of the test pieces.

8 TEST REPORT

The test report shall include the following particulars :

a) reference to this International Standard;

b) details concerning sampling of the test pieces;

c) details in accordance with clause 7 of ISO 3129,

d) the test results calculated as specified in clause 7, and their statistical values;

e) the value of coefficient K used for the adjustment of the test results to a 12 % moisture content.

APPENDIX ZZ

SUMMARY OF VARIATIONS TO ISO 3131:1975 FOR APPLICATION IN AUSTRALIA AND NEW ZEALAND

(Normative)

This Appendix sets out the variations between this Standard and ISO 3131:1975.

CLAUSE

1 *Add* the following Note:

NOTE: The following equivalent terms are commonly used in Australia and New Zealand (see AS/NZS 4491) and may be used in Standards that reference this method of test.

EQUIVALENCE OF TERMS

ISO term	Common Australian/New Zealand usage
Density at the moisture content at the time of test	Nominal density
Density in the absolutely dry condition	Oven dry density
Conventional density	Basic density

2 *Add* the following to the list of referenced documents:

AS/NZS 4491 Timber — Glossary of terms in timber-related Standards

AS 2878   Timber — Classification into strength groups

5.1 *Delete* all except the first sentence and *add* the following:

Alternatively, the samples may be of any size and shape, provided that the volume can be determined to the accuracy specified in Clause 6.1 either by measurement or some other method such as by immersion.

5.2 *Replace* the reference to 'ISO 3129' with the following:

'the Standard appropriate to the testing being carried out (e.g. AS 2878)'.

6.2 *Add* the following note:

NOTE: The apparatus used for oven drying may be the same as that used in the moisture content determination given in AS/NZS 1080.1 capable of maintaining the temperature at $103 \pm 2°C$.

8 *Add* the following Notes:

NOTES:

1 The results may be expressed to the nearest 1 kg/m^3 if required.

2 The statistical values, where appropriate, should include the mean and standard deviation.

This Australian/New Zealand was prepared by Joint Technical Committee TM/3, Timber Grading. It was approved on behalf of the Council of Standards Australia on 26 July 1999 and on behalf of the Council of Standards New Zealand on 24 September 1999 and published on 12 May 2000.

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The following interests are represented on Committee TM/3:

Australian Timber Importers Federation
CSIRO—Building, Construction and Engineering
Curtin University of Technology
Forest and Forest Products Employment Skills Company
Housing Industry Association
Master Builders Australia
New Zealand Forest Research Institute
New Zealand Timber Industry Federation
New Zealand Timber Suppliers Group
Pine Australia
Queensland Forestry Research Institute
State Forests of New South Wales
Timber Promotion Council
Timber Research and Development Advisory Council of Queensland
University of Technology, Sydney

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Detailed information about joint Australian/New Zealand Standards can be found by visiting the Standards Australia web site at www.standards.com.au or Standards New Zealand web site at www.standard.co.nz and looking up the relevant Standard in the on-line catalogue.

Alternatively, both organizations publish an annual printed Catalogue with full details of all current Standards. For more frequent listings or notification of revisions, amendments and withdrawals, Standards Australia and Standards New Zealand offer a number of update options. For information about these services, users should contact their respective national Standards organization.

We also welcome suggestions for the improvement in our Standards, and especially encourage readers to notify us immediately of any apparent inaccuracies or ambiguities. Please address your comments to the Chief Executive of either Standards Australia International or Standards New Zealand at the address shown on the back cover.

This Standard was issued in draft form for comment as DR 98606.

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