

Australian/New Zealand Standard™

Methods of test for pulp and paper

**Method 555: Determination of CIE
whiteness, C/2° (indoor illumination
conditions)**



AS/NZS 1301.555:2017

This Joint Australian/New Zealand Standard was prepared by Joint Technical Committee PK-019, Methods of Test for Pulp and Papers. It was approved on behalf of the Council of Standards Australia on 14 December 2016 and by the New Zealand Standards Approval Board on 9 December 2016.
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Method 555: Determination of CIE whiteness, C/2° (indoor illumination conditions)

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PREFACE

This Standard was prepared by the Joint Standards Australia/Standards New Zealand Committee PK-019, Methods of Test for Pulp and Papers.

The objective of this Standard is to specify the procedure to be used for determining the CIE whiteness of papers and boards, in order to obtain values which correspond to the visual appearance of white papers and boards, with or without fluorescent whitening agents, when they are viewed indoors.

This Standard is identical with, and has been reproduced from ISO 11476:2016, *Paper and board—Determination of CIE whiteness, C/2° (indoor illumination conditions)*.

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

- (a) In the source text ‘this International Standard’ should read ‘Australian/New Zealand Standard’.
- (b) A full point substitutes for a comma when referring to a decimal marker.

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

<i>Reference to International Standard</i>		<i>Australian/New Zealand Standard</i>	
ISO		AS/NZS	
186	Paper and board — Sampling to determine average quality	1301	Methods of test for pulp and paper
		1301.417s	Method 417s: Sampling to determine average quality
2469	Paper, board and pulps — Measurement of diffuse radiance factor (diffuse reflectance factor)	1301	Methods of test for pulp and paper
		1301.510	Method 510: Measurement of diffuse radiance factor (diffuse reflectance factor)
2470	Paper, board and pulps — Measurement of diffuse blue reflectance factor	1301	Methods of test for pulp and paper
2470-1	Part 1: Indoor daylight conditions (ISO brightness)	1301.515*	Method 515: Measurement of diffuse radiance factor—Indoor daylight conditions (ISO brightness)

The normative reference ISO 187 has not been adopted as an Australian/New Zealand Standard.

In Australia and New Zealand the following standards are generally used:

AS/NZS 1301.414s:2006 Methods of test for pulp and paper—Methods 414s: Conditioning of paper for testing.

AS/NZS 1301.415s:2008 Methods of test for pulp and paper—Methods 415s: Standard atmosphere for testing paper and board and procedure for monitoring the atmosphere.

Only normative references that have been adopted as Australian or Australian/New Zealand Standards have been listed.

The terms ‘normative’ and ‘informative’ have been used in this Standard to define the application of the annexes to which they apply. A ‘normative’ annex is an integral part of a Standard, whereas an ‘informative’ annex is only for information and guidance.

* To be published.

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NOTES

AUSTRALIAN/NEW ZEALAND STANDARD

Methods of test for pulp and paper

Method 555:

Determination of CIE whiteness, C/2° (indoor illumination conditions)

1 Scope

This International Standard specifies the procedure to be used for determining the CIE whiteness of papers and boards, in order to obtain values which correspond to the visual appearance of white papers and boards, with or without fluorescent whitening agents, when they are viewed indoors. It is based on radiance factor data obtained over the full visible spectral range (VIS) in contrast to the measurement of ISO brightness, which is limited to the blue region of VIS. This International Standard also specifies the procedures for the determination of CIE tint values and the fluorescent component of CIE whiteness.

In addition, it specifies a method for adjustment of the UV-content to correspond to that of CIE illuminant C,^{[10][12]} since the results obtained when fluorescent whitening agents are present are dependent upon the UV-content of the radiation falling upon the sample. The CIE illuminant C is taken to be representative of indoor illumination conditions because it contains a suitable proportion of UV radiation.^[7] This method is not applicable to coloured papers containing fluorescent dyes. It is specific to the situation where the fluorescence occurs in the blue region of the visible spectral range.

This International Standard is read in conjunction with ISO 2469.

NOTE 1 It is recognized that the CIE whiteness formula was developed in the context of the CIE standard illuminant D65,^[9] but the similarity between the relative spectral power curves for the C and D65 illuminants within the visible region and the closeness of their correlated colour temperatures (6 770 K and 6 500 K respectively) are taken as a justification for the use of the analogous whiteness formula with the CIE illuminant C.

NOTE 2 A related International Standard, ISO 11475, specifies the procedure for obtaining values corresponding to the appearance of papers viewed under the CIE standard illuminant D65.

2 Normative references

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO 186, *Paper and board — Sampling to determine average quality*

ISO 2469, *Paper, board and pulps — Measurement of diffuse radiance factor (diffuse reflectance factor)*

ISO 2470-1, *Paper, board and pulps — Measurement of diffuse blue reflectance factor — Part 1: Indoor daylight conditions (ISO brightness)*

ISO 4094, *Paper, board and pulps — International calibration of testing apparatus — Nomination and acceptance of standardizing and authorized laboratories*

3 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

NOTE The symbols used here are selected to maintain consistency, wherever possible, with the CIE International Lighting Vocabulary ILV. While the definitions used here are based upon the CIE ILV, they have been adapted for this International Standard.

3.1 reflectance factor

R

ratio of the radiation reflected by a body to that reflected by the perfect reflecting diffuser under the same conditions

Note 1 to entry: The reflectance factor is usually expressed as a percentage.

3.2 intrinsic reflectance factor

R_{∞}

reflectance factor (3.1) of a layer or pad of the material thick enough to be opaque, i.e. such that increasing the thickness of the pad by doubling the number of sheets results in no change in the measured reflectance factor

3.3 diffuse radiance factor

β

ratio of the diffusely reflected radiance of a body in a given direction to that of the perfect reflecting diffuser under specified conditions of irradiation

Note 1 to entry: For fluorescent (luminescent) materials, the specified conditions of irradiation in this International Standard are for CIE Illuminant C and the diffuse radiance factor is strictly the total radiance factor, β , which contains two components, the reflected radiance factor, β_R , and the luminescent radiance factor, β_L , so that

$$\beta = \beta_R + \beta_L$$

Note 2 to entry: For non-fluorescent materials, the diffuse radiance factor, β , is simply the *reflectance factor*, R (3.1).

3.4 intrinsic diffuse radiance factor

β_{∞}

diffuse radiance factor (3.3) of a layer or pad of the material thick enough to be opaque, i.e. such that increasing the thickness of the pad by doubling the number of sheets results in no change in the measured radiance factor

Note 1 to entry: For fluorescent (luminescent) materials, the intrinsic total radiance factor, β_{∞} , is the sum of two portions, the intrinsic reflected radiance factor, $\beta_{\infty,R}$, and the intrinsic luminescent radiance factor, $\beta_{\infty,L}$, so that

$$\beta_{\infty} = \beta_{\infty,R} + \beta_{\infty,L}$$

Note 2 to entry: For non-fluorescent materials, the intrinsic diffuse radiance factor, β_{∞} , is simply the *intrinsic reflectance factor*, R_{∞} (3.2).

3.5 CIE whiteness

W

measure of CIE whiteness derived from the CIE tristimulus values determined under the conditions specified in this International Standard

Note 1 to entry: The CIE whiteness is expressed in CIE whiteness units.