

भारतीय मानक मसौदा
कागज और संबद्ध उत्पादों के लिए
नमूना चयन और परीक्षण पद्धतियाँ

भाग 4 — कागज, बोर्ड और लुगदी के लिए परीक्षण पद्धतियाँ
अनुभाग 4 — विसरित चमक कारक का मापन (विसरित परावर्तन कारक)
(पहला पुनरीक्षण)

Draft Indian Standard

Methods of Sampling and Test for
Paper and Allied Products

Part 4 — Methods of Test for Paper, Board and Pulp
Section 4 — Measurement of diffuse radiance factor (diffuse reflectance
factor)
(*First Revision*)

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(ICS 85.040; 85.060)

Paper And Its Products Sectional
Committee, CHD 15

Last date of comments: 10th April 2024

NATIONAL FOREWORD

(*Formal clauses added to be later*)

The spectral diffuse radiance factor or the weighted diffuse radiance factor, applicable to one or several specified wavelength bands, is often used to characterize the properties such as ISO brightness (diffuse blue radiance factor) and the luminance factor of pulp, paper and board.

The diffuse radiance factor or diffuse reflectance factor is also used as the basis for calculating optical properties, such as opacity, colour, whiteness, effective residual ink concentration (ERIC number) and the Kubelka-Munk scattering and absorption coefficients.

The radiance factor is dependent on the conditions of measurement, particularly the spectral and geometric characteristics of the instrument used. Therefore, it is essential to specify the characteristics of the instrument and its calibration procedure.

The diffuse radiance factor is the sum of the reflected radiance factor and the luminescent radiance factor. The luminescent radiance factor of a luminescent (fluorescent) object depends on the spectral power distribution of the illumination. Hence, it is essential to adjust the instrument's UV-content in the illumination to produce the same amount of fluorescence for a fluorescent reference standard as the selected CIE illuminant and as the fluorescent objects. A standard was therefore required to also provide a description of the use of these fluorescent reference standards and the measurement of the properties of the materials containing fluorescent whitening agents.

The committee responsible for formulating this standard decided to describes the general procedure for measuring the diffuse radiance factor of all types of pulp, paper and board. More particularly, the characteristics of the equipment to be used for such measurements and the procedures to be used for calibrating that equipment.

ISO has published test method standards related to paper, pulp and board under three broad based titles namely 'Paper, board and pulps', 'Paper and board' and 'Pulps'. The three already published Indian Standards namely IS 1060 (Parts 1, 2 and 3) 'Methods of sampling and test for paper and allied products' and IS 6213 series of standards published for 'Methods of test for pulps' were widely used and known to all concerned. Therefore, to maintain consistency with the prevailing international practices and also to facilitate search of the relevant test methods instantly, the committee decided that all the adopted standards would be published under the following two series;

- (a) IS 1060 series on 'Methods of sampling and test for paper and allied products', and
 - (Part 4) Methods of test for paper, board and pulp
 - (Part 5) Methods of test for paper and board
 - (Part 6) Methods of test for paper
 - (Part 7) Methods of test for board
- (b) IS 6213 series for 'Methods of test for pulps'.

This Section of IS 1060 (Part 4) describes the general procedure for measuring the diffuse radiance factor of all types of pulp, paper and board. The other sections of IS 1060 (Part 4) are:

<i>IS No.</i>	<i>Title</i>
(Sec 1) : 2014	Standard atmosphere for conditioning and testing and procedure for monitoring the atmosphere and conditioning of samples
(Sec 2) : 2018	Determination of residue (Ash) on ignition at 525°C
(Sec 3) : 2018	Determination of residue (Ash) on ignition at 900°C
(Sec 7) : 2018	Determination of pH of aqueous extracts - Hot extraction method
(Sec 8) : 2014	Determination of water soluble chlorides
(Sec 9) : 2014	Determination of water soluble sulfates
(Sec 10) : 2014	Determination of total chlorine and organically bound chlorine
(Sec 11) : 2014	Determination of acid soluble magnesium, calcium, manganese, iron, copper, sodium and potassium
(Sec 12) : 2019	Determination of cadmium content - Atomic absorption spectrometric method
(Sec 13) : 2020	Measurement of diffuse blue reflectance factor — Indoor daylight conditions (ISO brightness) (<i>First Revision</i>)

This standard was first published in 2014 by identical adoption of ISO 2469: 2007, 'Paper, board and pulps — Measurement of diffuse radiance factor' under dual numbering. As the relevant ISO standard is under revision, the committee decided to revise this standard by aligning it with ISO FDIS 2469: 2023, 'Paper, board and pulps — Measurement of diffuse radiance factor (diffuse reflectance factor)' under dual numbering (The document under development). This is a technical revision of the standard and the following are the main changes in this revision:

- (a) introduction of the method for calibrating to the CIE illuminant C and to the standard illuminant D65, in addition to the procedure for calibration of the non-fluorescent part of the spectrum;
- (b) addition of limit values for brightness and whiteness to check the performance of the calibration (as it is reported for non-fluorescence calibration);

- (c) addition of Effective Residual Ink Concentration (ERIC number) to the list of optical properties based on reflectance and radiance measurements in the introduction;
- (d) update of Annex C in order to reflect the revised version of ISO 4094;
- (e) update of bibliography; and
- (f) editorial revision.

The text of ISO Standard has been approved as suitable for publication as an Indian Standard without deviations. Certain conventions are however not identical to those used in Indian Standards. Attention is particularly drawn to the following:

- a) Wherever the words 'International Standard' appear referring to this standard, they should be read as 'Indian Standard'.
- b) Comma (,) has been used as a decimal marker while in Indian Standards, the current practice is to use a point (.) as the decimal marker.

The technical committee has reviewed the provisions of the following International Standard referred in this adopted standard and has decided that it is acceptable for use in conjunction with this standard:

International Standard	Title
ISO 4094 : 2017	Paper, board and pulps — General requirements for the competence of laboratories authorized for the issue of optical reference transfer standards of level 3

In this adopted standard, reference appears to certain International Standards where the standard atmospheric conditions to be observed are stipulated which are not applicable to tropical / sub- tropical countries. The applicable standard atmospheric conditions for Indian conditions are $(27 \pm 2) ^\circ\text{C}$ and (65 ± 5) percent relative humidity and shall be observed while using this standard.

In reporting the result of a test made in accordance with this standard, if the final value, observed or calculated, is to be rounded off, it shall be done in accordance with IS 2:2022 'Rules for rounding off numerical values (second revision)'.