SRI LANKA STANDARD 1270 : 2016

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METHOD OF TEST FOR

DETERMINATION OF WATER ABSORPTIVENESS (COBB METHOD) OF PAPER AND BOARD

(FIRST REVISION)

SRI LANKA STANDARDS INSTITUTION

Sri Lanka Standard

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SLS 1270 : 2016
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Sri Lanka.

Sri Lanka Standards are subject to periodical revision in order to accommodate the progress made by industry. Suggestions for improvement will be recorded and brought to the notice of the Committees to which the revisions are entrusted.

This standard does not purport to include all the necessary provisions of a contract.

Sri Lanka Standard
METHOD OF TEST FOR DETERMINATION OF WATER ABSORPTIVENESS (COBB METHOD) OF PAPER AND BOARD
(First Revision)

NATIONAL FOREWORD

This Sri Lanka Standard was approved by the Sectoral Committee on Paper, Board and Packaging and was authorized for adoption and publication as a Sri Lanka Standard by the council of the Sri Lanka Standards Institution on 2016-12-28.

SLS 473 Testing of Paper and board water absorption (Cobb) method has been superseded by **SLS 1270** which is an adoption of **ISO 535:1991.**

The Sri Lanka Standard SLS **1270 :2005** was first published as an adoption of **ISO 535:1991** Paper and Board- determination of water absorptiveness –Cobb method. The text of this International standard which has been technically revised as **ISO 535 :2014** is accepted for adoption as the first revision of **SLS 1270 : 2016.**

TERMINOLOGY AND CONVENTIONS

The text of the International Standard has been accepted as a suitable for publication, without deviation, as a Sri Lanka Standard. However, certain terminology and conventions are not identical with those used in Sri Lanka Standards; attention is therefore drawn to the following:

a) Wherever the words “International Standard/Publication” appear referring to this standard, they should be interpreted as “Sri Lanka Standard”.

b) The comma has been used throughout as a decimal marker. In Sri Lanka Standards it is the current practice to use the full point at the base line as the decimal marker.

c) Wherever page numbers are quoted, they are ISO page numbers.

Cross References

International Standard	Corresponding Sri Lanka Standard
ISO 186 Paper and board - Sampling to determine average quality	SLS 808 Method of sampling paper and board
ISO 187 Paper, board and pulps - Standard atmosphere for conditioning and testing and procedure for monitoring the atmosphere and conditioning of samples	SLS 374 Standard atmospheric conditions for conditioning and testing
ISO 5269-1 Pulps - Preparation of laboratory sheets for physical testing - Part 1: Conventional sheet-former method	No corresponding Sri Lanka Standards

SLS 1270:2016

INTERNATIONAL STANDARD

ISO 535

Third edition
2014-02-01

Paper and board — Determination of water absorptiveness — Cobb method

Papier et carton — Détermination de l'absorption d'eau — Méthode de Cobb

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Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established 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. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular the different approval criteria needed for the different types of ISO documents should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see www.iso.org/directives).

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights. Details of any patent rights identified during the development of the document will be in the Introduction and/or on the ISO list of patent declarations received (see www.iso.org/patents).

Any trade name used in this document is information given for the convenience of users and does not constitute an endorsement.

For an explanation on the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the WTO principles in the Technical Barriers to Trade (TBT) see the following URL: Foreword - Supplementary information

The committee responsible for this document is ISO/TC 6, *Paper, board and pulps*, Subcommittee SC 2, *Test methods and quality specifications for paper and board*.

This third edition cancels and replaces the second edition (ISO 535:1991), which has been technically revised to include precision data.

Introduction

The test described in this International Standard permits the determination of the quantity of water that can be absorbed by the surface of paper or board in a given time. Water absorptiveness is a function of various paper and board characteristics such as sizing, porosity, etc.

Paper and board — Determination of water absorptiveness — Cobb method

1 Scope

This International Standard specifies a method of determining the water absorptiveness of sized paper and board, including corrugated fibreboard, under standard conditions. It may not be suitable for paper of grammage less than 50 g/m^2 or embossed paper. It is not suitable for porous papers such as newsprint or unsized papers such as blotting paper or other papers having a relatively high water absorptiveness for which ISO 8787[2] is more suitable.

This method is not intended to be used for precise evaluation of the writing properties of paper although it does give a general indication of suitability for use with aqueous inks.

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 187, *Paper, board and pulps — Standard atmosphere for conditioning and testing and procedure for monitoring the atmosphere and conditioning of samples*

ISO 5269-1, *Pulps — Preparation of laboratory sheets for physical testing — Part 1: Conventional sheet-former method*

3 Terms and definitions

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

3.1
water absorptiveness (Cobb value)
calculated mass of water absorbed in a specified time by 1 m^2 of paper or board under specified conditions

Note 1 to entry: The test area is normally 100 cm^2.

4 Principle

A test piece is weighed immediately before and immediately after exposure for a specified time of one surface to water, followed by blotting. The result of the increase in mass is expressed in grams per square metre (g/m^2).

5 Reagents and materials

5.1 Water, distilled or deionized. The temperature of the water is important and should be maintained during the test at the temperature used for conditioning and testing.

5.2 Blotting paper, having a grammage of 250 g/m^2 ± 25 g/m^2. Pulp evaluation blotters are acceptable for the purposes of this International Standard (see ISO 5269-1).

6 Apparatus

6.1 Absorptiveness tester for the determination of water absorptiveness.

Any type of apparatus may be used which permits

— an immediate and uniform contact of the water with the part of the test piece submitted to the test;

— controlled rapid removal of the unabsorbed water from the test piece at the end of the contact period; and

— the rapid removal of the test piece without the risk of contact with water outside the test area.

In its simplest form, the apparatus consists of a rigid base with a smooth, planar surface, and a rigid metal cylinder of 112,8 mm ± 0,2 mm internal diameter (corresponding to a test area approximately 100 cm^2) and with a means of clamping it firmly to the base plate. The edge of the cylinder in contact with the test piece shall be flat and machined smooth with a thickness sufficient to prevent the cylinder cutting into the test piece. The height of the cylinder is not important provided it is sufficient to contain a water depth of 10 mm.

NOTE 1 For materials where leakage between the cylinder and the upper surface of the test piece may occur during the test, a soft, elastic, non-absorbent gasket may be interposed to prevent this. This gasket should have the same internal diameter as the cylinder after clamping.

NOTE 2 To prevent damage to the machined edge of the cylinder caused by clamping it upside down it is advisable to mark the top in some way so that it can be identified readily.

NOTE 3 If a cylinder of a small area is used it is recommended that this should not be less than 50 cm^2. The water depth must still be 10 mm.

6.2 Metal roller, with a smooth face, 200 mm wide, a diameter of 90 mm ± 10 mm and a mass of 10 kg ± 0,5 kg.

6.3 Balance, with an accuracy of 1 mg.

6.4 Timer, reading in seconds and capable of timing up to at least 30 min.

6.5 Graduated cylinder, or other means of measuring appropriate aliquots.

7 Sampling

If the tests are being made to evaluate a lot, the sample shall be selected in accordance with ISO 186. If the tests are made on another type of sample, make sure that the specimens taken are representative of the sample received.

8 Conditioning

Condition the specimens as specified in ISO 187. Keep them in the conditioning atmosphere throughout the test.

9 Preparation of test pieces

Prepare the test pieces in the same atmospheric conditions used to condition the specimens. Avoid contact of the test area with hands or fingers, cut from the specimens at least 10 test pieces of sufficient

size to exceed the diameter of the cylinder by at least 10 mm from any edge, ensuring that the test area is free from visible folds, creases, cracks or other defects.

NOTE For normal apparatus (see 6.1) a width of about 125 mm is suitable.

If watermarks are present, these areas should be avoided if possible. When the specimens available are too small to allow the normal apparatus to be used, a smaller test area may be agreed upon between the interested parties and depending on the corresponding equipment availability.

10 Procedure

Carry out the test in the same atmospheric conditions used to condition the specimens (see Clause 8).

10.1 Mounting of the test piece

Ensure that the upper surface of the base plate and the edge of the cylinder which will come in contact with the test piece are dry before commencing each test.

Weigh the test piece to the nearest 1 mg and place it with the surface to be tested uppermost on the base plate. Place the cylinder with the machined edge in contact with the test piece and clamp sufficiently firmly to prevent any leakage of water between it and the test piece.

10.2 Exposure to water and blotting

For the purposes of this International Standard, the time of test is defined as the time between the moment the water first contacts the test piece and the commencement of blotting.

Pour 100 ml ± 5 ml of water (5.1) or proportionately less for a smaller test area, into the cylinder, thus providing a head of 10 mm and start the timer (6.4) immediately. Use new water for each determination.

The test procedure for any selected exposure time should, where possible, conform to the conditions summarized in 10.3, the exposure time being selected according to the water absorptiveness of the paper and board under consideration. If, for example, a test time of 60 s has been selected, pour off the excess water after 45 s (see Table 1), taking care that no water comes into contact with the surface of the test piece outside the test area. Quickly unclamp the cylinder and remove it. Remove the test piece and place it, test face uppermost, on a sheet of dry blotting paper (5.2) previously placed on a flat rigid surface. 60 s after commencement of the test, place a second sheet of blotting paper on top of the test piece and remove the excess water, using the hand roller (6.2) with two rollings (once forward and once back) without exerting any pressure on the roller.

NOTE 1 On corrugated fibreboard the roller should be applied with its axis parallel to the flutes.

NOTE 2 Where corrugated fibreboard is indented by the cylinder edge or which exhibits “washboarding” it may not be possible for the blotting paper to contact the entire wet area of the test piece. In such cases it is recommended that instead of using the roller, the back of the blotting paper is gently rubbed by hand.

Immediately after blotting, fold the test piece with the wet side inside, and weigh again so that the increase in mass due to absorption of water can be determined before any loss by evaporation occurs.

NOTE 3 In the case of board it may not be possible to fold the test piece. In such cases the second weighing must be carried out with the least possible delay.

Repeat the processes described in 10.1 and above for all the other test pieces so that at least five tests have been carried out on each face of the paper or board required to be tested.

10.3 Times of test

Table 1 specifies the times of tests together with the times at which excess water is removed and the times at which blotting is carried out.

The times of test may be increased according to the water absorptiveness and to the special nature of the paper or board under consideration and by agreement of the interested parties. In all cases, except $Cobb_{30}$, the difference in time between removing excess water and blotting shall be 15 s ± 2 s.

Table 1 — Test times

Recommended times of test s	Symbol	Time at which excess water is removed s	Time at which blotting is carried out s
30	$Cobb_{30}$	20 ± 1	30 ± 1
60	$Cobb_{60}$	45 ± 1	60 ± 2
120	$Cobb_{120}$	105 ± 2	120 ± 2
300	$Cobb_{300}$	285 ± 2	300 ± 2
1 800	$Cobb_{1\,800}$	1 755 to 1 815	15 ± 2 after removing excess water
NOTE The times given in columns three and four are calculated from the moment the water comes into first contact with the test piece (see 10.2).			

10.4 Rejection of test pieces

Reject test pieces which

a) have been penetrated through, by the water; or

b) show signs of leakage around the clamped area; or

c) show excess water after blotting (which is indicated by the gloss of the surface).

If the percentage of rejects due to a) exceeds 20 %, reduce the time of test until a satisfactory result is obtained. If no reduced time is satisfactory, this method is not suitable.

11 Expression of results

11.1 Calculate the water absorptiveness, A, expressed in grams per square metre, to the first decimal place for each test piece from the equation

$$A = (m_2 - m_1)F$$

where

m_1 is the dry mass, in grams, of the test piece;

m_2 is the wet mass, in grams, of the test piece;

F is 10 000/test area (for normal apparatus this is 100 cm^2).

11.2 For each side tested calculate the mean water absorptiveness to the nearest 0,5 g/m^2 and the standard deviation.

11.3 Use a standard notation, for example

$Cobb_{60}$ (value in grams per square metre) at t °C

dependent on the time of the test, in seconds.

11.4 If the faces are not identifiable, give the mean and standard deviation of the grouped results.

12 Test report

The test report shall include the following information:

a) a reference to this International Standard;

b) alI the information necessary for complete identification of the sample;

c) date and place of testing;

d) conditioning atmosphere used;

e) mean and standard deviation of the test results for each face tested expressed as in 11.3;

f) test area if other than 100 cm^2;

g) number of rejected test pieces and the reason for rejection;

h) any circumstances or factors which may have influenced or affected the results.

Annex A
(informative)

Precision

A.1 General

In 2012, 16 laboratories, from 11 European countries, tested two samples according to this International Standard. The data for water absorption $Cobb_{60}$ paper), water absorption $Cobb_{600}$ (board) and water absorption $Cobb_{1800}$ (corrugated board) have been obtained from CEPI-CTS, the Comparative Testing Service of the Confederation of European Paper Industries. The data for water absorption $Cobb_{60}$ (paper) are presented in Clause A.2. The data for water absorption $Cobb_{600}$ (board) are presented in Clause A.3. The data for water absorption $Cobb_{1800}$ (corrugated board) are presented in Clause A.4.

The calculations were made according to ISO/TR 24498[3] and TAPPI T 1200[4]

The repeatability standard deviation reported in Table A.1 is the "pooled" repeatability standard deviation that is, the standard deviation is calculated as the root-mean-square of the standard deviations of the participating laboratories. This differs from the conventional definition of repeatability in ISO 5725-1[1].

The repeatability and reproducibility limits reported are estimates of the maximum difference which should be expected in 19 of 20 instances, when comparing two test results for material similar to those described under similar test conditions. These estimates may not be valid for different materials or different test conditions. Repeatability and reproducibility limits are calculated by multiplying the repeatability and reproducibility standard deviations by 2,77.

NOTE 1 The repeatability standard deviation and the within-laboratory standard deviation are identical. However, the reproducibility standard deviation is NOT the same as the between-laboratories standard deviation. The reproducibility standard deviation includes both the between-laboratories standard deviation and the standard deviation within a laboratory, viz.:

$$s^2_{\text{repeatability}} = s^2_{\text{within lab}} \quad \text{but} \quad s^2_{\text{reproducibility}} = s^2_{\text{within lab}} + s^2_{\text{between lab}}$$

NOTE 2 $2{,}77 = 1{,}96\sqrt{2}$, provided that the test results have a normal distribution and that the standard deviation s is based on a large number of tests.

A.2 Water absorption $Cobb_{60}$ (paper)

See Tables A.1 and A.2.

Table A.1 — Estimation of repeatability ($Cobb_{60}$)

Sample	Number of laboratories	Mean water absorption $Cobb_{60}$ g/m²	Repeatability standard deviation s_r g/m²	Coefficient of variation $C_{V,r}$ %	Repeatability limit r g/m²
Sample 1	16	19,7	0,8	3,9	2,1
Sample 2	15	27,7	0,9	3,4	2,6

Table A.2 — Estimation of reproducibility ($Cobb_{60}$)

Sample	Number of laboratories	Mean water absorption $Cobb_{60}$ g/m²	Reproducibility standard deviation s_R g/m²	Coefficient of variation $C_{V,R}$ %	Reproducibility limit R g/m²
Sample 1	16	19,7	1,4	7,0	4,0
Sample 2	15	27,7	1,4	5,0	3,9

A.3 Water absorption $Cobb_{600}$ (board)

See Tables A.3 and A.4.

Table A.3 — Estimation of repeatability ($Cobb_{600}$)

Sample	Number of laboratories	Mean water absorption $Cobb_{600}$ g/m²	Repeatability standard deviation s_r g/m²	Coefficient of variation $C_{V,r}$ %	Repeatability limit r g/m²
Sample 1	16	96,1	2,2	2,2	6,0

Table A.4 — Estimation of reproducibility ($Cobb_{600}$)

Sample	Number of laboratories	Mean water absorption $Cobb_{600}$ g/m²	Reproducibility standard deviation s_R g/m²	Coefficient of variation $C_{V,R}$ %	Reproducibility limit R g/m²
Sample 1	16	96,1	5,0	4,7	12,5

A.4 Water absorption $Cobb_{1800}$ (corrugated board)

See Tables A.5 and A.6.

Table A.5 — Estimation of repeatability ($Cobb_{1800}$)

Sample	Number of laboratories	Mean water absorption $Cobb_{1800}$ g/m²	Repeatability standard deviation s_r g/m²	Coefficient of variation $C_{V,r}$ %	Repeatability limit r g/m²
Sample 1	14	115	2,5	2,2	6,9

Table A.6 — Estimation of reproducibility ($Cobb_{1800}$)

Sample	Number of laboratories	Mean water absorption $Cobb_{1800}$ g/m²	Reproducibility standard deviation s_R g/m²	Coefficient of variation $C_{V,R}$ %	Reproducibility limit R g/m²
Sample 1	14	115	6,9	7,0	19,0

Bibliography

[1] ISO 5725-1:1994, *Accuracy (trueness and precision) of measurement methods and results — Part 1: General principles and definitions*

[2] ISO 8787:1986, *Paper and board — Determination of capillary rise — Klemm method*

[3] ISO/TR 24498:2006, *Paper, board and pulps — Estimation of uncertainty for test methods*

[4] TAPPI Test method T 1200 sp-07, *Interlaboratory evaluation of test methods to determine TAPPI repeatability and reproducibility*

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SRI LANKA STANDARDS INSTITUTION

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In the International field the Institution represents Sri Lanka in the International Organization for Standardization (ISO), and participates in such fields of Standardization as are of special interest to Sri Lanka.

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