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Paper and board — Determination of water absorptiveness — Cobb method

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



Reference number
ISO 535:1991(E)

Foreword

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Draft International Standards adopted by the technical committees are circulated to the member bodies for voting. Publication as an International Standard requires approval by at least 75 % of the member bodies casting a vote.

International Standard ISO 535 was prepared by Technical Committee ISO/TC 6, *Paper, board and pulps*.

This second edition cancels and replaces the first edition (ISO 535:1976), which has been technically revised.

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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.

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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/m² 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 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 standards contain provisions which, through reference in this text, constitute provisions of this International Standard. At the time of publication, the editions indicated were valid. All standards are subject to revision, and parties to agreements based on this International Standard are encouraged to investigate the possibility of applying the most recent editions of the standards indicated below. Members of IEC and ISO maintain registers of currently valid International Standards.

ISO 186:1985, *Paper and board — Sampling to determine average quality*.

ISO 187:1990, *Paper, board and pulps — Standard atmosphere for conditioning and testing and procedure for monitoring the atmosphere and conditioning of samples*.

ISO 5269-1:1979, *Pulps — Preparation of laboratory sheets for physical testing — Part 1: Conventional sheet-former method*.

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

3 Definition

For the purposes of this International Standard, the following definition applies.

water absorptiveness (Cobb value): The calculated mass of water absorbed in a specified time by 1 m² of paper or board under specified conditions.

NOTE 1 The test area is normally 100 cm².

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/m²).

5 Reagents and materials

5.1 Water, distilled or deionized.

NOTE 2 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/m² ± 25 g/m². 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 $112,8 \text{ mm} \pm 0,2 \text{ mm}$ 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.

NOTES

3 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.

4 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.

5 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 $90 \text{ mm} \pm 10 \text{ mm}$ and a mass of $10 \text{ kg} \pm 0,5 \text{ kg}$.

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

Select specimens in accordance with ISO 186, with no apparent folds, visible cracks, or other defects.

8 Conditioning

Condition the specimens in the standard atmosphere or one of the other conditions specified in ISO 187.

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 6 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 $100 \text{ ml} \pm 5 \text{ ml}$ 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.

NOTES

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

8 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 9 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 Cobb₃₀, 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 cm²).

11.2 For each side tested calculate the mean water absorptiveness to the nearest 0,5 g/m² and the standard deviation.

11.3 Use a standard notation, for example

Cobb₆₀ (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) reference to this International Standard;
- b) all 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 cm²;
- g) number of rejected test pieces and the reason for rejection;
- h) any circumstances or factors which may have influenced or affected the results.

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